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Ready Reference

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How to use the MICROPAEDIA

The 12 volumes of the MICROPAEDIA contain tens of thousands of shorter articles on specific persons, places, things, and ideas, arranged in alphabetical order. The MICROPAEDIA can be used as an information resource on its own; and it can function as support for the longer articles in the MACROPAEDIA (to which it refers whenever appropriate). The MICROPAEDIA in turn is supported by references in the INDEX and by the lists of suggested readings in the PROPAEDIA. Finally, the MICROPAEDIA is the portion of the *Encyclopædia Britannica* best suited for the reader who wishes to browse among the countless subjects in all fields of human learning and history in all times and places.

Alphabetization

Entry titles are alphabetized according to the English alphabet, A to Z. All diacritical marks (such as in ö, ł, or ñ) and foreign letters without parallels in English (such as ayin [ʿ] and hamza [ʾ]) are ignored in the alphabetization. Apostrophes likewise are ignored. Titles beginning with numbers, such as "**1812, War of,**" are alphabetized as if the numbers were written out ("**Eighteen-twelve, War of**").

Alphabetization proceeds according to the "word-by-word" principle. Thus, "**Mount Vernon**" precedes "**mountain**"; any "**John**" entry precedes "**John Henry,**" which in turn precedes "**Johne's disease.**" Any character or string of characters preceding a space, hyphen, dash, or virgule is treated as a word and alphabetized accordingly. Thus, "**De Broglie**" precedes "**debenture,**" "**J/psi particle**" precedes "**jack,**" and "**jack-o'-lantern**" precedes "**jackal.**" Titles with identical spellings are arranged in the following order: (1) persons, (2) places, (3) things.

For many rulers and titled nobility, chronological order, as well as alphabetical order, governs placement. Rulers of the same given name (*e.g.,* William) may be grouped together, separate from other entries, and indicated by the symbol •. They may be subgrouped alphabetically by country and, within each country, arranged chronologically ("**William I,**" "**William II,**" etc.). Nobility or peers of the same titled name (*e.g.,* "**Essex,** EARLS OF") are similarly grouped together, separate from other entries; they are indicated by the symbol • and arranged chronologically.

Places with identical names are in alphabetical order according to the countries in which they are located, with entries on physical features following cities and other political units. Identical place-names in the same country are alphabetized according to the alphabetical order of the state, province, or comparable political subdivision in which they are found. Physical features with identical names that lie on or that cross national borders are alphabetized by the continent in which they are found.

Entry arrangement

The titles of entries are arranged according to the forms commonly found in indexes and dictionaries, with some special conventions.

Entry titles for certain physical features, institutions, structures, events, and concepts are ordinarily inverted to place the substantive word first. Thus, the Bay of Bengal is entered as "**Bengal, Bay of**"; the Bank of England as "**England, Bank of**"; the Tower of London as "**London, Tower of**"; the Siege of Vienna as "**Vienna, Siege of**"; and the balance of power as "**power, balance of.**" If the name of a physical feature, institution, structure, event, or concept has two or more descriptors, it is entered under the descriptor appearing first. Thus, the Episcopal Church in Scotland is entered as "**Episcopal Church in Scotland**" (not "**Scotland, Episcopal Church in**"); the Leaning Tower of Pisa as "**Leaning Tower of Pisa**"; and the kinetic theory of gases as "**kinetic theory of gases.**"

The entries for most Western persons are arranged so that one can read a name in correct order by beginning after the first comma, proceeding to the end of the boldface type, returning to the beginning word or words, and proceeding forward to the first comma. Thus, the entry "**March, Patrick Dunbar, 2nd earl of,**" is read "Patrick Dunbar, 2nd earl of March"; the entry "**Orléans, Louis, duc d',**" is read "Louis, duc d'Orléans." Names of Far Eastern origin are given in Oriental order, with the surname preceding the personal name (*e.g.,* "**Tōjō Hideki,**" "**Deng Xiaoping,**" "**Nguyen Cao Ky**").

Cross-references

Some cross-reference entries appear in the MICROPAEDIA for the purpose of leading a reader from names that are familiar to alternate names that may not be. Cross-references also appear frequently within or at the ends of standard entries, where they are identified by *see, see also, see under, q.v.* (*quod vide,* "which see"), or *qq.v.* (*quae vide,* "which see," plural).

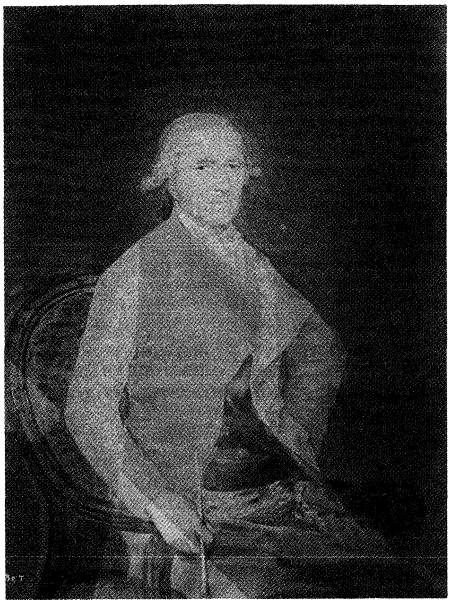
Certain entries serve both as relatively brief essays on general subjects and as cross-references to the same subjects treated at greater length and in greater depth in the MACROPAEDIA. Such an entry (*e.g.,* "**igneous rock**") begins with a definition of the subject and then provides the following cross-reference: "A brief treatment of igneous rocks follows. For full treatment, *see* MACROPAEDIA: Minerals and Rocks.

Entries on certain broad subjects (*e.g.,* "**music**") direct the reader to several relevant articles in the MACROPAEDIA and also to the PROPAEDIA for listings of related articles in the MICROPAEDIA.

Abbreviations

Abbreviations used in the MICROPAEDIA are given in a list that appears at the end of every MICROPAEDIA volume.

Bayeu (y Subías), Francisco (b. March 9, 1734, Zaragoza, Spain—d. Aug. 4, 1795, Madrid), painter, the brother-in-law of Francisco



"The Painter Francisco Bayeu," oil painting by Francisco de Goya; in the Prado, Madrid
SCALA—Art Resource/EB Inc.

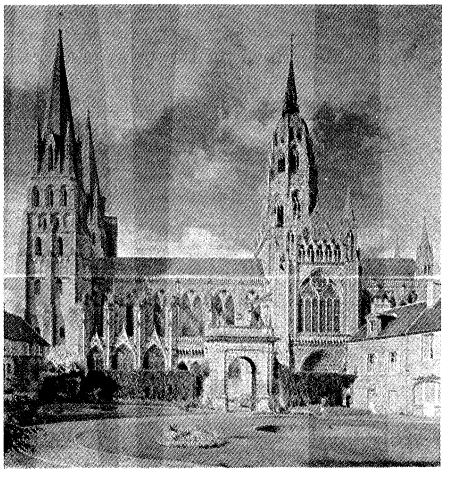
de Goya and court painter to King Charles III of Spain. Considered by his contemporaries to be the finest Spanish painter of the period, he was greatly influenced by Anton Raphael Mengs and the Italian Giovanni Battista Tiepolo, both painters at the court of Charles.

After studying in Zaragoza under José Luzán Martínez and in Madrid under Antonio González Velázquez, Bayeu was called by Mengs to assist in the decoration of the royal palace in 1763. He created frescoes for the cathedral of El Pilar in Zaragoza, Toledo cathedral, and the royal palaces in Madrid, El Pardo, La Granja, and Aranjuez. Bayeu's mature style was a mixture of French Rococo and the academic classicism of Mengs. Although his drawings, hundreds of which have been preserved, are beautifully animated, his finished frescoes have an academic stiffness. His brothers Ramon and Manuel were also painters.

Bayeux, town, Calvados *département,* Basse-Normandie region, northwestern France, cradle of the Norman ducal dynasty, on the Aure River, northwest of Caen. As Bajocasses, it was a capital of the Gauls, then, as Augustodurum and, later, Civitas Baiocassium, it was an important Roman city that became a bishopric in the 4th century. Captured in 880 by Rollo the Viking, it became a Norman stronghold. While Rouen was completely Gallicized, Bayeux remained Norse-speaking. During the quarrels between the sons of William the Conqueror, Henry I of England pillaged the town in 1106. Bayeux was besieged and taken on several occasions during the Hundred Years' War and the 16th-century Wars of Religion. Occupied by the Germans in June 1940, it was the first town liberated by the Allies (June 7, 1944) and the first to receive Gen. Charles de Gaulle (June 14) on his promised return to France.

A bypass encloses the town, which is in part modern and in part medieval, with half-timbered houses and cobbled streets. Its Gothic cathedral, mainly 13th century, has an 11th-century crypt. The Bishop's Palace (11th–14th century) now serves as the *hôtel de ville,* law courts, and art gallery. The renowned Bayeux Tapestry, telling the story of the Norman conquest of England, is displayed in the palace in the Musée de la Tapisserie de la Reine-Mathilde (Musée de Bayeux), a vast room especially designed for it.

Bayeux processes dairy foods and manufactures lace and plastics. Pop. (1982) 14,568.



The Gothic cathedral, Bayeux, Fr.
Club Iris

Bayeux Tapestry, medieval embroidery depicting the Norman Conquest of England, remarkable as a work of art and important as a source for 11th-century history. The "tapestry" is a band of linen 231 feet long and 19½ inches wide, now light brown with age, on which are embroidered more than 70 scenes

English axman in combat with Norman cavalry during the Battle of Hastings, detail from the Bayeux Tapestry; in the Musée de la Tapisserie de la Reine-Mathilde, in the former Bishop's Palace, Bayeux, Fr.
Giraudon—Art Resource/EB Inc.

of the Conquest, beginning with Harold's visit to France and ending with the English flight from the Battle of Hastings. Along the top and bottom run decorative borders, and through the pictured story is stitched a Latin narrative.

The tapestry dates from the 11th century and was probably commissioned by William the Conqueror's half brother Odo, bishop of Bayeux, in Normandy. Displayed in the nave of the Bayeux Cathedral from the end of the 15th century, it was "discovered" there by Bernard de Montfaucon in the early 18th century and was moved several times until a permanent display room was designed for it in the former Bishop's Palace in Bayeux. The tapestry is especially valuable for its detail of military equipment and tactics.

Bayezid, also spelled BĀYAZĪD, name of Ottoman sultans grouped below chronologically and indicated by the symbol •.

• **Bayezid I,** byname YILDIRIM (The Thunderbolt) (b. *c.* 1360—d. March 1403, Akşehir, Ottoman Empire), Ottoman sultan in 1389–1402 who founded the first centralized Ottoman state based on traditional Turkish and Muslim institutions and who stressed the need to extend Ottoman dominion in Anatolia.

In the early years of Bayezid's reign, Ottoman forces conducted campaigns that succeeded in controlling vast Balkan territories. Later, Venetian advances in Greece, Albania, and Byzantium and the extension of Hungarian influence in Walachia and Danubian Bulgaria compelled Bayezid to blockade Constantinople (1391–98), to occupy Tirnova, in what is now Bulgaria (July 1393), and to conquer Salonika (April 1394). His invasion of Hungary in 1395 resulted in a Hungarian–Venetian crusade against the Ottomans. Bayezid inflicted a crushing defeat on the crusaders at Nicopolis (Sept. 25, 1396).

To build a strong Islāmic and Turkish base for his domain, Bayezid began to widen Ottoman suzerainty over the Turkish-Muslim rulers in Anatolia. He annexed various Turkmen emirates (or principalities) in Anatolia and defeated the Karaman emirate at Akçay (1397). These conquests brought Bayezid into conflict with the Central Asian conqueror Timur (Tamerlane), who claimed suzerainty over the Anatolian Turkmen rulers and offered refuge to those expelled by Bayezid. In a confrontation between Bayezid and Timur in Çubukovası near Ankara (July 1402), Bayezid was defeated; he died in captivity.

• **Bayezid II,** byname BAYEZİD ADLÎ (Turkish: Bayezid the Just) (b. December 1447/January 1448?, Demotika, Thrace, Ottoman Empire—d. May 26, 1512, Demotika), Ottoman sultan (1481–1512) who consolidated Ottoman rule in the Balkans, Asia Minor, and the eastern Mediterranean and successfully opposed the Ṣafavīd dynasty of Persia.

Bayezid II was the elder son of the sultan Mehmed II, the conqueror of Constantinople. On the death of his father in 1481, his brother Cem contested the succession. Bayezid supported by a strong faction of court officials at Constantinople, succeeded in taking the throne. Cem eventually sought refuge with the Knights of Saint John at Rhodes and remained a captive until his death in 1495.

Under the new reign an immediate reaction set in against some of the policies of Mehmed II. Influenced by the *'ulamā',* interpreters of the law of Islām, and by the great officials aligned with them, Bayezid restored the Muslim properties dedicated to religious and

charitable purposes that Sultan Mehmed had taken over for the state. Bayezid also rejected his father's marked pro-European orientation by such acts as removing from the imperial palace the paintings that Italian artists had executed for Mehmed II.

At the same time, Bayezid II continued the territorial consolidation his father had begun. Hercegovina, in the Balkans, was brought under direct Ottoman control in 1483. The occupation, in 1484, of two fortresses on the estuaries of the Danube and the Dnestr strengthened the hold of the Ottomans over the land route to the Crimea, where the Khan of the Krim Tatars had been, in name at least, a vassal of the Sultan since 1475. The war of 1499–1503 directed against the Venetian empire in the Levant and in the Balkans carried the process of consolidation still further. It resulted in the Ottoman conquest of Venetian strongholds in Morea (Peloponnesus) and on the Adriatic shore—a triumph amply justifying the program of naval construction that Bayezid had approved in the years before the beginning of the war.

With the expansion of his rule over much of Asia Minor, Bayezid had earlier come into conflict with the Mamlūk sultanate of Egypt and Syria, each side striving to dominate the ill-defined border zones dividing them and to maintain under effective control the small principalities established there. While a Turkish fleet had sufficed to dismantle a large part of Venice's empire, Bayezid, fearing that an alliance of Christian powers using his brother Cem might be formed against him, committed only a modest force against the Mamlūks. The long land war ended in a stalemate.

More formidable still was the situation that arose in the lands to the east of Asia Minor. In 1499 the adherents of the Ṣafavīds, a heretical order of Islām, had set out to establish in Persia a powerful regime under their master Esmāʿīl I. The religious teaching of the Ṣafavīds had met with great success among the nomadic Turkmen tribes of Asia Minor, whose warriors formed the main element in the armies of Shah Esmāʿīl (or Ismāʿīl). It was evident that the propaganda of the Ṣafavīds, if allowed to continue without hindrance, might well undermine Ottoman rule within the Asiatic lands. The danger was underlined in 1511, when the adherents of the Shah rose in rebellion against the Ottomans in Asia Minor.

Bayezid II, miniature by an unknown Ottoman artist, *c.* 1580; in the Topkapı Saray Museum, Istanbul

By courtesy of the Topkapı Saray Museum, Istanbul

At this same time a dispute over the succession broke out between Bayezid's sons. One of them, Selim, the governor of Trebizond, went to the Crimea in 1511, secured aid there from the Tatar khan, and then crossed the Danube into the Balkans. Defeated in battle against Bayezid, Selim fled to the Crimea. Meanwhile, the Ṣafavīd rebellion had been put down; and Ahmed, another son, who had shared in the victory, marched toward Constantinople. Failing to gain the support of the Janissaries (elite military guards) he turned back to bring most of Asia Minor under his control. Bayezid, fearing that Ahmed might seek assistance from Shah Esmāʿīl and unable to resist pressures from some of his advisers and from the corps of Janissaries, who favoured Selim, recalled Selim from the Crimea and abdicated (April 1512) in his favour. He died the following month.

Bayezid II, known to his people as Adlî, was a pious Muslim, strict in his observance of the precepts of the Qurʾān and the Islāmic law. During his reign, much of the state revenue was devoted to the building of mosques, colleges, hospitals, and bridges. He also supported jurists, scholars, and poets, both within and outside the Ottoman Empire. In temperament "molto melancolico, superstizioso e ostinato" ("very melancholic, superstitious, and stubborn"), in the words (1503) of the Venetian ambassador, Bayezid was interested in philosophical and cosmographical studies.

(V.J.P.)

BIBLIOGRAPHY. J. von Hammer-Purgstall, *Histoire de L'Empire Ottoman,* vol. 3–4 (1835–43), a fundamental work based mainly on sources in Ottoman Turkish; S.N. Fisher, *The Foreign Relations of Turkey, 1481–1512* (1948), a most useful monograph based extensively on Venetian source materials; D.M. Vaughan, *Europe and the Turk: A Pattern of Alliances, 1350–1700* (1954); the *New Cambridge Modern History,* vol. 1, pp. 395–419 (1957); and the *Cambridge History of Islam,* vol. 1, pp. 308–314 (1970), three works that serve to illustrate the present attitude of historical scholarship toward Bayezid II; the article "Bāyazīd II," in the *Encyclopaedia of Islam,* 2nd ed. (1960), the standard work of reference for Orientalist scholars (with bibliography).

Bayinnaung, also called BRAGINOCO (fl. late 16th century), king of the Toungoo dynasty in Burma (reigned 1551–81), who unified his country and conquered the Shan States and Siam (now Thailand), making Burma the most powerful kingdom in mainland Southeast Asia.

In 1550 a revolt broke out among the Mons of Lower Burma, and Bayinnaung's brother-in-law, Tabinshwehti, was assassinated at Pegu in 1551 by a Mon prince. Bayinnaung marched to Toungoo, eliminated a pretender to the throne, and proclaimed himself king; then he marched south, captured the city of Pegu, and executed the rebel leader, Smim Htaw. The other Mon rulers then surrendered and the revolt was at an end. Bayinnaung made Pegu his capital, as Tabinshwehti had.

In 1554 Bayinnaung set out against Shan chiefs, who occupied the ancient Burmese capital of Ava. He captured it the following year. The Shans were placed under Burmese suzerainty. Bayinnaung was then in a position to attack his most powerful enemy, Siam.

In 1563 Bayinnaung took as a pretext for war the refusal of the Siamese to acknowledge his suzerainty. The following year he captured the Siamese capital of Ayutthaya and brought the Siamese royal family to Burma as hostages. In 1568, when a revolt flared up, Bayinnaung again invaded Siam. Because the Siamese put up fierce resistance, Ayutthaya was not captured until August 1569. The Burmese king installed a new vassal on the throne and deported thousands of Siamese into Burma as slaves. The Burmese dominated Siam for more than 15 years; they were expelled by a liberation movement led by a Siamese prince, Naresuan (reigned 1590–1605).

Bayinnaung was a patron of Buddhism; he built pagodas, gave generous donations to monasteries, and maintained extensive diplomatic relations with the Buddhist kingdom of Ceylon. When Pegu was burned in a Mon revolt in 1564, he rebuilt it on an even grander scale, making one of the richest cities in Southeast Asia.

Baykalskoye Ozero (Siberia): *see* Baikal, Lake.

Baykonyr, also spelled BAIKONUR, or BAJKONUR, also called TYURATAM, Soviet space centre in Kyzl-Orda *oblast* (administrative region), south central Kazakh Soviet Socialist Republic. Baykonyr is a Soviet code name for the centre, but U.S. analysts often call it Tyuratam, after the name of the railroad station at Leninsk, the nearest large city. (The location of the site has been confirmed by official visits by French prime ministers [1966 and 1970] and by U.S. astronauts preparing for joint U.S.–U.S.S.R. missions [1975].) The Soviet Union's secretiveness about its exact location has led to confusion of the site with another Baykonyr, located about 200 mi (320 km) west in a desert area of Dzhezkazgan *oblast.*

Satellite photographs indicate a built-up area of about 3 by 5 mi located on the north bank of the Syrdarya (*darya,* river), about 100 mi northwest of Kyzl-Orda. The facility and supporting town (Leninsk) were originally built in the mid-1950s as a long-range-missile centre, which was later expanded to include space flight facilities. Several historic flights originated there: that of the first artificial satellite (1957), the first manned orbital flight (Yury Gagarin; 1961), and the flight of the first woman in space (Valentina Tereshkova; 1963). The town supporting the facility was raised to city status in 1966 and named Leninsk. The facility remained the base of a still-active space program in the early 1980s. Pop. (mid-1970s) Leninsk, about 50,000.

Bayle, Pierre (b. Nov. 18, 1647, Carla-le-Comte, Fr.—d. Dec. 28, 1706, Rotterdam), philosopher whose *Dictionnaire historique et critique* was roundly condemned by the French Reformed Church of Rotterdam and by the French Catholic Church because of its numerous annotations deliberately designed to destroy orthodox Christian beliefs.

Bayle was the son of a Calvinist minister and briefly embraced Catholicism in 1669. He acted as tutor, then taught philosophy (1675–81) at the Protestant Academy of Sedan. After moving to Rotterdam in 1681 to teach philosophy and history, he published (1682) his anonymous reflections on the comet of 1680, deriding the superstition that comets presage catastrophe. He also questioned many Christian traditions, thus arousing the ire of a Calvinist colleague, Pierre Jurieu. Bayle's plea for religious toleration (even for atheists) eventually convinced Jurieu that Bayle was an atheist in disguise. The rift between the two was complete when Bayle advocated a conciliatory attitude toward the anti-Calvinist government of Louis XIV; in 1693 Bayle was deprived of his Rotterdam professorship.

Thereafter, Bayle devoted himself to his famous *Dictionnaire* (1697), ostensibly a supplement to Louis Moreri's dictionary but in fact a work of considerable originality. In this encyclopaedic work the articles themselves—on religion, philosophy, and history—are little more than summary expositions. The bulk of the *Dictionnaire* consists of quotations, anecdotes, commentaries, and erudite annotations that cleverly undo whatever orthodoxy the articles contain. Vehement objections were voiced, particularly to the article "David," to

the bias in favour of Pyrrhonistic (radical) skepticism, atheism, and epicureanism, and to the use of Scripture to introduce indecencies. This oblique method of subversive criticism was adopted by 18th-century encyclopaedists.

Bayle was convinced that philosophical reasoning led to universal skepticism, but that nature compelled man to accept blind faith, an extremely popular view in the early 18th century. Bayle's last years were troubled by allegations that he was conspiring with France to detach the Dutch from their Anglo-Austrian alliance. On his death, however, foe and friend alike lamented the passing of a great intellectual.

BIBLIOGRAPHY. Jean Delvolve, *Religion, critique, et philosophie positive chez Pierre Bayle* (1906); Howard Robinson, *Bayle the Skeptic* (1931).

Baylebridge, William, pseudonym of CHARLES WILLIAM BLOCKSIDGE (b. Dec. 12, 1883, Brisbane, Queen., Australia—d. May 7, 1942, Sydney), poet and short-story writer considered one of the leading writers of Australia in his day.

The son of an auctioneer, he was educated in Brisbane, then at the age of 25 went to England, where he published his first booklet of verse, *Songs o' the South* (1908). He also travelled to France and Egypt. He returned to Australia in 1919 and published more than 20 books and booklets of verse in private, limited editions.

His work leans heavily on Elizabethan and German models. The best known volumes of his verse are *Love Redeemed* (1934) and *This Vital Flesh* (1939); some excellent short stories about World War I were collected in *Anzac Muster* (1921).

Baylis, Lilian Mary (b. May 9, 1874, London—d. Nov. 25, 1937, London), theatrical manager and founder of the Old Vic as a centre of Shakespearean productions.

Baylis received a musical education, appeared as a child prodigy in London, and went with

Lilian Baylis

By courtesy of the Mander and Mitchenson Theatre Collection, London

her parents, who were singers, to South Africa in 1890. She returned to England in 1898 to assist her aunt, Emma Cons, who had turned the Royal Victoria Theatre into a temperance hall under the name of the Royal Victoria Coffee Music Hall. Taking complete control in 1912, Lilian Baylis created the Old Vic, world famous as the home of Shakespearean production, and in 1931 took over the derelict Sadler's Wells Theatre and made it a centre of opera and ballet; its company became, in 1956, the Royal Ballet. Lilian Baylis was created a companion of honour in 1929.

Bayliss, Sir William Maddock (b. May 2, 1860, Wolverhampton, Staffordshire, Eng.—d. Aug. 27, 1924, London), British physiologist, co-discoverer (with the British physiologist Ernest Starling) of hormones; he conducted pioneer research in major areas of physiology, biochemistry, and physical chemistry.

Bayliss studied at University College, London, and Wadham College, Oxford. He began a long and profitable collaboration with Starling soon after he obtained a teaching post at University College, London (1888), where he became professor of general physiology (1912–24). Their study in the 1890s of nerve-controlled contraction and dilation of blood vessels resulted in the development of an improved hemopiezometer (a device for measuring blood pressure). Observation of intestinal movements led to their discovery of the peristaltic wave, a rhythmic contraction that forces forward the contents of the intestine.

Bayliss and Starling are best known, however, for determining, in 1902, the chemical substance that stimulates the secretion of pancreatic digestive juices—the first example of hormonal action. In a famous experiment performed on anesthetized dogs, they showed that dilute hydrochloric acid, mixed with partially digested food, activates a chemical substance in the epithelial cells of the duodenum. They found that this activated substance, which they called secretin, released into the bloodstream, comes into contact with the pancreas, where it stimulates secretion of digestive juice into the intestine through the pancreatic duct. They coined the term hormone (Greek *horman*, "to set in motion") to describe specific chemicals, such as secretin, that stimulate an organ at a distance from the chemical's site of origin.

Bayliss went on to demonstrate how the enzyme trypsin was formed from inactive trypsinogen in the small intestine and to measure precisely the time required for a trypsin solution to digest specific quantities of protein.

Bayliss' World War I investigation of wound shock led him to recommend gum-saline injections that were responsible for saving many lives. He wrote *The Nature of Enzyme Action* (1908) and *The Vaso-Motor System* (1923); his best known work is *Principles of General Physiology* (1915), considered to be the best text on the subject at that time. He was knighted in 1922.

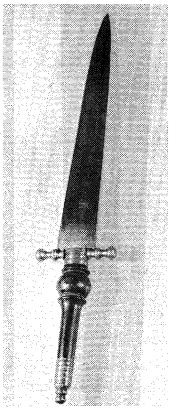
Baylor, Elgin (b. Sept. 16, 1934, Washington, D.C.), U.S. professional basketball player (6 ft 5 in.) who is regarded as one of the game's greatest forwards.

Baylor was an All-American (1958) at Seattle University (1955–58). He signed with the National Basketball Association (NBA) Lakers (Minneapolis and, later, Los Angeles) in 1958 and played for them until his retirement in 1971. During his 14-year career he had a game point average of 27.4, with a 38.2 average in the 1961–62 season. His 71 points in a 1960 game was an NBA record until broken by Wilt Chamberlain's 100 (1962). Baylor was elected to the Basketball Hall of Fame in 1976.

Baynes, Thomas Spencer (b. March 24, 1823, Wellington, Somerset, Eng.—d. May 31, 1887, London), man of letters who was editor of the ninth edition of *Encyclopædia Britannica* up to and including the 11th volume and who thereafter continued the work in partnership with William Robertson Smith. Bold and progressive in his planning of the edition, Baynes used his reputation as a scholar to persuade authors of "brilliance and character" to contribute. He himself wrote the *Britannica* article on Shakespeare.

bayonet, short, sharp-edged, sometimes pointed weapon, designed for attachment to the muzzle of a firearm and developed, according to tradition, in Bayonne, Fr., early in the 17th century. The Maréchal de Puységur described the earliest bayonets as having a straight, double-edged blade a foot long with a tapering wooden handle, of equal length, that could be inserted into the muzzle of a musket. The new weapon, considerably shortened, spread through Europe and supplanted the pike.

The plug bayonet, as this first type was called, had some serious defects; once it was inserted into the muzzle, the gun could not be fired, and if driven in too tightly, it could not easily be removed. Before 1689 a new bayonet was developed with loose rings on the haft to fit around the muzzle. This design was in turn superseded by the socket bayonet that the military engineer Sébastien Le Prestre de Vauban



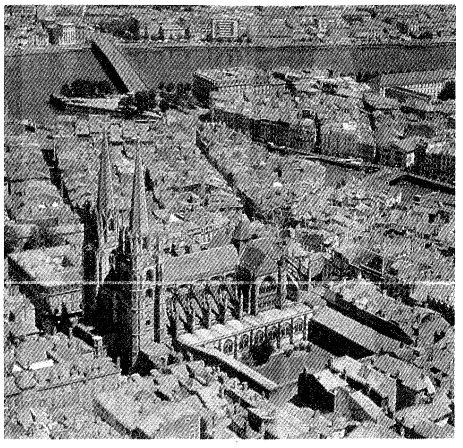
Plug bayonet, 17th century

By courtesy of the West Point Museum Collections, United States Military Academy

introduced into the French Army in 1688. Vauban's bayonet had a sleeve that slipped over the muzzle and was held in place by a stud on the barrel that locked in a right-angled slot in the socket. The blade was normally triangular in cross section. With minor alterations, Vauban's socket bayonet remained the basic form. In the 19th century some were equipped with saw teeth and could be used as engineering tools. Others were designed for use as entrenching tools.

The development of repeating firearms greatly reduced the combat value of the bayonet. Nevertheless, it was retained through World Wars I and II, though shortened into an all-purpose knife, equipped with a hand grip and carried in a scabbard when not affixed to a rifle.

Bayonne, town, Pyrénées-Atlantiques *département,* Aquitaine region, southwestern France, at the confluence of the Nive with the Adour River, 5 mi (8 km) from its mouth. With Biarritz, the noted Atlantic resort, it forms an urban concentration. As Lapurdum, it was the chief port of Roman Novempopulania, and the coastal zone is still called the Pays de Labourd. The present name is thought to be Basque in origin. Traditionally it was the Bayonne Basques who first used the bayonet. Grand Bayonne on the left bank of the Nive, behind fortifications designed by the 17th-century French military engineer Sébastien Le Prestre de Vauban, contains the Château Vieux and the Cathédral de Sainte-Marie (13th–16th century, with two 19th-century



Bayonne, Fr., and the Nive River with the Cathédral de Sainte-Marie

Club Iris

towers [210 ft; 64 m]). Across the river in Petit Bayonne are the Château Neuf, the arsenal, and the Musée Basque. Downstream, on the right bank of the Adour, are the port and industrial complexes of Le Boucau and Forges. Formerly busy with imports of English coal and Spanish ores, Bayonne languished until oil production was started at Parentis-en-Born and natural gas was discovered at Lacq in the 1950s. There are associated petrochemical industries, and sulfur and natural gas are extracted. It is still a port for tunny (tuna) fishermen. Pop. (1982) 40,088.

Bayonne, city, Hudson County, northeastern New Jersey, U.S., on a 3-mi (5-km) peninsula between Newark and Upper New York bays, adjacent to Jersey City and within the Port Authority of New York and New Jersey. Bayonne is connected with Staten Island (south) by a bridge over Kill Van Kull. Settled by Dutch traders in 1646, it was known as Konstable Hoeck (Constable Hook) until 1869, when it was consolidated with Bergen Point, Centerville, and Salterville and incorporated as Bayonne. Since 1875 it has been a centre for oil refining, and it is the northern terminus for several pipeline systems, including the Big Inch (1,476 mi long) from Longview, Texas. Manufactures include machinery, textiles, and chemicals. It has extensive docks and shipyards and a U.S. Army ocean terminal. Pop. (1980) 65,047.

bayram (Islām): *see* ʿīd.

Bayreuth, city, Bayern *Land* (Bavaria state), eastern West Germany, on the Roter (Red) Main River between the Fichtelgebirge (mountainous plateau) and the Franconian Jura, northeast of Nürnberg. First mentioned in 1194, it developed around a castle of the counts of Andechs-Meran and occupied a strategic position at the intersection of several trade routes. After the house of Andechs-Meran died out, Bayreuth passed to the Hohenzollerns in 1248 and became an important centre of the Upper Franconia region. In 1603 the city became the residence of the margraves, who actively patronized the arts and were responsible for many fine Baroque buildings. The reign of the margrave Frederick and his wife, Wilhelmina, the sister of Frederick the Great, was a particularly rich period (1735–63). The New Palace, the old opera house, and parts of the Hermitage (Eremitage) date from that era. Bayreuth was ceded to Prussia in 1791 and passed to Bavaria in 1810.

The city is best known for its association with the composer Richard Wagner. He settled there in 1872, and the foundation stone of the Festival Theatre (Festspielhaus) was laid that same year. It opened in 1876 with the premiere performance of the *Ring of the Nibelungen* cycle. After Wagner's death in 1883, the festivals were carried on by his wife, Cosima, his son Siegfried, and, since 1951, his grandsons Wolfgang and Wieland. The composer's home, villa Wahnfried, has been preserved; the graves of the composer and his wife are in the garden. The composer Franz Liszt and the writer Jean Paul Friedrich Richter are also buried in Bayreuth. The annual music festivals, held in July and August, are a significant factor in Bayreuth's economy.

The University of Bayreuth opened in 1975, and the city is also the site of two education faculties of the University of Erlangen-Nürnberg. Manufactures include machinery, textiles, chemicals, pianos, porcelain, and glassware. Pop. (1983 est.) 70,957.

Bayrisches Meer (West Germany): *see* Chiemsee.

Bayrūt, *muḥāfaẓah* (governorate), nearly coterminus with Beirut city (its administrative centre), west central Lebanon, fronting the Mediterranean Sea to the west and north. It consists of part of the coastal plain at the foot of the Lebanon Mountains. It borders Jabal Lubnān *muḥāfaẓah* to the east and south. The governorate has an area of 26 sq mi (67 sq km) and grows citrus fruit, bananas, and vegetables. Its traditional role as the hub and cosmopolis of the Middle East was shattered by the Lebanese civil war. Major economic activities were centred on trade, banking, and tourism. In addition to Beirut city, Byblos (Jubayl) is a major town. Pop. (1970 est.) 475,000.

Bayrūt (Lebanon) *see* Beirut.

Baysān (Israel): *see* Bet She'an.

Bayt al-Muqaddas (Israel): *see* Jerusalem.

Bayt Laḥm (Israeli-occupied Jordan): *see* Bethlehem.

Bayt Mirsham, Tall (Jordan): *see* Kiriath-sepher.

Baytown, city, Harris County, southeastern Texas, U.S., on Galveston Bay, 22 mi (35 km) east of Houston. The area was settled in 1822; in 1864 a Confederate shipyard was built at Goose Creek. The unincorporated community of Baytown was annexed by Pelly (incorporated 1920) in 1945; in 1948 Pelly and Goose Creek (incorporated 1919) were consolidated to form the present city of Baytown. Oil (discovered locally in 1916) is shipped from docks on the Houston Ship Channel at Baytown, which has oil refineries, petrochemical and synthetic-rubber plants, and steel-plate mills. Lee College (1934) is located in the city. Pop. (1980) 56,923.

Baza, city, Granada province, in the autonomous community (region) of Andalusia, southern Spain, at the foot of the Sierra de Baza, northeast of Granada city. The city contains the ruins of a Moorish fort (*alcazaba*), and the Gothic collegiate church of Santa María is on the site of the old Gothic cathedral. Called Basti by the Romans and Baṣṭah by the Moors, the city was an episcopal see before the Moorish conquest and later became one of the chief cities of the kingdom of Granada. Its capture by the forces of the Catholic monarchs Ferdinand and Isabella, in 1489, was a famous episode in the history of the Reconquista (reconquest). French Marshal Nicolas-Jean de Dieu Soult won a victory over Spanish forces nearby during the Peninsular War (Aug. 10, 1810). Manufactured products include cement, pottery, and esparto fibre. There are mineral springs in the vicinity. Pop. (1981) 20,609.

bazaar, originally, a public market district of a Persian town. From Persia the term spread to Arabia (the Arabic word *sūq* is synonymous), Turkey, and North Africa. In India it came to be applied to a single shop; and in current English usage it is applied both to a single shop or concession selling miscellaneous articles and to a fair at which such miscellany is sold, often for charity.

The familiar bazaar of the ancient Islāmic nations is vividly described in the traditional folktales of *The Thousand and One Nights.* It is a distinct quarter of the town, access to which is forbidden after sundown, bustling and noisy by day, in contrast to the quiet residential quarters. Such a bazaar may be divided into districts, with all the purveyors of one type of merchandise grouped together. In smaller towns the bazaar consists of a single narrow street of stalls. In larger cities, such as Istanbul, it consists of many miles of such passageways. Some bazaars, such as those built at Kāshān and Isfahan (in Iran) in the 17th century, were designed with great architectural integrity. They were usually roofed for protection against the hot desert sun, either with a single roof, with individual vaulted cupolas or domes, or with awnings. Most ancient bazaars have gradually been modernized over the centuries.

Bazaar in Marrakech, Mor.
Shostal Assoc.—EB Inc.

Bazaine, Achille (-François) (b. Feb. 13, 1811, Versailles, Fr.—d. Sept. 28, 1888, Madrid), marshal of France who, after distinguished service during the Second Empire, was sentenced to death for his surrender of Metz and 140,000 men to the Germans on Oct. 27, 1870, during the Franco-German War.

Bazaine, detail from a lithograph by Jean-Baptiste-Adolphe Lafosse, 1869
By courtesy of the Bibliotheque Nationale, Paris

Bazaine was commissioned second lieutenant in 1833. As a colonel he led a brigade in the Crimean War and in 1855 was promoted to major general and appointed governor of Sevastopol. In the Franco-Sardinian war against Austria, he captured Solferino (June 24, 1859). Sent to Mexico in 1863, he conquered Puebla in May of that year, became commander of

the French expeditionary force, and was promoted to marshal on Sept. 5, 1864.

On Aug. 10, 1870, just after the first major battle of the Franco-German War, Bazaine was appointed commander in chief. After a few indecisive engagements he withdrew into the entrenched camp at Metz. After the French defeat at Sedan (September 1), he negotiated with Otto von Bismarck, the Prussian chancellor, and on October 27 surrendered with his army of 140,000 men still intact.

For this action, Bazaine was sentenced, on Dec. 10, 1873, by a military court to degradation and death. Marshal Patrice de Mac-Mahon, then president of the French Republic, commuted the sentence to 20 years' imprisonment. Bazaine escaped on Aug. 9, 1874, and died in exile and poverty.

Bazalgette, Sir Joseph William (b. March 28, 1819, Enfield, Middlesex, Eng.—d. March 15, 1891, London), civil engineer who designed the main drainage system for London.

After working on drainage and reclamation projects in Northern Ireland, Bazalgette became a consulting engineer at Westminster (1842). Seven years later he joined the London Metropolitan Commission of Sewers, becoming chief engineer in 1852. He was appointed chief engineer to the Metropolitan Board of Works in 1855.

Financial problems and conflicts among consultants held back work on the London drainage system until 1859. The system, containing 83 miles of intercepting sewers, was opened in 1865 and fully completed in 1875. Other works by Bazalgette included embankments—the Victoria, Albert (1860–70), and Chelsea (1871–74)—Northumberland Avenue (1876), new bridges at Putney and Battersea, and the Woolwich steam ferry. He was knighted in 1874 and served as president of the Institution of Civil Engineers (1883–84).

Bazaruto Island, Portuguese ILHA DO BAZARUTO, island, Inhambane province, Mozambique, East Africa, situated in the Mozambique Channel of the Indian Ocean, about 15 mi (24 km) offshore from the town of Inhassoro and 130 mi southwest of Beira. Prior to independence (1975) it was one of Africa's most important game-fishing centres. It lies in the coastal waters where a developing fishing industry now produces significant shrimp exports. Its strategic location led to reports in 1976 that the island would be the site of a naval and air base for the Soviet Union, granted in exchange for military aid.

Bazille, Jean-Frédéric (b. Dec. 6, 1841, Montpellier, Fr.—d. Nov. 28, 1870, Beaune-la-Rolande), painter, who, as friend, benefactor, and colleague of the Impressionists, played an important role during the movement's formative years.

Bazille was an unenthusiastic medical student before his wealthy parents permitted him to study painting. While a student in Paris, he met Monet and Renoir, with whom he worked, travelled, and shared his studio when they could not afford their own. He exhibited at the Salons of 1866 and 1868; in the latter, his "Family Reunion" (Louvre, Paris) had some success. As a painter he combined a certain naiveté with a delicate feeling for nature and an exquisite sense of colour. His landscape figures are strangely immobile and have a sculptural, hard-edge quality. Bazille, who seemed destined to occupy a prominent place among the Impressionists, was killed in the Franco-Prussian War.

Bazin, Henri-Émile (b. Jan. 10, 1829, Nancy, Fr.—d. Feb. 7, 1917, Dijon), engineer and member of the French Corps des Ponts et Chaussées (Corps of Bridges and Highways) whose contributions to hydraulics and fluid mechanics include the classic study of water flow in open channels.

He worked as an assistant to the noted hydraulic engineer H.-P.-G. Darcy (1803–58), after whose death Bazin finished his program of tests on resistance to water flow in channels, the results of which were published in 1865.

Bazin then carried his study over into the problem of wave propagation and the contraction of fluid flowing through an orifice. In 1854 he enlarged the Canal de Bourgogne and made it profitable for commercial navigation. In 1867 he suggested the use of pumps for dredging rivers, leading to the construction of the first suction dredgers.

Bazin became chief engineer of the Corps des Ponts et Chaussées in 1875 and was placed in charge of the Bourgogne canal system; he became inspector general in 1886. He retired in 1900 and was elected to the French Academy of Sciences in 1913.

Bazin, Hervé, pseudonym of JEAN-PIERRE-MARIE HERVÉ-BAZIN (b. April 17, 1911, Anger, Fr.), poet, novelist, short-story writer, and great-nephew of the Catholic traditionalist novelist René Bazin; he introduced vitality to the current of Naturalism in post-World War II French fiction.

After solid academic training, years of family conflict, and financial and professional failure, Bazin, a rebel and bohemian approaching middle age, finally achieved literary fame in 1948 with the autobiographical *Vipère au poing* (*Viper in the Fist,* 1951). His virulent and relentless attacks upon the institutions of family, church, and motherhood seemed to many Frenchmen to verge on blasphemy. The revolt continued in *La Tête contre les murs* (1949; *Head Against the Wall,* 1952), a novel about penal institutions and the judicial system that supports them, and in a second autobiographical novel, *La Mort du petit cheval* (1950; "The Death of a Small Horse"). Having exorcised the demons of his youth in his writings, Bazin underwent a spiritual metamorphosis,

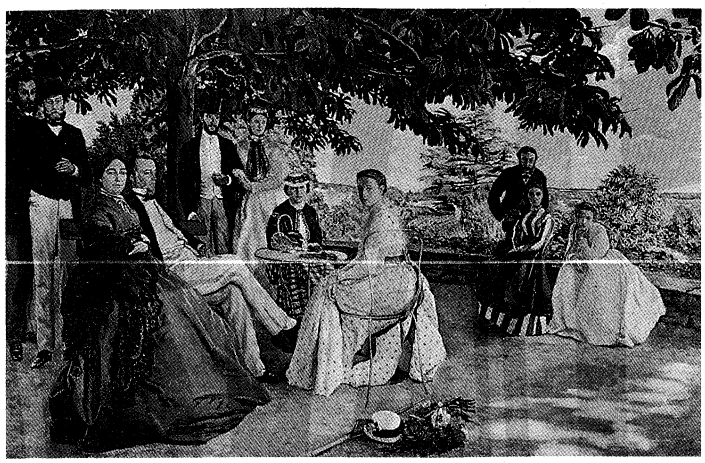
Hervé Bazin, 1961
Lipnitzhi—H. Roger-Viollet

from which he emerged a moralist. He discovered paternal love (*Au nom du fils,* 1960; *In the Name of the Son,* 1962), spiritual fortitude (*Lève-toi et marche,* 1952; *Constance,* 1955), and conjugal responsibility (*Le Matrimoine,* 1967). He departed from his mellower mood to exorcise a few remaining monsters in his world—a pyromaniac fireman in *L'Huile sur le feu* (1954) and a country Phaedra in *Qui j'ose aimer* (1956; *A Tribe of Women,* 1958). Later works include the novels *Madam Ex* (1975; "Madam X") and *Un Feu devore un autre feu* (1978; "A Fire Devours Another Fire") and the books of verse *Traits* (1976) and *Ce que je crois* (1977; "What I Believe"). He received the Grand Prix Littéraire de Monaco in 1957 for his literary work.

Bazin, René (-François-Nicolas-Marie) (b. Dec. 26, 1853, Angers, Fr.—d. July 20, 1932, Paris), influential French novelist of provincial life, strongly traditionalist in outlook; his works express in simple but elegant style his love of nature, of simple virtues, and of work, especially on the land.

Educated in Paris and Angers, Bazin became a professor of law at the Catholic University at Angers, remaining close throughout his life to the people and scenes of his native countryside. His early works presented an extremely idealistic view of peasant life, but after travels in Spain and Italy, begun in 1893, he acquired an insight into the universality of peasant themes that is reflected in his later, more forceful novels. *La Terre qui meurt* (1899) deals poignantly with the theme of emigration, as one by one the younger generation of a Vendée family leave their impoverished family farm to seek their fortunes in the city or in America. *Les Oberlé* (1901) concerns the Germanization of Alsace-Lorraine, in depicting the conflicts of divided loyalty within the Oberlé family. *Donatienne* (1903) is an account of the fortunes of a young Breton couple. Forced by poverty, the young mother, Donatienne, goes into service in the city, where she succumbs to the corruption of city life. The young husband, after losing his farm, leads the wretched life of a migrant worker, travelling from place to place with the children. Years after, spoiled Donatienne is reunited with her family and matter-of-factly takes up her duties as a peasant wife. *Le Blé qui lève* (1907) portrays the corrupting influence of trade unionism on woodcutters.

Though Bazin's works are now considered obsolete, he was an influential traditionalist in his day and a respected member of the spiritual family of French Catholic writers that includes, among others, Maurice Barrès, Georges Bernanos, and François Mauriac.



"Family Reunion," oil painting by Bazille, 1868; in the Louvre, Paris
Giraudon—Art Resource/EB Inc.

Baziotes, William (b. June 11, 1912, Pittsburgh—d. June 4, 1963, New York City), U.S. painter, one of the leading members of the New York Abstract Expressionist group

Baziotes, 1959
© Arnold Newman

from the late 1940s, when it became the most influential movement in international art.

Baziotes studied with Leon Kroll at the National Academy of Design in New York City (1933–36) and worked as a teacher with the Federal Art Project until 1941. In the late 1940s he founded the school "Subject of the Artist" with fellow painters Robert Motherwell, Barnett Newman, and Mark Rothko in New York City, where open sessions and lectures were attended by many artists.

Influenced by Cubism in its emphasis on structure, by the surface of a picture, and by Surrealism in its expression of the subconscious, Baziotes' works, such as "Congo" (1954), often develop around biomorphic shapes and biological forms such as the amoeba. His patterns, subtly coloured, appear to float on a watery background.

Bazna, Elyesa: *see* Cicero.

bazooka, 2.36-inch (6-centimetre) shoulder-type rocket launcher adopted by the U.S. Army early in World War II. The weapon consisted of a smooth-bore steel tube, originally about 5 feet (1.5 metres) long, open at both ends and equipped with hand grip, shoulder rest, trigger mechanism, and sights.

The bazooka, developed chiefly for attacking tanks and fortified positions at short range where artillery was not available, fired a 19-inch-long rocket that weighed about 3½ pounds (1.6 kilograms). The bazooka rocket carried 8 ounces (225 grams) of pentolite, a powerful explosive, that could penetrate as much as 5 inches (127 millimetres) of armour plate at 300 yards (270 metres). As the launcher tube was open at both ends, the bazooka was recoilless. Its chief defects were short range and lack of accuracy, both stemming from the rocket's low velocity (about 300 feet per second). To escape backblast, the operator held the bazooka on his shoulder with about half the tube protruding behind him. More powerful and more efficient bazookas were developed late in World War II and in the Korean War.

Bazzi, Giovanni Antonio: *see* Sodoma.

BBC: *see* British Broadcasting Corporation.

BCG vaccine, vaccine against tuberculosis, prepared from a weakened strain of tuberculosis bacteria named BCG—bacille Calmette-Guérin, from its French developers. The vaccine is of value in protecting persons who run a high risk of infection by tuberculosis, such as nurses, physicians, and persons in countries with high rates of tuberculosis. In many areas of western Europe and in North America, where tuberculosis has ceased to be a serious public health problem, the vaccine is seldom used.

BCS theory, in physics, a comprehensive theory developed in 1957 by the U.S. physicists John Bardeen, John N. Cooper, and John R. Schrieffer (their surname initials providing the designation BCS) to explain the behaviour of superconducting materials. Superconductors abruptly lose all resistance to the flow of an electric current when they are cooled to temperatures near absolute zero.

Cooper had discovered that electrons in a superconductor are grouped in pairs, now called Cooper pairs, and that the motions of all of the Cooper pairs within a single superconductor are correlated; they constitute a system that functions as a single entity. Application of an electrical voltage to the superconductor causes all Cooper pairs to move, constituting a current. When the voltage is removed, current continues to flow indefinitely because the pairs encounter no opposition. For the current to stop, all of the Cooper pairs would have to be halted at the same time, a very unlikely occurrence. As a superconductor is warmed, its Cooper pairs separate into individual electrons, and the material becomes normal, or nonsuperconducting.

Many other aspects of the behaviour of superconductors are explained by the BCS theory. The theory supplies a means by which the energy required to separate the Cooper pairs into their individual electrons can be measured experimentally. The BCS theory also explains the isotope effect, in which the temperature at which superconductivity appears is reduced if heavier atoms of the elements making up the material are introduced.

BD, abbreviation of *Bonner Durchmusterung* (*q.v.*), an astronomical catalog.

be, any of the hereditary occupational groups in early Japan (*c.* 5th–mid-7th century), established to provide specific economic services and a continuous inflow of revenue for the *uji* (*q.v.*), or clan rulers. Each *be* was thus subsidiary to one of the *uji* into which all of Japanese society was then divided, and each *kakibe,* or worker, was effectively owned by the chief of his *uji*.

Most *be* were agricultural units, producing rice for themselves and their superiors, but some engaged in crafts, fishing, or specific court functions. Those that acted as scribes, interpreters, diviners, or reciters for the court were national organizations; most other types of *be* were local.

After the Taika era reforms (*q.v.*; AD 645) asserted Imperial rule over the various *uji,* all *be* were abolished with the exception of those for specially skilled workers such as musicians and craftsmen, whose services were transferred from the Imperial family to individual governmental departments.

beach, sediments that accumulate along the sea or lake shores, the configuration and contours of which depend on the action of marine processes, the kinds of sediment involved, and the rate of delivery of this sediment. There are three different kinds of beaches. The first occurs as a sediment strip bordering a rocky or cliffy coast; the second is the outer margin of a plain of marine or fluvial accumulation (free beaches); and the third, of fairly peculiar character, consists of the narrow sediment barriers stretching for dozens or even hundreds of kilometres parallel to the general direction of the coast. These barriers separate lagoons from the open sea and generally are dissected by some tidal inlets. Certain sediment forelands, such as spits, points, and tombolos (connecting an island with a mainland), also are called beaches occasionally.

The upper limit of the active beach is the swash line reached by highest sea level during big storms. The lower beach margin is beneath the water surface and can be determined only if there is a definite border present between the sediment layer and the naked surface of the rocky bench. If the sediment cover extends into deep water, the lowest beach margin may be defined as the line where the strongest waves no longer sort and move the sand. It occurs approximately at a depth equal to one-third the wave length or 10 times the wave height.

The profile of an active beach varies greatly. Its form and dimensions depend on a number of factors, such as wave parameters, tide height, and sediment composition and distribution. The following, however, constitute some of the profile elements that commonly occur. At the upper part, above high sea level, a beach terrace is located, and there may be a series of beach ridges or berms created by the waves of a previous major storm. This terrace surface is inclined seaward. The next element is a steeper, frontal beach slope or face, and beneath it a low-tide terrace may be developed. If the tides are high enough (more than 2 metres [10.8 feet]), the frontal slope may be more than 1 kilometre (0.6 mile) in width in regions with abundant sand and a shallow bottom. In some areas the low-tide terrace terminates with another inclined shoreface, if the nearshore sea zone is rather deep. Finally, one or several parallel, submarine, long-shore bars with intervening troughs may exist along sandy shores; if present, these bars constitute the last profile element.

Some minor relief forms are usually present on the surface of sand beaches. These include oscillation ripples, swash or rill furrows, and the well-known beach cusps (concave seaward) at the beach margin.

Given the established system of strong waves normal to the shoreline, submarine bars are sometimes dismembered and are converted into large crescent elements convex seaward. These relief forms reflect the existence of large water eddies with vertical axes, which form as a result of the ebb and flow of the water. Often the water outflow proceeds in the form of linear rip currents. These may be so strong that they cause erosion of deep channels in the submarine slopes and sometimes dissect the entire system of submarine bars.

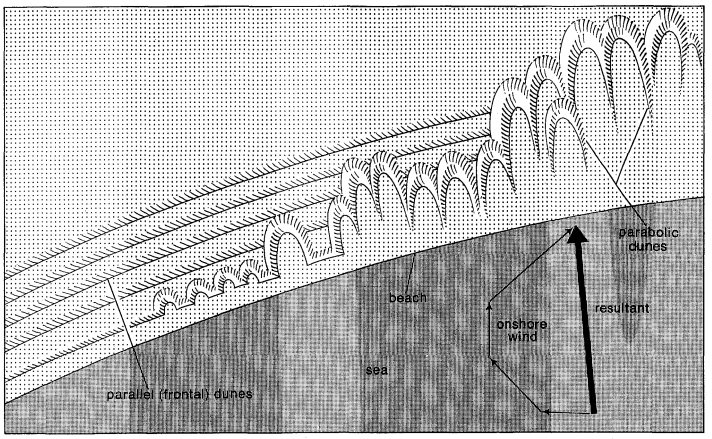
In many countries the wind strongly affects the dynamics of the beach. The beach is exposed to the sea wind, and sand is usually blown off to the rear parts of the beach where it forms small hummocks. As these join together, foredunes are being built, and, if the beach is well supplied with sand in the right area, several rows of dunes will be formed. When the sand is very abundant, dunes will shift to adjacent low-lying plains and may bury fertile soils, woods, and buildings (see Figure).

If sand is no longer delivered to the region of developed dunes, gaps will form in the ridges parallel to the shore. In such zones, parabolic dunes with their summits coastward are created. After long stabilization, the summits of the parabolas may be broken through by the wind, thus gradually forming a series of ridges parallel to the prevailing winds.

Beach sands in temperate latitudes consist mainly of quartz, some feldspars, and a small percentage of heavy minerals. In the tropics, however, calcareous beaches composed of skeletal remnants of marine organisms and precipitated particles, such as oolites, are widespread.

Sometimes the basement layers of the beach are cemented by calcium carbonate, precipitated from the groundwater. This will commonly result if fresh water penetrates a beach from swamps behind it. If the beach undergoes erosion and thus retreats, the cemented strata become exposed; termed beach rock, they are widespread in the tropics and along the shores of the Mediterranean, Black, and Caspian seas.

The practical significance of beaches is not limited to their function as protectors of the coast or as recreation sites. The sorting mech-



Scheme of frontal and parabolic shore dunes behind the beach and the onshore wind resultant

From E.C.F. Bird, *Coasts* (1968), p. 139; The Australian National University Press

anism of the offshore waves and currents determines the accumulation of heavy-mineral (specific weight more than 2.7) concentrates. On any sand beach there are thin layers of dark sand that can be seen. Some heavy minerals contain valuable metals, such as titanium, zirconium, germanium, tin, uranium, and gold. In many places the concentrations are so great that they are of industrial significance; placer deposits are worked in India, Brazil, Japan, Australia, the U.S.S.R., and Alaska. Heavy-mineral concentrates also are extracted from the submarine slopes by means of dredging ships.

Beach, Alfred Ely (b. Sept. 1, 1826, Springfield, Mass., U.S.—d. Jan. 1, 1896, New York City), U.S. publisher and inventor; his *Scientific American* performed signal service in stimulating 19th-century technological innovations, and Beach himself invented a tunnelling shield and the pneumatic tube, among other devices.

While Beach was attending Monson Academy in Massachusetts, his father bought the New York *Sun*, and at 22 Beach became co-publisher with his brother Moses Beach. The new magazine *Scientific American* interested him more, however, and he purchased it, announcing in his first issue that it would secure patents for U.S. inventors. For the next several decades Beach made biweekly trips to Washington, D.C., to carry out this pledge. In 1847 he applied for his own first patent, on a typewriter, and a few years later, at the Crystal Palace Exhibition of 1853, New York City, he displayed a version of his machine that produced embossed letters for the blind.

Beach originally envisioned the pneumatic tube as a means of delivering mail in downtown areas of cities, a use to which it was widely put, but in the 1860s, after experimenting with a cable railway, he conceived the idea of a pneumatic subway. At the Fair of the American Institute in New York City in 1867, he exhibited a tube in which a 10-passenger car was driven back and forth by a powerful fan. Because of the opposition of Boss Tweed, the political ruler of New York City, Beach found it necessary to construct an experimental subway in secret. Obtaining a charter in 1868 for a 4-foot pneumatic tube to demonstrate mail delivery, he actually dug an 8-foot bore tunnel 300 feet (100 metres) under Broadway, between Warren and Murray streets. Because he could not disturb street traffic with a trench, he was forced to drive the tunnel by underground methods and invented a cylindrical tunnelling shield, powered by hydraulic rams; this shield actually antedated that built by James Henry Greathead for the Tower Subway in London. A 100-horsepower blower, operating alternately as an exhauster, pushed and pulled the single car back and forth in the tunnel. The demonstration was a success, but adoption was blocked partly by Tweed's opposition, partly by the financial panic of 1873, and finally by the arrival of electric traction. In the 1960s the idea was revived in the form of a proposed gravity-vacuum train for long-distance high-speed transportation.

Beach, Amy Marcy, *née* CHENEY, married name MRS. H.H.A. BEACH (b. Sept. 5, 1867, Henniker, N.H., U.S.—d. Dec. 27, 1944, New York City), U.S. pianist and composer known for her *Piano Concerto* (1900) and her *Gaelic Symphony*, the first symphony by an American woman composer.

At 16 she became a professional pianist. Largely self-taught as a composer, she was the only woman member of the Boston school of U.S. composers, who were heavily influenced by the German Romantic style. She was a prolific composer of choral works, piano pieces, and songs, of which "Ah, Love, but a Day" and "The Year's at the Spring" became particularly popular.

Beach, Sir Michael Edward Hicks: *see* Hicks Beach, Sir Michael Edward.

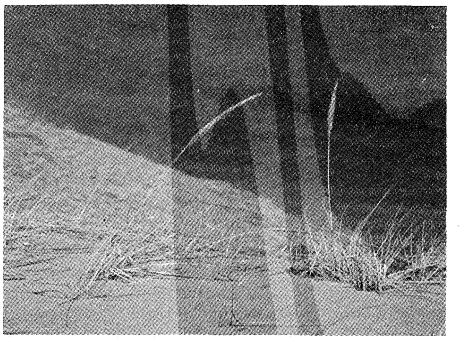
Beach, Sylvia (b. March 14, 1887, Baltimore—d. Oct. 5, 1962, Paris), bookshop operator who became important in the literary life of Paris, particularly in the 1920s, when her shop was a gathering place for expatriate writers and a centre where French authors could pursue their newfound interest in U.S. literature.

The daughter of a Presbyterian minister, Beach developed at 14 a lifelong love of France when her father held a pastorate in Paris among American students. In 1919 she opened her shop, Shakespeare and Company, which included a lending library, on the Left Bank in Paris. Perhaps her most heroic service to literature was her publication in 1922 of James Joyce's *Ulysses* after it had been turned down by several other publishers because of its explicit sexual content. She allowed Joyce the unlimited right to correct the proofs of his complex work, a lengthy process that she guided through typesetters unfamiliar with English. Her shop was closed in 1941, not to reopen, and she was interned for seven months by the occupying Germans. She wrote about her shop and its literary life in *Shakespeare and Company* (1959).

beach flea: *see* sand flea.

beach grass, also called MARRAM GRASS, PSAMMA, or SAND REED, any of the sand-binding plants in the genus *Ammophila* (family Poaceae). These coarse, perennial grasses are about one metre (about three feet) tall and grow on sandy coasts of temperate Europe, North America, and northern Africa.

American beach grass (*A. breviligulata*) grows along the Atlantic coast and in the Great Lakes region. European beach grass (*A. arenaria*) has been introduced on the northern Pacific coast of the United States as a dune stabilizer. Both species grow in tufts and have rolled, spikelike leaves. The flower clusters are long, dense, and cylindrical. The tough, scaly underground stems may spread 10 to 13



American beach grass (*Ammophila breviligulata*)
Karlene Schwartz

metres (33 to 43 feet) away from the plant, sending up new shoots throughout the dune. In some areas, beach grass is protected by law.

beach hopper: *see* sand flea.

Beach-la-Mar (language): *see* Melanesian Pidgin.

beach pea (*Lathyrus maritimus*, sometimes *L. japonicus*), sprawling perennial plant in the pea family (Fabaceae). It occurs on gravelly and sandy coastal areas throughout the North Temperate Zone. The stem is 30–60 centime-

Beach pea (*Lathyrus maritimus*)
Thomas W. Martin—Rapho/Photo Researchers

tres (1–2 feet) long. The alternate leaves are divided into 6 to 12 leaflets arranged along the leafstalk. The purplish-blue flowers, which appear throughout the summer, are followed by a hairy pod about 3 cm long.

Beachy Head, prominent headland on the English Channel coast in the county of East Sussex, England, in the borough of Eastbourne. Its chalk cliffs, more than 500 ft (150 m) high, represent the seaward extension of the South Downs. The cliffs face southward and are therefore subjected to severe gales from the southwest. Erosion is concentrated along joint planes and tends to produce isolated stacks. There were once seven of these, the Seven Charleses; the last fell in 1875.

Beacon, city, Dutchess County, southeastern New York, U.S., at the foot of Mt. Beacon, on the east bank of the Hudson River, there bridged to Newburgh, 58 mi (93 km) above New York City. It became a city when the 17th-century villages of Matteawan and Fishkill Landing were united in 1913. The name was inspired by the fires that blazed atop Mt. Beacon to warn George Washington of British troop movements; the mountain is now a resort, and the Mt. Beacon Incline Railway (1901) ascends its west spur (1,540 ft [469 m]

above the river). Industrialization began after the War of 1812 when John Jacob Astor and others built a cotton mill and foundry. Manufactures now include clothing, aluminum and rubber fabricated products, and fans. Madam Brett Homestead (1709) in Beacon and Van Wyck Homestead (1732; site of Revolutionary War courts-martial) in Fishkill are preserved as museums. Pop. (1980) 12,937.

Beaconsfield, town in northern Tasmania, Australia. It lies on the west bank of the Tamar River, 29 mi (46 km) northwest of Launceston. The site of the present town, originally known as Cabbage Tree Hill, was renamed Brandy Creek when gold was found nearby in 1870. In 1879, F.A. Weld, governor of Tasmania, gave the town its present name in honour of Benjamin Disraeli, the 1st earl of Beaconsfield. Between 1877 and 1919 Beaconsfield's Tasmania Mine was the largest single source of gold in the state, reaching its peak in gold production in 1899. Today gold is mined together with copper, lead, and zinc. Beaconsfield is also an agricultural centre producing apples, dairy products, and oysters. Inc. town, 1908. Pop. (1981) 898.

Beaconsfield, town, in South Bucks (formerly Beaconsfield) district, county of Buckinghamshire, England, in the Chiltern Hills.

The wide main street of the old town of Beaconsfield, bordered by 18th-century houses, contrasts with the modern town in which commuters to London—28 mi (39 km) to the southeast—reside. Beaconsfield was adopted by Benjamin Disraeli, the 19th-century British prime minister, for his earl's title and was also the home of Edmund Burke, the 18th-century statesman, who is buried in the parish church. Pop. (1981 prelim.) 10,909.

Beaconsfield, Benjamin Disraeli, earl of: *see* Disraeli, Benjamin.

bead, small, usually round object made of glass, wood, metal, nut, shell, bone, seed, or the like, pierced for stringing. Among primitive peoples, beads were worn as much for magical as for decorative purposes; hence, little variation was allowed in their shapes and materials. In Arab countries in the 20th century, single blue talismanic beads are attached to domestic animals, children, brides, and even automobiles to avert bad luck. Because of the value attached to them as light articles of trade and as substitutes for coinage, beads yield valuable information about ancient trade and cultural patterns.

In prehistoric times, beads were worn not only around the neck but around the hips, over the ears, threaded through the nose, and even attached to the eyelashes. In the Stone Age, the earliest beads probably were plant seeds; but, by Acheulian times, collars of seashells and small fossils were bored for stringing, and, from the Aurignacian and Magdalenian periods, whole necklaces of pierced shells have survived, some of them carried long distances from the sea. Collars made of the pierced canine teeth of Arctic foxes and of chamois and human teeth pierced for stringing also have been found. A type of bilobed bead carved out of mammoth ivory was often worn in Siberian Paleolithic settlements. It was perhaps ancestral to a bone or stone bead of double-ax shape that was popular in the Neolithic period, especially in northern Europe, Britain, and southern France. Beads of stone, bone, and amber, pierced through their narrower ends, became common in the Late Neolithic Period in Scandinavia and are found in Megalithic graves of western Europe.

The earliest Egyptian beads, dating from *c.* 4000 BC, are generally made of stone, usually steatite (soapstone), covered with a near-glass glaze; glass itself is not found until much later. In the pre-dynastic period appeared beads of blue faience that continued essentially the same until Roman times. Other favourite materials were green feldspar, lapis lazuli (possibly from Persia), carnelian, turquoise, hematite, and amethyst. Usually these materials were made into spherical, barrel-shaped, or discoidal beads; but locust, falcon, crouching-baboon, hippopotamus-head, and conus-shell shapes are well represented. Phoenician workshops at Carthage and in the Egyptian delta made fancy beads in the form of comic human faces and animal heads.

In the Sumerian and Indus Valley civilizations, variously shaped gold beads were in use by the early 3rd millennium BC. There were tubular, spherical, and melon-shaped beads, but most distinctive was a tubular bead with two semicircular wings attached to each side, as though in imitation of a plant seed. By 2000 BC a spherical bead resembling a nasturtium seed, with light flutings along the line of the piercing, was in use; it remained popular with the Babylonians and lasted into Assyrian times. Meanwhile, the Minoan and Mycenaean peoples of Crete and the Aegean developed gold beads of great originality and beauty in the shapes of polyps, lilies, and lotuses; there are also a number of spherical Mycenaean gold beads decorated with granulated patterns. Beads of opaque glass with impressed circlets of glass of a different colour came to Britain and western Europe in the Late Bronze Age. Their precise origin is unknown, but they probably were manufactured in the Mediterranean.

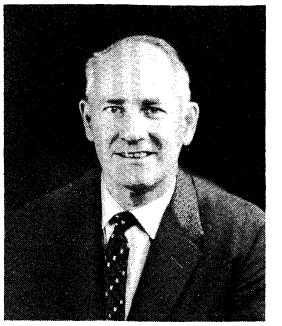
Among the Indians of North and South America, a great quantity of stone and shell beads commonly was worn, the latter being either complete shells or shaped out of shell. On the whole, except in the classical Inca civilizations of Peru, beads of fine stone were rare. Some, of a curious shape that suggests a double ax, are Peruvian, but there are elaborate Aztec and Inca beads of jadeite and other coloured stones in shapes such as frogs and human skulls. A number of sites in Peru, Guiana, and Honduras have yielded elaborate tubular, gold filigree beads.

Since the Middle Ages, beads have been used on an extensive scale for trade and barter. Explorers have found them invaluable as gifts for primitive peoples, and during the 17th and 18th centuries, this trade in beads was enormous. Their importance was well known to the Spanish conquistadores, whose gifts of Renaissance glass beads manufactured in Venice are said to have been worn until recent times by primitive peoples of Brazil. The use of beads as personal decoration has continued on and off throughout history, the richness of ornamentation varying with fashions.

bead lightning, also called CHAIN LIGHTNING, form of lightning of long duration that appears as a string of luminous segments instead of a continuous channel. It occurs infrequently but has been observed many times. Its causes are unknown, but among the theories proposed are the following: portions of the lightning channel are slanted toward or away from the observer and thus seem brighter; parts of the channel are obscured by rain or clouds; and sections of the channel with large radii cool more slowly than do those with small radii.

Beadle, George Wells (b. Oct. 22, 1903, Wahoo, Neb., U.S.), U.S. geneticist, Nobel laureate, and sixth president of the University of Chicago (1960–68), who helped found the field of biochemical genetics when he showed that genes affect heredity by determining enzyme structure.

After earning his Ph.D. in genetics from Cornell University (1931), Beadle went to the laboratory of Thomas Hunt Morgan at the California Institute of Technology, where he did work on the fruit fly, *Drosophila*



Beadle

By courtesy of California Institute of Technology, Pasadena

melanogaster. Beadle soon realized that genes must influence heredity chemically. In 1935, with Boris Ephrussi at the Institut de Biologie Physico-Chimique in Paris, he designed a complex technique to determine the nature of these chemical effects in *Drosophila.* Their results indicated that something as apparently simple as eye colour is the product of a long series of chemical reactions and that genes somehow affect these reactions.

After a year at Harvard, Beadle pursued gene action in detail at Stanford University in 1937. Working there with Edward Tatum, he found that the total environment of a red bread mold, *Neurospora,* could be varied in such a way that the researchers could locate and identify genetic changes, or mutants, with comparative ease. They exposed the mold to X-rays and studied the altered nutritional requirements of the mutants thus produced. These experiments enabled them to conclude that each gene determined the structure of a specific enzyme that, in turn, allowed a single chemical reaction to proceed. This "one gene–one enzyme" concept won Beadle and Tatum (with Joshua Lederberg) the 1958 Nobel Prize for Physiology or Medicine. Further, the use of genetics to study the biochemistry of microorganisms, outlined in the landmark paper "Genetic Control of Biochemical Reactions in *Neurospora*" (1941), by Beadle and Tatum, opened up a new field of research with far-reaching implications. Their methods immediately revolutionized the manufacture of penicillin and provided insights into many biochemical processes.

In 1946 Beadle became professor and chairman of the biology division at the California Institute of Technology and served there until 1960, when he was invited to succeed R. Wendel Harrison as chancellor of the University of Chicago; the title of president was reassigned to the position a year later. He retired from the university to direct (1968–70) the American Medical Association's Institute for Biomedical Research. His major works include *An Introduction to Genetics* (with A.H. Sturtevant; 1939), *Genetics and Modern Biology* (1963), and *The Language of Life* (with Muriel M. Beadle; 1966).

beadwork, use of beads in fabric decoration; beads may be individually stitched, applied in threaded lengths, or actually woven into the material, the weft threaded with beads before being woven in. Glass beads were used decoratively in ancient Egypt, Greece, and Rome, and by the Druids in religious rites.

During the Middle Ages, when embroidery was an important art form, beads sometimes were used in the finest embroidery work. The magnificent Butler-Bowden cope, a long ecclesiastical vestment (English, *c.* 1330; Victoria and Albert Museum, London), was elaborately embellished with seed pearls and green beads. Examples of beadwork of a purely pictorial, rather than decorative, nature also survive from this period. A series of small portraits of apostles executed entirely with coloured beads

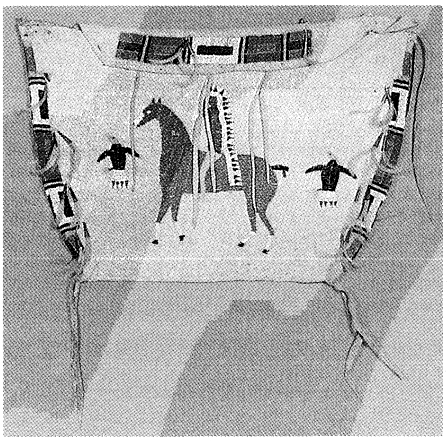
stitched to a vellum backing are believed to have come from Halberstadt cathedral (now in East Germany) and may have been inspired by small contemporary Byzantine mosaics.

During the Renaissance, pearls and beads often were sewn in patterns on the clothing of the wealthy. In Elizabethan England, purses and other small objects often were liberally adorned with gilt thread, beads, and seed pearls. By the third quarter of the 17th century, beadwork had become so popular in England that many articles—chiefly fancy boxes, small pictures, and a particular form of basket—were decorated all over with beads. In southern Italy and Sicily, a bold form of decoration with gilt thread and coral beads was produced, apparently in considerable quantity, during the 17th century and later.

In the 18th century beadwork fell out of favour in Europe, but it became popular again during the 19th century. Purses knitted with bead-threaded cotton were particularly popular shortly after 1800, and throughout the 19th century such small articles as gloves, mittens, belts, garters, stockings, and parasol covers frequently were decorated with beads. A great many women's dresses were richly ornamented with beads of all kinds. Beadwork as dress decoration recurred periodically in the 20th century.

The simplest and earliest American Indian beadwork may have been a string made from bone, shell, or seeds. The introduction of glass trade beads by Europeans between the 15th and 19th centuries stimulated more complex designs. Among the Plains Indians, beadwork designs originally were geometrical, similar to the old porcupine-quill or moose-hair embroidery, and were placed on skin clothing, bags, and other articles. In the 19th century, floral designs became popular. The Eskimos of Greenland and North America use beadwork to ornament thigh boots, capes, and tunics.

Throughout Africa beadwork is used to ornament ceremonial headdresses, tunics, masks, baskets and other vessels, dolls, and a variety of other objects. Motifs and palettes vary among the peoples, with a vivid and sophisticated geometry predominating. Beadwork in Africa has also been used to convey information (*e.g.,* Zulu love messages).

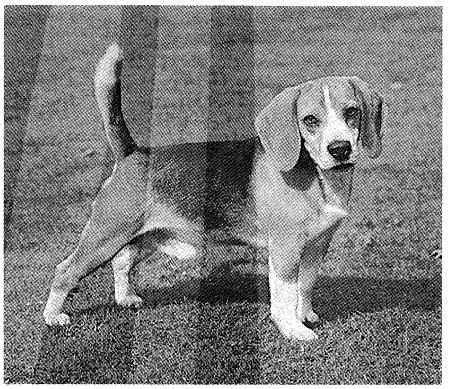


Arapaho beaded storage bag *c.* 1890; in the Denver Art Museum, Colorado

By courtesy of the Denver Art Museum, Colorado

Beads are used over most of Southeast Asia, mainly as dress and weapon ornaments. Borneo beadwork, exceptionally, uses curvilinear zoomorphic ornament, mostly in black, yellow, and red. Oceanic beadwork is simpler and, except in Melanesia, tends to rely on natural materials such as wood and shell.

beagle, small hound-dog breed popular as both a pet and a hunter. It looks like a small foxhound and has large brown eyes, hanging ears, and a short coat, usually a combination of black, tan, and white. The beagle is a solidly built dog, heavy for its height. It generally excels as a rabbit hunter and is typically an alert, affectionate dog. There are two sizes recognized in the breed: beagles standing less than 13 inches (33 centimetres) and weighing about 18 pounds (8 kilograms) and those standing about 15 inches (38 centimetres) and weighing about 30 pounds (13.5 kilograms).



Beagle

Sally Anne Thompson—EB Inc.

Beagle, British naval vessel aboard which Charles Darwin served as naturalist on a surveying expedition (1831–36) in the Pacific and elsewhere. On that sailing, the *Beagle,* a brig displacing about 240 tons, was commanded by Robert Fitzroy (*q.v.*). Darwin sailed from Devonport, Eng., in the *Beagle* on Dec. 27, 1831. After circumnavigating the globe, the *Beagle* arrived back at Falmouth, Eng., on Oct. 2, 1836. The voyage provided Darwin with the observations that led him toward the theory of evolution.

Beagle Channel, strait in the Tierra del Fuego archipelago at the southern tip of South America. The channel, trending east–west, is about 150 mi (240 km) long and 3 to 8 mi wide; it separates the archipelago's main island to the north from Navarino, Hoste, and other smaller islands to the south. At its western end the channel splits into two branches that encircle Isla Gordon. The eastern portion forms part of the Chile–Argentina border, while the western portion lies entirely within Chile. The three islands at the channel's eastern end, Picton, Nueva, and Lennox islands, were the subject of a territorial dispute between Chile and Argentina that began in the 1840s and which almost led to war between the two nations in 1978. The dispute officially ended on May 2, 1985, when a treaty awarding the three islands to Chile went into effect between the two countries. The Beagle Channel was named for the British ship *Beagle,* in which Charles Darwin explored the area (1833–34).

beak, also called BILL, stiff, projecting oral structure of certain animals. Beaks are present in a few invertebrates (*e.g.,* cephalopods and some insects), some fishes and mammals, and all birds and turtles. Many dinosaurs were beaked. The term bill is preferred for the beak of a bird, platypus, or dinosaur. Many beaked animals, including all birds and turtles, lack teeth.

A bird's bill is composed of the upper and lower jaws covered by a horny sheath of skin. The nostrils are found dorsally, usually at the base of the bill. Bills take many shapes and sizes, adapted for food-getting, preening, nest-building, and other functions. Feeding modifications alone include the pouched fish-netting bill of pelicans; the serrated grazing bill of geese; the long, slim nectar-sipping bill of hummingbirds; and the sturdy, curved nut-cracking bill of parrots.

beak style, distinctive use of birdlike forms in human figures carved in wood in the lower Sepik and Ramu regions of Papua New Guinea. The head of the figure is generally placed on a short neck that connects it to a thick body, over which a long, beaklike nose often projects. Facial features have a thin, linear quality that emphasizes the downward thrust of the nose and contrasts with the robust heaviness of the limbs of the full-length figures.

Examples of the beak style are seen in masks, statues, and utilitarian objects such as headrests, which are frequently painted and decorated with shells, tufts of hair, feathers, and bits of fibre and cloth. A sculptural form similar to the beak style is known in Vanuatu (formerly the New Hebrides) and New Caledonia.

Painted wooden neckrest in the beak style with cowrie-shell decoration, *c.* 1870, from the Sepik River district, Papua New Guinea; in the Rautenstrauch-Joest-Museum, Cologne

By courtesy of the Rautenstrauch-Joest-Museum, Cologne

beaked nightshade (plant): *see* buffalo bur.

beaked whale, any of a family (Ziphiidae, or, in some classifications, Hyperoodontidae) of medium-sized toothed whales (suborder Odontoceti), encompassing 6 genera and about 18 species, including the bottlenose whales. Members of the family are characterized by an extended beaklike snout, small rounded flippers, a dorsal fin set toward the rear, two throat grooves that meet under the chin, and the lack of a central notch in the wide flukes. The stomach is compartmented, containing up to 14 sections. In almost all species, functional teeth are limited to one or two pairs, present only in the lower jaw and usually erupting through the gums only in the male whale. In the remarkable strap-toothed whale (*Mesoplodon layardi*), these teeth curve up and out, around the upper jaw, holding it partially shut. Shepherd's beaked whale (*Tasmacetus*) is also unusual, as it has numerous small functional teeth.

Beaked whales are distributed throughout the world, although certain species are limited to one ocean. Ranging in size from 3.5 metres (12 feet) for Hector's beaked whale, *M. hectori,* to 12.8 m for the giant bottlenose whale, *Berardius bairdii,* these whales weigh between 1,000 and 11,000 kilograms (1.1 and 12 tons). Colour is variable but is usually some combination of gray or black with white. Their bodies are often covered with long scars from fighting with each other. Beaked whales are the least known of the large mammals, and the mystery continues as the bodies of undescribed species occasionally drift ashore.

Rapid swimmers and deep divers, beaked whales are teuthophagous (squid-eating), although most also eat fish and bottom-dwelling

invertebrates. Some are solitary or travel in small groups, while others may appear in pods of 30 or more. Groups often surface and dive in unison. *See also* bottlenose whale.

Beaker folk, Late Neolithic–Early Bronze Age people living about 6,000 years ago in the temperate zones of Europe; they received their name from their distinctive bell-shaped beakers, decorated in horizontal zones by finely toothed stamps. (Their culture is often called the Bell-Beaker culture.) The graves of the Beaker folk were usually modest single units, though in much of western Europe they often took the form of megalithic tombs. A warlike stock, they were primarily bowmen but were also armed with a flat, tanged dagger or spearhead of copper, and a curved, rectangular wrist guard. Their extensive search for copper (and gold), in fact, greatly accelerated the spread of bronze metallurgy in Europe. Probably originally from Spain, the Beaker folk soon spread into central and western Europe in their search for metals. In central Europe they came into contact with the Battle-Ax (or Single-Grave) culture, which was also characterized by beaker-shaped pottery (though different in detail) and by the use of horses and a shaft-hole battle-ax. The two cultures gradually intermixed and later spread from central Europe to eastern England.

Beaker found at Denton, Lincolnshire, Eng.
By courtesy of the trustees of the British Museum

beam, in engineering, originally a solid piece of timber, as a beam of a house, a plow, a loom, or a balance. In building construction, a beam is a horizontal member spanning an opening and carrying a load that may be a brick or stone wall above the opening, in which case the beam is often called a lintel (*see* post-and-lintel system). The load may be a floor or roof in a building, in which case the beam is called a floor joist or a roof joist. In a bridge deck the lightly loaded longitudinal beams are the stringers; the heavier, transverse members are called floor beams.

Large beams carrying the ends of other beams perpendicular to them are usually called girders. Metal girders may be single rolled pieces or, to permit greater stiffness and longer spans, may be built up in the form of an I by riveting or welding plates and angles. Concrete girders are also widely used.

Beams may be of wood, steel or other metals, reinforced or prestressed concrete, plastics, and even brickwork with steel rods in the bond between bricks. For weight reduction, beams of metal are formed as an I or other shape having a thin vertical web and thicker horizontal flanges where most of the strain appears. *See also* cantilever.

Beamon, Bob (b. Aug. 29, 1946, Bronx, New York City), U.S. long jumper who set a world record of 29 ft 2½ in. (8.90 m) at the 1968 Olympic Games at Mexico City. He was then a student at the University of Texas at El Paso. The new record surpassed the preceding one by 21½ in.

Beamon began jumping at Jamaica High School (Long Island, N.Y.) and first attended North Carolina Agricultural and Technical College (Greensboro). Later he transferred from El Paso to Adelphi University (Long Island), where he also played basketball. After his 1968 record, he competed irregularly and retired before the 1972 Olympics. In 1973 he turned professional; later he was a track coach, did youth work, and participated in various sports-related activities, including fund raising for the U.S. Olympic Committee in 1984.

bean, seed or pod of certain leguminous plants of the family Fabaceae, originally of *Vicia faba,* an Old World species called Windsor bean, broad bean, and horsebean. The mature seeds of the principal beans used for food, except soybeans (*q.v.*), are rather similar in composition, although they differ widely in eating quality. Rich in protein and providing moderate amounts of iron and vitamins B_1 and B_2, beans are used worldwide for cooking in either fresh or dried form.

Most varieties of the common bean grow either as an erect bush 30–75 centimetres (12–30 inches) tall or as a climbing plant 1.2–2.1 metres (50–80 inches) long, but a few important kinds are of intermediate form. Dwarf and semiclimbers are grown extensively. When the climbing type is grown for its immature pods, artificial supports are necessary to facilitate harvesting. Varieties differ greatly in size, shape, colour, and fibrousness or tenderness of the immature pods. In general, varieties grown for dry mature seeds produce pods that are too fibrous to be eaten at any state of development. Most edible-podded beans produce relatively low yields of mature seeds, or seeds that are of low eating quality. Seed colours range from white through green, yellow, tan, pink, red, brown, and purple to black in solid colours and countless contrasting patterns. Seed shapes range from nearly spherical to flattened, elongated, and kidney-shaped. Pods are of various shades of green, yellow, red, and purple and splashed with red or purple; pod shapes range from flat to round, smooth to irregular, and straight to sharply curved; length ranges from 75 to 200 millimetres (3 to 8 inches) or more.

Bean (*Phaseolus vulgaris*)
Walter Chandoha

The common bean of Central and South American origin (*Phaseolus vulgaris*) is second to the soybean in importance. It is called French bean, haricot bean, and kidney bean in various countries; in the United States, however, kidney bean refers to a specific type that is definitely kidney-shaped and red, dark red, or white. Some varieties of common bean are grown only for the dry seeds, some only for the edible immature pods, and others for the seeds, either immature or mature. Brazil, China, and the United States produce more than a third of the world's supply of this bean in the mature state. This bean figures prominently in Latin-American and Creole cuisines.

Third in importance, the principal bean of Europe though little known in the United States, is the Windsor, or broad, bean (*Vicia faba*). The broad bean will not tolerate hot weather; it is grown in summer only in the cool parts of the temperate zone and during the winter in the warmer parts. Unlike other beans described, it tolerates slight freezing. The plant is erect, from 600 to 1,500 mm tall, and bears few branches; the stem and branches are crowded with short-petioled leaves; the pods are nearly erect in clusters in the axils of the leaves; the seeds are large and irregularly flattened.

Most edible-podded beans can be grown over wide ranges of territory if they are planted at suitable times. The edible-podded varieties are popular in many countries, especially in Europe. In the United States the predominant edible-podded bean is the common string, snap, or green bean (*P. vulgaris*).

Of Central American origin, the lima bean (*P. limensis*) is of commercial importance in few countries outside the Americas. Grown only for food, dry mature lima beans constitute approximately 2½ percent of the total dry-bean production in the United States. There is a wide range of pod size and shape and of seed size, shape, thickness, and colour in both bush and climbing forms. Pods are wide, flat, and slightly curved. The lima bean is readily distinguished by the characteristic fine ridges in the seed coat that radiate from the "eye." A perennial in the tropics, elsewhere it is normally grown as an annual; it requires a longer season and warmer weather than most varieties of common American bean.

The scarlet runner bean (*P. coccineus*) is native to tropical America. Naturally a perennial, it is grown to a small extent in temperate climates as an annual. It is a vigorous climbing plant with showy racemes of scarlet flowers, large, coarse pods, and large, coloured seeds. The scarlet runner bean is grown in Great Britain and Europe for the attractive flowers and fleshy immature pods.

The mung bean, or green gram (*P. aureus*), is native to India. The pods and seeds are by far the smallest of any of the beans named here. The pods are slender, 75–100 mm long, and contain 10–14 spherical-to-oblong seeds about 3 mm in diameter. Extensively grown in the Orient for food, as bean sprouts and otherwise, the mung bean is little known in Europe and the Americas except for the preparation of sprouts. In this form the beans are a good source of vitamin C.

The horse gram (*Dolichos biflorus*) and the bonavist bean, native to India, are related, large, tropical climbing plants, the immature seeds of which are commonly used for food in Asia. The dry seeds are large, dark to black, nearly round to slightly flattened and elongated.

Bean, Alan L(aVern) (b. March 15, 1932, Wheeler, Texas, U.S.), astronaut, participant in the Apollo 12 mission (Nov. 14–22, 1969), in which two long walks, totalling nearly eight hours, were made on the Moon's surface. Bean and Comdr. Charles Conrad, Jr., piloted the Lunar Module to a pinpoint landing on the Moon, while astronaut Richard F. Gordon, Jr., orbited overhead in the Command Module.

Bean entered the U.S. Navy upon graduation (1955) from the University of Texas, Austin, and served as a test pilot before entering the manned spaceflight program in 1963. In addition to the Apollo 12 mission, Bean was

commander of the Skylab 3 mission (July 28–Sept. 25, 1973), during which he, Owen K. Garriott, and Jack R. Lousma formed the second crew to occupy the orbiting laboratory.

Bean, 1969

By courtesy of the National Aeronautics and Space Administration

Bean retired from the Navy in 1975 but remained with the National Aeronautics and Space Administration as chief of the astronaut candidate operations and training group.

Bean, Roy (b. 1825?, Mason County, Ky., U.S.—d. March 16, 1903, Langtry, Texas), justice of the peace and saloonkeeper who styled himself the "law west of the Pecos."

For much of his life from the time he left his Kentucky home in 1847, Bean moved from town to town—in Mexico, Southern California, New Mexico, and Texas—getting into and fleeing from one scrape after another, killing at least two men in duels. During the Civil War he first served with Confederate regulars and then was a blockade runner in Texas, becoming so prosperous that he could live married in San Antonio for some 16 years at ease. In 1882 he moved on, west of the Pecos River, and set up a saloon, the Jersey Lilly, next to a railroad line through Dead Man's Canyon. He named the site Langtry (after the actress Lillie Langtry) and eventually established himself as justice of the peace, with the approval of the Texas Rangers. He knew neither law nor court procedure and became celebrated for his rulings, which were variously hard, common-sensical, and prankish; he once reportedly fined a dead man $40 for carrying a concealed weapon and pocketed the proceeds.

bear, large carnivore of the family Ursidae, closely related to the dog (family Canidae) and raccoon (Procyonidae). The bear is the most recently evolved of carnivores. Its ancestral line appears to have diverged from canid stock during the Miocene and to have developed, through such forms as the Pliocene *Hyaenarctos* (of Europe, Asia, and North America), into modern types such as the black and brown bear (*Ursus*).

Generally massive and short legged, bears vary in size from the smallest sun bear (27–46 kilograms [59–80 pounds]) to the huge Alaskan brown bear (*see* grizzly bear), which attains a weight of 780 kg. Despite this bulkiness, most bears climb with ease and swim strongly. They walk with their soles on the ground in plantigrade fashion, as does man, with the heel touching the ground. Each foot has five digits, ending in nonretractile claws (sometimes particularly adapted for digging, as in the sloth bear).

Lengthening of the canine teeth, reduction or absence of the first three premolars, and modifications for crushing with the molars (broad and flat crowned) characterize ursid dentition, completed with typical incisors. Bears constitute a generally omnivorous family, but individual dietary preferences range from seals for the extremely carnivorous polar bear to vegetative materials for the largely herbivorous spectacled bear; most bears enjoy honey. Usually gaining weight beforehand, a bear often sleeps fitfully through much of the winter; this long slumber, however, does not constitute true hibernation. Bears in the wild live from 15 to 30 years. The life span in captivity is considerably longer.

The bear may be hunted for trophy value or for its various economic assets, hides for clothes or rugs and meat and fat for food. Local names, derived particularly from their geographic locations, abound for these bears (the more usual equivalents are in the column on the right):

local and occasional names	more common names
American bear	black bear
Andean bear	spectacled bear
moon bear	Asiatic black bear
bhalu	sloth bear
brown bear	brown bear or black bear
bruang	sun bear
cinnamon bear	black bear
Himalayan bear	Asiatic black bear
ice bear	polar bear
Japanese bear	brown bear
Malay bear	sun bear
Mongolian bear	brown bear
sea bear	polar bear
Siberian bear	brown bear
silvertip	grizzly bear
Tibetan bear	brown bear or Asiatic black bear
water bear	polar bear
white bear	polar bear

Bear Flag Revolt (June–July 1846), short-lived independence rebellion precipitated by American settlers in California's Sacramento Valley against Mexican authorities. In 1846 approximately 500 Americans were living in California, compared with between 8,000 and 12,000 Mexicans. Nonetheless, early in June a group of about a dozen Americans seized a large herd of horses from a Mexican military commandant. On June 14 another group captured Sonoma, the chief settlement north of San Francisco. Led by William B. Ide, the Americans issued a declaration of independence and hoisted a flag, its white ground emblazoned with a grizzly bear facing a red star. On June 25 Capt. John Charles Frémont arrived at Sonoma and gave his support to the Bear Flag Revolt. And on July 5 the insurrectionists elected Frémont to head the "Republic of California."

But the Republic was quick to fall. On July 9 forces under Commodore John D. Sloat occupied San Francisco and Sonoma, claimed California for the United States, and replaced the bear flag with the American flag.

bear grass, also called TURKEY BEARD, one of two species of North American plants comprising the genus *Xerophyllum* of the lily family (Liliaceae). The western species, *X. tenax,* also is known as elk grass, squaw grass, and fire lily. It is a smooth, light-green mountain perennial with a stout, unbranched stem, from 0.6 to 2 metres (2 to 6 feet) high, which rises from a woody, tuber-like rootstock and cordlike roots. The stem bears a dense basal tuft of narrow, grasslike, rough-edged leaves, about one metre long; the leaves of the upper part of the stem are similar but much smaller. Flowering occurs at five to seven years. The top of the stem develops a large cluster of many small, creamy white flowers.

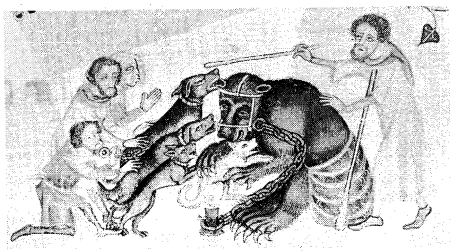
The turkey beard (*X. asphodeloides*) of southern North America is a similar plant that grows in dry pine barrens. In the southern and southwestern United States the name bear grass is given to various kinds of yucca, especially to *Yucca filamentosa* and *Y. glauca;* also to the camas (*Camassia scilloides*) and the aloelike *Dasylirion texanum,* all of which have grasslike leaves.

bear market, in securities and commodities trading, a declining market. A bear is an investor who expects prices to decline and, on this assumption, sells a borrowed security or commodity in the hope of buying it back later at a lower price, a speculative transaction called selling short. The term bear may derive from the proverb about "selling the bearskin before one has caught the bear" or perhaps from selling when one is "bare" of stock. *Compare* bull market.

bearbaiting, alternatively BULLBAITING, the setting of dogs on a bear or a bull chained to a stake by the neck or leg. Held from the 12th to the 19th century, when they were banned as inhumane, these spectacles were usually staged at theatre-like arenas popularly called bear gardens.

In England many large groups of bears were kept expressly for the purpose. For a baiting attended by Queen Elizabeth I in 1575, 13 bears were provided.

When a bull was baited, its nose was often blown full of pepper to further arouse it. Specially trained dogs were loosed singly, each attempting to seize the tethered animal's nose. Often, a hole in the ground was provided into which the bull might thrust this vulnerable part. A successful dog was said to have pinned



Bearbaiting, a miniature from the Luttrell Psalter, English, *c.* 1340; in the British Library

By courtesy of the trustees of the British Library

the bull. Some of the variations of these activities included whipping a blinded bear and baiting a pony with an ape tied to its back. Dogfighting and cockfighting were often provided as companion diversions.

A sport called bull-running also developed in some places, usually as an annual affair. The townspeople, armed with clubs, chased a bull until all were exhausted; then the bull was killed.

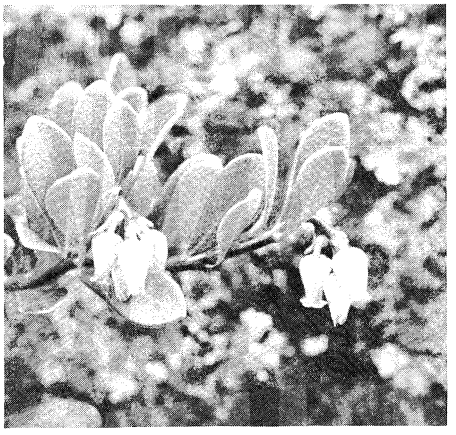
Baiting and its variations declined, although very slowly, from the late 17th century onward, the sports having been banned in England by the Puritans during the Civil Wars and Commonwealth (1642–60). The spectacles were permanently outlawed by act of Parliament in 1835.

Allied activities had scattered revivals on the U.S. frontier: typical examples included dogs being matched against badgers, or a chained bull being matched against a grizzly bear. In each case the battle ended when one killed the other. As U.S. frontiers disappeared, these pastimes disappeared as well.

Consult the INDEX *first*

bearberry, also called KINNIKINNICK (*Arctostaphylos uva-ursi*), flowering, prostrate, evergreen shrubs, of the heath family (Ericaceae), occurring widely throughout North America in rocky and sandy woods and open areas. It has woody stems that are often 1.5–1.8 metres (5–6 feet) long. Roots develop from the stem joints, and the plant spreads, forming a broad, massive ground cover. The foliage turns bronzy in winter. The leaf margins are

rolled and fringed with hairs. The flowers, which may be white, pink, or pink-tipped in



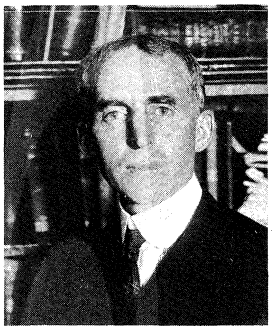
Bearberry (*Arctostaphylos uva-ursi*) showing (top) flowers, (bottom) berries

(Top) Ingmar Holmasen, (bottom) Joan E. Rahn—EB Inc.

colour, are in the shape of a narrow-mouthed bell. The berries are red.

Beard, Charles A(ustin) (b. Nov. 27, 1874, near Knightstown, Ind., U.S.—d. Sept. 1, 1948, New Haven, Conn.), American historian, best-known for his iconoclastic studies of the development of U.S. political institutions. His emphasis on the dynamics of socioeconomic conflict and change and his analysis of motivational factors in the founding of institutions made him one of the most influential American historians of his time.

Reared in a prosperous family, Beard attended De Pauw University, Greencastle, Ind., and after his graduation in 1898 he studied at the University of Oxford. In 1899 he helped found a workingmen's school in Oxford. He visited the United States briefly in 1900, when he married Mary Ritter, returned to England, and permanently returned to the United States



Beard, 1917

By courtesy of the Library of Congress, Washington, D.C.

in 1904 to teach political science at Columbia University.

Beard subsequently became one of the intellectual leaders of the Progressive movement and of American liberalism. He was a leader in movements seeking improvements in municipal government and administration and in national planning. He was initially interested in European history, and he collaborated with J.H. Robinson in writing several widely used textbooks on that subject. He then developed a schema of historical explanation that found its most famous expression in *An Economic Interpretation of the Constitution of the United States* (1913). In this book he claimed that the Constitution had been formulated by interest groups whose motivations were just as much personal financial ones as they were political ones. Although American politicians were generally outraged at the implications of material interests embodied in the Constitution by the Founding Fathers, the book was received by academicians as an innovative study on motivational factors among socioeconomic groups. In *The Economic Origins of Jeffersonian Democracy* (1915), Beard placed somewhat more emphasis on the philosophical context of political struggles, but he nevertheless reaffirmed his view of the importance of economic interests in governmental action. Beard and his wife, Mary R. Beard, subsequently produced a monumental synthesis of the history of the United States entitled *The Rise of American Civilization,* 2 vol. (1927). This widely acclaimed work was supplemented by two more volumes, *America in Midpassage* (1939) and *The American Spirit* (1942).

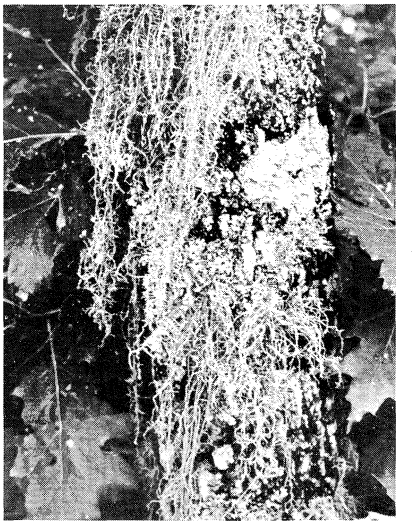
In 1917 Beard resigned from Columbia University in protest against the investigation and dismissal of several faculty members on charges of disloyalty and subversion. He was a cofounder of the New School for Social Research in New York City in 1919. His intellectual orientation in the next years began to shift toward the problem of historical knowledge, which occupied him during the early 1930s. Beard pointed out the subjective nature of the historian's selection and arrangement of facts on the basis of his own relationship to contemporary thought.

In the 1930s and '40s Beard's interests turned to the history of U.S. foreign policy. In 1934 he began writing a series of books and articles in which he attacked President Franklin D. Roosevelt's foreign policy. In such books as *American Foreign Policy in the Making, 1932–1940* (1946) and *President Roosevelt and the Coming of War, 1941* (1948), he charged Roosevelt with virtually maneuvering the United States into war with Japan. Beard was criticized as an isolationist because of these views, and his reputation declined somewhat after the publication of his last works, but he is still considered to be one of the most influential American historians of the 20th century.

BIBLIOGRAPHY. Thomas C. Kennedy, *Charles A. Beard and American Foreign Policy* (1975); Elias Berg, *The Historical Thinking of Charles A. Beard* (1957); Richard Hofstadter, *The Progressive Historians: Turner, Beard, Parrington* (1968, reprinted 1979); and Ellen Nore, *Charles Beard, an Intellectual Biography* (1983).

beard grass: *see* bluestem.

beard lichen, any member of the genus *Usnea,* a yellow or greenish fruticose (bushy, branched) lichen with long stems and disk-shaped holdfasts, which resembles a tangled mass of threads. It occurs in both the Arctic and the tropics, where it is eaten by wild animals or collected as fodder. In the past it was used as a remedy for whooping cough, catarrh, epilepsy, and dropsy. It has been used also as an astringent, a tonic, and a diuretic. Old-man's-beard (*U. barbata*) was first described in 300 BC as a hair-growth stimulant. Hanging moss (*U. longissima*) looks like gray threads about 1.5 m (5 feet) long hanging from



Old-man's-beard (*Usnea barbata*)

Louise K. Broman—Root Resources

tree branches in humid, mountainous regions. Some species of *Usnea* also produce an orange dye. It is the "beard moss," or "tree moss," of the poets and Shakespeare's "idle moss." It is sometimes confused with the plant known as Spanish moss, which is similar in appearance but is unrelated to lichens.

bearded seal (*Erignathus barbatus*), nonmigratory seal of the family Phocidae, distinguished by the bushy, bristly whiskers for which it is named; it is also known as "square-flipper" after the rectangular shape of the foreflipper. Highly valued by Eskimos for its hide, meat, and blubber, the bearded seal is a grayish or yellow-brown animal that lives alone or in small groups in coastal Arctic waters. It attains a length of about 2.4–3.7 m (8–12 feet) and a weight of about 225–454 kg (500–1,000 pounds); the female is somewhat smaller than the male. An adept diver, the bearded seal feeds mainly on clams and other bottom animals, possibly using its whiskers to scrape for prey. The female breeds every other year, bearing a single dark-gray pup after about 11 months' gestation.

bearded tit (bird): *see* reedling.

bearded vulture: *see* lammergeier.

Bearden, Romare (Howard) (b. Sept. 2, 1914, Charlotte, N.C., U.S.—d. March 11, 1988, New York City), American painter whose collages of photographs and painted paper on canvas depict aspects of American black culture in a style derived from Cubism.

Bearden studied at the Art Students League in New York City with George Grosz (1936–37) and at Columbia University (1943). His early paintings were realistic and often religious in theme (*e.g.,* "The Annunciation," 1942). After military service during World War II, he lived in Paris (1950–51), studied at the Sorbonne, and traveled extensively in Europe. During this period he developed his mature, semiabstract collage style. He first achieved recognition in the mid-1940s, and by the 1960s he had come to be regarded as the preeminent collagist in the United States.

The narrative structure of Bearden's paintings is simple and archetypal; ritual, music, and family are his pervasive themes. His works' complexity lies in their poetic abstraction, in which layered fragments of colour and pattern evoke the rhythms, textures, and mysteries of a people's experience (*e.g.,* in "Family," 1969).

beardfish, any of the five species of fishes in the genus *Polymixia* constituting the family Polymixiidae (order Beryciformes). Beardfishes are restricted primarily to deep-sea marine habitats in tropical and temperate regions of the Atlantic and Pacific oceans.

They generally are found at depths from about 200 to 600 metres (650 to 2,000 feet). The term beardfish comes from the beardlike appearance of two enlarged barbels that extend downward from the chin region. Beardfishes are not particularly large; the widely distributed stout beardfish (*P. nobilis*) attains a length of less than 20 centimetres (8 inches).

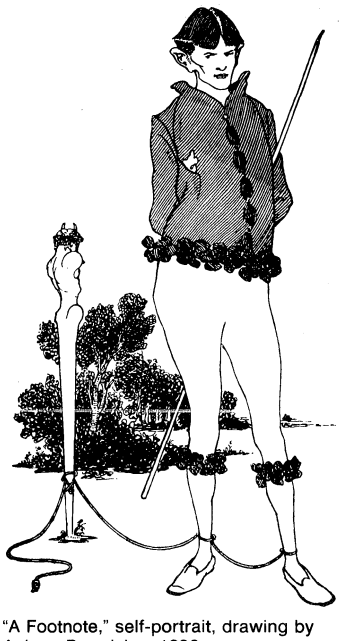
Beardmore Glacier, glacier in central Antarctica, descending about 7,200 ft (2,200 m) from the South Polar Plateau to Ross Ice Shelf, dividing the Transantarctic Mountains of Queen Maud and Queen Alexandra. One of the world's largest known valley glaciers, it is 125 mi (200 km) long and is 25 mi in width. The British explorers Ernest Henry Shackleton (1908) and Robert Scott (1911) discovered the glacier on their route to the South Pole. Later scientific research found the glacier to contain petrified wood and fossils of ferns and coral, evidence of a time when Antarctica possessed a temperate climate.

Beardsley, Aubrey (Vincent) (b. Aug. 21, 1872, Brighton, Sussex, Eng.—d. March 16, 1898, Menton, Fr.), the leading English illustrator of the 1890s and, after Oscar Wilde, the outstanding figure in the Aestheticism movement.

Drawing was a strong interest from early childhood, and Beardsley continued with it while earning his living as a clerk. A meeting with the English artist Sir Edward Burne-Jones in 1891 led to his attending evening classes at the Westminster School of Art for a few months—his only professional instruction.

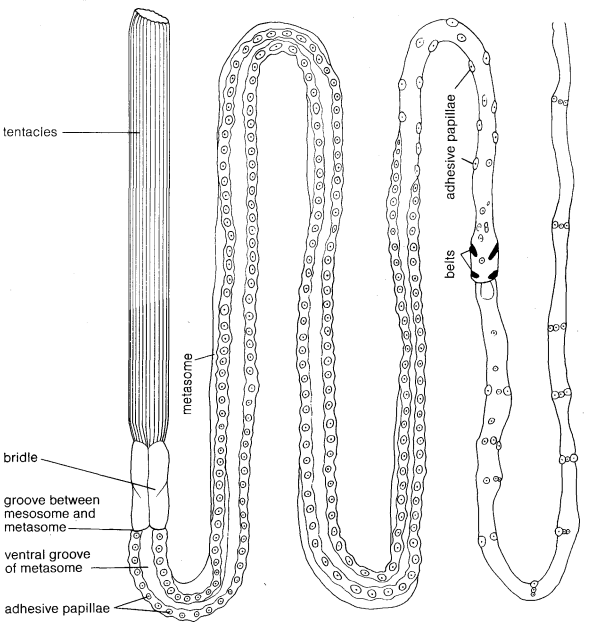
In 1893 he was commissioned to illustrate a new edition of Sir Thomas Malory's *Morte Darthur,* and in 1894 he was appointed art editor and illustrator of a new quarterly, *The Yellow Book.* His illustrations for Oscar Wilde's play *Salomé* (1894) won him widespread notoriety. He was greatly influenced by the elegant, curvilinear style of Art Nouveau (*q.v.*) and the bold sense of design found in Japanese woodcuts. But what startled critics and public alike was the obvious sensuality of the women in his drawings, which usually contained an element of morbid eroticism. This tendency became pronounced in his openly licentious illustrations to Aristophanes' *Lysistrata* (1896). Although Beardsley was not homosexual and was quite outside the scandals surrounding Wilde, he was dismissed from *The Yellow Book* in the general revulsion against Aestheticism that followed Wilde's exposure in 1895. He then became principal illustrator of another new magazine, *The Savoy,* and he illustrated numerous books, including Alexander Pope's *Rape of the Lock* (1896). During this period he also wrote some poems and a prose parody, *Under the Hill* (1903; the original unexpurgated version, *The Story of Venus and Tannhauser,* appeared in 1907).

Delicate in health from the age of six, when he first contracted tuberculosis, he was attacked again by the disease when he was 17. From 1896 he was an invalid. In 1897, after being received into the Roman Catholic Church, he went to live in France, where he died at the age of 25. His work enjoyed periodic revivals, most notably during the 1960s.



"A Footnote," self-portrait, drawing by Aubrey Beardsley, 1896

beardworm, also called POGONOPHORAN, any of a group of marine invertebrates constituting the phylum Pogonophora. Pogonophorans live a sedentary life in long, protective tubes on seafloors throughout the world. The common name beardworm refers to the beardlike mass of pinnate (feather-like) tentacles borne at the anterior end of many species. An intestine, which forms in embryos, disappears as development progresses. Males of the phylum are generally similar in appearance to females. Pogonophorans are the only multicellular animals that have neither mouth nor anus.



Female *Spirobrachia beklemischevi,* ventral view with posterior one-sixth of trunk not shown

From A.V. Ivanov, *Zoologische Jahrbucher Abt. 1 Systematik,* 85 (1957); Gustav Fischer Verlag

Pogonophorans were first classified as a distinct phylum in the middle of the 20th century. The first species, *Siboglinum weberi,* described in 1914, came from the seas of the Malayan Archipelago; the second species, *Lamellisabella zachsi,* which came from the Okhotsk Sea, was described in 1933. In 1937 a new class called Pogonophora was established for *Lamellisabella.* In 1955 a close affinity between *Siboglinum* and *Lamellisabella* was proved, and the members were placed in the newly established phylum Pogonophora.

Pogonophorans usually inhabit marine waters to depths that exceed 1,000 metres (32,800 feet); some species have been found at depths ranging from 7,000 to 10,000 metres. A native population inhabits the trenches of the Pacific and the Indian oceans. Many genera have a discontinuous distribution.

Natural history. The tentacles, probably used during feeding, vary in number according to body size. The tentacles are long processes containing blood vessels and are continuous with the body cavity, or coelom. Rows of very thin single-celled units called pinnules are found on the tentacles. The pinnules, which extend into the intertentacular cavity formed by the free or fused tentacles, intermesh to form a filter. Beside each pinnule base is a ciliary tract. In each intertentacular region, ciliary tracts produce a current of water that carries in microorganisms and other nutrients; these are filtered through the pinnule filter. Digestive enzymes probably are secreted by gland cells located at the pinnule bases. Water leaves by an opening at the base of certain tentacles. The digested food may be absorbed by the pinnules. The pinching off of small food particles in the outer layers of the pinnules during a process known as pinocytosis also has been observed. Direct penetration of amino acids from sea-water into the tentacles also has been reported to take place.

Reproduction is sexual. Eggs, which have a high yolk content, are laid by the female in the anterior part of the tube, in which fertilization and early development to formation of a swimming larva also occur. Cleavage leads to the formation of a bilaterally symmetrical embryo. A cell layer called the endoderm first is represented by a few yolk-rich cells, which form a primary intestine; the intestine disappears as the yolk is utilized. Both mouth and anus fail to develop. A secondary body cavity is formed by separation of coelomic pockets from the primary intestine. The embryo develops into a larva having two ciliary belts and three body segments.

Form and function. The wormlike body varies in length from several centimetres to 0.5 metre (1.64 feet), the body diameter, from 0.06 millimetre to 4 millimetres (0.002 inch to 0.16 inch). *Lamellibrachia barhami* is one of the largest species. The body consists of three segments: two small anterior regions are called protosome and mesosome; the long trunk section is called the metasome. Each segment has its own coelom. The small protosome bears tentacles. The mesosome contains a structure known as a bridle, also called a frenulum, a pair of oblique cuticular ridges that extend backward to meet in the midventral line. The bridle supports the protruding worm on the edge of its tube. The metasome is divided into two sections by a pair of parallel ridges called belts; these have rows of small platelets containing minute teeth. One part of the metasome, in front of the belts, has a groove bordered by low folds.

The protective tube is submerged in mud at the lower end; the very thin tubes of *Sclerolinum,* however, pierce pieces of sunken wood. The tube, secreted by special glands, contains a hard substance called chitin. Although the animals never leave their tubes, they are able to move inside them.

The body wall consists of an outer layer of epidermal cells covered by a cuticle. Beneath the epidermal cells is a layer of longitudinal muscle cells. The nervous system, found within the epidermis, forms an almost continuous network. There are no sense organs. The circulatory system consists of two long vessels: in one, blood flows forward; in the other, backward. At the base of the tentacles, the vessel through which blood flows forward is differentiated into a muscular heart, which serves to push blood into the tentacle vessels. The blood contains the pigment hemoglobin. The excretory system consists of a pair of nephridia, or coelomoducts, which connect the body cavity with the exterior.

The reproductive system consists of a pair of sexual glands that lie in the trunk. In females, ovaries are found in the anterior part of the metasome, while the sexual openings, or oviducts, are found in the middle of the body. In males, the testes are located in the posterior part of the body, and the sexual openings, called sperm ducts, in the anterior part. Numerous capsules containing sperm form in the sperm ducts of the males.

Evolution and classification. The Pogonophora may be separated into two classes, Afrenulata and Frenulata. The Afrenulata contains one species—*Lamellibrachia barhami,* which has been found in the Pacific Ocean near the coast of California. The class Frenulata contains 16 genera in six families. A total of 110 species of Pogonophora thus far have been identified; it is probable that many more species remain to be identified.

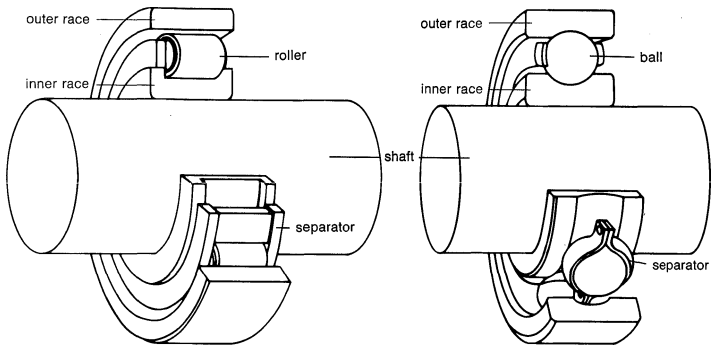
According to general body plan and embryological development, Pogonophora should be included with the large group of animals that have a secondary body cavity; this group also includes Chaetognatha, Tentaculata, Hemichordata, and Echinodermata. A rich fossil Pogonophora fauna has been found in Cambrian (about 500,000,000 to 570,000,000 years ago) and Ordovician (about 430,000,000 to 500,000,000 years ago) deposits near Leningrad, in Poland, and in Siberia.

bearing, in machine construction, a connector (usually a support) that permits the connected members to rotate or to move in a straight line relative to one another. In many applications one of the members is fixed, and the bearing acts as a support for the moving member.

Most bearings support rotating shafts against either transverse (radial) or thrust (axial) loads. To minimize friction, the contacting surfaces in a bearing may be partially or completely separated by a film of liquid (usually oil) or gas; these are sliding bearings, and the part of the shaft that turns in the bearing is the journal. The surfaces in a bearing may be separated also by balls or rollers; these are known as rolling bearings. In the illustration, the inner race turns with the shaft.

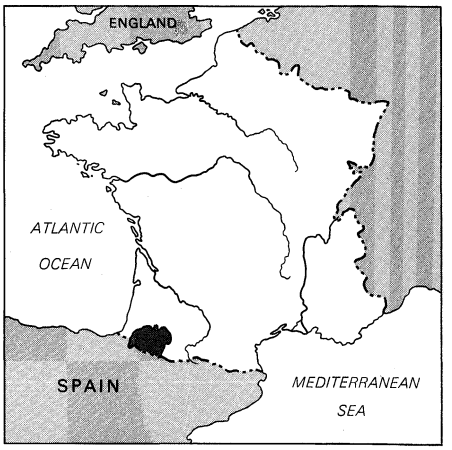
Under certain combinations of load, speed, fluid viscosity, and bearing geometry, a fluid film forms and separates the contacting surfaces in a sliding bearing; this is known as a hydrodynamic film. An oil film can also be developed with a separate pumping unit that supplies pressurized oil to the bearing; this is known as a hydrostatic film.

Because shaft speed is required for the development of a hydrodynamic film, the starting friction in these bearings is higher than in ball or roller bearings. To minimize friction when metal-to-metal contact occurs, low-friction-bearing materials have been developed; among these are bronze alloys and babbitt metal. *See also* ball bearing; roller bearing.



Rolling bearings
(Left) Roller (cylindrical) bearing, (right) ball bearing
By courtesy of Anti-Friction Bearing Manufacturers Assoc., Inc.

Béarn, historic and cultural region encompassing mountainous regions of the south-



The province of Béarn

western French *département* of Pyrénées-Atlantiques and coextensive with the former province of Béarn.

The following article summarizes the political history, geography, and modern culture of Béarn; for additional treatment of its geography and history, *see* MACROPAEDIA: France.

Béarn's name can be traced to the town of Beneharnum (Lescar). Béarn was conquered by the Vascones (the ancestors of the modern Basques) in the 6th century and in 819 became a viscounty feudally dependent on the dukes of Aquitaine; in the 11th century the viscounts ceased to acknowledge any suzerain. Their coinage, the "morlans" (of Morlaas), was famous.

In 1290 the viscounty passed to the counts of Foix, from whom it was transmitted to the kings of Navarre. When Henry III of Navarre became Henry IV of France in 1589, Béarn became a holding of the French crown.

From the 12th century until the French Revolution, the Béarnais had a form of representative government with *cours plénières* composed of deputies from the three estates.

Until the early 20th century the inhabitants of the mountains were largely seminomadic and practiced transhumance, moving their flocks between the highlands of Ossau in the summer and the lowlands around Pau in the winter. Pastures were collectively owned. Settlements in the valleys of the centre subsequently grew at the expense of the mountain regions, and the population has become predominantly urban. The usual farmstead of the valleys has two stories and is roofed with slate shingles. Stables occupy the ground floor; living quarters are upstairs. Immigrants from other French regions and repatriates from North Africa are of considerable social and economic importance.

Roman Catholicism predominates; Protestantism made some inroads during the second half of the 16th century but is now largely limited to the town of Orthez. The regional dialect, which shows strong Gascon influence, was used in public acts between 1589 and 1789. The École Gaston Phébus was founded in 1897 in Pau and has been instrumental in preserving the literary traditions of Béarn.

Regional cuisine features trout, mushrooms, and cheese from sheep's milk. *Tourin* is a soup of onions, tomatoes, and garlic; *cousinette* is a soup whose ingredients include mallow, chard, sorrel, and chicory. Jurançon produces renowned white wines. Madiran is an outstanding red wine from Gers.

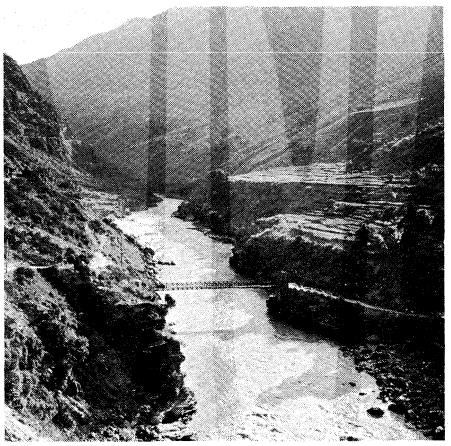
Béarn, Henri de Bourbon, prince de: *see* Henry IV *under* Henry (France).

Bearsden and Milngavie, district, Strathclyde region, southwestern Scotland; created by the reorganization of 1975, it is part of the former county of Dunbarton (*q.v.*). The district, area 28 sq mi (73 sq km), consists of the small burghs of Milngavie, the seat of the district authority, and Bearsden, with a little countryside on the northwest. The burghs, though they have some industry, are northern outer suburbs of Glasgow and are mainly residential. Pop. (1982 est.) 39,404.

Beartooth Range, segment of the northern Rocky Mountains in the U.S., extending east-southeastward for 50 mi (80 km) from the Stillwater River, in southern Montana, to the Clarks Fork of the Yellowstone River, in northwestern Wyoming. Many peaks rise to more than 12,000 ft (3,700 m), including Granite Peak (12,799 ft), the highest point in Montana. It was through these mountains that Chief Joseph led the Nez Percé Indians on their attempt to reach Canada in 1877.

The range serves as a source region for the Clarks Fork (stream) and includes the Granite Range (a northwestern extension), parts of the Gallatin, Custer, and Shoshone national forests, and the Absaroka Beartooth Wilderness area. Scenic granite formations, alpine peaks, high plateaus, glaciers, and lakes attract many tourists.

Beās River, also spelled BIĀS, Ancient Greek HYPHASIS, Sanskrit VIPĀŚĀ, river in Himāchal Pradesh and Punjab states, northwestern India. It is one of the five rivers that give the Punjab (Five Rivers) its name. It rises at an altitude of 14,308 ft (4,361 m) in the Rohtang Pass in the Punjab Himalayas, in the Kulu district of Himāchal Pradesh. From there it flows south through the Kulu Valley, receiving tributaries from the flanking mountains, and then turns west to flow past Mandi into the Kāngra Valley. After crossing the valley, the Beās enters Punjab state and veers south and then southwest to its confluence with the Sutlej River at Harike after a course of about



Beās River in the Punjab Himalayas, Himāchal Pradesh, India

B. Bhansali—Globe

290 mi (470 km). The Beās River was the approximate eastern limit of Alexander the Great's invasion of India in 326 BC.

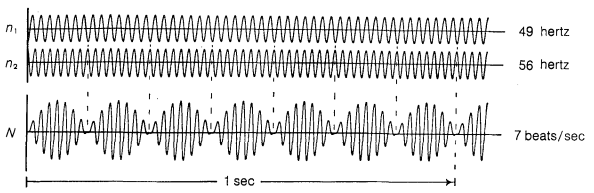
beast epic, popular genre in various literatures, consisting of a lengthy cycle of animal tales that provides a satiric commentary on human society. Although individual episodes may be drawn from fables, the beast epic differs from the fable not only in length but also in putting less emphasis on a moral.

The earliest European beast epics were written in Latin, but vernacular epics in French, German, and Dutch existed in the late Middle Ages. Among the most famous are the 10th- and 11th-century cycles in which the hero is Reynard the Fox. The cycle includes the tale of the Fox and Chanticleer the Cock, later used as the basis of "The Nun's Priest's Tale" in Chaucer's *Canterbury Tales.* Dryden used the beast epic as the framework of the poem *The Hind and the Panther* (1687); Joel Chandler Harris' *Uncle Remus: His Songs and His Sayings* (1880) derived many episodes from beast tales carried to the United States by African slaves; *Animal Farm* (1945), an anti-Utopian satire by George Orwell, is a modern adaptation of the beast tale.

The best known Asian collection of beast tales is the *Pañca-tantra* of India.

Beast of Belsen: *see* Kramer, Josef.

beat, in physics, the pulsation caused by the combination of two waves of slightly different frequencies. The principle of beats for sound waves can be demonstrated on a piano by striking a white key and an adjacent black key at the bass end of the keyboard. The resulting sound is alternately soft and loud—that is, having characteristic pulsations, or throbs, called beats. Toward the treble end of the keyboard, the beat frequency is greater because the difference in frequency of adjacent keys is more than at the lower end. The Figure depicts two waves n_1 and n_2 with respective frequencies of 49 and 56 vibrations per second (hertz); the beat frequency N is their difference, 7 beats per second.



Wave graphs illustrating how beat notes are produced by two different frequencies

From *Modern College Physics* by H.E. White © 1966 by Litton Educational

The phenomenon of beats is employed in various ways. For example, in the tuning of instruments, if a tuning fork and piano key of the same note are struck simultaneously and no beat is heard, then they are of identical pitch. Ultrasonic vibrations (having a frequency higher than is audible), such as the vocal sounds made by bats and dolphins, may be detected by superimposing a sound of different frequency to produce audible beats. The principle is also used in the superheterodyne reception of radio waves, in which the signal from an oscillator is beat against the incoming radio signal to produce a frequency in the audible range.

beat, in metrically organized music, the basic rhythmic unit of a measure or bar, not to be confused with rhythm as such; nor is the beat necessarily identical with the underlying pulse of a given piece of music, which may extend over more than a single beat. The number and relative positions of accented and unaccented beats furnish the basis of proper metric articulation, with the strongest accent usually falling on the first beat after the bar line. In Western musical notation the number of beats to the measure is indicated by the upper figure of the time signature at the beginning of a musical composition, while the time value of each separate beat (*e.g.*, a quarter or eighth note) is indicated by the lower figure.

In musical acoustics, "beat" refers to the periodic intensifications of sound produced by slight differences between nominally identical pitches. Though considered undesirable in tuning generally, such small frequency differentials may be deliberately induced, for example in the voix céleste, an organ stop that owes its peculiar undulating quality to the simultaneous sounding of two pipes minimally out of tune with each other. *See also* metre; rhythm.

Beat movement, American social and literary movement originating in the 1950s and centred in the bohemian artist communities of San Francisco's North Beach, California's Venice West, and New York City's Greenwich Village. Its adherents, self-styled as "beat" (originally meaning "exhausted"; later sometimes interpreted as "beatific") but derisively called "beatniks," expressed their alienation from conventional or "square" society by adopting an almost uniform style of seedy dress, manners, and a "hip" vocabulary borrowed from jazz musicians. Generally apolitical and indifferent to social problems, they advocated personal release, purification, and illumination through the heightened sensory awareness that might be induced by drugs, jazz, sex, or the disciplines of Zen Buddhism. Apologists for the Beats, among them Paul Goodman (*Growing Up Absurd,* 1960), found the joylessness and purposelessness of modern society sufficient justification for both withdrawal and protest. Beat poets sought to liberate poetry from academic preciosity and bring it "back to the streets." They read their poetry, sometimes to the accompaniment of progressive jazz, in such Beat strongholds as the Coexistence Bagel Shop and Lawrence Ferlinghetti's City Lights bookstore in San Francisco. The verse was often chaotic and liberally sprinkled with obscenities but was sometimes, as in the case of Allen Ginsberg's *Howl* (1956), ruggedly powerful and moving. Ginsberg and other major figures of the movement, such as the novelist Jack Kerouac, advocated a kind of free, unstructured composition in which the writer put down his thoughts and feelings without plan or revision—to convey the immediacy of experience—an approach that led to the production of much undisciplined and incoherent verbiage on the part of their imitators. By about 1960, when the faddish notoriety of the movement had begun to fade, it had produced a number of interesting and promising writers, including Ferlinghetti, Gregory Corso, Philip Whalen, and Gary Snyder, and had paved the way for acceptance of other unorthodox and previously ignored writers, such as the Black Mountain poets and the novelist William Burroughs. John Tytell's *Naked Angels: The Lives and Literature of the Beat Generation* (1976) is a study of the movement.

Beata Ridge, submarine ridge of the southern Caribbean Sea floor. Trending south-southwest from Beata Cape on the island of Hispaniola, the Beata Ridge divides this part of the sea into two areas, the Colombian and the Venezuelan abyssal plains. The Aruba Gap, a narrow connection between these two basins, truncates the Beata Ridge before it reaches the continental slope of South America. This ridge should not be confused with the Beata Rise, which is located directly east in the Venezuelan Basin.

beatification, in the Roman Catholic Church, second stage in the process of canonization (*q.v.*).

Beatitude, any of the blessings said by Jesus in the Sermon on the Mount as told in the New Testament in Matt. 5:3–12 and in the Sermon on the Plain, in Luke 6:20–23. Named from the initial words (*beati sunt,* "blessed are") of those sayings in the Latin Vulgate Bible, the Beatitudes describe the blessedness of those who have certain qualities or experiences peculiar to those belonging to the Kingdom of Heaven (*e.g.*, "Blessed are the poor in spirit, for theirs is the kingdom of heaven").

The four blessings in the Sermon on the Plain may have been the nucleus of the expanded nine in the Sermon on the Mount. In addition to these two compilations, other Beatitudes are found in other places in the New Testament (*e.g.*, Matt. 11:6, Luke 7:23, and John 20:29).

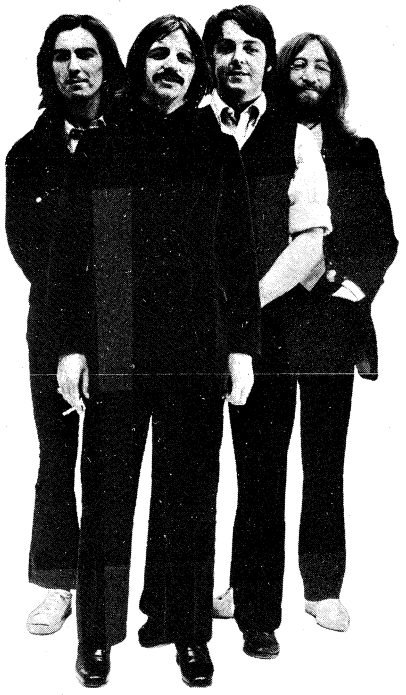
Beatles, the, English musical group that enjoyed worldwide popular adulation in the 1960s; the group was known for its rock style of music.

The four members of the group, all born in Liverpool, were (James) Paul McCartney (b. June 18, 1942), John (Winston) Lennon (b. Oct. 9, 1940—d. Dec. 8, 1980, New York City), George Harrison (b. Feb. 25, 1943), and Ringo Starr (original name Richard Starkey, b. July 7, 1940). Each came from a working-class background, and all had had experience in various other rock groups before they started performing together. The group began in the pairing of McCartney and Lennon in 1956, joined by Harrison in 1957; the three (along with one member who died in 1962 and another who was later replaced by Starr) adopted the name the Beatles in 1960, performing at clubs in Liverpool and in Hamburg, which served as a proving ground for popular musicians of the period. In 1962 the group, under the management of Brian Epstein, signed a recording contract and recruited Starr from another band. The subsequent commercial release (1962–63) of such songs as "Love Me Do," "Please Please Me," "She Loves You," and "I Want To Hold Your Hand" made them the most popular rock group in England, and early in 1964 what soon came to be called

"Beatlemania" struck the United States with the release there of the two last-named records and their first U.S. television appearance on the "Ed Sullivan Show."

The Beatles' music, originally inspired by such U.S. performers as Chuck Berry, Elvis Presley, and Bill Haley, recaptured much of the freshness and excitement of the earliest days of rock and roll and, in combination with the simple but engaging lyrics of Lennon and McCartney, kept the group at the top of popularity charts for several years. They won recognition from the music industry in the form of awards for performances and songs and from Queen Elizabeth II, who named each of them to membership in the Order of the British Empire. Their long hair and tastes in dress proved influential throughout the world, as did their highly publicized experimentation with hallucinogenic drugs and Indian mysticism. With a solid financial basis—any single record or album of theirs was virtually guaranteed sales of more than a million—they felt free to experiment with new musical forms and arrangements. The result was a variety of songs ranging from ballads such as "Yesterday" to complex rhythm tunes like "Paperback Writer," from children's songs such as "Yellow Submarine" to songs of social comment, including "Eleanor Rigby." Their public performances ended in 1966.

In 1967 they produced "Sgt. Pepper's Lonely Hearts Club Band," an album conceived as a dramatic whole rather than as a collection of miscellaneous songs; it was novel, too, in its use of electronic music and in its being explicitly a studio work unreproducible on stage. Their prestige won attention to their experiments from their predominantly young audience, opening up new possibilities for musical expression that other performers were quick to follow, and it attracted other, more serious listeners as well. The Beatles engaged in other artistic pursuits, together in two critically well-received films, *A Hard Day's Night* (1964) and *Help!* (1965), and separately. Finally, the pressures of their public lives, together with their growing outside interests, led to the group's dissolution in 1971, although rumours that they might reunite persisted. McCartney produced solo albums and in 1971 formed his own band, Wings. Harrison worked alone and with Lennon and Starr in the 1970s. Starr appeared in films and showed some attraction to country music. Lennon continued as a musician with his wife, Yoko Ono, and as a political activist. He was wantonly assassinated in 1980.

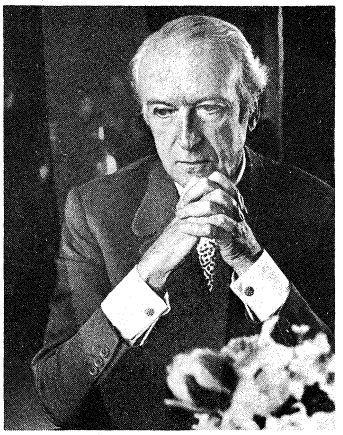


The Beatles (left to right: George Harrison, Ringo Starr, Paul McCartney, John Lennon), *c.* 1969–70

By courtesy of ABKCO Industries; photograph, from the Collection of Penguin Photo

Beaton, Sir Cecil (Walter Hardy) (b. Jan. 14, 1904, London—d. Jan. 18, 1980, Broadchalke, Salisbury, Wiltshire, Eng.), photographer, important primarily for his decorative portraits of celebrated persons.

His interest in photography began when, as a young boy, he admired the portraits of society women and actresses circulated on picture postcards and in Sunday supplements of newspapers. His nurse taught him camera work and photographic printing, and, when he got his first camera at the age of 11, he imitated those portraits by costuming and posing his sisters.



Sir Cecil Beaton, 1968

Louanne Richards

In the 1920s, Beaton became a staff photographer for *Vanity Fair* and *Vogue,* fashion magazines for which he did most of his work. He continued to develop a style of portraiture in which the sitter became merely one element of an overall decorative pattern dominated by backgrounds specially made of materials such as aluminum foil or papier-mâché. The results were alternately exquisite, exotic, or bizarre, but always chic. Many of these portraits are gathered in his photographic books *The Book of Beauty, Persona Grata,* and *It Gives Me Great Pleasure.*

During World War II, Beaton served in the Ministry of Information, covering the fighting in Africa and the Far East. But the most effective of his wartime photographs are those of the siege of Britain, published in the photographic book *Winged Squadrons* (1942). After the war Beaton resumed portrait photography, but his style was much less flamboyant. He also broadened his activities, designing the costumes and sets for a revival of Oscar Wilde's play *Lady Windermere's Fan* and the costumes for the musical comedy *My Fair Lady.* Beaton was knighted in 1972.

Beaton, David, Beaton also spelled BETHUNE (b. *c.* 1494—d. May 29, 1546, St. Andrews, Fife, Scot.), Scottish cardinal and statesman who promoted a close alliance between Scotland and France and who was an implacable opponent of the Scottish Reformation.

Beaton became archbishop of St. Andrews in 1539 and papal legate in Scotland in 1544. Beginning his political career in 1529, he eventually became the trusted counsellor of King James V. He dissuaded the King from following the Reformist religious policies of Henry VIII of England and helped arrange James's two successive marriages to French noblewomen. After James's death in 1542, Beaton's opposition to the pro-English policies of James Hamilton, 2nd earl of Arran—regent for James's daughter, Mary Stuart—led to his imprisonment from January to April 1543. After Arran changed sides, Beaton became chancellor and virtual ruler of Scotland and initiated a persecution of Protestants. By blocking the proposed marriage of Mary Stuart to the future king Edward VI of England, he frustrated Henry's design for the subjugation of Scotland and provoked the abortive English invasion of 1544.

David Beaton, oil painting by an unknown artist; in a private collection

By courtesy of the Scottish National Portrait Gallery, Edinburgh

Beaton had the popular reformer George Wishart burned at the stake on March 1, 1546, and in revenge a band of Protestant nobles murdered him in St. Andrews Castle.

Beaton, James, Beaton also spelled BETHUNE (b. 1470?—d. 1539, St. Andrews, Fife, Scot.), primate of Scotland from 1522 and chancellor from 1513 to 1526.

Uncle of the cardinal David Beaton, he was abbot of Dunfermline, Kilwinning, and Arbroath and successively archbishop of Glasgow (1509–22) and of St. Andrews (1522–39). As treasurer of Scotland (1505–09) and chancellor, he was a powerful figure during the minority of James V, when he was one of the regents allied with the party that wished to preserve Scottish ties with France. It was chiefly due to his efforts that James's first marriage, with a daughter of Francis I of France, was arranged. As primate, Beaton set an example for his nephew David Beaton by burning the first Scottish martyr, Patrick Hamilton, in 1528, and later three other reformers. David Beaton succeeded him as archbishop of St. Andrews.

Beaton, James, also called JAMES BETHUNE (b. 1517—d. April 30, 1603, Paris), last Roman Catholic archbishop of Glasgow.

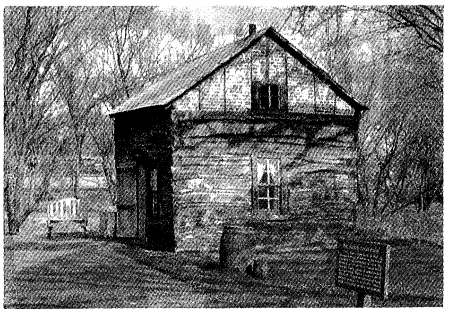
A son of John Bethune of Auchmuty and a nephew of the cardinal David Beaton, James Beaton was a trusted adviser of the Scottish regent, Mary of Lorraine, widow of James V, and a determined foe of the Protestant reformers. Educated in France, he was consecrated at Rome as archbishop of Glasgow in 1552, but from 1560 until his death he served as ambassador in Paris for Mary Stuart and James VI of Scotland.

Beatrice, the woman to whom the great Italian poet Dante dedicated most of his poetry and almost all of his life, from his first sight of her at the age of nine ("from that time forward, Love quite governed my soul") through his glorification of her in *La divina commedia,* completed 40 years later, to his death in 1321.

Beatrice is usually identified as Beatrice Portinari, the daughter of a noble Florentine family, who married Simone de' Bardi and died

at the age of 24 on June 8, 1290. Dante wrote a chronicle of his relationship with her in *La vita nuova* (*c.* 1293; *The New Life*), a prose work interlaced with lyrics. Dante tells of his meetings with her, praises her beauty and goodness, describes his own intense reactions to her kindness or lack of it, tells of events in both their lives, and explains the nature of his feelings for her. *La vita nuova* also tells of the day when Dante was informed of her death and contains several anguished poems written after that event. In the final chapter, Dante vows to write nothing further of Beatrice until he writes "concerning her what hath not before been written of any woman." The promise is fulfilled in *La divina commedia*, which he composed many years later, expressing his exalted and spiritual love for Beatrice, who is his intercessor in the *Inferno,* his goal in traveling through *Purgatorio,* and his guide through *Paradiso.* At first sight of her, in *Purgatorio,* he is as overwhelmed as he was at the age of nine, and he is dazzled by her presence throughout the journey, until she ascends again to her place in heaven. This expression of sublimated and spiritualized love ends with Dante's total absorption in the divine.

Beatrice, city, seat of Gage County, in the Big Blue River Valley, southeastern Nebraska, U.S. Established in 1857, it was named for the daughter of one of its founders, Judge John Kinney. Beatrice (pronounced Be-AT-riss) is the seat of the Martin Luther Home for retarded children and the Beatrice State De-



Homestead National Monument of America near Beatrice, Neb.

Milt and Joan Mann from CameraMann

velopmental Center for the mentally ill. The Homestead National Monument of America (*q.v.*), comprising the Dan Freeman farm, the first claim entered under the Homestead Act of 1862, is 4 miles (6 km) northwest. The city's economy depends on mixed agriculture and light manufacturing. Inc. town, 1871; city, 1873. Pop. (1982 est.) 12,830.

Beatrice Companies Inc., one of the largest food-processing companies in the United States. The conglomerate, which is involved in more than 300 autonomous businesses, makes thousands of different food and consumer products, including vegetable and dairy products, meats, and beverages. Headquarters are in Chicago.

Beatrice, incorporated in 1924, was started in 1894 as a creamery in Beatrice, Neb. The founders, dairymen George Haskell and William Bosworth, quickly expanded the business by using a plan that was simple but new to the dairy business. Their company sold cream separators to dairy farmers who in turn sold their cream to Beatrice. By the turn of the century, Beatrice's Meadow Gold dairy products were nationally known.

In 1946 Beatrice Creamery Company was renamed Beatrice Foods Company and started to diversify its food product lines, concentrating on candy, snack, and specialty food items. In 1964 it began diversifying into nonfood areas, primarily manufactured and chemical products. In the mid-1980s, however, Beatrice sold many of its nonfood businesses in order to concentrate on enlarging its food-processing and distributing operations both at home and overseas. The name was changed to Beatrice Companies Inc. in 1984. In 1985 the publicly owned stock of Beatrice Companies was bought by Kohlberg, Kravis, Roberts & Company in what was both the largest non-oil business takeover and by far the largest management buyout up to that time. The company has occasionally run afoul of federal antitrust regulations, as in the 1930s, when the federal government instructed Beatrice to stop buying milk plants.

Beatrijs, lyric narrative containing a noted medieval European Mary legend. The oldest extant *Beatrijs* manuscript dates from 1374, although it is thought to be taken from an earlier collection, *Dialogue miraculorum* (*c.* 1200) by Caesarius of Heisterbach. An anonymous text written in an East Flemish dialect, it is the simple courtly tale of a nun who flees from her convent to marry a man she has loved from childhood. After fathering two children, he deserts her; she is forced into a life of sin, but remorse eventually drives her back to the convent where she discovers that she was not missed because the Virgin Mary had taken her place. Among the many poems that the *Beatrijs* legend has inspired is "Beatrijs" (1908) by Peter Cornelis Boutens. It is the basis of Maurice Maeterlinck's drama *Sister Beatrice* and Karl Vollmoeller's *The Miracle* (1910), memorable for its spectacular production by Max Reinhardt.

Beatrix, in full BEATRIX WILHELMINA ARMGARD (b. Jan. 31, 1938, Soestdijk, Neth.), queen of The Netherlands from 1980.

The eldest of four daughters born to Princess (later Queen) Juliana and Bernhard of Lippe-Biesterfeld, Beatrix went into exile with her family when the Germans overran The Netherlands in World War II, and she spent the war years in Britain and Canada. When Juliana ascended the throne in 1948, Princess Beatrix received the title of heiress presumptive. From 1956 to 1961 she attended the State University of Leiden, studying mainly social sciences, law, and history.

In 1965 her betrothal to a German diplomat, Claus George Willem Otto Frederik Geert von Amsberg, caused a national furor because of his past membership in the Hitler Youth and the German Army, even though he had been cleared by an Allied court. On March 10, 1966, they were married, and the hostility apparently dimmed with the births of Willem-Alexander (1967), Johan-Frisco (1968), and Constantijn (1969), the first male heirs in the House of Orange since 1890.

In 1980 Queen Juliana abdicated, and Beatrix ascended the throne on April 30.

Beattie, James (b. Nov. 5, 1735, Laurencekirk, Kincardine, Scot.—d. Aug. 18, 1803, Aberdeen), Scottish poet and essayist,

Beattie, detail of an engraving by William Ridley after a portrait by an unknown artist

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

whose once-popular poem *The Minstrel* was one of the earliest works of the Romantic movement.

Beattie was a farmer's son. He graduated from Marischal College, Aberdeen, and became professor of moral philosophy there. At the age of 25, he published *Original Poems and Translations* (1760), which already showed a Romantic attitude toward nature. With his *Essay on the Nature and Immutability of Truth, in Opposition to Sophistry and Scepticism* (1770), a vigorous defense of orthodoxy against the rationalism of David Hume, he achieved fame. Addressed to the layman, the *Essay* is based on social rather than metaphysical arguments and enjoyed wide popularity. The next year he published the first part of *The Minstrel,* a poem in the Spenserian stanza tracing the development of a poet's mind under the influence of nature. The second part was published in 1774. Although the setting is artificial and the moralizing tedious, the poem reflects the author's gentleness and sensitivity to natural beauty. To his generation it was a revelation, and it influenced Robert Burns, Sir Walter Scott, and Lord Byron. This double success, as the defender of Christianity and the poet of a new era, opened all doors. Beattie was welcomed into Samuel Johnson's circle, sat for his portrait by Sir Joshua Reynolds, and was given a life pension by George III. Success brought little happiness. His wife became insane and his sons, one of whom was a promising poet, died young. Beattie, who published the elder son's writings with a memoir in 1794 (*Essays and Fragments in Prose and Verse*), was overwhelmed by the death of the younger son and never recovered his health.

Beatty, Clyde (b. 1903, Bainbridge, Ohio, U.S.—d. July 19, 1965, Ventura, Calif.), American trainer of wild animals who was known for his "fighting act," designed to demonstrate his courage and mastery of the ferocious animals under his control. In one of the most daring acts in circus history, he mixed 40 lions and tigers of both sexes and also used dangerous combinations of tigers, lions, leopards, pumas, hyenas, and bears.

Beatty left home at the age of 18 to be a circus cage attendant. A year later he had his own animal act. From 1925 through 1934 he toured with the Hagenbeck–Wallace Circus. From 1931 through 1934 he appeared with the Ringling Bros. and Barnum & Bailey Circus in its New York City and Boston appearances. He also performed with the Cole Bros. Circus from 1935 through 1938. Beatty bought a circus in 1945 that later merged with Cole Bros. (1958) to form the largest tent show on the road in the United States at that time. He appeared in several motion pictures, including *The Big Cage* (1933) and *Ring of Fear* (1957).

Beatty, David, 1ST EARL BEATTY, VISCOUNT BORODALE OF WEXFORD, BARON BEATTY OF THE NORTH SEA AND OF BROOKSBY (b. Jan. 17, 1871, Howbeck Lodge, Stapeley, near Nantwich, Cheshire, Eng.—d. March 11, 1936, London), British admiral of the fleet, who commanded Britain's battle cruisers in the Battle of Jutland (1916).

Beatty began training as a naval cadet in 1884. From 1896 to 1898 he served in Egypt and the Sudan and then in 1900 in China during the Boxer Rebellion and was promoted to captain at the early age of 29. In 1911, as a rear admiral, he became naval secretary to the first lord of the Admiralty, then Winston Churchill, and in 1913 was appointed to command the battle cruiser squadron.

Soon after the outbreak of World War I in August 1914, Beatty's naval force made a raid into the Helgoland Bight and sank three cruisers and one destroyer without loss. A few months later he intercepted the German

squadron under Admiral von Hipper in its third attempt on the English coastal towns. In a running fight, the rear German battle cruiser "Blücher" was sunk by British gunfire. This action was known as the Battle of the Dogger Bank.

In the Battle of Jutland on May 31, 1916, the battle cruiser fleet under Beatty was heavily engaged in a running fight with the German battle cruisers in the van under Hipper. Although Beatty's battle cruisers were superior in numbers, they proved unable to sustain the gunfire of the German ships, with the result that the "Indefatigable" and "Queen Mary" were sunk. Nevertheless, Beatty succeeded in his main object of drawing the combined German high sea fleet to the northward, whence Admiral Jellicoe, with the whole British grand fleet, was hastening to meet and engage it. The resulting engagement, the Battle of Jutland, proved indecisive. In December 1916, on Jellicoe's being appointed first sea lord, Beatty became commander in chief of the grand fleet.

From 1919 to 1927 Beatty served as first sea lord, and in this capacity he had to deal with the creation of a much smaller, modernized peacetime navy. In 1921 he was a British delegate at the Washington Conference on the limitation of armaments. He received the Knight Commander of the Bath in 1914 and the Order of Merit in 1919, when he was created Earl Beatty.

Beatty, Louise Dilworth: *see* Homer, Louise.

Beatus Rhenanus, also called BEATUS BILD (b. Aug. 22, 1485, Schlettstadt, Alsace—d. July 20, 1547, Strasbourg), German humanist, writer, and advocate of Christian reform whose editorial work helped to preserve a wealth of classical literature.

In 1505 Rhenanus received the master of arts degree from the University of Paris, where he studied Aristotelian philosophy. In 1511 he settled in Basel, Switz., where for the next 15 years he was one of the scholars working for the scholar-printer Johann Froben. Using recently discovered Rhineland manuscripts whenever possible, he edited the works of Tertullian (1521, first printed edition) and of the historians Curtius Rufus (1518), Velleius Paterculus (1520, first printed edition), Procopius, Jordanes, and Agathias (1531), Tacitus (1533), and, in collaboration with Sigismund Gelenius, those of Livy (1535). Influenced by Tacitus' study of German history and culture, Rhenanus in 1531 wrote the first extensive commentary on the origins and cultural achievements of Germanic peoples, *Rerum Germanicarum libri tres* ("Three Books on Germanic Matters").

At Basel, Rhenanus befriended Desiderius Erasmus, the Dutch humanist and critic of the medieval church. Both men sympathized with the principles of religious reform enunciated by Martin Luther, but when Protestant Reformers openly broke with the papacy, Rhenanus and Erasmus did not join them. In vain, Rhenanus attempted a reconciliation among Luther, Calvin, and Zwingli. He became the beneficiary of Erasmus' letters and treatises and was the first to catalog and edit the scholar's works (1540). His biography of Erasmus is valuable for its sensitive and detailed account of its subject.

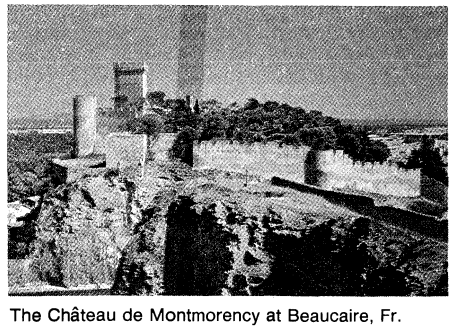
Beau Bassin-Rose Hill, town, the second largest settlement on the island of Mauritius, in the western Indian Ocean. It lies on the western slope of the island, just south of Port Louis, the capital. The town was originally two separate communities, Beau Bassin and Rose Hill, but these have now merged into one, as a consequence of the rapidly increasing island population. The town is a busy market and shopping centre and a residential suburb. The British Council Library is located in Beau Bassin-Rose Hill, along with some secondary schools and law courts. Pop. (1983 est.) 87,520.

Beau de Rochas, Alphonse(-Eugène) (b. April 9, 1815, Digne, Fr.—d. March 27, 1893, Vincennes), French engineer who originated the principle of the four-stroke internal-combustion engine. His achievement lay partly in his emphasizing the previously unappreciated importance of compressing the fuel–air mixture before ignition.

Beau de Rochas patented his idea in 1862 but did not build such an engine, leaving the development to others. As a result of the work of Nikolaus A. Otto of Germany and Étienne Lenoir of France, four-stroke engines almost completely displaced all other types of internal combustion engines and came into universal use.

Beaubourg, Centre (museum): *see* Pompidou Centre.

Beaucaire, town, Gard *département,* Languedoc-Roussillon region, southeastern France. It lies along the Rhône River, opposite Tarascon, to which it is linked by several bridges. Called Ugernum by the Romans, its modern name comes from the medieval Belli Quadrum, which described the pine-clad rock rising abruptly from the river. Atop the rock is a castle built by the counts of Toulouse in the 13th century. Beaucaire suffered severely in the wars of religion when both the town and its castle were destroyed on the Cardinal de Richelieu's orders in 1632. The chief remains of the castle are its Romanesque chapel and the triangular keep, or stronghold. From its gardens there is an extensive view over the Rhône Delta and the Camargue. The most important buildings of the old town itself are the churches of St. Paul (15th century) and the hôtel de ville (1683).



The Château de Montmorency at Beaucaire, Fr.
Editions "La Cigogne"—Hachette

Beaucaire was formerly an important river port, and for more than six centuries (13th–20th) the July Beaucaire fair was known throughout Europe, attracting as many as 300,000 visitors a year. Most goods were brought to Beaucaire by boat, however, and thus the market subsequently declined with the coming of the railways. Now a purely local event, the fair deals mainly in leather goods. The port, which is connected with Aigues-Mortes and the Canal du Midi, is still an outlet for wine and quarried stone produced in the vicinity. Pop. (1982) 10,622.

Beauce, region, northwestern France. It stretches southwest of Paris toward the Forêt d'Orléans. One of the great traditional granaries of France, Beauce is a flat, fertile, treeless limestone plain that was once planted mainly with wheat and sugar beets. Since the "Maize Revolution" of 1956, however, the countryside has been transformed—corn (maize), irrigated in the summer, now predominates. Petit Beauce is a similar section between the Loir and Loire rivers. Agriculture here is modern, completely mechanized, and yields very high production levels. The church spires, grain silos, and water towers of the market towns thrust vividly out of the unrelieved flatness. Chartres, Châteaudun, Étampes, and Pithiviers are the main towns, all having agricultural markets.

Beauchamp, Alphonse de (b. 1767, Monaco—d. June 1, 1832, Paris), French historian whose many works were of popular interest; though they were based upon authentic documents, they were largely compilations and not wholly trustworthy.

Beauchamp became an officer in a Sardinian regiment (1784), but after the outbreak of war between Sardinia and the French republic in 1792 he refused to fight for what he considered an unjust cause and was imprisoned for about a year. Upon his release in 1793 he went to Paris and was employed in the office of the committee of general security. After taking part in the conspiracy that led to the fall and execution of the revolutionary leader Maximilien de Robespierre, Beauchamp was transferred in 1794 to the bureau of the minister of police in the capacity of superintendent of the press. His position gave him access to materials that he used in his first and most popular book, *Histoire de la Vendée et des Chouans,* 3 vol. (1806; "History of the Vendée and the Chouans"), an account of a counterrevolution in the west of France in the 1790s. Accused of revealing state secrets, he was relieved of his post; when the third edition appeared in 1809, he was banished from Paris and went to live in Reims. In 1811 he obtained permission to return and again received a government appointment.

Beauchamp wrote extensively for newspapers and magazines; his numerous biographical and historical treatises include biographies of Gen. Jean-Victor Moreau (1814) and Marshal Joachim Murat (1815), a history of the Napoleonic campaigns in Spain and Portugal (1819), and the edited and revised memoirs of Joseph Fouché (1824), the notorious police minister.

Beauchamp, Edward Seymour, Baron: *see* Hertford, Edward Seymour, earl of.

Beauchamp (of Hache), Edward Seymour, Viscount: *see* Somerset, Edward Seymour, 1st duke of.

Beauchamp, Kathleen Mansfield: *see* Mansfield, Katherine.

Beauchamp, Pierre, Beauchamp also spelled BEAUCHAMPS (b. 1636, Versailles, Fr.—d. 1705, Paris), French ballet dancer and teacher whose contributions to the development of ballet include the definition of the five basic positions of the feet.

In 1661 Beauchamp was appointed director of the Académie Royale de Danse, which in 1672 under the composer Jean-Baptiste Lully became a part of the Académie Royale de Musique, now called the Paris Opéra. As a dancer Beauchamp was noted for his dignified style and for his technique, particularly his pirouettes; in 1681 he appeared as Louis XIV's female partner in Lully's ballet *Le Triomphe de l'amour.* Considered the first choreographer of the Paris Opéra, Beauchamp arranged many court ballets and staged the dance sequences in several of Molière's plays as well as Lully's operas.

He also devised a system of dance notation that, though never published, was used by his pupils, one of whom was Raoul Feuillet, author of one of the earliest published systems of dance notation. With Lully and Louis XIV, Beauchamp was largely responsible for the increasing professionalization of ballet; through his teaching he helped raise technical standards so that specialized training became necessary and amateur dancers from the royal court were no longer the sole performers of ballet. He retired in 1687 following Lully's death.

Beauchamp, Richard: *see* Warwick, Richard Beauchamp, earl of.

Beauchamp, Thomas I de: *see* Warwick, Thomas I de Beauchamp, 12th earl of.

Beauchemin, Nérée (b. Feb. 20, 1850, Yamachiche, Que., Can.—d. June 29, 1931, Trois-Rivières, Que.), French-Canadian poet and physician who is regarded as the leading poet of Le Terroir (French: "the soil") school of Quebec regionalist poetry. A traditionalist noted for his perfection of poetic form, he drew on the religion and culture of Quebec and on a love of the Canadian landscape for his material. Beauchemin published only two collections of poems, *Les Floraisons matutinales* (1897; "The Morning Efflorescence") and *Patrie intime* (1928; "Intimate Birthplace").

Beaudesert, town, southeastern Queensland, Australia, on the Logan River. A livestock station was established there in 1842 and named after Beaudesert, Staffordshire, Eng. In 1863 the state's first cotton plantation was begun nearby, using kanakas (South Sea islanders) as labourers. The community that developed became a town in 1876. On the Mt. Lindesay Highway and a rail line to Brisbane (37 mi [60 km] north), Beaudesert is now the centre for a district of dairy, fruit, pig, corn (maize), alfalfa (lucerne), and pumpkin farming. It has sawmills, butter works, and meatworks. The town, which has become increasingly important as a resort, holds an agricultural show in September. Pop. (1981) 3,780.

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Beaufort, colonial seaport town, seat of Carteret County, southern North Carolina, U.S., opposite Morehead City on Beaufort Harbor (there bridged) and linked to the Atlantic by Beaufort Inlet, between Bogue and Shackleford Banks, which there receives the Newport River. Laid out in 1715 on the site of an Indian village (Wareiock), it was incorporated in 1723 and named for Henry Somerset (1684–1714), duke of Beaufort. More than 100 colonial houses remain along narrow oak-lined streets, and the town's Old Burying Ground has interesting colonial markers. Beaufort Harbor was the base of the pirate Edward Teach (Blackbeard) and his ship "Queen Anne's Revenge." In 1862 the town was occupied by Union troops to thwart blockade running through Beaufort Inlet. Tourism is now an economic mainstay. Fish meal is a leading product, and there is some boat building and lumber milling. The Hampton Mariner's Museum features maritime history exhibits. Pop. (1980) 3,826.

Beaufort, city, seat of Beaufort County, southern South Carolina, U.S., on Port Royal, one of the Sea Islands. Its harbour was first visited by Spaniards in 1521. Early settlement attempts were made by French Huguenots (1562), English (1670), and Scottish Covenanters (1684). A fort was built by the British in 1711 and the town, founded *c.* 1712, was named for the duke of Beaufort (Henry Somerset); it was occupied by invading forces during the Revolutionary and Civil wars. Between wars it thrived on a plantation economy, exporting indigo, rice, and cotton. An antebellum atmosphere with numerous colonial buildings and historic landmarks has been preserved; these include the Episcopal church (built in 1724 and later remodelled) and the arsenal (built in 1795). Seafood processing, truck farming, cattle raising, garment manufacturing, lumber milling, tourism, and the U.S. Marine Corps Recruit Depot (on Parris Island, 5 mi [8 km] south) contribute to the city's economy. After 1959 Beaufort College (1852) became a branch of the University of South Carolina. The city is also the site of Beaufort Technical Education Center. The South Atlantic Sailing Regatta is held each July during the Beaufort Water Festival. Inc. 1803. Pop. (1980) 8,634.

Marshlands, the John Robert Verdier house, built *c.* 1814, Beaufort, S.C.
Milt and Joan Mann from CameraMann

Beaufort FAMILY, English family comprising the descendants of Edward III's son John of Gaunt, duke of Lancaster, by his liaison with Catherine Swynford; the name derived from a lordship that Gaunt had held in France, the modern Montmorency-Beaufort near Bar-sur-Aube. The four offspring of the union were legitimized after their parents' subsequent marriage (1396) but were, by their half-brother, Henry IV, expressly excluded from succession to the crown. The first generation comprised John (d. 1410), created marquess of Somerset and marquess of Dorset; Henry, cardinal bishop of Winchester; Thomas (d. 1426); and a sister, Joan. In the next generation, the possible claim to the throne of John's third (but then first surviving) son, Edmund (d. 1455), 2nd duke of Somerset, precipitated the Wars of the Roses, in which the remaining male members of the house were killed. Margaret Beaufort, Edmund's niece, became the mother of the future king Henry VII.

Beaufort, Edmund: *see* Somerset, Edmund Beaufort, duke of.

Beaufort, François de Vendôme, duc de (duke of) (b. Jan. 16, 1616, Paris—d. June 25, 1669, Crete), French prince, one of the leaders of the Fronde (1648–53) and later admiral in the Mediterranean.

He won a high reputation in King Louis XIII's army during 1635–40 but linked himself with the opposition to Louis's minister, Cardinal de Richelieu, and became known as a devoted partisan of the queen, Anne of Austria. In 1642 Beaufort fled to England to avoid interrogation about the conspiracy of Cinq-Mars, but upon the Cardinal's death later that year he promptly returned to France. When Jules Mazarin became head of the government after Louis XIII's death in 1643, Beaufort, with others, plotted to supplant Mazarin but was arrested (September 1643) and imprisoned.

François de Vendôme, duc de Beaufort, engraving by J.-B. Humbelot, 17th century
By courtesy of the Bibliotheque Nationale, Paris

In May 1648 Beaufort escaped. In January 1649 he presented himself to the rebellious Parlement of Paris and became one of the generals of the first Fronde (Fronde of the Parlement, June 1648–March 1649). His handsome appearance and sincerity, as well as his sorties against the royal forces blockading Paris, won him the adoration of the populace.

After the Peace of Rueil (March 1649) he allied himself with J.F.P. de Gondi, later Cardinal de Retz, who obtained from the court Beaufort's designation as admiral. Gondi plotted with Anne and Mazarin the arrest of their rival, the Prince de Condé (January 1650). This event triggered the second Fronde, or Fronde of the Princes. After Condé's release and Mazarin's flight from Paris (February 1651), Beaufort organized the patrols around the Palais-Royal to prevent Anne from taking the young Louis XIV to join Mazarin. Thereafter Beaufort and Gondi became progressively estranged.

When Mazarin returned to France from exile (January 1652), Beaufort led the troops of Gaston, duc d'Orléans, on Condé's side against the royalist forces. On July 30, 1652, he shot his sister Élisabeth's husband, the duc de Nemours (Charles-Amédée de Savoie), in a duel. Upon the collapse of the Fronde he was banished from Paris.

Restored to royal favour in 1658, Beaufort concerned himself with his duties as admiral. In 1664 he led the first French attempt on Algeria. Sent as admiral and as "general of the church" to Crete to help the Venetians in Candia against the Turks, he was lost in battle.

Beaufort, Gabrielle d'Estrées, duchesse de (duchess of): *see* Estrées, Gabrielle d'.

Beaufort, Henry (b. *c.* 1374, Château Beaufort, Anjou, Fr.—d. April 11, 1447, Winchester, Hampshire, Eng.), cardinal and bishop of Winchester and a dominant figure in English politics throughout the first 43 years of the 15th century. From about 1435 until 1443 he controlled the government of the weak king Henry VI.

Beaufort's father was John of Gaunt, duke of Lancaster, son of King Edward III, and his mother was Catherine Swynford. During the reign of his cousin King Richard II, he became chancellor of Oxford University (1397) and bishop of Lincoln (1398).

With the accession of his half brother, Henry IV, in 1399, Beaufort was guaranteed a prominent place in politics. In 1403 he became chancellor of England and a royal councillor; in the following year he was appointed bishop of Winchester, one of the richest sees in the country. He then resigned his chancellorship and led the opposition within the council to Henry IV's chief minister, Thomas Arundel, archbishop of Canterbury. When Beaufort's nephew and political ally became king as Henry V in 1413, Beaufort again received the chancellorship. In order to climb still higher, the ambitious bishop sought a position with the papacy. Pope Martin V made him a cardinal and papal legate in 1417, but the King, fearing that Beaufort would be an all too effective spokesman for papal policies, soon forced him to resign these ecclesiastical offices.

Upon the accession of the infant Henry VI in 1422, however, Beaufort's talents were allowed to flourish. Already wealthy, he en-

riched himself further by lending money to the insolvent crown at high interest rates. Beaufort's financing of the state solidifed his power; there was little his enemies could do against the man on whom the solvency of the government depended. Beaufort was made cardinal of St. Eusebius and papal legate in 1426, a move for which he was continually attacked by his uncle, Humphrey, duke of Gloucester, who criticized him for simultaneously holding high positions in church and state. But Beaufort survived Gloucester's sniping, and with the support of the young Henry VI, by the mid-1430s the government was firmly back in his hands. In 1435 and 1439 he attempted without success to negotiate an end to the Hundred Years' War (1337–1453) between England and France, and in 1443 he retired from politics. Beaufort was arrogant, self-serving, and greedy to the point of rapacity, but his political and financial acumen were unrivaled in the England of his time. His career is authoritatively recounted in L.B. Radford's *Henry Beaufort* (1908).

Henry Beaufort, detail of a portrait on painted glass, *c.* 1633; in Queen's College, Oxford

By courtesy of Queen's College, Oxford; photograph, Thomas-Photos

Beaufort, Henry: *see* Somerset, Henry Beaufort, 2nd duke of.

Beaufort scale, in full BEAUFORT WIND FORCE SCALE, scale devised in 1805 by Comdr. (later Admiral and Knight Commander of the Bath) Francis Beaufort of the British Navy for observing and classifying wind force at sea. Originally based on the effect of the wind on a full-rigged man-of-war, in 1838 it became mandatory for log entries in all ships in the Royal Navy. Altered to include observations of the state of the sea and phenomena on land as criteria, it was adopted in 1874 by the International Meteorological Committee for international use in weather telegraphy.

The Beaufort scale as originally drawn up made no reference to the speed of the wind, and various attempts, particularly during the 20th century, have been made to correlate the two. An attempt made in 1912 by the International Commission for Weather Telegraphers was interrupted by World War I. In 1921 G.C. Simpson was asked to formulate equivalents, which were accepted in 1926 by the Committee. In June 1939 the International Meteorological Committee adopted a table of values referring to an anemometer at a height of 6 metres (20 feet). This was not immediately adopted by the official weather services of the United States and Great Britain, which used the earlier scale referring to an anemometer at an elevation of 11 metres (36 feet). The Beaufort force numbers 13 to 17 were added by the U.S. Weather Bureau in 1955 (*see* Table).

The scale is now rarely used by professional meteorologists, having been largely replaced by more objective methods of determining wind speeds. Nevertheless, it is still useful in estimating the wind characteristics over a large area, and it may be used to estimate the wind where there are no wind instruments. The Beaufort scale also can be used to measure and describe the effects of different wind velocities on objects on land or at sea. As is evident in the Table, the terms for winds that are used by the U.S. National Weather Service sometimes differ from those used by other countries.

Beaufort Sea, outlying sea of the Arctic Ocean situated north of Canada and Alaska. It extends northeastward from Point Barrow, Alaska, toward Lands End on Prince Patrick Island, and westward from Banks Island to the Chukchi Sea. Its surface area is about 184,000 sq mi (476,000 sq km). The average depth is 3,239 ft (1,004 m) and the greatest depth 15,360 ft. It is named for the British rear admiral Sir Francis Beaufort.

The continental shelf is narrow, especially near and east of Point Barrow; it widens somewhat north of the Mackenzie River mouth but nowhere exceeds 90 mi (145 km). The usual depth is less than 210 ft, although the slope descends steeply to 5,000 or 6,500 ft in the sea's upper part. Small gravel islands or shallows are often found. The largest islands are west of the Mackenzie River mouth—Herschel (7 sq mi) and Barter (5 sq mi). Very small islands and banks are found in the Mackenzie River Delta.

The continental slope of the sea is cut by numerous submarine valleys. The Beaufort plateau, with depths from 6,500 to 10,000 ft, protrudes far into the sea, west of Banks Island. The geological structure of the bottom is that of a massive platform, and seismic data

The Beaufort scale of wind (nautical)

Beaufort number	name of wind	wind speed		description of sea surface	sea disturbance number	average wave height	
		knots	kph			ft	m
0	calm	<1	<1	sea like a mirror	0	0	0
1	light air	1–3	1–5	ripples with appearance of scales are formed, without foam crests	0	0	0
2	light breeze	4–6	6–11	small wavelets still short but more pronounced; crests have a glassy appearance but do not break	1	0–1	0–0.3
3	gentle breeze	7–10	12–19	large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered white horses	2	1–2	0.3–0.6
4	moderate breeze	11–16	20–28	small waves becoming longer; fairly frequent white horses	3	2–4	0.6–1.2
5	fresh breeze	17–21	29–38	moderate waves taking a more pronounced long form; many white horses are formed; chance of some spray	4	4–8	1.2–2.4
6	strong breeze	22–27	39–49	large waves begin to form; the white foam crests are more extensive everywhere; probably some spray	5	8–13	2.4–4
7	moderate gale (or near gale)	28–33	50–61	sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spindrift begins to be seen	6	13–20	4–6
8	fresh gale (or gale)	34–40	62–74	moderately high waves of greater length; edges of crests break into spindrift; foam is blown in well-marked streaks along the direction of the wind	6	13–20	4–6
9	strong gale	41–47	75–88	high waves; dense streaks of foam along the direction of the wind; sea begins to roll; spray affects visibility	6	13–20	4–6
10	whole gale (or storm)	48–55	89–102	very high waves with long overhanging crests; resulting foam in great patches is blown in dense white streaks along the direction of the wind; on the whole the surface of the sea takes on a white appearance; rolling of the sea becomes heavy; visibility affected	7	20–30	6–9
11	storm (or violent storm)	56–63	103–114	exceptionally high waves; small- and medium-sized ships might be for a long time lost to view behind the waves; sea is covered with long white patches of foam; everywhere the edges of the wave crests are blown into foam; visibility affected	8	30–45	9–14
12–17	hurricane	64 and above	117 and above	the air is filled with foam and spray; sea is completely white with driving spray; visibility very seriously affected	9	over 45	over 14

indicate a similarity between the crust of the Canadian Basin and of the oceans.

The low-lying sea coasts are almost entirely covered with tundra. Only west of the Mackenzie River mouth do spurs of the Brooks Range approach the coastline. Banks and Prince Patrick islands are also fairly low, maximum elevations being from about 900 to 2,450 ft. The southern coastal regions of the sea are navigable from middle August until late September, although a permanent barrier of ice 10 ft thick begins near the shores.

Four water masses may be distinguished. The surface water mass is nearly 330 ft thick. Temperature ranges from 29.5° F (−1.4° C) in late summer to 28.8° F (−1.8° C) in winter. Salinity is 28 to 32 parts per thousand. The subsurface water mass, formed by the waters of the Pacific Ocean and the Bering Sea flowing through the Bering Strait, is much warmer than the surface water and almost reaches the North Pole. The deep Atlantic water is the warmest of all, its temperature ranging from 32° to 34° F (0° to 1° C) and its salinity from 34.9 to 35.5 parts per thousand. The bottom water has temperatures ranging from 30.6° to 31.3° F (−0.4° to −0.8° C) and almost constant salinity of 34.9 parts per thousand.

Current direction is closely related to the general current system of the Arctic Ocean. The majority of the sea's currents are westward or southwestward; only near the Mackenzie River mouth is there an eastward current.

The Mackenzie River deposits about 15 million tons of sedimentary material annually, including high concentrations of dolomite and calcium carbonate, which are found at great distances from the river delta. Gravel, pebble, and sand deposits, sometimes mixed with mud, are widely distributed on the shelf. Gray muds containing rare microfauna have been found on the continental slope and north of Banks Island. Sediments also contain significant proportions of hornblende and iron oxides.

More than 70 phytoplankton species are found in the Beaufort Sea, but the total biomass is not large. Nearly 80 zooplankton species have been found, and the bottom fauna consists of nearly 700 species of polychaetes, bryozoans, crustaceans, and mollusks. Fishing and sea hunting are for local supply only.

Beaufort Series, Permo-Triassic rock strata of the Karroo System that overlie strata of the Ecca Series and underlie rocks of the Stormberg Series. The Beaufort is especially well developed and has been extensively studied in the Republic of South Africa. It is primarily composed of sandstones, with some shales and coal lenticles (lens-shaped strata, thinner at the edges), and reaches a maximum thickness of about 3,000 metres (10,000 feet).

Of special importance is the fact that the Beaufort Series contains a rich and diverse reptilian fauna, characterized by an almost unparalleled mammal-like therapsid assemblage. This assemblage has enabled the Beaufort to be further subdivided into six faunal zones, each of which is characterized by a particular and distinctive assemblage.

The boundary between the Lower and Upper Beaufort Series is recognized as the boundary between the Permian and Triassic systems (*i.e.,* about 225,000,000 years ago). Although some therapsid groups did suffer reduction in the Triassic Period, faunal continuity is evident across the boundary, but close analysis discloses that there were critical shifts in faunal assemblages. The gorgonopsian therapsids (specialized sabre-toothed carnivores) became extinct at the end of the Permian, and the therocephalians and dicynodonts ("two-tuskers") were reduced; the more generalized cynodont therapsids, however, remained abundant. Over time, the typical reptilian Mesozoic assemblages, characterized by archosaurs and thecodonts, gradually became dominant.

Beaufre, André (b. Jan. 25, 1902, Neuilly-sur-Seine, Fr.—d. Feb. 13, 1975, Belgrade), French military strategist and an articulate exponent of an independent French nuclear force.

In 1921 Beaufre entered the military academy at Saint-Cyr, where he met the future French president Charles de Gaulle, who was an instructor. In 1925 he saw action in Morocco against the Rif, who opposed French rule. Beaufre then studied at the École Supérieure de Guerre and at the École Libre des Sciences Politiques and was subsequently assigned to the army general staff. Beaufre served again in Morocco in 1938–39, was part of a military mission to the Soviet Union in 1939, and then was reassigned to General Headquarters in Paris. Serving as permanent secretary of national defense in Algeria in 1940–41 during World War II, he was arrested by the French Vichy regime, but after his release in 1942 served in the Free French Army on several fronts until the end of the war in 1945. Beaufre then saw service in Indochina and Algeria and commanded the French forces in the Suez campaign against Egypt in 1956.

Chief of the general staff of the Supreme Headquarters, Allied Powers in Europe (SHAPE) in 1958, he was chief French representative to the permanent group of the North Atlantic Treaty Organization in Washington in 1960 when he was named *général d'armée.*

During the early 1960s Beaufre came to prominence as a theoretical military strategist and as an advocate of the independent French nuclear force, which was a major priority of Pres. Charles de Gaulle. Beaufre remained on good terms with the U.S. authorities who opposed nuclear proliferation but argued that French nuclear independence would give the West greater unpredictability vis-à-vis the Soviet Union and thus strengthen the deterrent capacity of the North Atlantic Alliance.

A contributor to *Le Figaro* from 1966, Beaufre was the author of many books, including *Introduction à la stratégie* (1963; *An Introduction to Strategy,* 1965); *Le Drame de 1940* (1965; *1940: The Fall of France,* 1967); *L'O.T.A.N. et l'Europe* (1966; *NATO and Europe*); *Mémoires 1920–1940–1945* (1969); and *La Nature de l'histoire* (1974). He was co-editor of the proceedings of a Conference on American–Allied Relations in Transition (Juan-les-Pins, Fr., 1973).

Beaugency, town, Loiret *département,* Centre region, north central France, on the right bank of the Loire River. The lords of Beaugency were powerful from the 11th to the 13th century. The first Council of Beaugency (1104) excommunicated Philip I, who had repudiated his queen and abducted and married the Count of Anjou's wife; the second council (1152) annulled the marriage of Louis VII with Eleanor of Aquitaine, who later married Henry Plantagenet (Henry II) and gave almost all of southwestern France to the English crown. Beaugency was an important bridge crossing of the Loire, and the restored 13th-century 26-span bridge still serves. The town fell to the English four times in the Hundred Years' War and was delivered by Joan of Arc in 1429. In 1567 it was burned by the Protestants. In December 1870 the Germans defeated the French Army of the Loire northwest of the town. The 15th-century château is a regional museum. The roofless square keep (11th century) is nearby. Bedding and automobile seats are manufactured. Pop. (1982) 7,106.

Beauharnais, Alexandre, vicomte de (viscount of) (b. May 28, 1760, Martinique—d. June 23, 1794, Paris), first husband of Joséphine (later empress of the French) and grandfather of Napoleon III; he was a prominent figure during the Revolution.

He married Joséphine in Martinique in 1779. Known as a liberal noble, he rose after the French Revolution to important posts in France, presiding over the Constituent Assembly in 1791 and serving with gallantry in the army. In 1793 he was named general in chief of the Army of the Rhine and, soon after, was nominated minister of war but declined the latter offer. During the Reign of Terror he was seized—in large measure, simply because he was a noble—and guillotined.

Beauharnais, Eugène de (b. Sept. 3, 1781, Paris—d. Feb. 21, 1824, Munich), soldier, prince of the French First Empire, and viceroy of Italy for Napoleon I, who was his stepfather (from 1796) and adoptive father (from 1806).

His father, the general Alexandre, vicomte de Beauharnais, was guillotined on June 23, 1794. The marriage of the general's widow, Joséphine Tascher de La Pagerie, to Napoleon Bonaparte on March 9, 1796, was at first resented by Eugène and his sister Hortense, but

Eugène de Beauharnais, detail of a portrait by François Gérard; in the Château de Versailles, France
Giraudon—Art Resource/EB Inc.

their stepfather proved kind and genuinely interested in their welfare. Eugène in turn was a useful military aide to Napoleon, particularly in the coup d'etat of 18 Brumaire (Nov. 9, 1799) and the victory over the Austrians at Marengo (June 14, 1800). In 1804 Eugène received the title of prince and was appointed archchancellor of state.

In 1805, when Napoleon proclaimed himself king of Italy, Eugène became his viceroy there. He reorganized public finances and the civil service, built roads, and introduced the French legal system.

In the war against Austria in 1809, Eugène, as commander of the Italian army, won an important victory at Raab (Györ) and fought well at Wagram. He also distinguished himself in Russia in 1812 and in Germany the following year. In 1814 he held out as long as possible in Italy against the Austrians and the Neapolitans, resisting their attempts to induce him to desert Napoleon. Finally, however, he had to conclude the armistice of Schiarino-Rizzino (April 16, 1814). He then retired to Munich, to the court of the Bavarian king Maximilian I, whose daughter Amelia Augusta he had married in 1806 and who gave Eugène the title of Herzog (duke) von Leuchtenberg.

Beauharnais, Eugénie-Hortense de: *see* Hortense.

Beauharnais, Marie-Josèphe-Rose, vicomtesse de (viscountess of), also called JOSÉPHINE DE BEAUHARNAIS: *see* Joséphine.

Beauharnois, city, Montréal region, southern Quebec province, Canada, on the southern shore of Lac Saint-Louis—a widening of the St. Lawrence River—at the mouth of the

Rivière Saint-Louis. Founded in 1819, it was named for the Marquis de Beauharnois, governor of New France and owner of the seigneury in which the city developed. Beauharnois, 22 mi (35 km) southwest of Montreal city, together with the village of Melocheville, is now an industrial centre and rail hub on the east outlet of Beauharnois Canal—a major link in the St. Lawrence Seaway. A large hydroelectric station at the Beauharnois Dam west of the city supplies power for much of the province and fosters local industries, which include steel and paper milling, printing, and the manufacture of aluminum, metal alloys, chemicals, furniture, sashes, and doors. Pop. (1981) 7,025.

Beaujeu, Pierre, seigneur de (lord of): *see* Bourbon, Pierre II, 7e duc de (7th duke of).

Beaujolais, ancient province of France, of which Beaujeu and Villefranche were successively the capital and which corresponded in area to much of the modern *département* of Rhône, with a small portion of Loire. Crossed by the mountains of Beaujolais (Monts du Beaujolais) and bounded on the east by the Saône River, it is a fertile region noted for its fine wines, marketed at Belleville.

From the 10th to the 13th century, the seigneurs (lords) of Beaujeu gradually enlarged their possessions into a considerable feudal lordship. Édouard I de Beaujeu, marshal of France, fought at the Battle of Crécy (1346) and perished in the Battle of Ardres in 1351. His son died without issue in 1374 and was succeeded by his cousin Édouard II, who gave his estates of Beaujolais and Dombes to Louis II, duc de Bourbon, in 1400. In 1531 the province was united to the French crown, but in 1560 King Francis II gave it back to the House of Bourbon-Montpensier, from which it passed to that of Orléans. The title comte (count) de Beaujolais was borne by Louis-Charles d'Orléans, youngest son of Philippe Egalité.

Beaujolais, region just east of the Massif Central, west of Lyon, in southeastern France. The local relief is broken and culminates in Mont Saint-Rigaud, 3,320 ft (1,012 m); well-wooded, the region supports a local forestry industry. Small family farmsteads characterize the region west of Mont Saint-Rigaud. To the east of it, the limestone escarpments of the Côte Beaujolaise, drier in climate, support a world-famous red wine industry, known for such names as Beaujolais, Fleurie, and Juliénas.

Beaujoyeulx, Balthazar de, also spelled BALTHASAR DE BEAUJOYEUX, Italian BALTAZARINI DI BELGIOIOSO (b. early 16th century, Piedmont region, Italy—d. 1587, Paris), composer and choreographer who influenced the development of theatrical dance and opera.

In 1555 the Duc de Brissac brought Beaujoyeulx to the French court of Queen Catherine de Médicis as a violinist. He became valet de chambre to the royal family and unofficially arranged court festivals.

For the marriage of the Queen's sister, Marguerite de Lorraine, to the Duc de Joyeuse, Beaujoyeulx staged the *Ballet comique de la reine,* a 5½-hour spectacle costing 3,600,000 gold francs. Presented on Oct. 15, 1581, the ballet portrayed the vanquishing of Circe by the King of France. Considered the first ballet of which there is a complete printed account, it included poetry, spoken dialogue, singing, and orchestral music as well as dance. Beaujoyeulx's choreography, performed by members of the court, incorporated overall structural patterns and a geometric arrangement of the dancers; these innovations contributed to the development of theatrical dance. As a precursor of opera, which developed about 20 years later in Italy, the work was unique among court entertainments in that it was unified by a plot. It also contained passages of sung recitative accompanied by simple chords, a style fully developed (with more emotional power) in the early Italian operas. Although its tremendous cost prohibited repeat performances of the *Ballet comique de la reine,* imitative and similar ballets were later produced, particularly after the publication of the ballet's libretto in 1582. Its impact was diplomatic as well as aesthetic, and monarchs of other lands hastened to emulate it with lavish court ballets of their own that, a century later, would metamorphose into the beginnings of professional ballet.

Beaumanoir, Philippe de Remi, sire de (lord of) (b. *c.* 1246, near Compiègne, Fr.—d. Jan. 7, 1296, buried Compiègne), French administrator and jurist whose major work, *Coutumes de Beauvaisis* (drafted *c.* 1280–83), was an early codification of old French law. He also wrote two metrical romances, *La Manekine* and *Jehan et Blonde,* preserved in a single 14th-century manuscript. In 1279, perhaps after travelling in Britain, he succeeded his brother Girard as *bailli* (bailiff) of the Gâtinais, an area lying southeast of Paris in the region of present-day Brie, afterward holding similar administrative positions in other parts of France.

Beaumarchais, Pierre-Augustin Caron de (b. Jan. 24, 1732, Paris—d. May 18, 1799, Paris), French author of two outstanding comedies of intrigue that still retain their

Pierre Beaumarchais, oil painting by Jean-Marc Nattier

Giraudon—Art Resource/EB Inc.

freshness, *Le Barbier de Séville* (1775; *The Barber of Seville,* 1776) and *Le Mariage de Figaro* (1784; *The Marriage of Figaro,* 1785).

Although Beaumarchais did not invent the type character of the scheming valet (who has appeared in comedy as far back as Roman times), his Figaro, hero of both plays, became the highest expression of the type. The valet's resourcefulness and cunning were portrayed by Beaumarchais with a definite class-conscious sympathy. *Le Barbier de Séville* became the basis of a popular opera by the Italian composer Rossini. The second play, which inspired Mozart's opera *Le nozze di Figaro* (1786), is openly critical of aristocratic privilege and to some extent anticipates the social upheavals of the Revolution of 1789.

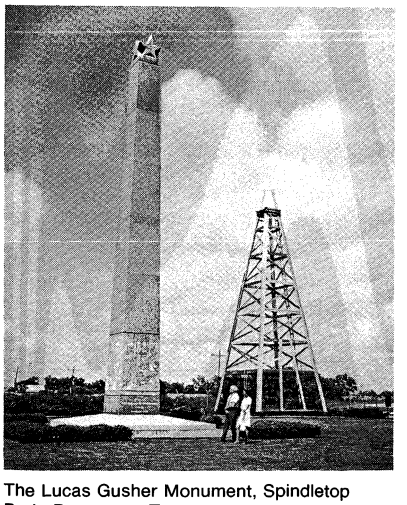
Beaumarchais's life rivals his work as a drama of controversy, adventure, and intrigue. The son of a watchmaker, he invented an escapement mechanism, and the question of its patent led to the first of many legal actions. For his defense in these suits he wrote a series of brilliant polemics (*Mémoires*), which made his reputation, though he was only partly successful at law.

After 1773, because of his legal involvements, he left France on secret royal missions to England and Germany for both Louis XV and Louis XVI. Despite growing popularity as a dramatist, Beaumarchais was addicted to financial speculation. He bought arms for the American revolutionaries and brought out the first complete edition of the works of Voltaire. Of his dramatic works, only his two classic comedies were to have lasting success. Because of his wealth, he was imprisoned during the French Revolution (in 1792), but, through the intervention of a former mistress, he was released.

Beaumaris, town, Ynys Môn (Isle of Anglesey) district, Gwynedd county, Wales, at the northeastern end of the Menai Strait. The Norman castle, built 1295–1323, was begun by Edward I as a coastal base and was the nucleus of the small medieval market town (charter 1294), built on drained marshland (*beau-marais*). The town is a tourist resort and yachting centre. Nearby is Puffin Island, a breeding ground for numerous seabirds. Pop. (1981 prelim.) 2,088.

Beauménard, Mademoiselle (French actress): *see* Bellecour, Madame.

Beaumont, city, seat (1838) of Jefferson County, southeastern Texas, U.S., at the head of navigation on the Neches River (an arm of the Sabine–Neches Waterway), 85 mi (137 km) east-northeast of Houston. With Port Arthur and Orange, it forms the "Golden Triangle" petrochemical and industrial complex. In 1825 Noah Tevis founded the settlement of Tevis Bluff in the locality; in 1835 he sold 50 ac (30 ha) of land for a townsite to Henry Millard, who supposedly named it for his brother-in-law, Jefferson Beaumont. Lumbering, rice cultivation, and shipping were early activities, and in the 1890s five railroads came through the site. Spindletop, the first major oil field in Texas, was discovered nearby when the Lucas Well blew in 1901, and a typical boom city sprang up. After the completion of a deep-river channel (1916) Beaumont became a key port of the Texas petrochemical industry with large oil refineries and shipbuilding, grain storage, and rice-processing facilities. Salt and sulfur domes are also worked in the area. Lamar University (1923) is in the



The Lucas Gusher Monument, Spindletop Park, Beaumont, Texas

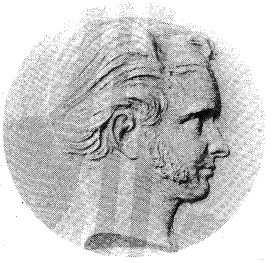
By courtesy of the Texas Highway Department

city. The Lucas Gusher Monument and the reconstructed Gladys City–Spindletop Boomtown commemorate the oil strike. Inc. town,

1838; city, 1881. Pop. (1980) city, 118,102; metropolitan area (SMSA), 375,497.

Beaumont, Charles, chevalier d'Éon de: *see* Éon de Beaumont, Charles(-Geneviève-Louis-Auguste-André-Timothée), chevalier d'.

Beaumont, (Jean-Baptiste-Armand-Louis-Léonce) Élie de (b. Sept. 25, 1798, Canon, Fr.—d. Sept. 21, 1874, Canon), geologist who



Élie de Beaumont, medallion by David d'Angers
H. Roger-Viollet

prepared the great geological map of France in collaboration with the French geologist Ours Pierre Dufrénoy.

Beaumont was appointed professor of geology at the École des Mines, Paris, in 1835. He was engineer in chief of mines in France from 1833 to 1847, when he was appointed inspector general. In 1861 he became vice president of the Conseil-Général des Mines. In his work *Notice sur les systèmes des montagnes* (1852; "Review of Mountain Systems"), he summarized his theories on the origin of mountain ranges, attributing them to cataclysmic upheavals caused by the slow cooling and shrinking of the Earth.

Beaumont, Francis (b. *c.* 1584, Grace-Dieu, Leicestershire, Eng.—d. March 6, 1616, London), English Jacobean poet and playwright

Francis Beaumont, engraving by George Vertue, 1729
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

who collaborated with John Fletcher (*q.v.*) on comedies and tragedies between about 1606 and 1613 or 1614.

The son of Francis Beaumont, justice of common pleas of Grace-Dieu priory, Charnwood Forest, Leicestershire, Beaumont entered Broadgates Hall (later Pembroke College), Oxford, in 1597. His father dying the following year, he abruptly left the university without a degree and later (November 1600) entered London's Inner Temple—again, however, without much enthusiasm for legal studies, becoming instead a frequenter of the Mermaid tavern.

In 1602 there appeared the poem *Salmacis and Hermaphroditus,* generally attributed to Beaumont, a voluptuous and voluminous expansion of the Ovidian legend, marked by a long-winded and fantastic diffusion of episodes and conceits. At the age of 23 he prefixed to Ben Jonson's *Volpone* (1607) some verses in honour of his "dear friend" the author. John Fletcher contributed verses to the same volume, and, by about this time, the two were collaborating on plays for the Children of the Queen's Revels. According to John Aubrey, a 17th-century memorialist, "They lived together on the Banke side, not far from the Play-house, both batchelors; lay together . . .; had one wench in the house between them . . .; the same cloathes and cloake, &c., betweene them" (*Brief Lives*). Their collaboration as playwrights was to last for some seven years: in 1613 Beaumont married an heiress, Ursula Isley of Sundridge in Kent, retired from the theatre, died in London in 1616, and was buried in Westminster Abbey.

As a playwright, Beaumont remains a shadowy figure whose contributions to drama are not as clear as Fletcher's. Of the 54 plays with which their names or the names of their other collaborators are associated, only one was written by Beaumont alone and only 10 were written by Beaumont and Fletcher in collaboration; three others were written with a third collaborator, Philip Massinger.

Beaumont's unaided work, *The Knight of the Burning Pestle,* parodies a then popular kind of play—sprawling, episodic, with sentimental lovers and chivalric adventures. It opens with The Citizen and his Wife taking their places on the stage to watch "The London Merchant"—itself a satire on the work of a contemporary playwright, Thomas Dekker. Citizen and Wife interrupt, advise, and insist that their apprentice should take a leading part. In it, Beaumont indulgently satirizes bourgeois naiveté about art. The play, however, was not immediately popular.

In the three masterpieces of the Beaumont and Fletcher collaboration—*The Maides Tragedy, Phylaster,* and *A King and No King*—Beaumont is assumed to have been the controlling hand, since the plays manifest a firmer structure than Fletcher's single or collaborative efforts. Attempts to disentangle the various shares of Beaumont and Fletcher in any given work are complicated by the fact that Beaumont sometimes revised scenes by Fletcher, and Fletcher edited some of Beaumont's work.

MAJOR WORKS. The dates of composition given here for the individual plays are largely conjectural.

Poems (1640), with additions (1653).

Play by Beaumont unaided. The Knight of the Burning Pestle (1607).

Plays by Beaumont and Fletcher in collaboration. The Woman Hater (1606); *Phylaster* (1608–10); *The Coxcombe* (1608–10); *The Maides Tragedy* (1608–11); *The Captaine* (1609–12); *A King and No King* (1611); *Cupids Revenge* (1611); *The Scornful Ladie* (1613–17); *Loves Pilgrimage* (?1616); *The Noble Gentleman* (*c.* 1625).

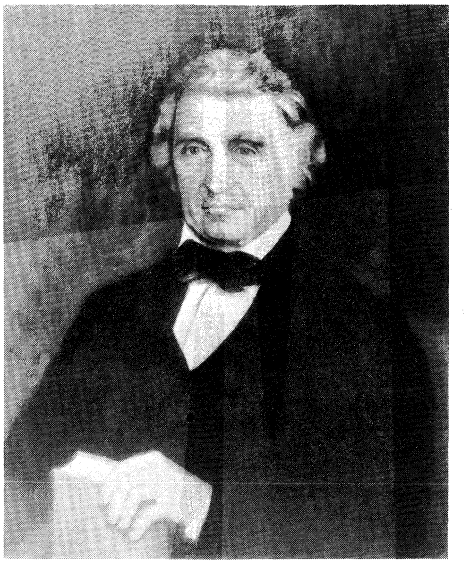
Plays by Beaumont, Fletcher, and Philip Massinger. Thierry and Theodoret (date of composition unknown, printed 1621); *The Beggars Bush* (?1622); *Loves Cure* (?revived 1625).

Beaumont, Sir John, 1ST BARONET (b. 1583, Grace-Dieu?, Leicestershire, Eng.—d. April 1627, London?), English poet who cultivated literary "order" and precision, together with natural simplicity of style. He wrote a drama for James I, *The Theatre of Apollo* (1625); a poem about the Battle of Bosworth (fought in 1485) and other poems to James I and Charles I; and elegies on the poet's friends and relatives, published posthumously.

Beaumont was an elder brother of Francis, the dramatist. After studying at Oxford University (1597), he studied law but settled at Grace-Dieu Priory, from 1605, because he was a Roman Catholic recusant. Through court connections he was made a baronet in January 1627.

Beaumont, William (b. Nov. 21, 1785, Lebanon, Conn., U.S.—d. April 25, 1853, St. Louis, Mo.), U.S. army surgeon, the first person to observe and study human digestion as it occurs in the stomach.

On June 6, 1822, while serving at Fort Mackinac (now in Michigan), Beaumont was summoned to Michilimackinac to treat Alexis St. Martin, a 19-year-old French-Canadian trapper, who had been wounded at close range by a shotgun blast. The shot had removed a portion of the abdominal wall and left a perforation in the anterior wall of the stomach. During the year it took for the wound to heal, the aperture in the abdominal wall never sealed but was held closed by the inversion of tissue surrounding it. As a result, a gastric fistula, or passage, remained. When it was depressed with the finger, Beaumont could view the activities occurring within St. Martin's stomach.



William Beaumont, painting by Chester Harding; in the collection of the New York Academy of Medicine
By courtesy of the New York Academy of Medicine

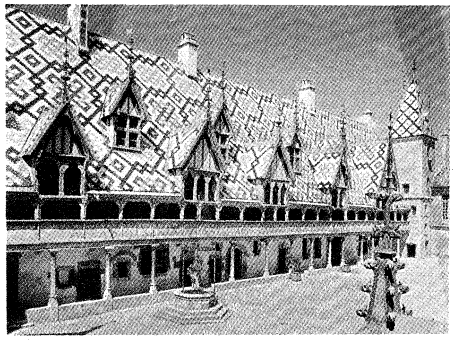
Three years after the near-fatal accident Beaumont began physiological studies of St. Martin's stomach. He believed that the process of digestion was essentially a chemical process carried out by chemicals in the stomach. Determined to prove this hypothesis, he collected samples of gastric juice and sent them for analysis to several chemists, who established the presence of free hydrochloric acid in the juice. Beaumont also reported on the effects of different foods on the stomach, finding that vegetables were less digestible than other foods, that milk coagulated prior to the onset of digestion, and that cold gastric juice had no effect upon food. In 1833 he published *Experiments and Observations on the Gastric Juice and the Physiology of Digestion.*

Beaumont's experiments threw new light upon the nature of gastric juice and the digestive process in general, and established alcohol as a cause of gastritis (inflammation of the stomach's mucous membrane).

Beaune, town, Côte-d'Or *département,* Bourgogne region, east central France, on the Bouzaise River, southwest of Dijon. Settled since prehistoric times, it prospered under the Romans as a centre for cattle and viticulture and is still the wine capital of Burgundy. In the 3rd and 4th centuries it was fortified against Germanic invasions and was the seat of a count under Charlemagne. The first Burgundian Parliament (Jours Généraux) met at Beaune in 1227, and the dukes of Burgundy resided there. France took the town from the Burgundians in 1478. During the religious wars Beaune expelled the Catholic

League's partisans and welcomed Henry IV. The town's prosperity declined with the flight of the Huguenot weavers and leather workers at the revocation of the Edict of Nantes in 1685, but its fortunes revived with the wine trade of the 18th century. Beaune has given its name to part of the celebrated wine country of Burgundy, the limestone hills (*côtes*) of the Côtes de Beaune.

The town, circular in shape, is still partly protected by walls that retain 13th- and 16th-century towers. In other parts, promenades have replaced the ramparts and separate town from suburb. Two towers of the dismantled château survive. The Hôtel-Dieu (1443), which owns some of the finest vineyards, remains operational; one of its wards is a museum for Rogier van der Weyden's great altarpiece, "The Last Judgment," commissioned by the hospital's builder, Nicolas Rolin, last chancellor of the Burgundian dukes. The Collégiale



The medieval hospital of Saint-Esprit, Beaune, Fr.
Jean Feuillie

Notre-Dame (begun in the 12th century) has a beautiful series of 15th-century tapestries. The Musée du Vin de Bourgogne is a wine museum.

The regional wine sales (including Beaune, Pommard, Volnay, and Meursault) are in November. Pop. (1982) 19,110.

Beauport, city, Québec region, southeastern Quebec province, Canada. A northeastern suburb of Quebec city, it is situated on the north bank of the St. Lawrence River. In 1634 Robert Giffard established there one of the first European settlements in Canada. The name Beauport probably comes from the bay in the historic province of Brittany in France. In 1976 the surrounding towns of Courville, Giffard, Montmorency, Saint-Michel-Archange, Sainte-Thérèse-de-Lisieux, and Villeneuve were incorporated into Beauport. The city is largely residential, with some light industry. Pop. (1981 est.) 60,447.

Beauregard, P(ierre) G(ustave) T(outant) (b. May 28, 1818, near New Orleans—d. Feb. 20, 1893, New Orleans), Confederate general in the U.S. Civil War.

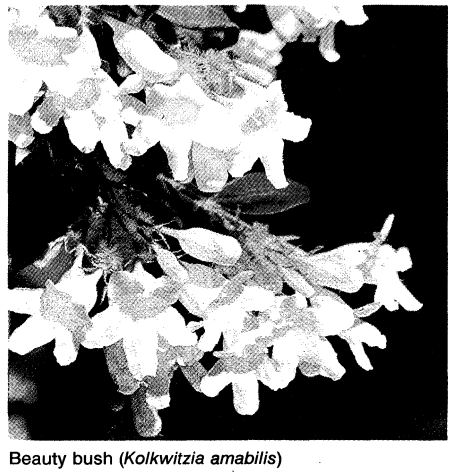
Beauregard graduated from the U.S. Military Academy at West Point, N.Y. (1838) and served in the Mexican War (1846–48). After the secession of Louisiana from the Union (January 1861), Beauregard resigned from the U.S. Army and was commissioned a brigadier general in the Confederate Army; he eventually became one of the eight full generals of the Confederacy and participated in almost every important theatre of the war. He commanded the forces that bombarded Ft. Sumter, S.C., was on the field at the First Battle of Bull Run (1861), and assumed command at Shiloh after the death of Gen. Albert Sidney Johnston (1862). He later conducted the defense of Charleston and toward the end of the war defended the southern approaches to Richmond. Though he proved to be a capable combat commander and often displayed

Beauregard
By courtesy of the National Archives, Washington, D.C.

sound strategic sense, Beauregard revealed serious deficiencies as a general officer. His penchant for questioning orders bordered on insubordination.

After the war he returned to Louisiana, where he became a railroad director, adjutant general of the state, and manager of the Louisiana lottery. His last years were marked by bitter quarrels with Joseph E. Johnston, Jefferson Davis, and William Preston Johnston over their published accounts of the war and Beauregard's role in it. Beauregard was the author of *Principles and Maxims of the Art of War* (1863) and *Report on the Defense of Charleston* (1864).

beauty bush (*Kolkwitzia amabilis*), ornamental flowering shrub of the family Caprifo-



Beauty bush (*Kolkwitzia amabilis*)
J.C. Allen and Son

liaceae, native to central China and the only member of its genus. Its paired, bell-like flowers, one above the other, range in colour from white to pink and are massed at the branch tips.

The early summer flowers of the beauty bush are followed by brown, bristly fruits that persist on the bush into winter. The leaves are oval, and the maximum height of the shrub is about 2½ metres (8 feet).

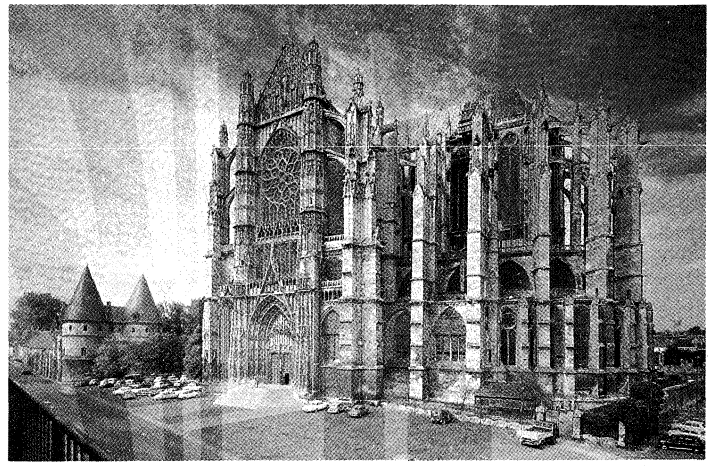
beauty leaf, also called ALEXANDRIAN LAUREL, or DILO OIL TREE (*Calophyllum inophyllum*), ornamental plant, of the family Clusi-

Beauty leaf (*Calophyllum*)
Douglas David Dawn

aceae, native to tropical Asia and cultivated as an ornamental for its handsome leathery, glossy foliage and fragrant white flowers. Beauty leaf often is grown near the ocean for its resistance to salt spray and its leaning habit. The multibranched, often gracefully crooked tree reaches 16–19 metres (50–60 feet). It produces upright sprays of yellow-centred flowers on white stalks. Dilo, a strongly scented medicinal oil, is extracted from the seeds.

beauty-of-the-night (plant): *see* four-o'clock.

Beauvais, town, capital of Oise *département,* Picardie region, northern France, at the juncture of the Thérain and Avelon rivers, north of Paris. Capital of the Bellovaci tribe, it was first called Caesaromagus after its capture by Caesar in 52 BC, and later Civitas de Bellovacis. In the 9th century it became a countship, which passed to the bishops who became peers of France in 1013. The cathedral of Saint-Pierre was ambitiously conceived as the largest in Europe; the apse and transept have survived several collapses, and the choir (157 ft [48 m]) remains the loftiest ever built. The whole dates from the 10th to the 16th century, with the Romanesque church of the Basse Oeuvre standing in the space planned for the cathe-



The cathedral of Saint-Pierre and the towers of the Palace of Justice, Beauvais, Fr.
Editions "La Cigogne"—Hachette

dral nave. Other public buildings date from the 14th century to the 16th. An annual June celebration commemorates Jeanne Hachette, who seized a standard from besieging Burgundian troops in 1472. Marshal Ferdinand Foch directed battle operations from the town hall in 1918. Badly bombed in 1940, Beauvais was rebuilt on the original plan. The Beauvais tapestry factory, which in the 17th and 18th centuries produced many tapestries of exceptionally high quality, was destroyed in World War II. The city's modern manufactures include carpets, blankets, felt, chemicals, and tractors. Pop. (1982) 51,542.

Beauvais tapestry, any product of the tapestry factory established in 1664 in Beauvais, Fr., by two Flemish weavers, Louis Hinart and Philippe Behagle. Although it was under the patronage of Jean-Baptiste Colbert, the finance minister to Louis XIV, and was subsidized by the state, the Beauvais works was a private enterprise.

Tapestries were made at Beauvais for the wealthy bourgeoisie and nobility of France, as well as for export. The royal tapestries for the king were made exclusively at the Gobelins factory. In the 19th century the quality began to deteriorate and production declined.

Beauvoir, Simone (Lucie-Ernestine-Marie-Bertrand) de (b. Jan. 9, 1908, Paris—d. April 14, 1986, Paris), French writer and feminist, a member of the intellectual fellowship of philosopher-writers who have given a literary transcription to the themes of Existentialism. She is known primarily for her treatise *Le Deuxième Sexe,* 2 vol. (1949; *The Second Sex*), a scholarly and passionate plea for the abolition of what she called the myth of the "eternal feminine." It became a classic of feminist literature during the 1960s.

Simone de Beauvoir
Pictorial Parade—EB Inc.

Schooled in private institutions, de Beauvoir attended the Sorbonne, where, in 1929, she passed her *agrégation* in philosophy and met Jean-Paul Sartre, beginning a free, lifelong association with him. She taught at a number of schools (1931–43) before turning to writing for her livelihood. In 1945 she began editing *Le Temps Modernes,* a monthly review, with Sartre.

Her novels expounded the major Existential themes, demonstrating her conception of the writer's commitment to the times. *L'Invitée* (1943; *She Came To Stay*) describes the subtle destruction of the relationship of a couple brought about by a young girl's prolonged stay in their home; it also treats the difficult problem of the relationship of a conscience to "the other," each individual conscience being fundamentally a predator to another. Of her other works of fiction, perhaps the best known is *Les Mandarins* (1954; *The Mandarins*), for which she won the Prix Goncourt. It is a chronicle of the attempts of post-World War II intellectuals to leave their "mandarin" (educated elite) status and engage in political activism. She also wrote four books of philosophy, including *Pour une morale de l'ambiguïté* (1947; *The Ethics of Ambiguity*); travel books on China (*La Longue Marche: Essai sur la Chine* [1957]; *The Long March*) and the United States (*L'Amérique au jour de jour* [1948]; *America Day by Day*); and a number of essays, some of them book-length, the best known of which is *The Second Sex.*

Several volumes of her work are devoted to autobiography. These include *Mémoires d'une jeune fille rangée* (1958; *Memoirs of a Dutiful Daughter*), *La Force de l'âge* (1960; *The Prime of Life*), *La Force des choses* (1963; *Force of Circumstance*), and *Tout compte fait* (1972; *All Said and Done*). This body of work, beyond its personal interest, constitutes a clear and telling portrait of an entire generation of French intellectual life from the 1930s to the 1970s.

In addition to treating feminist issues, de Beauvoir was concerned with the issue of aging, which she addressed in *Une Mort très douce* (1964; *A Very Easy Death*), on her mother's death in a hospital, and in *La Vieillesse* (1970; *Old Age*), a bitter reflection on society's indifference to the elderly. In 1981 she wrote *La Cérémonie des adieux* (*Adieux: A Farewell to Sartre*), a painful account of Sartre's last years.

Simone de Beauvoir revealed herself as a woman of formidable courage and integrity, whose life supported her thesis: the basic options of an individual must be made on the premises of an equal vocation for man and woman founded on a common structure of their being, independent of their sexuality.

Beaux-Arts, École des, in full ÉCOLE NATIONALE SUPÉRIEURE DES BEAUX-ARTS, school of fine arts founded (as the Académie Royale d'Architecture) in Paris in 1671 by Jean-Baptiste Colbert, minister of Louis XIV; it merged with the Académie Royale de Peinture et de Sculpture (founded in 1648) in 1793. The school offered instruction in drawing, painting, sculpture, architecture, and engraving to students selected by competitive examination; since 1968, architecture is no longer taught there.

Beaux-Arts architectural design has been particularly influential. About 1935 the system of the Paris school began to be displaced by an essentially German curriculum stemming from functionalism and machine-inspired theory taught at the Bauhaus.

Beaux-Arts style (architecture): *see* Second Empire style.

Beaver, a small, Athabascan-speaking Indian tribe living in the mountainous riverine areas of northern Alberta. In the early 18th century they were driven westward into this area by the expanding Cree, who, armed with guns, were exploiting the European fur trade. The name Beaver derives from the Indian name for their main site, Tsades, or River of Beavers, now called the Peace River, where the remaining members of the tribe live today.

The Beaver were scattered in many independent nomadic bands, each with its own hunting territory. They hunted moose, caribou, beavers, and bison; lived in skin-covered tepees in winter and brush-covered tepees or lean-tos in summer; and traveled mainly by canoe. Little is known of their religion or ceremony, other than their belief in guardian spirits and in an afterlife.

beaver (*Castor*), any member of the aquatic rodent family Castoridae (order Rodentia), highly prized for its fur and well known for its dam-building activities. Beavers are thickset animals with small, rounded ears, short legs, and large, webbed hind feet. They may grow to about 1.3 metres (4 feet) long, including the flat, scaly, 0.3-m tail, and may weigh more than 27 kilograms (60 pounds). Both sexes possess musk glands that produce a liquid, castoreum, used in perfumes.

The coat, consisting of a dense, fine underfur overlaid with many coarse guard hairs, is glossy tan to dark brown above, paler below. The search for this fur stimulated some of the early 19th-century explorations of western North America; the pelts were a standard medium of exchange.

Beaver (*Castor canadensis*)
Karl Maslowski

New World beavers (*C. canadensis*) once ranged from northern Mexico to the Arctic. Extensive trapping has reduced their numbers. Old World beavers (*C. fiber*) are now found only in the Elbe and Rhône drainages of Europe. Both species are now protected.

Beavers show preference for streams and small rivers but also live around the margins of forest-edged lakes. Their dams of sticks, stones, and mud may last for years, impounding pools that sometimes cover many acres. Eventually, silt fills the ponds and produces meadows.

Beavers build dome-shaped island lodges of sticks plastered with mud. The interior may be 1.8 m high. The mud freezes in winter, and the lodge becomes impregnable to predators; one or more tunnel entrances open below the ice level. In rivers and lakes, beavers often burrow into banks.

Food usually consists of the tender bark and buds of trees. Saplings and even large trees are felled by gnawing, cut into portable lengths, and dragged or floated through beaver-made canals to the pond. Branches, twigs, and small logs are anchored in the bottom mud in deep water for winter food.

Beavers live in colonies, one or more family groups to a lodge. A family usually consists of a mated pair and two sets of offspring. Breeding takes place in midwinter, and two to eight (usually four) young, or kits, are born four months later. Of placid disposition, beavers often work cooperatively. When alarmed, they immediately seek safety in the water. They warn others of danger by slapping the surface of the water with their tails.

Beaver Island, also called BIG BEAVER ISLAND, largest of an island group in northeastern Lake Michigan, U.S., 35 mi (56 km) west of the resort city of Charlevoix, Mich. It extends about 14 mi in length and is 3 to 6 mi wide. It is administered as part of Charlevoix County. French explorers called it Île du Castor (for the *castors* ["beavers"] found there), and a French settlement (abandoned 1603) was one of the earliest in the area. In 1847 James Jesse Strang took over the island for his Mormon colony, was crowned "king," established his "capital" at St. James, and exercised spiritual and temporal authority. Strang's tyrannical rule aroused resentment among both his followers and people on the mainland, which led to his assassination in 1856 and the disintegration of his "kingdom." The Mormons left in 1895. Irish fishermen then occupied the island, which is now popular with anglers, hunters, and boaters. St. James, the island's only village, with some buildings dating from the Mormon period, has air and ferryboat connections with Charlevoix. Pop. (1980) 321.

Beaverbrook (of Beaverbrook and of Cherkley), Sir (William) Maxwell Aitken, 1st Baron, 1ST BARONET (b. May 25, 1879, Maple, Ont., Can.—d. June 9, 1964, near Leatherhead, Surrey, Eng.), financier in Canada, politician and newspaper proprietor in Great Britain, one of three persons (the others were Winston Churchill and John Simon)

Beaverbrook, 1941
Robert Capa—Magnum

to sit in the British Cabinet during both World Wars I and II. A highly idiosyncratic and successful journalist, he never fully achieved the political power that he sought.

A stockbroker in Montreal who had made a fortune by amalgamating the entire cement industry of Canada, Aitken moved to England and was elected to the House of Commons in 1910. As private secretary to Andrew Bonar Law (also Canadian-born), he helped him win the Conservative Party leadership in 1911. He also worked with Law to remove the Liberal H.H. Asquith as prime minister in favour of the Liberal David Lloyd George in December 1916. In the same month Aitken bought a majority interest in the London *Daily Express.* Subsequently, he founded the London *Sunday Express* and acquired the London *Evening Standard* (which then absorbed a noted Liberal paper, the *Pall Mall Gazette*) and the Glasgow *Evening Citizen.*

Failing to receive government office from Lloyd George in 1916, Aitken accepted a baronetcy in that year and a peerage as Baron Beaverbrook the following year. In 1918 he served in the Cabinet as chancellor of the duchy of Lancaster and minister of information. He aided in breaking up Lloyd George's postwar coalition in 1922, and in 1930–31 he tried unsuccessfully to overthrow Stanley Baldwin as Conservative leader. During the 1930s he was notable as one of the "press lords" and as a leader of the United Empire Party. During World War II he was a member of Winston Churchill's war Cabinet as minister of aircraft production (1940–41) and minister of supply (1941–42); he also served as British lend-lease administrator in the United States (1942) and lord privy seal (1943–45).

In his newspapers Beaverbrook colourfully championed individual enterprise and British imperial interests. He also wrote several books about his political experiences, the most important being *Politicians and the Press* (1925) and *Politicians and the War,* 2 vol. (1928). Caricatured in Evelyn Waugh's novel *Scoop* (1938), he was the subject of two biographies, by Tom Driberg (1956) and A.J.P. Taylor (1972), both entitled *Beaverbrook.*

Beaverhead River (Montana, U.S.): *see* Jefferson River.

Beāwar, town, Ajmer district, Rājasthān state, northwestern India. A major rail and road junction, Beāwar is an agricultural and woollen market centre. Industries include cotton ginning, handloom weaving, hosiery manufacture, and wood carving. Formerly also called Nayānagar, the town was founded in 1835 and grew rapidly in prosperity because of its advantageous position between Udaipur and Jodhpur. It has a government college affiliated with the University of Rājasthān. Pop. (1981) 89,998.

bebeeru (tree): *see* greenheart.

Bebel, August (b. Feb. 22, 1840, Deutz, near Cologne—d. Aug. 13, 1913, Passugg, Switz.), German Socialist, co-founder of the German Social Democratic Party and its most influential and popular leader for more than 40 years. He is one of the outstanding figures in the history of western European Socialism.

Bebel was the son of a Prussian noncommissioned officer. Growing up in extreme poverty at Wetzlar, where he learned the turner's craft, he began to travel as a journeyman through southern Germany and Austria and in the spring of 1860 settled in Leipzig, where he began his political career.

In 1861 Bebel joined the Leipzig Workers' Educational Association, which, like many others of its kind, was formed through the initiative of members of the liberal bourgeoisie; in 1865 he became its chairman. Political and economic circumstances, however, gave the workers' education movement an increasingly political orientation, which was to be significantly reflected in the development of Bebel's own political views. Like the other young workers in the new associations, Bebel had not yet heard anything of *The Communist Manifesto* or of its authors, Friedrich Engels and Karl Marx.

Bebel, *c.* 1898
Archiv fur Kunst und Geschichte, West Berlin

If in 1863 Bebel believed that the working classes were not ready for the vote, he was already changing his mind when he began his friendship with Wilhelm Liebknecht, who came to Leipzig from Berlin in 1865. Liebknecht, older than Bebel and a man with university training, became in many respects Bebel's mentor. But the more open-minded Bebel always maintained his independence. The Austro-Prussian War (1866), which divided German opinion between the advocates of a Kleindeutschland (Small Germany) and those of a Grossdeutschland (Large Germany), advocated by the Prussian prime minister Otto von Bismarck, drove the Saxon workers' associations into an alliance with the radical anti-Prussian democrats, for Bebel and Liebknecht, the workers' leaders, were implacable opponents of Bismarck. The Sächsische Volkspartei (Saxon People's Party) was thus brought into being, and in 1867 Bebel entered the constituent Reichstag of the North German confederation as a member for this party. Eventually, this and other like-minded parties united in 1869 in the Sozialdemokratische Arbeiterpartei (Social Democratic Labour Party) of Germany.

Already in 1867, as a member of the North German Reichstag, Bebel had protested against the Bismarckian "greater Prussia," believing that it meant "turning Germany into one great barracks." In parliament he continued this protest both before and after the founding of the German Empire. He and Liebknecht were the only voices to speak against the war loan voted in the Reichstag on July 21, 1870; as a result, they were brought to trial on a charge of high treason at Leipzig in March 1872. Sentenced to two years' imprisonment, Bebel recovered from tuberculosis during this period of enforced idleness. Also, he was able to give himself a systematic education.

Beginning with an earlier sentence in 1869, Bebel spent a total of nearly five years in prison within less than 20 years, though he never faced any graver charge than that of "spreading doctrines dangerous to the state," "lese majesty," "libel of Bismarck," or "libel of the Bundesrat." These sentences were a serious threat to his livelihood. As the party itself could afford only the most essential expenditure and as a member of the Reichstag received no allowances, Bebel continued to rely on his income as a craftsman. He had established himself in Leipzig as a master turner and had married the daughter of a railway worker in 1864. Not until the end of the 1880s was he able to live by his writing.

As a writer Bebel had most success with *Die Frau und der Sozialismus* (1883; *Woman and Socialism,* 1904), which went through many editions and translations. This book was the most powerful piece of Social Democratic propaganda for decades. Above all, by its combination of science and prophecy, it served as a blueprint for German social democracy in the conditions produced by Bismarck's Anti-Socialist Law (1878–90). Bebel himself never doubted that this period of repression under the emergency laws was anything more than an episode, declaring to his opponents in the Reichstag: "Your lances will be shattered in this struggle like glass on granite." His unshakable confidence gave his colleagues the courage to stand firmly together, but he opposed all tendencies toward retaliation by force, since terrorism or attempts at subversion might have endangered the very existence of the party.

These tactics were proved right when the emergency laws were allowed to lapse and when, in the elections of 1890, the Social Democrats received nearly 20 percent of the vote. Bebel's position at the head of the party was now uncontested, and in the Reichstag he was the most prominent opponent of the government. Within the party itself he opposed all the "opportunist" tendencies, which had come out into the open since the ending of the anti-Socialist laws. According to these, features of the existing social and political structure might be developed gradually until social democracy was attained. At the Erfurt congress of 1891 he reproached the leader of the Bavarian Social Democrats, Georg von Vollmar, with belying the "inspiration" of social democracy, without which "a party such as ours cannot exist."

The struggle against open reformism and the theoretical revisionism advocated by Eduard Bernstein at the end of the 1890s reached its climax at the Dresden congress of 1903. Just as he condemned all deviations from the party's official radical creed, so too was Bebel unwilling to yield to left-wing pressure to indulge in extraparliamentary experiments and thus perhaps to bring repression of the party again. His stand was justified, for in election after election the party gained new adherents, and Bebel lived to see the day when, in 1912, it became, with 110 seats, the strongest group in the Reichstag.

Bebel, as no other, embodied the tradition of the German Social Democratic Party. Already in 1882 Engels had described him as "a unique manifestation of the German, indeed of the European working class." A member of the Reichstag from 1867 almost continuously until his death, he achieved his most celebrated triumphs as a parliamentarian. Even his opponents could not withhold their re-

spect in the face of his passionate honesty. A shrewd contemporary, Hellmut von Gerlach, suggested that in politics Bebel lived from hand to mouth: "His political aims were for the most distant future or for the immediate present"; he did not concern himself with what might lie between. This is true. For him and for the leading body of Social Democratic thought he represented, political activity essentially consisted in promoting as effectively as possible the politico-social interests of the working classes. His contradictory combination of futuristic revolutionary sentiment and a social policy rooted in the present reflects the equivocal position of his party under the conditions of the new German Empire. This explains to a great extent both the strength of Bebel's position within the party and the political passivity of German social democracy, already noticeable before his death and fully revealed when, on the fall of the empire, the party had to face its first great political test.

(E.Ma.)

BIBLIOGRAPHY. Bebel's autobiography, *Aus meinem Leben,* 3 vol. (1910–14; new ed., 1953; Eng. trans. of 1st ed., *My Life,* 1912), extends only up to 1882. More recent research includes Ernst Schraepler, *August Bebel, Sozialdemokrat im Kaiserreich* (1966). Schraepler has also published an *August-Bebel-Bibliographie* (1962). For Bebel's significance, see Guenther Roth, *The Social Democrats in Imperial Germany* (1963).

Bebey, Francis (b. July 15, 1929, Douala, Cameroon), writer, guitarist, and composer of international reputation.

Trained at the Sorbonne and New York University in musicology and French and English literature, Bebey first became known as a musician. By 1967 he had made several recordings and had performed in New York City and Paris as well as in Africa. That same year his first novel, *Le Fils d'Agatha Moudio* (1967; *Agatha Moudio's Son,* 1971), won the Grand Prix Littéraire de l'Afrique Noire, and the following year *Embarras et Cie: Nouvelles et poèmes* (1968; nine short stories, each accompanied by a poem) was published. His later works include *La Poupée Ashanti* (1973; "The Ashanti Doll") and *Le Roi Albert d'Effidi* (1974; "King Albert of Effidi").

Bebey claims that his wide experience as a radio broadcaster has affected the style of his stories, which he directs toward hearers rather than readers. Critics found his first novel a carefully constructed masterpiece of burlesque. Bebey has also written a book on broadcasting in Africa (having worked on several French-language African radio stations and on a broadcasting project for UNESCO) and two books on African music. His verse has appeared in a number of journals and anthologies, and his several record albums have been well received.

bebop, also called BOP, the first kind of modern jazz, which split jazz into two opposing camps in the last half of the 1940s. The word is an onomatopoeic rendering of a staccato two-tone phrase distinctive in this type of music. When it emerged, bebop was unacceptable not only to the general public but also to many musicians. The resulting breaches—first, between the older and younger schools of musicians and, second, between jazz musicians and their public—were deep, and the second never completely healed.

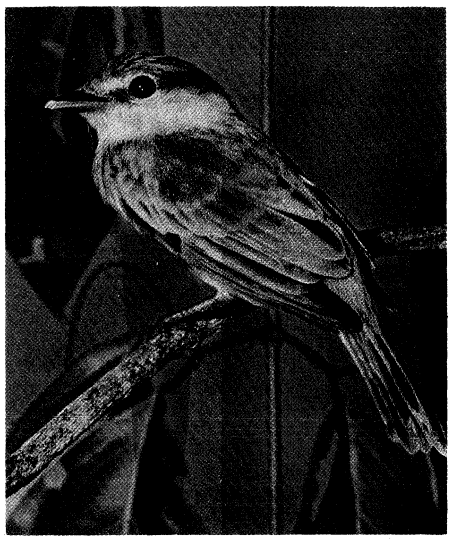
Whereas earlier jazz was essentially diatonic (*i.e.,* basing melodies and harmonies on traditional Western major and minor 7-note scales comprising 5 whole and 2 half steps), much of the thinking that informed the new movement was chromatic (drawing on all 12 notes of the chromatic scale). Thus the harmonic territory open to the jazz soloist was vastly increased.

Bebop took the harmonies of the old jazz and superimposed on them additional "substituted" chords. It also broke up the metronomic regularity of the drummer's rhythmic pulse and produced solos played in double-time and having several bars packed with sixteenth notes. The result was complicated improvisation.

The movement originated during the early 1940s in the playing of trumpeter Dizzy Gillespie, guitarist Charlie Christian, pianist Thelonius Monk, and drummer Kenny Clarke, and the most richly endowed of all, alto saxophonist Charlie "Bird" Parker.

A later style, known as hard bop, or funky, evolved from and incorporated elements of gospel music and rhythm and blues. Horace Silver was the most prominent pianist, composer, and bandleader in this period. Cannonball Adderley and Art Blakey led other hard bop combos.

becard, any of many tropical American birds belonging to the family Cotingidae (order Passeriformes) that usually builds its large ball nest on an exposed branch near a colony of stinging wasps. The 15 species of becards (comprising the genera *Platypsaris* and *Pachyramphus*) are rather plain, small birds with thick bills hooked at the tip. They pluck fruit and capture insects (particularly caterpillars) in the treetops, often by hovering. The 16-centimetre (6½-inch) rose-throated becard, (*Platypsaris aglaiae*), occurring from Costa Rica to the U.S.–Mexican border, is the farthest north representative of the group and of the family Cotingidae. The becards are considered by some authorities to belong with the tyrant flycatchers in the family Tyrannidae.



Becard (*Pachyramphus*)
John S. Dunning—Photo Researchers

Beccafumi, Domenico, also called DOMENICO DI PACE, or MECHERINO (b. *c.* 1486, Cortina, Republic of Venice—d. May 1551, Siena, Republic of Siena), Italian painter and sculptor, a leader in the post-Renaissance style known as Mannerism.

Beccafumi was the son of a peasant named di Pace. He adopted the name of his patron Lorenzo Beccafumi. About 1510 he went to Rome to study the work of Raphael and Michelangelo. Returning in 1512 to Siena, Beccafumi and the painter Sodoma decorated the facade of the Palazzo Borghese. In 1517 he was in charge of the painters at the church of San Bernardino and from 1518 to 1546 contributed many fine designs to the *commesso* (white marble inlay with subjects outlined in black) in the pavement of Siena cathedral. These rich, colourful scenes from the Old Testament impressed Charles I of England, who tried unsuccessfully to purchase the original drawings. In 1541, Prince Doria called Beccafumi to Genoa, where he created the fresco "Episode in the Life of Medea and Jason," now lost. Returning to Siena, he executed and cast the bronze angels (*c.* 1548) of the cathedral. The illuminism, or "chromatic lyricism," that he achieved on the ceiling of the Palazzo Bindi Sergardi and in the Pinacoteca of Siena added to his reputation. His "Birth of the Virgin" and "The Expulsion of the Rebel Angels" in the latter show the typical elongated and foreshortened forms employed by the Mannerists. But his work contained many diverging tendencies, producing an overall unevenness.

"The Birth of the Virgin," panel painting by Domenico Beccafumi, 1544; in the Pinacoteca Nazionale, Siena, Italy
SCALA—Art Resource/EB Inc.

Beccaria, Cesare, in full CESARE, MARCHESE (marquess) DI BECCARIA BONESANA (b. March 15, 1738, Milan—d. Nov. 28, 1794, Milan), Italian criminologist and economist whose *Dei delitti e delle pene* (Eng. trans. J.A. Farrer, *Crimes and Punishment,* 1880) was a celebrated volume on the reform of criminal justice.

Early life. Beccaria was the son of a Milanese aristocrat of modest means. From an early age, he displayed the essential traits of his character. A highly volatile temperament resulted in periods of enthusiasm followed by depression and inactivity. He was reserved and somewhat taciturn in his social contacts but placed great value on his personal and family relationships. At the age of eight he was sent to the Jesuit school in Parma. Beccaria later described the education he received there as "fanatical" and stifling to "the development of human feelings." Although he revealed a mathematical aptitude, little in his student days gave indication of the remarkable intellectual achievements that were soon to follow. In 1758 he received a degree in law from the University of Pavia.

In 1760 Beccaria's proposed marriage to the 16-year-old Teresa Blasco encountered the obdurate opposition of his father. The following year the marriage took place without parental consent, and the young couple began their life together in poverty. The breach between father and son was ultimately repaired, and Beccaria and his wife were received into the family home. In 1762 a daughter, the first of his three children, was born.

Upon completion of his formal training Beccaria returned to Milan and was soon caught up in the intellectual ferment associated with the 18th-century Enlightenment. He joined with Count Pietro Verri in the organization of a literary society and participated actively in its affairs. In 1762 his first writing appeared,

a pamphlet on monetary reform. Later he associated himself with the periodical *Il Caffè*, a journal modelled on the English essayist Joseph Addison's *Spectator*, and contributed several anonymous essays to its pages.

Beccaria, engraving by Carlo Faucci, 1766
By courtesy of Raccolta Delle Stampe Achille Bertarelli, Milan

Criminal law studies. In 1763 Verri suggested that Beccaria next undertake a critical study of the criminal law. Although he had had no experience in the administration of criminal justice, Beccaria accepted the suggestion, and in 1764 his great work *Dei delitti e delle pene* was published. Almost immediately Beccaria, then only 26 years of age, became an international celebrity. The work enjoyed a remarkable success in France, where it was translated in 1766 and went through seven editions in six months. English, German, Polish, Spanish, and Dutch translations followed. The first American edition was published in 1777. Since then translations in many other languages have appeared.

Beccaria's treatise is the first succinct and systematic statement of principles governing criminal punishment. Although many of the ideas expressed were familiar, and Beccaria's indebtedness to such writers as the French philosopher Montesquieu (which he generously acknowledged) is clear, the work nevertheless represents a major advance in criminological thought. The argument of the book is founded on the utilitarian principle that governmental policy should seek the greatest good for the greatest number. He lashed out at the barbaric practices of his day: the use of torture and secret proceedings, the caprice and corruption of magistrates, brutal and degrading punishments. The objective of the penal system, he argued, should be to devise penalties only severe enough to achieve the proper purposes of security and order; anything in excess is tyranny. The effectiveness of criminal justice depends largely on the certainty of punishment rather than on its severity. Penalties should be scaled to the importance of the offense. Beccaria was the first modern writer to advocate the complete abolition of capital punishment and may therefore be regarded as a founder of the abolition movements that have persisted in most civilized nations since his day.

Beccaria's treatise exerted significant influence on criminal-law reform throughout western Europe. In England, the utilitarian philosopher and reformer Jeremy Bentham advocated Beccaria's principles, and the Benthamite disciple Samuel Romilly devoted his parliamentary career to reducing the scope of the death penalty. Legislative reforms in Russia, Sweden, and the Habsburg Empire were influenced by the treatise. The legislation of several American states reflected Beccaria's thought.

Work in economics. Although nothing Beccaria achieved in later life approaches the importance of the treatise, his subsequent career was fruitful and constructive. In 1768 he accepted the chair in public economy and commerce in the Palatine School in Milan, where he lectured for two years. His reputation as a pioneer in economic analysis is based primarily on these lectures, published posthumously in 1804 under the title *Elementi di economia pubblica* ("Elements of Public Economy"). He apparently anticipated some of the ideas of Adam Smith and Thomas Malthus, such as the concept of division of labour and the relations between food supply and population.

In 1771 he was appointed to the Supreme Economic Council of Milan and remained a public official for the remainder of his life. In his public role Beccaria became concerned with a large variety of measures, including monetary reform, labour relations, and public education. A report written by Beccaria influenced the subsequent adoption of the metric system in France.

Beccaria's later years were beset by family difficulties and problems of health. He apparently did not relish the role of celebrity. In 1766 he went to Paris, where he was warmly greeted by distinguished figures of the day, but cut short his visit because of acute homesickness. His wife died in 1774 after a period of declining health. Three months later he remarried. Property disputes initiated by his two brothers and sister resulted in litigation that distracted him for many years. Beccaria's last months were saddened by events in France: although he had initially welcomed the French Revolution enthusiastically, he was shocked by the excesses of the terror.

Beccaria's rationality, versatility, and insistence on the unity of knowledge were typical of the intellectual life of his time. His treatise, the most important volume ever written on criminal justice, is still profitably consulted two centuries after its first appearance.

(F.A.A.)

BIBLIOGRAPHY. P. Villari, "Discorso sulla vita e le opere di Cesare Beccaria," in *Le opere* (1854); C. Cantu, *Beccaria e il diritto penale* (1862); C.A. Vianello, *La vita e l'opera di Cesare Beccaria con scritti e documenti inediti* (1938); C. Phillipson, *Three Criminal Law Reformers: Beccaria, Bentham, Romilly* (1923); M.T. Maestro, *Voltaire and Beccaria As Reformers of Criminal Law* (1942); and *Cesare Beccaria and the Origins of Penal Reform* (1973). For an assessment of Beccaria's economic writings, see J.A. Schumpeter, *History of Economic Analysis* (1954).

Becchus (Greek Orthodox leader): *see* John XI Becchus.

Béchar, *wilāyah* (province, or *département*), southwestern Algeria, lying entirely within the Sahara. It was created in 1974, has an area of about 118,000 sq mi (306,000 sq km), and is bounded by Morocco (northwest), by the *wilāyāt* (provinces) of Saïda (northeast) and Adrar (southeast), and by Mauritania and the Western Sahara (southwest). The part of the province adjacent to the Moroccan border is comprised primarily of flat, stony sandstone plateaus (*hamada*). To the southeast the landscape is typified by *erg*s (sand dunes), specificially, parts of the Grand Erg Occidental, the Erg er-Raoui, and the Erg Iguidi. Béchar *wilāyah* is bisected in the north by the Oued (wadi) Saoura that forms the valley where lies the oasis town of Beni Abbes (Béni-Abbas). Along the Oued Saoura (called Oued Messaoud farther south) date-palm groves extend about 200 mi (320 km). Béchar town, the *wilāyah* capital, is 36 mi south of the Moroccan border. Other major towns include Abadla and Tindouf. Locally important crops include dates, cereals, vegetables, figs, and almonds. Bituminous coal deposits at Kenadsa, 15 mi southwest of Béchar town, formerly important, are exploited minimally because of high transportation costs. There is a large reserve of high-grade iron-ore deposits at Gara Djebilet, 150 mi southeast of Tindouf. The Mouggar, a trade fair attended by nomads (especially the Regeibat) from Mali, Mauritania, Western Sahara, Morocco, and Algeria, is held annually at Tindouf. Pop. (1980 est.) 149,808.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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Béchar, formerly COLOMB-BÉCHAR, town, capital of Béchar *wilāyah* (province, or *département*), west Algeria, in the northern reaches of the Sahara, 36 mi (58 km) south of the Moroccan border. The town is named for the nearby Djebel (mount) Béchar, rising to 1,600 ft (488 m). To the west, the region is crisscrossed by numerous wadies and ravines, forming a landscape known as *chebka*. Béchar's former European quarter contains a military station and has modern buildings, while the traditional quarter has covered, narrow streets. Surrounded by date-palm groves watered by the Oued (wadi) Béchar, the town

Date-palm grove, Béchar, Alg.
W. Luthy—De Wys Inc.

is noted for its leatherwork and jewelry. It is a trade centre at the junction of trans-Saharan roads, is the terminus of the railroad running southward from Oran, and has an airport. Béchar Djedid (New Béchar), 3 mi south, was built to house the employees of the nearby coalfields at Kenadsa. Pop. (1977 prelim.) mun., 72,790.

Becharri (Lebanon): *see* Bsharrī.

Beche, Sir Henry Thomas De La (b. 1796, London—d. April 13, 1855, London), geologist who founded the Geological Survey of Great Britain, which made the first methodical geological survey of an entire country ever undertaken.

Educated for the military, De la Beche left the army in 1815 and two years later joined the Geological Society of London. During the following 10 years he travelled widely in Europe and began detailed geological studies of Cornwall and Devon. The papers resulting from these studies described and illustrated for the first time the Jurassic (136,000,000 to 90,000,000 years old) and Cretaceous (65,000,000 to 136,000,000 years old) strata of those regions. He also investigated the geology of the Pembrokeshire coast, the coasts of France, and the island of Jamaica.

Interest in the mining operations of his country led De La Beche to suggest compiling a geological map of the United Kingdom as an aid to the scientific development of the min-

eral industries. Through his efforts the Geological Survey of Great Britain was organized in 1835, with De La Beche as director. He was knighted in 1848, and in the same year he served as president of the Geological Society. In 1851 the combined offices of the Geological Survey, the Museum of Practical Geology, the Royal School of Mines, and the Mining Record Office were opened in London.

His *Geological Manual* (1831), *Researches in Theoretical Geology* (1834), and *How to Observe in Geology* (1835) are important contributions to geological literature.

bêche-de-mer, plural BÊCHE-DE-MER, or BÊCHES-DE-MER, also called TREPANG, boiled, dried, and smoked flesh of sea cucumbers (phylum Echinodermata) used to make soups. Most bêche-de-mer comes from the southwestern Pacific, where the animals (any of a dozen species of the genera *Holothuria, Stichopus,* and *Thelonota*) are obtained on coral reefs. Bêche-de-mer is consumed chiefly in China.

Bêche-de-mer, or Beach-la-Mar, is a pidgin English term used in New Guinea and nearby islands, where the trepang trade has long been important. The term Bêche-de-Mer has also come to designate the pidgin English language spoken in these regions.

Becher, Johann Joachim (b. 1635, Speyer, Bishopric of Speyer—d. 1682, England), chemist, physician, and adventurer whose theories of combustion influenced Georg Stahl's phlogiston theory. In Becher's view, substances are composed of three earths, the vitrifiable, the mercurial, and the combustible. He supposed that when a substance burned, a combustible earth was liberated.

During his youth study was difficult because he had to support his mother and brothers, but at 19 he began an extraordinary career that alternated learned publication with colonization and trade enterprises. His ideas and experiments on the nature of minerals and other substances were set forth in *Subterranean Physics* (1669). At Munich he suggested that the elector of Bavaria establish South American colonies and a cloth-trade monopoly, but the anger of merchants forced him to flee. At

Johann Joachim Becher, detail from an engraving
Historia-Photo

Vienna he proposed a Rhine–Danube canal and was also employed in experiments to transmute Danube sand into gold. He fell into disgrace and fled first to Holland and then to England.

Becher, Johannes Robert (b. May 22, 1891, Munich—d. Oct. 11, 1958, Berlin), poet and critic, editor, and government official who was among the most important advocates of revolutionary social reform in Germany during the 1920s and later served as minister of culture for the German Democratic Republic (East Germany).

Becher studied medicine, literature, and philosophy, and, in 1918, joined the German Communist Party (KPD). He was already an established commentator on the social and artistic scene and a leader of the movement to transform German society through a revolution of the proletariat. Involved in the Expressionist school that dominated German writing in the period 1910–20, he wrote romantic, emotionally complex poetry that mirrored both his personal turmoil and his visions of a new social order.

Though elected to the German Reichstag in 1933, he was forced into exile with the advent of Nazi power and went to Moscow, where he edited a German-language newspaper (1935–45). Life in Moscow disillusioned him about Joseph Stalin's Communism but not Communist ideology itself. Returning to Germany in 1945, he was made president of the Association for the Democratic Rebirth of Germany. In 1954 he became East German minister of culture. Becher's diaries in the decade 1945–55 give intimate insights into the many personal and ideological conflicts that tormented his life as a poet and as a political activist.

Bechet, Sidney (b. May 14, 1897, New Orleans—d. May 14, 1959, Paris), jazz musician, regarded as a master of the soprano saxophone. Bechet began as clarinetist at the age of six and by 1914 was a veteran who had worked in several semi-legendary local bands, including those of Jack Carey and Buddy Petit. After working in New Orleans with Clarence Williams and King Oliver, pioneer jazz greats, he moved to Chicago and then, in 1919, to New York City. In that year he toured Europe with the Southern Syncopated Orchestra, becoming the first jazz musician ever to be praised by a distinguished classicist, the Swiss conductor Ernest Ansermet. Through the 1920s he gradually concentrated on the soprano saxophone, working briefly with his great admirer Duke Ellington in 1925 before touring Europe again. Intermittently, he worked in the Noble Sissle band (1928–38) and from the late 1940s based himself in Paris, where by the time of his death he had attained the kind of eminence granted to such world-famed Parisians as Maurice Chevalier and Jean Cocteau.

Along with trumpeter Louis Armstrong, Bechet was one of the first musicians to improvise with jazz swing feeling. He intelligently crafted logical lines atop the New Orleans-style ensemble, double-timing and improvising forcefully with pronounced authority. Bechet produced a large, warm tone with a wide and rapid vibrato. It was his mastery of drama and his use of critically timed deviations in pitch ("note bending") that had the greatest long-lasting influence, because they were absorbed by his disciple Johnny Hodges, Duke Ellington's principal soloist from 1928 to 1970. With a style developed around Bechet's expressive techniques, Hodges became one of the two or three most influential alto saxophonists in the first half of the century. Bechet's autobiography, *Treat It Gentle*, was published in 1960.

Bechtel, Friedrich (b. Feb. 2, 1855, Durlach, Baden—d. March 9, 1924, Halle, Ger.), classical scholar who contributed substantially to Greek dialectology and Homeric criticism.

After study under some of the most prominent language scholars of the 19th century, Bechtel became professor at the University of Halle (1895–1924) and published extensively. He collaborated with the German scholar August Fick on *Die griechischen Personennamen nach ihrer Bildung erklärt* (2nd ed., 1894; "Greek Personal Names as Explained by Their Formation"). With the German-U.S. scholar Hermann Collitz he edited *Sammlung der griechischen Dialektinschriften,* 4 vol. (1884–1915; "Collection of Greek Dialect Inscriptions"). *Die griechischen Dialekte,* 3 vol. (1921–24; "The Greek Dialects") was his last major work.

Bechtel, Stephen D(avison) (b. Sept. 24, 1900, Aurora, Ind., U.S.), U.S. construction engineer and business executive, president (1936–60) of Bechtel Corp., one of the world's largest construction and engineering firms. Projects to which his firm and its affiliated companies have substantially contributed include the Hoover Dam, the San Francisco–Oakland Bay Bridge, and the Alaska oil pipeline.

Having worked with his father, Warren A. Bechtel, on various construction projects as a youth, Stephen Bechtel was made a vice president when the W.A. Bechtel Company was organized in 1925 as one of the largest construction companies in the western United States, headquartered in San Francisco. He became president in 1936. A year later he and John McCone formed the Bechtel–McCone Corporation, which built refineries and chemical plants. Bechtel's companies built ships and aircraft parts during World War II. After the war, Bechtel Corporation, successor to W.A. Bechtel, built pipelines in Canada, the Middle East, and elsewhere and constructed power plants all over the world. In 1977 it was estimated that the various Bechtel companies had designed or built half the nuclear power plants then operating in the United States. Considered an energetic and imaginative man, Bechtel was frequently called on to handle unusually large or complex projects.

He turned the presidency of the company over to his son Stephen Davison Bechtel, Jr., in 1960, but he remained a senior director of what was now known as the Bechtel Group.

Bechuana (people): *see* Tswana.

Beck, Józef (b. Oct. 4, 1894, Warsaw—d. June 6, 1944, Stăneşti, Rom.), Polish army officer and foreign minister from 1932 to 1939, one of Józef Piłsudski's most trusted confidants, who attempted to maintain friendly relations with both the Soviet Union and Germany while preserving alliances of Poland with France and with Romania.

After service against tsarist Russia in World War I, Beck held various posts in the newly restored Poland, becoming Marshal Piłsudski's *chef de cabinet* in 1926 and foreign minister on Nov. 2, 1932. While maintaining a non-threatening attitude toward the Soviet Union and Germany, he attempted to improve the international position of Poland by strengthening its alliances. After the Germans invaded Czechoslovakia in March 1939. Beck gained the disputed Teschen area for his country and on April 6 of that year signed the alliance with Great Britain that was to bring Britain into World War II after the Germans invaded Poland in September of that year. Upon the German–Soviet partition of Poland, Beck was interned in Romania, where he died in 1944.

Beck, Ludwig (b. June 29, 1880, Biebrich, Ger.—d. July 20, 1944, Berlin), German general, chief of the General Staff 1935–38, opposed Hitler's occupation of the Rhineland (1936), and was a central figure in the unsuccessful generals' plot of 1944 against Hitler.

Beck was attached to the General Staff in World War I. After Hitler came to power, he rose rapidly, becoming chief of the elitist Army General Staff in 1935, but he resigned in 1938 after protesting the decision to conquer Czechoslovakia and after failing to organize army opposition to Hitler's expansionist policies. He became the recognized leader of the conspirators against Hitler and was seen as a possible president of Germany with Hitler out of the way. After the failure of the plot to assassinate Hitler on July 20, 1944, Beck attempted suicide, receiving the coup de grace from an attending sergeant.

Beck, Martin (b. July 30, 1867, Liptószentmiklós, Hung.—d. Nov. 16, 1940, New York City), Hungarian-born American theatre manager, owner, and impresario, who managed (1903–23) the dominant vaudeville circuit between Chicago and California.

Educated in Vienna, he immigrated to the United States with a group of German actors. Stranded in Chicago *c.* 1890, when his vaudeville troupe disbanded, Beck soon became the successful manager of the Orpheum Concert Saloon, out of which grew the Orpheum Vaudeville Circuit (established 1903). Beck extended the circuit to more than 60 theatres and built the most famous vaudeville theatre in the nation, the Palace, in Times Square, New York City. He introduced to the United States entertainments as diverse as the D'Oyly Carte Opera Company and the magic of Houdini. Noted throughout his career for an unmatched ability to select successful sites, Beck built a theatre, named the Martin Beck, some distance from the central theatrical thoroughfare of Broadway. It prospered in spite of its unorthodox location and the opposition of the United Bookings Office, which had a monopoly on vaudeville talent in the eastern United States. Beck was active in the management of the theatre until his death.

Beck, Max Wladimir, Freiherr von (baron of) (b. Sept. 6, 1854, Vienna—d. Jan. 20, 1943, Vienna), premier (1906–08) of Austria whose administration introduced universal male suffrage to the Austrian half of the Habsburg monarchy.

Rising quickly in Austrian government service after 1876, Beck served after 1880 in the Ministry of Agriculture, becoming subsequently director of legislative and organizational affairs (1888) and finally departmental chief (1900). He also served as adviser to the heir apparent, Archduke Francis Ferdinand. He was named premier for Austria (1906) in the midst of controversy over impending suffrage legislation and a tariff crisis with Hungary. His draft bill of December 1906, establishing universal male suffrage and proportional representation of nationalities in the Reichsrat (legislature), became law in 1907.

During Beck's administration, new programs of social insurance were implemented and two railways were nationalized. His opposition to the Austro-Hungarian annexation of Bosnia, however, cost him the support of the Archduke, who favoured annexation and who also resented that Beck had taken office as prime minister under the emperor Francis Joseph; on Nov. 15, 1908, Beck was forced to resign. Beck is generally considered to have been one of the ablest Austrian premiers of the late monarchy.

Becke, Friedrich Johann Karl (b. Dec. 31, 1855, Prague—d. June 18, 1931, Vienna), mineralogist who in 1903 presented to the International Geological Congress a classic paper on the mineral composition and texture of the crystalline schists. Published in amplified form in 1913, his paper contained the first comprehensive theory of metamorphic rocks and proved to be singularly fruitful for further advances in their study. Becke's subsequent contribution on retrogressive metamorphism led to a deeper understanding of many ancient mountain belts.

Becke

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

He studied mineralogy and allied sciences in Vienna under Gustav Tschermak, whose *Mineralogische und petrographische Mitteilungen* ("Mineralogical and Petrographical Notices") he edited after 1899. Becke was appointed to the chair of mineralogy at the University of Vienna in 1898, became rector of the university in 1921, and retired in 1927.

Becker, Boris (b. Nov. 22, 1967, Leimen, near Heidelberg, W.Ger.), West German tennis player who, on July 7, 1985, became the youngest champion in the history of the men's singles at Wimbledon. At the same time, he became the only unseeded player and the only German ever to win the title, as well as the youngest person ever to win any Grand Slam title in men's singles.

Becker's father, an architect, built the hometown tennis club (Blau-Weiss Tennisklub) where Becker learned to play as a child. He started playing competitively at age 8 and began concentrating almost wholly on tennis by age 12; he dropped out of school in the 10th grade, or form, and instead was schooled in the West German Tennis Federation, where his principal coach was Günther Bosch, a Romanian-born German.

Becker, Carl (Lotus) (b. Sept. 7, 1873, near Waterloo, Iowa, U.S.—d. April 10, 1945, Ithaca, N.Y.), American historian known for his work on early American intellectual history and on the 18th-century Enlightenment.

Carl Becker

By courtesy of Cornell University Archives, Ithaca, New York

Becker in 1893 entered the University of Wisconsin, Madison, where he studied under the historians Charles Homer Haskins and Frederick Jackson Turner. Some of his graduate work was done at Columbia University (1898) under James Harvey Robinson. Becker taught at the University of Kansas, Lawrence, from 1902 to 1916 and at Cornell University, Ithaca, N.Y., from 1917 until his retirement in 1941. In *The Beginnings of the American People* (1915), Becker elaborated on his doctoral work by advancing the thesis of a dual American Revolution—the first being the struggle for self-government and the second concerning the ideological battle over the form such government should take. In *The Eve of the Revolution* (1918) and *The Declaration of Independence* (1922), he further probed the relationship between 18th-century natural-rights philosophy and the American Revolution.

The interwar period was a time of dejection and increasing philosophical skepticism for Becker. During the 1920s, particularly, he began challenging the then-orthodox assumption of the superiority of a scientific methodology in historical study. He maintained that perceived "facts" are basically mental images created by the historian's experience and a larger, socially defined reality that determines the process by which the historian selects his data. His presidential address in 1931 to the American Historical Association, "Everyman His Own Historian" (published in 1932 and expanded to book length in 1935), deals most explicitly with this theme of historical relativism. In one of his best known books, *The Heavenly City of the Eighteenth Century Philosophers* (1932), Becker not only examined the ideas of the Philosophes, such as their belief in progress and human perfectibility, but also stressed their intellectual fervour and their success in bridging traditional Christianity and Enlightenment secularism. During World War II he repudiated his earlier skepticism, urging the need for a reinsertion of moral statements in historical writing. Becker was also a popular historian who was widely read outside his field.

BIBLIOGRAPHY. C.W. Smith, *Carl Becker: On History and the Climate of Opinion* (1956); Cushing Strout, *The Pragmatic Revolt in American History: Carl Becker and Charles Beard* (1958); and B.T. Wilkins, *Carl Becker* (1961).

Becker, George Ferdinand (b. Jan. 5, 1847, New York City—d. April 20, 1919, Washington, D.C.), geologist with the U.S. Geological Survey for 40 years who advanced the study of mining geology from a physical, chemical, and mathematical approach.

In 1874 he became an instructor of mining and metallurgy at the University of California, Berkeley, where he met Clarence King, the first director of the U.S. Geological Survey. Becker obtained a position with the survey and began a study of mining districts on the West Coast. His best known report from this work is *Geology of the Comstock Lode and Washoe District* (1882).

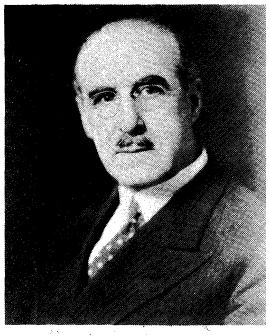
Becker's main interest was the study of the Earth's interior, and his theoretical work on this topic was presented in a series of important papers in the 1890s. He played a major role in the establishment of the Geophysical Laboratory of the Carnegie Institution of Washington, D.C., of which he was the first director. In 1896 Becker went to South Africa to study the gold and diamond fields, and from 1898 to 1899 he served as geologist to the U.S. Army in the Philippines.

Becker, Wilhelm Adolf (b. 1796, Dresden, Saxony—d. Sept. 30, 1846, Meissen), German classical archaeologist and professor of archaeology at the University of Leipzig who is remembered for his works on the everyday life of the ancient Romans and Greeks.

Becker's early studies of Plautus' comedies led him to publish *Gallus* (1838), the story of a Roman youth. Derived from Suetonius' *Life of Augustus* and embellished to include all aspects of Roman life and customs, the book became a classic in its field, the English translation passing through 10 editions between 1844 and 1891. A similar work on Greek life, *Charikles* (1840), enjoyed comparable success. His *Handbuch der römischen Altertumer,* 5 vol. (1843–68; "Handbook of Roman Antiquities"), was completed by the classical scholars Theodor Mommsen and Joachim Marquardt.

Becket, Frederick Mark (b. Jan. 11, 1875, Montreal—d. Dec. 1, 1942, New York City), metallurgist who developed a process of using silicon instead of carbon as a reducing agent in metal production, thus making low-carbon ferroalloys and certain steels practical.

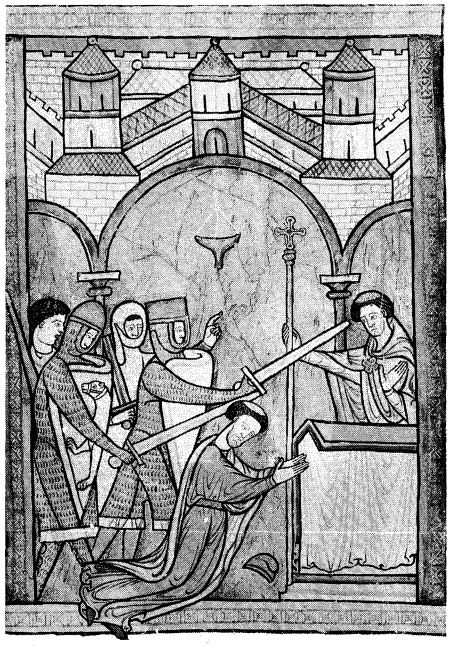
After graduating (1895) from McGill University, Montreal, Becket attended Columbia University, New York City, and embarked on a career of utilizing electrical energy in the production of metals and chemicals. He joined the Union Carbide and Carbon Corporation in 1906, rising eventually to a vice presidency and spending his last years as a consultant. He pioneered in the use of the electric furnace in



Frederick Becket
By courtesy of Union Carbide Corporation

the production of ferrovanadium, ferromanganese, ferromolybdenum, ferrotungsten, and low-carbon ferrochromium, an essential ingredient of stainless steel. During World War I he made possible tonnage production of ferrozirconium, previously unavailable, and speeded production of silicon for use in making steel shells and aluminum alloys for aviation use. More than 100 patents, covering a wide range of electric furnace and chemical products, were issued to him.

Becket, Saint Thomas, also called THOMAS À BECKET, or THOMAS OF LONDON (b. *c.* 1118, Cheapside, London—d. Dec. 29, 1170, Canterbury, Kent, Eng.; canonized 1173; feast day December 29), chancellor of England (1155–62) and archbishop of Canterbury (1162–70)



Murder of Thomas Becket, illustration from an English psalter, *c.* 1200; in the British Library
By courtesy of the trustees of the British Library

during the reign of King Henry II. His career was marked by a long quarrel with Henry that ended with Becket's murder in Canterbury cathedral.

Early life and career. Thomas was born to Norman parents of the merchant class. He was educated first at Merton priory, then in a City of London school, and finally at Paris. Deeply influenced in childhood by a devout mother who died when he was 21, Thomas entered adult life as a city clerk and accountant in the service of the sheriffs. After three years he was introduced by his father to Archbishop Theobald, a former abbot of Bec, of whose household he became a member. His colleagues were a distinguished company that included the political philosopher John of Salisbury, the Roman lawyer Vacarius, and several future bishops, including Roger of Pont l'Évêque, later archbishop of York. Thomas won Theobald's confidence, acted as his agent, and was sent by him to study civil and canon law at Bologna and Auxerre.

His contemporaries described Thomas as a tall and spare figure with dark hair and a pale face that flushed in excitement. His memory was extraordinarily tenacious and, though neither a scholar nor a stylist, he excelled in argument and repartee. He made himself agreeable to all around him, and his biographers attest that he led a chaste life—in this respect uninfluenced by the King.

As chancellor. In 1154 Theobald, as a reward of his services, appointed Thomas archdeacon of Canterbury, an important and lucrative post, and less than three months later recommended him to Henry as chancellor. Here Thomas showed to the full his brilliant abilities, razing castles, repairing the Tower of London, conducting embassies, and raising and leading troops in war. Trusted completely by the King, Thomas was compared by a biographer to Joseph under Pharaoh. To Henry himself Thomas was a welcome companion and intimate friend, both at court and in the chase, aiding the King in his policy of gathering all power into the hands of the monarchy, even when that policy went against claims of the church. Thomas, older than Henry by 15 years and celibate, may well have felt, at least initially, a quasi-paternal or elder-brother affection, mingled with admiration for Henry's talents and charm. He must also have enjoyed the satisfaction of moving in a rank of society to which he had not been born. Henry's attitude is less easy to identify, but the efficiency and intelligence of Thomas must have recommended him to a king surrounded by uneducated and at times truculent barons.

Whether Becket was fully satisfied with his life as chancellor is another matter. Throughout his life Thomas gave with prodigality and acted with panache. The description of the procession of men, beasts, and carriages laden with objects of luxury that accompanied him as envoy to Paris in 1158 is one of the highlights of William FitzStephen's *Life of Thomas Becket.* This, and his customary splendour of clothing and furnishings, suited ill with his status as archdeacon. More serious in the eyes of contemporaries was his refusal to surrender his archdeaconry while neglecting its duties, and his extraction of scutage (payment in lieu of military service) at a high rate from ecclesiastical fiefs. Most serious to modern minds is his failure to visit the disapproving and dying Theobald when summoned. In general, there can be no doubt that in public affairs he was the King's man, even when Henry endeavoured to reassert what he claimed to be his ancestral rights.

Meanwhile, the great movement known as the Gregorian reform had spread from Italy to France and the Holy Roman Empire and had begun to influence English churchmen. In its program, free elections to clerical posts, inviolability of church property, freedom of appeal to Rome, and clerical immunity from lay tribunals were leading points. Under Henry I and Stephen, the archbishops had stood out for these reforms, sometimes with partial success. Henry II, however, undoubtedly aimed at a complete return to the practice of Henry I, who had strict control over the church. He had begun to press his claims, and his chancellor had aided him. With the death of Theobald in 1161, Henry hoped to appoint Thomas as archbishop and thus complete his program.

As archbishop. For almost a year after the death of Theobald the see of Canterbury was vacant. Thomas was aware of the King's intention and tried to dissuade him by warnings of what would happen. Henry persisted and Thomas was elected. Once consecrated, Thomas changed both his outlook and his way of life. He became devout and austere and embraced the integral program of the papacy and its canon law. This spectacular change has baffled historians, and several explanations have been attempted: that Thomas was intoxicated by his ambition to dominate or that he threw himself, as before, into a part he had agreed to play. It is simpler to suppose that he accepted at last the spiritual obligations he had ignored as chancellor and turned into a new channel his mingled energy, force of character, impetuosity, and ostentation. Greatly to Henry's displeasure, he immediately resigned the chancellorship but clung to the archdeaconry until forced by the King to resign. Henry had been in Normandy since August 1158, and on his return in January 1163 Thomas began the struggle by opposing a tax proposal and excommunicating a leading baron. More serious was his attitude in the matter of "criminous clerks." In western Europe, accused clerics for long had enjoyed the privilege of standing trial before the bishop rather than secular courts and usually received milder punishments than lay courts would assess. In England before the Conquest this was still the custom. If found guilty in an ecclesiastical court, clerics could be degraded or exiled but were not liable to death or mutilation. For 60 years after the Norman Conquest little is heard of clerical crime or its punishment, while on the Continent, Gregorian reformers were tending to emphasize the sole right of the church to try and punish clerks in major orders. The position of Thomas, that a guilty clerk could be degraded and punished by the bishop but should not be punished again by lay authority—"not twice for the same fault"—was canonically arguable and ultimately prevailed. Henry's contention that clerical crime was rife and that it was encouraged by the absence of drastic penalties commends itself to modern readers as a fair one. But it must be remembered that the King's motives were authoritarian and administrative rather than enlightened. Nevertheless, it may be thought that Thomas was ill-advised in his rigid stand on this point. The issue was joined in a council at Westminster (October 1163), but the crisis came at Clarendon (Wiltshire, January 1164), when the King demanded a global assent to all traditional royal rights, reduced to writing under 16 heads and known as the Constitutions of Clarendon. These asserted the King's right to punish criminous clerks, forbade excommunication of royal officials and appeals to Rome, and gave the King the revenues of vacant sees and the power to influence episcopal elections. Henry was justified in saying that these rights had been exercised by Henry I, but Thomas also was justified in maintaining that they contravened church law. Thomas, after verbally accepting the constitutions, revoked his assent and appealed to the Pope, then in France, who supported him while deprecating precipitate action.

Quarrel with Henry. Good relations between Thomas and Henry were now at an end; the Archbishop was summoned to trial by the King on a point of feudal obligation. At the Council of Northampton (Oct. 6–13, 1164), it was clear that Henry intended to ruin and imprison or to force the resignation of the Archbishop. In this he was encouraged by some of the bishops, among them Gilbert Foliot, bishop of London. Thomas fled in disguise and took refuge with Louis VII of France. Pope Alexander III received him with honour but hesitated to act decisively in his favour in fear that he might throw Henry into the arms of the Holy Roman emperor Frederick I and his antipope, Paschal III.

Thomas' exile lasted for six years (Nov. 2, 1164–Dec. 2, 1170). He was joined by many of his distinguished household and lived ascetically, first at Pontigny Abbey and then,

when Henry threatened the monks, at an abbey near Sens. Henry meanwhile had seized the properties of the Archbishop and his supporters and had exiled all Thomas' close relatives. In the following years several abortive attempts were made at reconciliation, but new acts of hostility by the King and declarations of excommunication hurled by Thomas at his opponents embittered the struggles.

The bishops were divided, but a majority of them, led by Foliot, were either hostile to Thomas or hesitant in supporting him. Papal legates more than once endeavoured to mediate, and the King and the Archbishop came together at Montmirail in 1169, only to part in anger. Thomas distrusted the King and was, in turn, hated by him. In the same year Henry put out additions to the Constitutions of Clarendon, virtually withdrawing England from papal obedience. Finally, in 1170, he had his eldest son crowned as co-king by the archbishop of York, Becket's old rival.

This was a flagrant breach of papal prohibition and of the immemorial right of Canterbury to crown the king. Thomas, followed by the Pope, excommunicated all responsible. Henry, fearing an interdict for England, met Thomas at Fréteval (July 22), and it was agreed that Thomas should return to Canterbury and receive back all the possessions of his see. Neither party withdrew from his position regarding the Constitutions of Clarendon, which on this occasion were not mentioned. This "open-ended" concordat has remained an inexplicable event. Thomas returned to Canterbury (December 2) and was received with enthusiasm, but further excommunications of the hostile royal servants, refusal to lift the excommunication of Roger of York and Foliot, as well as his ready acceptance of tumultuous acclaim by the crowds infuriated Henry in Normandy.

Martyrdom. Some violent words of Henry were taken literally by four leading knights of the court, who proceeded swiftly to Canterbury (December 29), forced themselves into the Archbishop's presence, and, on his refusal to absolve the bishops, followed him into the cathedral. There, at twilight, after further altercation, they cut him down with their swords. His last words were an acceptance of death in defense of the church of Christ.

Within a few days after Thomas' death, his tomb became a goal of pilgrimage, and he was canonized by Alexander III in 1173. In 1174 Henry did penance at Canterbury and was absolved. For almost four centuries, Becket's shrine was one of the most famous in Europe. Thomas was portrayed in illuminations and sculpture, and churches were dedicated to him throughout western Christendom.

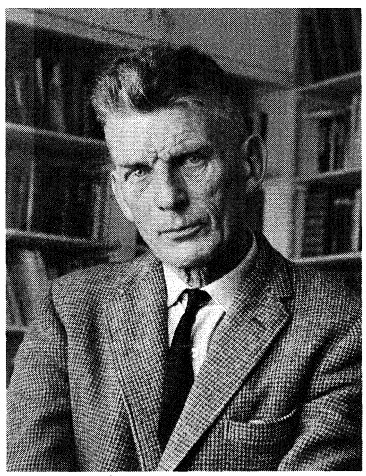
Judgment on the character and actions of St. Thomas has been varied. From his martyrdom till the reign of Henry VIII he was the "blisful martyr" of Chaucer's pilgrims, who had heroically defied a tyrant. Henry VIII despoiled his shrine, burned his bones, and erased his name from all service books. Thenceforth Thomas was a hero to Catholics and a traitor to Protestants.

Many recent historians, impressed by the legal and administrative reforms of Henry II, have seen Thomas as an ambitious and fanatical nuisance. Certainly there is room for debate, for both Thomas and his king were remarkable men with complex characters. If Henry had moral failings and made private and political miscalculations, Thomas can rightly be accused, at various moments of his life, of worldly behaviour, ostentation, impetuosity, weakness, and violent language. If Henry was ill-advised in committing his claims to writing at Clarendon and in crowning his son, Thomas was equally ill-advised in needlessly opposing the King in 1163 and in wavering between compliance and intransigence when careful diplomacy might have won out. But his courage and sincerity cannot be doubted, and in the quarrel between church and state he gave his life for what he took to be a vital issue. (M.D.K.)

BIBLIOGRAPHY. The nine contemporary Latin *Lives*, mostly by men who knew the Archbishop, in *Materials for the History of Thomas Becket, Archbishop of Canterbury*, vol. 1–4, "Rolls Series" (1875–85), are described and translated in a selection by D.C. Douglas and G.W. Greenaway, *English Historical Documents II*, pp. 698–776 (1953). Becket's letters and many addressed to him are in *Materials*, vol. 5–7 (not translated). There is an excellent short account by Kate Norgate in the *Dictionary of National Biography* (1898, reprinted 1937–38); and brief lives, *Thomas Becket*, by R. Winston (1967), with bibliography; and D. Knowles (1970). See also D. Knowles, *The Episcopal Colleagues of Archbishop Thomas Becket* (1951) and *Archbishop Thomas Becket: A Character Study* (1949).

Beckett, Sir Edmund: *see* Grimthorpe of Grimthorpe, Sir Edmund Beckett, 1st baron.

Beckett, Samuel (Barclay) (b. April 13, 1906, Foxrock, County Dublin, Ire.), author, critic, and playwright, winner of the Nobel Prize for Literature (1969). He has written in both French and English and is perhaps best known for his plays, especially *En attendant Godot* (1952; *Waiting for Godot*, 1954).



Samuel Beckett, 1965
© Gisele Freund

Life. Samuel Beckett was born in a suburb of Dublin. Like his fellow Irish writers George Bernard Shaw, Oscar Wilde, and William Butler Yeats, he came from a Protestant, Anglo-Irish background. At the age of 14 he went to the Portora Royal School, in what became Northern Ireland, a school that catered to the Anglo-Irish middle classes.

From 1923 to 1927, he studied Romance languages at Trinity College, Dublin, where he received his bachelor's degree. After a brief spell of teaching at a school in Belfast, he became a reader in English at the École Normale Supérieure in Paris in 1928. Here he met the self-exiled Irish writer James Joyce, the author of the controversial and seminally modern novel *Ulysses*, and became a member of his circle. Contrary to often-repeated reports, however, he never served as Joyce's secretary. He returned to Ireland in 1930 to take up a post as lecturer in French at Trinity College, but after only four terms he resigned, in December 1931, and embarked upon a period of restless travel in London, France, Germany, and Italy.

In 1937 Beckett decided to settle in Paris. As a citizen of a country that was neutral in World War II, he was able to remain there even after the occupation of Paris by the Germans, but he joined an underground resistance group in 1941. When, in 1942, he received news that members of his group had been arrested by the Gestapo, he immediately went into hiding and eventually moved to the unoccupied zone of France. Until the liberation of the country, he supported himself as an agricultural labourer.

In 1945 he returned to Ireland but volunteered for the Irish Red Cross and was back in France as an interpreter in a military hospital in Saint-Lô, Normandy. In the winter of 1945, he finally returned to Paris.

Production of the major works. There followed a period of intense creativity, the most concentratedly fruitful period of Beckett's life. His relatively few prewar publications included two essays on Joyce and the French novelist Marcel Proust. The volume *More Pricks Than Kicks* (1934) contained 10 stories describing episodes in the life of a Dublin intellectual, Belacqua Shuah, and the novel *Murphy* (1938) concerns an Irishman in London who escapes from a girl he is about to marry to a life of contemplation as a male nurse in a mental institution. His two slim volumes of poetry were *Whoroscope* (1930), a poem on the French philosopher René Descartes, and the collection *Echo's Bones* (1935). A number of short stories and poems were scattered in various periodicals.

During his years in hiding in unoccupied France, Beckett also completed another novel, *Watt*, which was not published until 1953. After his return to Paris, between 1946 and 1949, Beckett produced a number of stories, the major prose narratives *Molloy* (1951; Eng. trans. 1955), *Malone meurt* (1951; *Malone Dies*, 1956), and *L'Innommable* (1953; *The Unnamable*, 1958) and two plays, the unpublished three-act *Eleutheria* and *En attendant Godot*.

It was not until 1951, however, that these works saw the light of day. After many refusals, Mme Beckett, who had been in Beckett's resistance group during the war, finally succeeded in finding a publisher for *Molloy*. When this book not only proved a modest commercial success but also was received with enthusiasm by the French critics, the same publisher brought out the two other novels and *En attendant Godot*. It was with the amazing success of this play, however, at the small Théâtre de Babylone in Paris, in January 1953, that Beckett's rise to world fame began. Following this, Beckett continued writing, but more slowly than in the immediate postwar years. Plays for the stage and radio and a number of prose works occupied much of his attention.

Beckett continued to live in Paris, but most of his writing was done in a small house secluded in the Marne Valley, a short drive from Paris. His total dedication to his art extended to his complete avoidance of all personal publicity, of appearances on radio or television, and of all journalistic interviews. When, in 1969, he received the Nobel Prize for Literature, he accepted the award but declined the trip to Stockholm to avoid the public speech at the ceremonies.

Continuity of his philosophical explorations. Beckett's writing reveals his own immense learning. It is full of subtle allusions to a multitude of literary sources as well as to a number of philosophical and theological writers. The dominating influences on Beckett's thought are undoubtedly the Italian poet Dante, the French philosopher René Descartes, the 17th-century Dutch philosopher Arnold Geulincx—a pupil of Descartes who dealt with the question of how the physical and the spiritual sides of man interact—and, finally, his fellow Irishman and revered friend, James Joyce. But it is by no means essential for the understanding of Beckett's work that one be aware of all the literary, philosophical, and theological allusions.

The widespread idea, fostered by the popular press, that Beckett's work is concerned primar-

ily with the sordid side of human existence, with tramps and with cripples who inhabit trash cans, is a fundamental misconception. He deals with human beings in such extreme situations not because he is interested in the sordid and diseased aspects of life but because he concentrates on the essential aspects of human experience. The subject matter of so much of the world's literature—the social relations between individuals, their manners and possessions, their struggles for rank and position, or the conquest of sexual objects—appears to Beckett as mere external trappings of existence, the accidental and superficial aspects that mask the basic problems and the basic anguish of the human condition. The basic questions for Beckett seem to be these: How can we come to terms with the fact that, without ever having asked for it, we have been thrown into the world, into being? And who are we; what is the true nature of our self? What does a human being mean when he says "I"?

What appears to the superficial view as a concentration on the sordid thus emerges as an attempt to grapple with the most essential aspects of the human condition. The two heroes of *Waiting for Godot,* for instance, are frequently referred to by critics as tramps, yet they were never described as such by Beckett. They are merely two human beings in the most basic human situation of being in the world and not knowing what they are there for. Since man is a rational being and cannot imagine that his being thrown into any situation should or could be entirely pointless, the two vaguely assume that their presence in the world, represented by an empty stage with a solitary tree, must be due to the fact that they are waiting for someone. But they have no positive evidence that this person, whom they call Godot, ever made such an appointment—or, indeed, that he actually exists. Their patient and passive waiting is contrasted by Beckett with the mindless and equally purposeless journeyings that fill the existence of a second pair of characters. In most dramatic literature the characters pursue well-defined objectives, seeking power, wealth, marriage with a desirable partner, or something of the sort. Yet, once they have attained these objectives, are they or the audience any nearer answering the basic questions that Beckett poses? Does the hero, having won his lady, really live with her happily ever after? That is apparently why Beckett has chosen to discard what he regards as the inessential questions and begins where other writing leaves off.

This stripping of reality to its naked bones is the reason that Beckett's development as a writer was toward an ever greater concentration, sparseness, and brevity. His two earliest works of narrative fiction, *More Pricks Than Kicks* and *Murphy,* abound in descriptive detail. In *Watt,* the last of Beckett's novels written in English, the milieu is still recognizably Irish, but most of the action takes place in a highly abstract, unreal world. Watt, the hero, takes service with a mysterious employer, Mr. Knott, works for a time for this master without ever meeting him face to face, and then is dismissed. The allegory of man's life in the midst of mystery is plain.

Most of Beckett's plays also take place on a similar level of abstraction. *Fin de partie* (one-act, 1957; *Endgame,* 1958) describes the dissolution of the relation between a master, Hamm, and his servant, Clov. They inhabit a circular structure with two high windows—perhaps the image of the inside of a human skull. The action might be seen as a symbol of the dissolution of a human personality in the hour of death, the breaking of the bond between the spiritual and the physical sides of man. In *Krapp's Last Tape* (one-act, first performed 1958), an old man listens to the confessions he recorded in earlier and happier years. This becomes an image of the mystery of the self, for to the old Krapp the voice of the younger Krapp is that of a total stranger. In what sense, then, can the two Krapps be regarded as the same human being? In *Happy Days* (1961), a woman, literally sinking continually deeper into the ground, nonetheless continues to prattle about the trivialities of life. In other words, perhaps, as one gets nearer and nearer death, one still pretends that life will go on normally forever.

In his trilogy of narrative prose works—they are not, strictly speaking, novels as usually understood—*Molloy, Malone Dies,* and *The Unnamable,* as well as in the collection *Stories and Texts for Nothing* (1967), Beckett raises the problem of the identity of the human self from, as it were, the inside. This basic problem, simply stated, is that when I say "I am writing," I am talking about myself, one part of me describing what another part of me is doing. I am both the observer and the object I observe. Which of the two is the real "I"? In his prose narratives, Beckett tries to pursue this elusive essence of the self, which, to him, manifests itself as a constant stream of thought and of observations about the self. One's entire existence, one's consciousness of oneself as being in the world, can be seen as a stream of thought. *Cogito ergo sum* is the starting point of Beckett's favourite philosopher, Descartes: "I think; therefore, I am." To catch the essence of being, therefore, Beckett tries to capture the essence of the stream of consciousness that is one's being. And what he finds is a constantly receding chorus of observers, or storytellers, who, immediately on being observed, become, in turn, objects of observation by a new observer. Molloy and Moran, for example, the pursued and the pursuer in the first part of the trilogy, are just such a pair of observer and observed. Malone, in the second part, spends his time while dying in making up stories about people who clearly are aspects of himself. The third part reaches down to bedrock. The voice is that of someone who is unnamable, and it is not clear whether it is a voice that comes from beyond the grave or from a limbo before birth. As we cannot conceive of our consciousness not being there—"*I* cannot be conscious that *I* have ceased to exist"—therefore consciousness is at either side open-ended to infinity. This is the subject also of the play *Play* (first performed 1963), which shows the dying moments of consciousness of three characters, who have been linked in a trivial amorous triangle in life, lingering on into eternity.

The humour and mastery. In spite of Beckett's courageous tackling of the ultimate mystery and despair of human existence, he is essentially a comic writer. In a French farce, laughter will arise from seeing the frantic and usually unsuccessful pursuit of trivial sexual gratifications. In Beckett's work, as well, a recognition of the triviality and ultimate pointlessness of most human strivings, by freeing the viewer from his concern with senseless and futile objectives, should also have a liberating effect. The laughter will arise from a view of pompous and self-important preoccupation with illusory ambitions and futile desires. Far from being gloomy and depressing, the ultimate effect of seeing or reading Beckett is one of cathartic release, an objective as old as theatre itself.

Technically, Beckett is a master craftsman, and his sense of form is impeccable. *Molloy* and *Waiting for Godot,* for example, are constructed symmetrically, in two parts that are mirror images of one another. In his work for the mass media, Beckett also showed himself able to grasp intuitively and brilliantly the essential character of their techniques. His radio plays, such as *All That Fall* (1957), are models in the combined use of sound, music, and speech. The short television play *Eh Joe!* (1967) exploits the television camera's ability to move in on a face and the particular character of small-screen drama. Finally, his film script *Film* (1967) creates an unforgettable sequence of images of the observed self trying to escape the eye of its own observer.

Beckett's later works tended toward extreme concentration and brevity. *Come and Go* (1967), a playlet, or "dramaticule," as he called it, contains only 121 words that are spoken by the three characters. The prose fragment "Lessness" consists of but 60 sentences, each of which occurs twice. His series *Acts Without Words* are exactly what the title denotes, and one of his last plays, *Rockabye,* lasts for 15 minutes. Such brevity is merely an expression of Beckett's determination to pare his writing to essentials, to waste no words on trivia.

Assessment. Among the major writers of the 20th century, Samuel Beckett stands out by virtue of the uncompromising austerity and purity of his approach to literature. His work, though seasoned with a bitter humour, was a dedicated and courageous exploration of his stark perceptions of the transitoriness and insignificance of human existence in a bleak universe. Whether his work took the form of narrative prose, poetry, criticism, or drama, this boldness in seeking ultimate truths made his writings invaluable documents of human experience and of the workings of man's consciousness. At the same time, the writings represented important contributions to existential philosophical thought, which is concerned with human experience at its most concrete and specific as the basis of all more general concepts and values.

Writing in both French and English, and translating his works from one to the other, Beckett was an incomparable stylist in both. His output in verse was small, but his narrative and dramatic prose was so delicately phrased, so subtle in its rhythms, and so intricately structured that it, too, must be considered poetry. (M.J.E.)

MAJOR WORKS. *Narrative prose. More Pricks Than Kicks* (1934), *Murphy* (1938), and *Watt* (written *c.* 1942–44, published 1953), all in English; a trilogy consisting of *Molloy* (Eng. trans. by Beckett and Patrick Bowles, 1955), *Malone meurt* (1951; *Malone Dies,* trans. by Beckett, 1956), and *L'Innommable* (1953; *The Unnamable,* trans. by Beckett, 1958); *Nouvelles et textes pour rien* (1955; *Stories and Texts for Nothing,* in *No's Knife: Collected Shorter Prose 1945–66,* 1967); *Comment c'est* (1961; *How It Is,* trans. by Beckett, 1964); *Imagination morte imaginez* (1965; *Imagination Dead Imagine,* trans. by Beckett, 1965), a short novel, also included in *Collected Shorter Prose; Assez* (1966; *Enough,* in *Collected Shorter Prose*); *Bing* (1966; *Ping,* in *Collected Shorter Prose*); *Têtesmortes* (1967); *Fizzles* (1977); *Company* (1980).

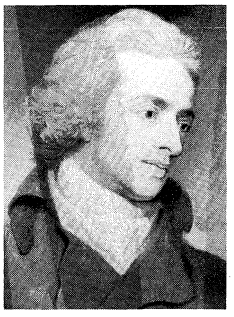
Plays and dramatic pieces. En attendant Godot (1952; *Waiting for Godot,* trans. by Beckett, 1954); *Fin de partie* (1957; *Endgame,* trans. by Beckett, 1958), one-act play; *Acte sans paroles I* (1957; *Act Without Words,* trans. by Beckett, 1958), *All That Fall* (1957; in *Krapp's Last Tape and Other Dramatic Pieces,* 1960), one-act play for radio; *Krapp's Last Tape* (1959), one-act play; *Embers* (1959), for radio; *Happy Days* (1961; French trans. by Beckett, *Oh les Beaux Jours,* 1963); *Play* (1964; French trans. by Beckett, *Comédie,* published in *Comédie et actes divers,* 1966); *Words and Music* (1964), for radio—music and voices; *Cascando* (1964), for radio—music and voices; *Come and Go,* first published in Beckett's French trans., *Va et vient* (1966; English original first published in a bilingual German collection 1966, separately 1967), a "dramaticule" lasting only a few minutes; *Eh Joe* (1966), for television, first published in Beckett's French trans., *Dis Joe* (1966, in English 1967); *Film* (1967), film script; *Ends and Odds* (1977); *Rockaby and Other Short Pieces* (1981).

Other works (verse). Whoroscope (1930); *Echo's Bones* (1935); *Poems in English* (1961). (*Essays*): "Dante . . . Bruno. Vico . . . Joyce," (1929), in *Our Exagmination Round his Factification . . .; Proust* (1931); *Proust/Three Dialogues* (1965). *I Can't Go*

On, I'll Go On: A Selection from Samuel Beckett's Work (1977; ed. by Richard W. Seaver) contains a good sampling of writing from the entire oeuvre.

BIBLIOGRAPHY. Raymond Federman and John Fletcher, *Samuel Beckett: His Works and His Critics: An Essay in Bibliography, 1929–1966* (1970), is an exhaustive bibliography of the author's writings and writings about him. Both Vivian Mercier, *Beckett/Beckett* (1977), and Deirdre Bair, *Samuel Beckett: A Biography* (1978), are excellent biographical studies. Many critical studies have been devoted to Beckett; among these Hugh Kenner, *Samuel Beckett: A Critical Study* (1962); Ruby Cohn, *Samuel Beckett: The Comic Gamut* (1962); John Fletcher, *The Novels of Samuel Beckett* (1964); and on Beckett's plays, Martin Esslin, *The Theatre of the Absurd* (1961), can serve as a basis for an approach to Beckett. Two anthologies of shorter articles of important Beckett criticism are *Samuel Beckett: A Collection of Critical Essays,* ed. by Martin Esslin (1965); and *Samuel Beckett Now,* ed. by Melvin J. Friedman (1970). Beckett's early writings are the subject of Raymond Federman, *Journey to Chaos: Samuel Beckett's Early Fiction* (1965); and Lawrence E. Harvey, *Samuel Beckett: Poet and Critic* (1970). John Fletcher, *Samuel Beckett's Art* (1967), is a valuable study of Beckett's technique as a writer. *Beckett at Sixty* (1967), is a collection of reminiscences by friends and admirers. Richard N. Coe, *Beckett* (1964), is a useful introduction. Two books devoted to the interpretation of single works are *Casebook on Waiting for Godot,* ed. by Ruby Cohn, a collection of early reviews and critical essays on the play (1967); and *Twentieth Century Interpretations of Endgame,* ed. by B.G. Chevigny (1969).

Beckford, William (b. Oct. 1, 1760?, Fonthill Gifford, Wiltshire, Eng.—d. May 2, 1844, Bath, Somerset), eccentric English dilettante, author of the Oriental novel *Vathek* (1786), and builder of Fonthill Abbey, the most sensational building of the English Gothic revival.



Beckford, detail from an oil painting by John Hoppner, *c.* 1800; in the Salford Museum and Art Gallery, London

By courtesy of the Salford Museum and Art Gallery, London

Beckford was the pampered heir to great wealth. His natural talents were given every encouragement. At five he received piano lessons from the eight-year-old master Mozart. He also received training in architecture and drawing from prominent teachers. At 11 his father died, and he came into his fortune.

After travel and study in Europe with a tutor, and after a marriage that was quickly terminated by his wife's death, Beckford remained abroad for many years. From 1796, after his return to England, he devoted his energies to his Gothic "abbey" at Fonthill. His architect was James Wyatt, but Beckford himself supervised the planning and building of what became the most extraordinary house in England. He lived there as a recluse, collecting curios, costly furnishings, and works of art and reading the library of Edward Gibbon, which he had purchased in its entirety. In 1807 the abbey's great central tower collapsed, destroying most of the building. Beckford's extravagances forced him to sell his estate in 1822.

His fame rests on *Vathek,* first written in French in 1782; its English translation (1786) by Samuel Henley was later revised by Beckford. A classic among Gothic novels, it is a masterpiece of fantastic invention and bizarre detail. Among Beckford's other published works are accounts of his travels and a journal, *Life at Fonthill, 1807–22.*

Boyd Alexander's *England's Wealthiest Son* (1962) is the definitive biography.

Beckley, city, seat (1850) of Raleigh County, southern West Virginia, U.S., 50 mi (80 km) southeast of Charleston. The first settlement was established by Gen. Alfred Beckley in 1838, but the city's growth dates from 1890 when the first commercial smokeless coal shipment was made from local mines. After the rich Winding Gulf coalfield was opened in 1907, the population increased sharply. During the Civil War, the city was occupied by both Federal and Confederate troops. Beckley is now the commercial centre for the surrounding coal and agriculture areas and has light manufactures, including mining machinery and electronic devices. Beckley College was founded in 1933. Grandview and Twin Falls state parks and Lake Stephens are nearby. Beckley Exhibition Coal Mine is in New River City Park. Inc. 1858. Pop. (1980) 20,492.

To make the best use of the Britannica, consult the INDEX *first*

Beckmann, Max (b. Feb. 12, 1884, Leipzig—d. Dec. 27, 1950, New York City), Expressionist painter and printmaker whose works are notable for the violence with which they reflect the tragic events of the 20th century.

He was trained from 1900 to 1903 at the conservative Weimar Academy, where he was influenced by the idealistic classicism of his master, Hans von Marées.

In 1904 Beckmann moved to Berlin, where he adopted the lush brushwork of the German Impressionist Lovis Corinth. Two years later he joined the prestigious Berlin Sezession, an association of Art Nouveau artists that had abandoned its earlier progressive policies in favour of a conservative stance—an attitude Beckmann continued to share. But in the same year, he met the Norwegian Expressionist painter Edvard Munch, whose morbid, curvilinear compositions influenced Beckmann to develop an Expressionistic style.

Beckmann served as a medical corpsman in World War I. The shock of exposure to dead and maimed soldiers changed his art, filling it with the sordid, often horrifying imagery that characterizes his mature work. The distorted figures of "The Descent from the Cross" (1917; Museum of Modern Art, New York City) and its pendant, "Christ and the Woman Taken in Adultery" (1917; St. Louis Art Museum, Missouri), illustrate his new style. In "The Night" (1918–19; Kunstsammlung Nordrhein-Westfalen, Düsseldorf, W.Ger.), a scene of nightmarish sadism, the deliberately repulsive colours and the erratic forms convey Beckmann's horror of man's bestiality.

"The Night," oil on canvas by Max Beckmann, 1918–19; in the Kunstsammlung Nordrhein-Westfalen, Düsseldorf, W.Ger.

By courtesy of Peter Beckmann; photograph, Kunstsammlung Nordrhein-Westfalen, Dusseldorf, W.Ger.

In 1932 the Nazis declared Beckmann's art "degenerate" and forced him to resign his professorship at the Städel School of Art in Frankfurt. He returned to Berlin, where he completed "Departure" (1932–33; Museum of Modern Art, New York City), the first of the large-scale allegorical triptychs that constitute his most important works.

Finding the conditions in Germany intolerable, he fled to Amsterdam in 1937. In 1947 he moved to the United States, settling ultimately in New York after teaching for three years at Washington University in St. Louis, Mo. Among the most important fruits of his years of exile are such triptychs as "The Actors" (1942; Fogg Art Museum, Harvard University), "Carnival" (1943), and "Blindman's Bluff" (1945; Minneapolis Institute of Arts, Minneapolis, Minn.). Although they retain many of his earlier violent themes, the late triptychs, especially his "Argonauts" (1950; Mrs. Mathilde Q. Beckmann Collection, New York City), completed on the day of his death, affirm Beckmann's belief in the ineradicable human spirit. His numerous self-portraits provide a moving diary of the artist's spiritual experience.

Becknell, William (b. 1796?, Amherst County, Va., U.S.—d. April 30, 1865, Texas), Western trader who established the Santa Fe Trail.

Upon settling in Missouri, Becknell became involved in trade with the Southwest. At the time, the Spanish government prohibited U.S. traders from selling goods in New Mexico. But after Spanish control of the area was overthrown in 1821, Americans were more welcome there. Becknell was in the southern Rockies when he learned of the change in policy, and he immediately set out for Santa Fe with his goods.

He took the customary route, following the Arkansas River nearly to its source and then turning south, to Taos and then Santa Fe. He sold his goods at a sizable profit and resolved to return. In his venture from Missouri in 1822, Becknell pioneered a new route. After moving south from the Missouri River to the Arkansas, he followed the latter only to around the site of the present Dodge City, Kansas. There he trekked southwest to the Cimarron River, following its main fork into the Rockies, and descended through a mountain pass into Santa Fe.

Becknell's route became famous as the Santa Fe Trail. Pioneer caravans crossed it time and again, and merchants used it to convey their products to the Southwest. Becknell followed it at least one more time before he settled in Texas in about 1834. There he fought in the war for Texan independence from Mexico (1836) and later joined the Texas Rangers.

Beckwourth, Jim, byname of JAMES PIERSON BECKWITH (b. April 26, 1798, Virginia, U.S.—d. 1867?, Denver, Colorado Territory), U.S. mountain man who lived for an extended period among the Indians.

He was the son of a white man, Sir Jennings Beckwith, and a mulatto slave woman and legally was born a slave. His father took him to Louisiana Territory in 1810 and eventually to St. Louis and there apparently manumitted him, for he was thereafter regarded as a "free Negro." His features were said to have resembled those of an American Indian.

In 1823 Beckwourth signed on as a groom with a fur-trading expedition. The following year, he was hired to handle the horses on an expedition to the Rocky Mountains. While in the West, he married a series of Indian women and eventually settled down for about

six years to live among the Crow Indians. According to his own testimony, Beckwourth greatly impressed the Indians with his strength and skill. Other evidence supports this claim, although Beckwourth was universally considered to exaggerate wildly.

He returned to white settlements in 1833, apparently abandoning his Indian wives. He established a route through the Sierras for Easterners en route to California after gold was discovered there in 1848. There he encountered a wandering journalist, Thomas D. Bonner, who recorded many of the frontiersman's yarns and recollections in an 1856 book that made his subject famous for a time: *The Life and Adventures of James P. Beckwourth, Mountaineer, Scout, Pioneer and Chief of the Crow Nation of Indians.* After participating briefly in the Mexican War, he returned to Missouri but soon joined the flood of settlers bound for Colorado in 1859. He served, probably as a guide and interpreter for U.S. troops, in the Cheyenne War of 1864, then settled near Denver. His death during a visit to the Crow is variously described as occurring on a hunting trip or by poison at the hands of a former wife.

Becque, Henry-François (b. April 18, 1837, Neuilly, Fr.—d. May 12, 1899, Paris), dramatist and critic whose loosely structured plays, based on character and motivation rather than on closely knit plots, provided a healthy challenge to the "well-made plays" that held the stage in his day. Although Becque disliked literary theory and refused identification with any school, he has been remembered as a forerunner of the Naturalist movement, whose chief exponent was the novelist Émile Zola.

Becque, photograph by Nadar (Gaspard-Félix Tournachon), *c.* 1880
Archives Photographiques—J.P. Ziolo

From 1867 Becque tried his hand at various types of drama, including vaudeville and a play on a socialist theme. *Les Corbeaux* (1882; *The Vultures,* 1913), his masterpiece, describes a bitter struggle for an inheritance. The unvaried egotism of the characters and the realistic dialogue were unfavourably received, except by the Naturalist critics, and the play had only three performances. *La Parisienne* (1885; *Parisienne,* 1943) scandalized the public by its treatment of the story of a married woman and her two lovers. Its importance, like that of *Les Corbeaux,* was not recognized until a decade after its appearance. In his last years, a withdrawn and somewhat misanthropic figure, Becque devoted himself to journalism and to a drama of the financial world that he never completed.

Bécquer, Gustavo Adolfo, original name GUSTAVO ADOLFO DOMÍNGUEZ BASTIDA (b. Feb. 17, 1836, Seville—d. Dec. 22, 1870, Madrid), poet and author of prose legends of the late Romantic period who is considered one of the first modern Spanish poets.

Orphaned by the age of 11, Bécquer was strongly influenced by his painter brother, Valeriano. He moved to Madrid at 17 in pursuit of a literary career and from 1861 to 1868 contributed to the newspaper *El Contemporáneo.* Bécquer's major literary production consists of nearly 100 *Rimas,* a series of about 20 *Leyendas* ("Legends") in prose, and the literary essays *Cartas desde mi celda* ("Letters From My Cell"). Although many of his poems and prose works were published individually in *El Contemporáneo,* they did not appear in book form until after his death, when his friends collected his writings and published them in *Obras,* 2 vol. (1871; "Works"). His *Rimas,* probably his best known works, are sensitive, retrained, and deeply subjective. Bécquer's poetry explores the themes of love—particularly in connection with disillusionment and loneliness—and the mysteries of life and poetry.

In sharp contrast to the rhetorical, dramatic style of the Romantic period, Bécquer's lyricism, in which assonance predominates, is simple and airy.

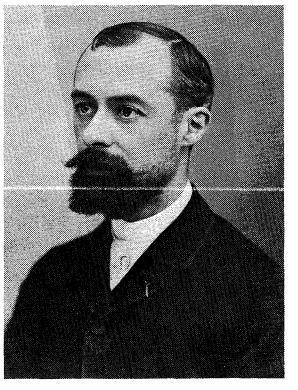
The prose pieces, *Leyendas,* are characterized by medieval settings, supernatural characters such as nymphs, and a mysterious, dreamlike atmosphere. Written in a lyrical style, the narratives are based upon the themes of love, death, and the world beyond. His spiritual autobiography, the series of letters *Desde mi celda,* was composed at the monastery of Veruela, in northern Spain.

Becquerel, (Antoine-)Henri (b. Dec. 15, 1852, Paris—d. Aug. 25, 1908, Le Croisic, Fr.), French physicist who discovered radioactivity through his investigations of uranium and other substances. In 1903 he shared the Nobel Prize for Physics with Pierre and Marie Curie.

He was a member of a scientific family extending through several generations, the most notable being his grandfather Antoine-César Becquerel (1788–1878), his father, Alexandre-Edmond Becquerel (1820–91), and his son Jean Becquerel (1878–1953).

Education and training. After his early schooling at the Lycée Louis-le-Grand, Henri received his formal scientific education at the École Polytechnique (1872–74) and engineering training at the École des Ponts et Chaussées (Bridges and Highways School; 1874–77). In addition to his teaching and research posts, Becquerel was for many years an engineer in the Department of Bridges and Highways, being appointed chief engineer in 1894. His first academic situation was in 1876 as assistant teacher at the École Polytechnique, where in 1895 he succeeded to the chair of physics. Concurrently, he was assistant naturalist to his father at the museum, where he also assumed the physics professorship upon his father's death.

Electricity, magnetism, optical phenomena, and energy were major areas of physical investigation during the 19th century. For several years the young man's research was concerned with the rotation of plane-polarized light by magnetic fields, a subject opened by Michael Faraday and to which Henri's father had also contributed. Henri then concerned himself with infrared radiation, examining, among other things, the spectra of different phosphorescent crystals under infrared stimulation. Of particular significance, he extended the work of his father by studying the relation between absorption of light and emission of phosphorescence in some uranium compounds.



Becquerel
Archives Photographiques

By 1896 Henri was an accomplished and respected physicist—a member of the Académie des Sciences since 1889—but more important than his research thus far were his expertise with phosphorescent materials, his familiarity with uranium compounds, and his general skill in laboratory techniques, including photography. Together, these were to place the discovery of radioactivity within his reach.

Systematic study of radiation. At the end of 1895, Wilhelm Röntgen discovered X-rays. Becquerel learned that the X-rays issued from the area of a glass vacuum tube made fluorescent when struck by a beam of cathode rays. He undertook to investigate whether there was some fundamental connection between this invisible radiation and visible light such that all luminescent materials, however stimulated, would also yield X-rays. To test this hypothesis, he placed phosphorescent crystals upon a photographic plate that had been wrapped in opaque paper so that only a penetrating radiation could reach the emulsion. He exposed his experimental arrangement to sunlight for several hours, thereby exciting the crystals in the customary manner. Upon development, the photographic plate revealed silhouettes of the mineral samples, and, in subsequent experiments, the image of a coin or metal cutout interposed between the crystal and paper wrapping. Becquerel reported this discovery to the Académie des Sciences at its session on February 24, 1896, noting that certain salts of uranium were particularly active.

He thus confirmed his view that something very similar to X-rays was emitted by this luminescent substance at the same time it threw off visible radiation. But the following week Becquerel learned that his uranium salts continued to eject penetrating radiation even when they were not made to phosphoresce by the ultraviolet in sunlight. To account for this novelty he postulated a long-lived form of invisible phosphorescence; when he shortly traced the activity to uranium metal, he interpreted it as a unique case of metallic phosphorescence.

During 1896 Becquerel published seven papers on radioactivity, as Marie Curie later named the phenomenon; in 1897, only two papers; and in 1898, none. This was an index of both his and the scientific world's interest in the subject, for the period saw studies of numerous radiations (*e.g.,* cathode rays, X-rays, Becquerel rays, "discharge rays," canal rays, radio waves, the visible spectrum, rays from glowworms, fireflies, and other luminescent materials), and Becquerel rays seemed not especially significant. The far more popular X-rays could take sharper shadow photographs and faster. It required the extension in 1898 of radioactivity to another known element, thorium (by Gerhard Carl Schmidt and independently by Marie Curie), and the discovery of new radioactive materials, polonium and radium (by Pierre and Marie Curie and their colleague, Gustave Bémont), to awaken the world and Becquerel to the significance of his discovery.

Further contributions. Returning to the field he had created, Becquerel made three more important contributions. One was to measure, in 1899 and 1900, the deflection of beta particles, a constituent of the radiation, in both electric and magnetic fields. From the charge to mass value thus obtained, he showed that the beta particle was the same as Joseph John Thomson's recently identified electron. Another discovery was the circumstance that

the allegedly active substance in uranium, uranium X, lost its radiating ability in time, while the uranium, inactive when freshly prepared, regained its activity. When Ernest Rutherford and Frederick Soddy found similar decay and regeneration in thorium X and thorium, they were led to the transformation theory of radioactivity, which explained the phenomenon as a subatomic chemical change in which one element spontaneously transmutes into another. Becquerel's last major achievement concerned the physiological effect of the radiation. Others may have noticed this before him, but his report in 1901 of the burn caused when he carried an active sample of the Curies' radium in his vest pocket inspired investigation by physicians, leading ultimately to medical use.

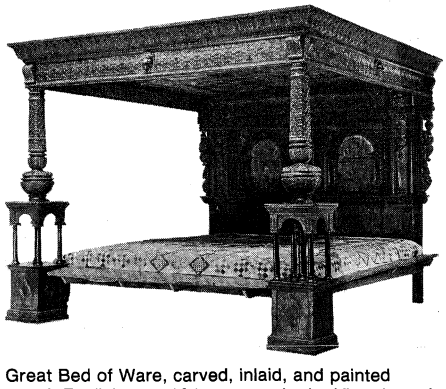
For his discovery of radioactivity, Becquerel shared the 1903 Nobel Prize for Physics with the Curies; he was also honoured with other medals and memberships in foreign societies. His own Académie des Sciences elected him its president and one of its permanent secretaries. (L.Ba.)

BIBLIOGRAPHY. There is no full-length biography of Becquerel in English. Alfred Romer's article on him in the *Dictionary of Scientific Biography* provides further details. Aspects of Becquerel's work are discussed by Lawrence Badash in the following articles: "Chance Favors the Prepared Mind: Henri Becquerel and the Discovery of Radioactivity," *Archs. Int. Hist. Sci.*, 18:55–66 (1965); "Becquerel's 'Unexposed' Photographic Plates," *Isis*, 57:267–269 (1966); and "Radioactivity Before the Curies," *Am. J. Phys.*, 33:128–135 (1965). Becquerel summarized his own work on radioactivity in vol. 46 of *Mémoires de l'Académie des Sciences* (1903).

Bécs (Austria): *see* Vienna.

Bécu, (Marie-)Jeanne: *see* Barry, (Marie-) Jeanne Bécu, comtesse de.

bed, piece of furniture upon which a person may recline or sleep, for many centuries considered the most important piece of furniture in the house and a prized status symbol. In ancient civilizations (and, indeed, in Europe until the later Middle Ages), beds were used not merely for sleeping but also, except in Egypt, for reclining when taking meals. They were either solid constructions built into the wall or lighter objects made of wood or metal, or a combination of both consisting of a couch supported on four legs with a low headboard at one end.



Great Bed of Ware, carved, inlaid, and painted wood, English, late 16th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London, Crown copyright reserved

As shown on early medieval ivories and miniatures, even the beds of princes were remarkably simple. In 12th-century manuscripts, much richer bedsteads appear, with inlay, carving, and painting, and embroidered coverlets and mattresses. To keep out drafts the bed was enclosed with curtains suspended from the ceiling. At first curtains were used only for the bed of the lord and his lady, but later they were also used for the beds of those in their immediate entourage.

Fifteenth-century western European beds had a panelled back with carved columns at the front corners, supporting a canopy, or tester, from which hung curtains that enclosed the four bedposts. A remarkable feature of these beds was their size, as large as 8 by 7 feet (240 by 210 centimetres); it has been supposed that several people slept in them.

During the 16th century, beds became more decorative, with much carved work on the bedhead and bedposts. In France the taste for such beds hardly survived the beginning of the 17th century, when they disappeared again behind precious fabrics; but in England the carved oak or walnut bedstead with panelled and inlaid bedhead and tester continued into the first half of the 17th century. A well-known English Elizabethan bed is the Great Bed of Ware (Victoria and Albert Museum, London), which is 10 feet 11 inches (3.33 metres) square.

During the first half of the 17th century, two types of beds were made, one with a heavy carved frame and the other with a light framework and elaborate hangings; by the middle of the century the latter had become prevalent in England and Europe. The second half of the 17th through the early 18th century was a period of magnificent beds. No fewer than 413, some of great splendour, were described in the inventory of Louis XIV's palaces. In the 17th century the appearance of the bed was determined by its hangings, but in the 18th the frame became visible again, appropriately carved and gilded. The curtains became lighter, being made of taffeta or satin instead of the heavy brocades and velvets of the 17th century.

With the development of coiled springs, which were first fitted into mattresses in the 1820s, bed comfort was transformed. During the second half of the 19th century, metal bedsteads became common, first made of cast iron, subsequently of brass tubing. One of the main features of bed design in the 20th century has been the tendency to abandon the traditional, standard size double, or matrimonial, bed in favour of two smaller single, or twin-size, beds or a larger queen- or king-size. One popular form is the divan, or daybed, which can serve as a seat during the day and a bed at night, and another is the convertible sofa that unfolds to become a bed.

In the Middle East it was the custom to make beds simply by piling up rugs on the floor. In both Persian and Indian miniatures of the Mughal period, lovers are shown reclining on low divan beds, with carved legs at the corners and sometimes a low headboard as well. No difference is apparent in the representations of beds in miniatures dating from periods as far apart as the 15th and 19th centuries.

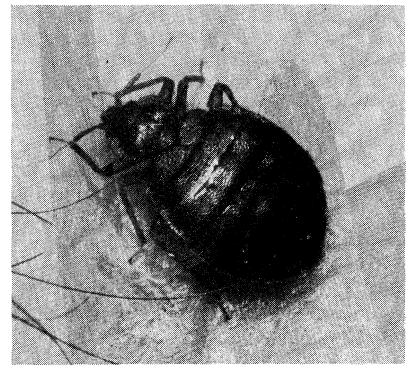
In China raised and canopied beds were used about 2,000 years ago. During the Ming dynasty (1368–1644), or perhaps earlier, it became the custom in some areas to enclose beds with gauze or netting; later the bed was made along the back wall of a small back room with a small antechamber cut off by sliding doors. These beds were covered with matting.

Traditional Japanese bedding, the use of which persisted in the late 20th century, consisted of quilted padding and coverlets called *futon* arranged directly on the floor, which was covered with tatami, or resilient mats of woven fibre. During the day the *futon* were stored in a cupboard, and the room was used for eating and general social gatherings.

Exotic innovations in bed design in the 1960s were the inflatable air mattress and the water bed, a mattress-sized plastic or vinyl bag filled with water and supported in a wooden frame. At first popular primarily as a novelty among the young, the water bed was later more widely accepted and has been used in hospitals, infant nurseries, and convalescent homes.

bed-wetting: *see* enuresis.

bedbug, any member of the approximately 75 species of nocturnal insects of the family Cimicidae (order Heteroptera) that feed by sucking the blood of man and other warm-blooded animals. The reddish-brown adult is broad and flat and 4 to 5 millimetres (less than 1/5 inch) long. The greatly atrophied, scalelike, vestigial wings are inconspicuous and nonfunctioning. The distinctive, oily odour of bedbugs results from a secretion of the scent, or stink, glands. Each female lays an average of 200 or more eggs during a single reproductive period, and there may be three or more generations a year.



Bedbug (*Cimex lectularius*) magnified 5 ×

William E. Ferguson

Bedbugs are among the most cosmopolitan of human parasites. They are found in every kind of dwelling place, hiding during the day and coming out at night to feed; afterward, they retreat to their hiding place to digest the meal, which may require several days. Adult specimens have lived for at least a year without food. Although the bedbug has an irritating bite, it is not known to transmit diseases to humans.

Cimex lectularius, which occurs in temperate regions, and *C. hemipterus,* which is common in the tropics, attach to humans. The species *C. pilosellus* lives on bats; species of *Oeciacus,* on swallows and martins; *Cimexopsis nyctalis,* on chimney swifts; and *Haematosiphon inodora,* on poultry, although it has been known to feed on humans and pigs as well.

Bedde, traditional emirate, Bornu State, northern Nigeria. Although Bade (Bedde, Bede) peoples settled in the vicinity of Tagali village near Gashua as early as the 14th century, they shortly thereafter came under the jurisdiction of a *galadima* ("governor") of the Bornu kingdom based at nearby Nguru (*see* Kanem-Bornu). Not until the late 18th century did they come under the rule of the present Gidgid (from the name of a settlement 30 mi [48 km] south-southwest of Gashua) dynasty of Bedde. Dispersed *c.* 1808 by warriors in the *jihād* ("holy war") conducted by the Fulani, the Bade sought protection and again agreed to pay tribute in slaves to Bornu. About 1825, however, Lawan Babuje, the Bade *mai* ("ruler"), found the tribute too high, organized a pan-Bade federation, built the walled town of Gorgoram (27 mi southwest of Gashua) as his capital, and declared Bedde's independence from both the Fulani and the Kanuri. Mai Alhaji, his son and successor (reigned 1842–93), successfully defended Gorgoram from both Fulani (mostly from Hadejia town, 73 mi west-southwest) and Kanuri attacks. Although Gorgoram was captured during the reign of Mai Duna (1893–97) by the forces of Rābiḥ az-Zubayr, the Sudanese warrior who destroyed the power of Bornu, following the

advent of British rule in 1902, Mai Saleh (also Sale; reigned 1897–1919) was recognized as the emir of independent Bedde.

Bedde traditional emirate is mainly inhabited by the predominantly Muslim Bade, Ngizim, and Kanuri peoples. Its arid savanna climate supports only a sparse population, but its location in the drainage systems of the seasonal Hadejia and Katagum rivers, which join together within the emirate to form the Komadugu Yobe, allows fishing during the rainy season. Peanuts (groundnuts) and cotton are the chief cash crops; but sorghum, millet, cowpeas, tobacco, and gum arabic are also collected for sale in the local markets. Cattle, goats, and sheep are the principal livestock. Gashua, by far Bedde's largest town, is the headquarters of a local government council and a market centre as well as the seat of the Mai Bedde.

Beddoes, Thomas Lovell (b. June 30, 1803, Clifton, Somerset, Eng.—d. Jan. 26, 1849, Basel, Switz.), poet best known for his haunting dramatic poem *Death's Jest-Book; or, The Fool's Tragedy.*

The son of a distinguished scientist, Beddoes seems early to have acquired, from his father's

Beddoes, detail of a portrait by Nathan C. Branwhite, 1824

By courtesy of Pembroke College, Oxford; photograph, J.R. Freeman & Co. Ltd.

dissections and speculations on anatomy and the soul, an obsession with death that was to dominate his life and work. He was educated at Charterhouse, where his passion for the drama became evident and where he nourished his imagination on 18th-century Gothic romances. In 1820 he went to Oxford University, where he wrote his first considerable work, *The Bride's Tragedy* (1822), based on the story of a murder committed by an undergraduate. In 1825 he went to Göttingen, Ger., to study anatomy and medicine. There he continued work on *Death's Jest-Book.* Friends who read the first version advised revision, and Beddoes' acceptance of their advice hindered his poetic development: for the rest of his life he was unable to escape from the work or to complete it, and it was eventually published posthumously in 1850.

In *Death's Jest-Book* itself, which Beddoes described as an example of "the florid Gothic," he aimed to use Gothic material to discuss the problems of mortality and immortality.

After trouble with the university authorities, Beddoes left Göttingen, moved to Würzburg (where he received his M.D.), and there involved himself in radical politics. More trouble caused him to leave Germany for Zürich, where his interest in writing English verse waned. In 1840 he had to flee from Switzerland, probably for political reasons, and he never afterward settled in one place for very long. He visited England for the last time in 1846–47. Two years later he committed suicide. The standard biography of Beddoes is by H.W. Donner (1935).

Bede the VENERABLE, SAINT, Bede also spelled BAEDA, or BEDA (b. 672/673, traditionally Monkton in Jarrow, Northumbria—d. May 25, 735, Jarrow; canonized 1899; feast day May 25), Anglo-Saxon theologian, historian, and chronologist, best known today for his *Historia ecclesiastica gentis Anglorum* ("Ecclesiastical History of the English People"), a source vital to the history of the conversion to Christianity of the Anglo-Saxon tribes. During his lifetime and throughout the Middle Ages Bede's reputation was based mainly on his scriptural commentaries, copies of which found their way to many of the monastic libraries of western Europe. His method of dating events from the time of the incarnation, or Christ's birth—*i.e.*, AD—came into general use through the popularity of the *Historia ecclesiastica* and the two works on chronology. Bede's influence was perpetuated at home through the school founded at York by his pupil Archbishop Egbert of York and was transmitted to the Continent by Alcuin, who studied there before becoming master of Charlemagne's palace school at Aachen.

Nothing is known of Bede's parentage. At the age of seven he was taken to the Monastery of St. Peter, founded at Wearmouth (near Sunderland, Durham) by Abbot St. Benedict Biscop, to whose care he was entrusted. By 685 he was moved to Biscop's newer Monastery of St. Paul at Jarrow. Bede was ordained deacon when 19 years old and priest when 30. Apart from visits to Lindisfarne and York, he seems never to have left Wearmouth–Jarrow. Buried at Jarrow, his remains were removed to Durham and are now entombed in the Galilee Chapel of Durham Cathedral.

Bede's works fall into three groups: grammatical and "scientific," scriptural commentary, and historical and biographical. His earliest works include treatises on spelling, hymns, figures of speech, verse, and epigrams. His first treatise on chronology, *De temporibus* ("On Times"), with a brief chronicle attached, was written in 703. In 725 he completed a greatly amplified version, *De temporum ratione* ("On the Reckoning of Time"), with a much longer chronicle. Both these books were mainly concerned with the reckoning of Easter. His earliest biblical commentary was probably that on the Revelation to John (703?–709); in this and many similar works, his aim was to transmit and explain relevant passages from the Fathers of the Church. Although his interpretations were mainly allegorical, treating much of the biblical text as symbolic of deeper meanings, he used some critical judgment and attempted to rationalize discrepancies. Among his most notable are his verse (705–716) and prose (before 721) lives of St. Cuthbert, bishop of Lindisfarne. These works are uncritical and abound with accounts of miracles; a more exclusively historical work is *Historia abbatum* (*c.* 725; "Lives of the Abbots").

In 731/732 Bede completed his *Historia ecclesiastica.* Divided into five books, it recorded events in Britain from the raids by Julius Caesar (55–54 BC) to the arrival in Kent (AD 597) of St. Augustine. For his sources he claimed the authority of ancient letters, the "traditions of our forefathers," and his own knowledge of contemporary events. Bede's *Historia ecclesiastica* leaves gaps tantalizing to secular historians. Although overloaded with the miraculous, it is the work of a scholar anxious to assess the accuracy of his sources and to record only what he regarded as trustworthy evidence. It remains an indispensable source for some of the facts and much of the feel of early Anglo-Saxon history. T.A. Carroll's *Venerable Bede: His Spiritual Teachings* appeared in 1946, followed by P.H. Blair's *Bede's Ecclesiastical History of the English Nation and Its Importance Today* in 1959. Another useful work is A.H. Thompson, *Bede: His Life, Times, and Writings* (1935).

Bedford (district, England): *see* North Bedfordshire.

Bedford, locality, North Bedfordshire district, county of Bedfordshire, England, in the fertile valley of the River Great Ouse. A Roman fording station and a Saxon town (cemetery of Kempston), it was recaptured by the Anglo-Saxon sovereign Edward the Elder (ruled 899–924) from the Danes in 914. The community became the capital of the nascent shire because of its commanding position. It received its first charter from Henry II (ruled 1154–89), and this was confirmed by successive monarchs to Charles II (ruled 1660–85).

St. Paul's church is mainly Decorated and Perpendicular in style. The Bunyan Meeting House (1850) stands on the site of a barn in which John Bunyan preached from 1656 onward, and the panels of the door (1876) depict scenes from his *Pilgrim's Progress.* The parlour is now the Bunyan Museum. The public library contains the Mott-Harrison collection of Bunyan's works, as well as other old books and pamphlets. Bunyan, who was born at Elstow (1½ mi [2.5 km] south), underwent a long but in part nominal imprisonment in Bedford. Howard House, belonging to the prison reformer John Howard, is near the Howard Congregational Church, which he helped to found in 1772. The Cecil Higgins Art Gallery and the Prichard Collection in the Embankment Museum are nearby, as is the mound on which stood the Norman castle.

Bedford is well served by rail and road. It is the centre for a large agricultural area and one of commerce and local government, serving as the county town (seat). Industries include the making of pumps, diesel engines, gas and steam turbines, agricultural implements, milling machinery, switches, tube fittings, castings, electric lamps, transistors, and confectionery. There are also wind tunnels operated by aircraft firms and complementary to the Royal Aircraft Establishment at Thurleigh. Pop. (1981 prelim.) 74,245.

Bedford, city, seat of Lawrence County, southern Indiana, U.S., 23 mi (37 km) south of Bloomington. Founded in 1825 as the county seat, and named by Joseph Rawlins for his home county of Bedford, Tenn., it developed with the discovery of oölitic limestone in the 1830s. Bedford limestone is a highly prized building material, used to great effect in such famous buildings as the Empire State in New York City and the Pentagon in Arlington, Va. Immense quarries and mills are characteristic of the area. The economy is augmented by foundries, manufacturing (textiles, electronic and transportation equipment), and agriculture (cattle, grain, fruit). Bedford is the headquarters for both the nearby Hoosier National Forest and Wayne National Forest (in Ohio). Inc. 1889. Pop. (1980) 14,410.

Bedford, urban town (township), Middlesex County, northeastern Massachusetts, U.S., near the Concord River, just northwest of Boston. Settled in 1642, it developed around an Indian trading post called the Shawsheen House. It was incorporated in 1729 and named for Bedford, Eng. The Bedford flag, designed in England in the 1660s and the only flag carried by the minutemen (people who took up arms at a "minute's notice" during the Revolutionary period) on April 19, 1775, against the British at Concord Bridge, is displayed in the town library; the house of the flag carrier, Cornet Nathaniel Page, is now a historic site. Other landmarks include Ye Olde Burying Ground with graves of Revolutionary War soldiers, the first Parish Church (1816), and Fitch Tavern (1731). Lawrence G. Hanscom Field (a federal electronics-research centre) and the U.S. Veterans' Hospital are economic assets. Nearby are the Two Brothers Boulders, the site where the Massachusetts colonial administrators Thomas Dudley and John Winthrop settled their claims for land grants. Middlesex Community College was established (1969) in Bedford. Pop. (1980) 13,067.

Bedford, town, Westchester County, southeastern New York, U.S., north of White Plains, near the Connecticut state line. Bedford Village, the original settlement, was founded in 1680 by 22 farmers from Stamford, Conn., on a tract known as the hopp ground, purchased from Katonah and other Indian chiefs. Originally in Connecticut, the village was made part of New York in 1700 by royal boundary decree. During the American Revolution, it was burned (1779) by British troops led by Lieut. Col. Banastre Tarleton. The Town (township) of Bedford, officially established in 1682, covers an area of 43.6 sq mi (113 sq km) and includes the hamlets of Bedford Village, Bedford Hills, and Katonah, and shares the Village of Mount Kisco (incorporated 1874) with New Castle. The building of New York City reservoirs forced the removal of Katonah to its present site (1897), changed the town's landscape, and stimulated a residential trend. Pop. (1970) 18,329; (1980) 15,137.

Bedford, borough, seat (1771) of Bedford County, southern Pennsylvania, U.S., on the Pennsylvania Turnpike and the Raystown branch of the Juniata River, in the Allegheny Mountains, 38 mi (61 km) south of Altoona. A settlement, made on the site about 1750 by Robert Ray, an Indian trader, was known as Raystown. Ft. Bedford (built 1758 and apparently named for the Duke of Bedford) was a

The Bedford Springs Hotel, used by President Buchanan as a summer White House, Bedford, Pa.
Milt and Joan Mann from CameraMann

frontier rallying point and supply base for the British colonial campaign against the French Fort-Duquesne. The town of Bedford was platted in 1766. In 1794 George Washington paused there to review troops sent to quell the Whiskey Rebellion; Espy House, which he then occupied, has been preserved. Bedford formed the background for several of Hervey Allen's historical novels, notably *Bedford Village* (1944) and *The Forest and the Fort* (1943).

The nearby resort area of Bedford Springs with its medicinal waters was used by Pres. James Buchanan as a summer White House. The Blue Knob ski area, Coral Caverns, and the Shawnee State Park are nearby. Fort Bedford Park and Museum includes a replica of the original fort, and Old Bedford Village has reconstructed buildings of the 1750–1850 period. Bedford's manufactures include clothing, mining equipment, toys, and wood products. Inc. 1795. Pop. (1980) 3,326.

Bedford, EARLS AND DUKES OF, titled English nobility of several creations, in the families Plantagenet, Tudor, and Russell, grouped below chronologically and indicated by the symbol ●.

● **Bedford, John Plantagenet, duke of** (b. June 20, 1389—d. Sept. 14, 1435, Rouen, Fr.), general and statesman who commanded England's army during a critical period in the Hundred Years' War (1337–1453) with France. Despite his military and administrative talent, England's position in France had irreversibly deteriorated by the time he died.

The third son of King Henry IV of England (ruled 1399–1413), he was made duke

John Plantagenet, duke of Bedford, praying to St. George, miniature from the *Bedford Book of Hours*, *c.* 1430; in the British Library (MS. 18850)
By courtesy of the trustees of the British Library

of Bedford by his brother King Henry V in 1414. Between 1415 and 1422 he served as lieutenant of the kingdom three times while Henry was campaigning in France. Bedford helped relieve the besieged city of Harfleur in 1416, and he and the King were both in France at the time of Henry's death in 1422. He then became regent for Henry's son, the infant King Henry VI, and it was agreed that during his absence from England his brother Humphrey, duke of Gloucester, was to take over his duties.

Bedford again turned his attention to the war. By allying with Philip the Good, duke of Burgundy, in 1423, he gained control over northwestern France, and he then opened an offensive against the French king, Charles VII. On Aug. 17, 1424, Bedford won an important victory at Verneuil. Nevertheless, throughout this period he had to struggle to maintain the crucial Anglo-Burgundian alliance, which was threatened by hostility between Gloucester and Duke Philip. Furthermore, Bedford was recalled to England in 1426 to arrange a reconciliation between the warring factions led by Gloucester on the one side and the chancellor, Henry Beaufort, on the other.

Returning to France in 1427, Bedford had continual success until he was forced, under pressure from a French army led by Joan of Arc, to raise his siege of Orléans in April 1429. This setback was the turning point of the war. Thereafter, all Bedford's energy and judgment could not keep England's hold on France from weakening. In addition, in 1433 he discovered that his country was rapidly becoming too insolvent to prosecute the conflict. Bedford's death came as Burgundy was in the process of abandoning the English cause and making a separate peace with France.

● **Bedford, Jasper Tudor, duke of,** EARL OF PEMBROKE, byname JASPER OF HATFIELD (b. *c.* 1430—d. Dec. 21/26, 1495), leader of the Lancastrians in Wales, uncle and guardian of Henry, earl of Richmond, afterward Henry VII of England.

The second son of Owen Tudor, founder of the family's fortunes, he was knighted in 1449 and created earl of Pembroke about 1452. Between 1456 and 1459 he worked hard to increase his influence in West Wales. He was with Henry VI when the Yorkists were forced to flee at Ludford (Shropshire) in 1459, and in 1460 he besieged and captured the Duke of York's North Welsh stronghold of Denbigh Castle. He shared in the Lancastrian defeat at Mortimer's Cross (February 1461), where his father was taken and beheaded, but he made his escape to Ireland and later to Scotland.

In 1468 he landed in North Wales in an attempt to relieve Harlech Castle, which held out for King Henry VI; he was able to capture Denbigh Castle but was then defeated by William, lord Herbert, who was rewarded with his forfeited earldom of Pembroke. Landing with the Earl of Warwick in 1470, he was sent to Wales and arrived too late for the defeat of the Lancastrians at Tewkesbury (1471).

With his young nephew, Henry of Richmond, he escaped to Brittany, where Henry grew up under his guidance. He attempted a further invasion of England during the rebellion of 1483 but was prevented from landing. In August 1485 he landed with Henry in South Wales and fought at Bosworth Field. His unflinching loyalty was rewarded by Henry VII with the dukedom of Bedford (1485) and a grant of the lordship of Glamorgan (1486), and he was afterward lord lieutenant of Ireland (1486–94). Jasper played a leading part in the suppression of the rebellions of 1486 and 1487 and lived into an honoured old age. He had issue by his wife, Catherine Woodville, sister of Edward IV's queen, but the dukedom became extinct upon his death.

● **Bedford, John Russell, 1st earl of** (b. *c.* 1485—d. March 14, 1555, London), founder of the wealth and greatness of the house of Russell, who was a favourite of England's Henry VIII and was created earl of Bedford during the reign of Edward VI.

He was with Henry VIII at the Field of Cloth of Gold in 1520 and, returning to military service when the French war was renewed, lost his right eye at the siege of Morlaix in 1522. In 1523 he went secretly to France, where he negotiated a treaty between Henry and Charles, duke of Bourbon, who wished to betray the French king, Francis I. He visited Pope Clement VII in Rome in 1524 and, having eluded the French, who endeavoured to capture him, was present at the Battle of Pavia in February 1525, returning to England about the close of the year. From 1527 on,

John Russell, 1st earl of Bedford, chalk drawing by Hans Holbein the Younger; in Windsor Castle, England
Reproduced by gracious permission of Her Majesty Queen Elizabeth II

Russell's life was mainly spent in England. He entered the Reformation Parliament for Buckingham in 1529 and, although an opponent of the party of Anne Boleyn, retained the favour of Henry VIII. He received many high honours and offices and became Baron Russell in 1539. When Charles V and Francis I were threatening to invade England in 1539, he was sent into the west and crossed to France when Henry attacked Francis in 1544. He was in command of an army in the west of England in 1545 and, when Henry died in January 1547, was one of the executors of his will.

Under Edward VI, Russell was lord high steward and keeper of the privy seal. He was created earl of Bedford in January 1550 and was one of the commissioners appointed to make peace with France in that year. He opposed the proposal to seat Lady Jane Grey on the throne; supported Mary I, who reappointed him lord privy seal (November 1553); and helped to prevent Sir Thomas Wyat's rising from spreading to Devonshire. He went to Spain to conclude the marriage treaty between Mary I and Philip II in 1554. He died in London, soon after his return.

• **Bedford, Francis Russell, 2nd earl of** (b. *c.* 1527—d. July 18, 1585, London), Protestant supporter of Queen Elizabeth I of England.

Only son of the 1st earl, he took his seat in the House of Lords as Lord Russell in 1552. Russell was in sympathy with the Protestant reformers, whose opinions he shared, and was imprisoned during the earlier part of Mary's reign. He inherited the earldom in 1555 and left for the Continent, where he met foreign reformers and fought at the Battle of Saint Quentin (1557). When Elizabeth I ascended the throne (November 1558) Bedford became an active figure in public life. He was made a privy councillor, had some influence in the religious settlement, and was sent on diplomatic errands to Charles IX of France and Mary Stuart. He was governor of Berwick and warden of the east marches of Scotland (February 1564–October 1567), in which capacity he conducted various negotiations between Elizabeth and Mary. When the northern insurrection broke out in 1569, Bedford was sent into Wales, and he sat in judgment upon the Duke of Norfolk in 1572. He was president of the council of Wales in 1576 and, in 1581, was deputed to arrange a marriage between Elizabeth and the Duke of Anjou. Bedford was succeeded by his grandson Edward Russell, the 3rd earl.

Articles are alphabetized word by word, not letter by letter

• **Bedford, Francis Russell, 4th earl of** (b. 1593—d. May 9, 1641, London), only son of William, Lord Russell of Thornhaugh, who became earl of Bedford by the death of his cousin Edward, the 3rd earl, in May 1627.

When the quarrel broke out between Charles I and Parliament in 1628, Bedford supported the demands of the House of Commons as embodied in the Petition of Right, and in 1629 he was arrested for his share in an opposition pamphlet but was quickly released. The Short Parliament meeting in April 1640 found the Earl as one of the King's leading opponents. In July 1640 he was among the peers who wrote to the Scottish leaders refusing to invite a Scottish army into England but promising to stand by the Scots in all legal and honourable ways; and his signature was afterward forged by Thomas, Viscount Savile, in order to encourage the Scots to invade England. In the following September he was among those peers who urged Charles to call a parliament, to make peace with the Scots, and to dismiss his obnoxious ministers; and he was one of the English commissioners appointed to conclude the treaty of Ripon. When the Long Parliament met in November 1640, Bedford was generally regarded as the leader of the Parliamentarians. In 1641 he became a privy councillor and was appointed treasurer but died in the middle of the Parliamentary struggle.

• **Bedford, William Russell, 1st duke and 5th earl of** (b. 1613—d. Sept. 7, 1700), eldest son of the 4th earl, who fought first on the side of Parliament and then on that of Charles I during the Civil War.

In general, he played a minor part in politics. His son Lord William Russell (1639–83) was involved in the opposition to Charles II, led by Lord Shaftesbury, and was executed for treason in 1683. It was partly because of his son's fame as patriot martyr that the 5th earl was granted a dukedom in 1694. He was succeeded by his grandson Wriothesley Russell (1680–1711), 2nd duke, who was succeeded by his son Wriothesley Russell, (1708–32), 3rd duke.

• **Bedford, John Russell, 4th duke of** (b. Sept. 30, 1710—d. Jan. 15, 1771, Woburn, Bedfordshire, Eng.), leader of the "Bedford Whigs," a major parliamentary force in the third quarter of the 18th century in England.

Brother of the 3rd Duke (Wriothesley Russell), he joined the opposition to Sir Robert Walpole and in November 1744 became first lord of the Admiralty in the administration of Henry Pelham. He was subsequently lord privy seal in Lord Bute's Cabinet of 1761. He wanted peace at any cost, was sent to France to negotiate in 1762, and signed the Peace of Paris in 1763. He was lord president of the council in George Grenville's Cabinet in the same year.

Bedford was the leader of a political group which bore his name. The Bedford Whigs were a group built up on family connections and electoral influence. Lord Sandwich, Lord Gower, Lord Weymouth, and Richard Rigby were notable Bedfordites. Because of his failing eyesight, Bedford himself did not hold office after 1765, when the Grenville administration fell, but his party continued to hold office in successive ministries, and it remained a cohesive political group for more than a decade after Bedford's death.

• **Bedford, Francis Russell, 5th duke of** (b. July 23, 1765—d. March 2, 1802, Woburn, Bedford, Eng.), eldest son of Francis Russell (d. 1767), marquess of Tavistock, the eldest son of the 4th duke; he succeeded his grandfather as duke of Bedford in 1771.

Regarding Charles James Fox as his political leader, he joined the Whigs in the House of Lords and became a member of the circle of the Prince of Wales, afterward George IV. Bedford was greatly interested in agriculture. He established a model farm at Woburn and made experiments in sheep breeding that were recorded by Arthur Young in the *Annals of Agriculture* (1795). He was a member of the original board of agriculture and was the first president of the Smithfield Club.

• **Bedford, John Robert Russell, 13th duke of** (b. May 24, 1917), elder son of the 12th duke (Hastings William Sackville Russell), succeeding to the title in 1953.

Faced with paying heavy death duties on his father's estate, including Woburn Abbey, the 13th duke developed to the full the commercial possibilities inherent in opening a "stately home" to the public—adding to the show of magnificent collections of furniture and art treasures a number of popular attractions on the grounds, including the Wild Animal Kingdom, administered by a famous circus family, the Chipperfields. He showed himself to be a resourceful publicist, and both he and Woburn Abbey became well known to the British public and to foreign tourists. He wrote *A Silver-Plated Spoon* (1959), *Book of Snobs* (with G. Mikes; 1965), *The Flying Duchess* (1968), and *How To Run a Stately Home* (with G. Mikes; 1971).

Bedfordshire, county of the southern Midlands of England. Its area is 477 sq mi (1,235 sq km); the county town (seat) is Bedford (*q.v.*). The county is divided into four districts: the borough of Luton and the districts of North Bedfordshire, Mid Bedfordshire, and South Bedfordshire. The latter three are largely rural, centred, respectively, on the market towns of Bedford, Ampthill, and Dunstable.

Much of the county is occupied by the broad valley of the River Great Ouse and its tributaries, but at its southern extremity the chalk ridge known as the Chiltern Hills cuts across the county on a southwest–northeast alignment. Below the chalk scarp lies a clay vale, whose materials are extensively worked for large-scale brickmaking. Apart from the easily flooded valley bottoms and a belt of light sands, the county is largely cultivated, and milk and vegetables for the London market, 40–50 mi (70–80 km) to the south, are the principal products.

Settlement in Bedfordshire is very ancient. In the early Bronze Age (*c.* 1800 BC) the Beaker people, immigrants from the eastern Mediterranean with a highly developed culture, settled in the Ouse Valley. Roman settlement (1st–5th centuries AD) was concentrated in the south of the county, with Dunstable (Roman Durocobrivae) as an important route centre. After the Roman withdrawal the area was settled by invading Anglo-Saxons and Danes; Bedford itself was founded by Danes. The shire was first mentioned as a political unit in 1010 and has survived virtually unchanged within its present boundaries.

The urbanized southern fringe of the county contains the town of Luton and Dunstable, once noted for the manufacture of straw hats but now producers of a wide variety of industrial goods. These include motor vehicles, some of which are marketed under the trade name of Bedford. Luton represents the outermost fringe of the London industrial region. Situated 30 mi (48 km) from central London, it is on a major rail route and beside the motorway to the north, and it possesses one of London's overflow airports. The county has long-standing connections with aerospace industries, and the College of Aeronautics is at Cranfield.

The outstanding architectural masterpiece of the county is Woburn Abbey, seat of the dukes of Bedford. The present structure dates from 1747 and is surrounded by a magnificent park of 3,000 ac (1,200 ha). A second house of special distinction is Luton Hoo, near Luton, designed by Robert Adam in 1762; both it and Woburn are open to the public. Pop. (1982 est.) 511,900.

Bédier, (Charles-Marie-) Joseph (b. Jan. 28, 1864, Paris—d. Aug. 29, 1938, Le Grand-Serre, Fr.), scholar whose work on the Tristan and Isolde and the Roland epics made invaluable contributions to the study of medieval French literature.

He was appointed to the Collège de France in 1903. His reputation as a writer was established with the publication of *Le Roman de Tristan et Iseult* in 1900, and his scholarship was fully expressed in his epoch-making critical edition of *Le Roman de Tristan* by the

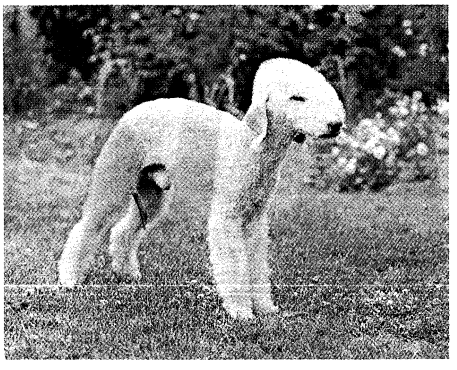
Bédier, drawing by Aaron Bilis, 1931
J.P. Ziolo

Anglo-Norman poet Thomas (1902–05). He proved that the earliest Tristan poem was the product of an individual genius, not of popular tradition. *Les Légendes épiques,* 4 vol. (1908–21), presents his theory on the origins of the old French epic poems, the chansons de geste. He marshals convincing evidence in support of his belief that they were originally composed by the troubadours on themes provided by the monks traveling on the pilgrimage routes. In 1922 he published a critical edition of *La Chanson de Roland.* He was elected to the Académie Française in 1921.

Bedlam, byname of BETHLEHEM ROYAL HOSPITAL, the first asylum for the insane in England, and, with the exception of one in Granada, Spain, the first in Europe. The word Bedlam came to be used generically for all insane asylums and is used colloquially for an uproar.

The asylum was founded by Simon Fitz-Mary, sheriff of London, in 1247, as a priory in Bishopsgate Street for the order of the Star of Bethlehem. Bedlam was mentioned as a hospital in 1330, and some permanent patients were accommodated there by 1403. In 1547 it was given by Henry VIII with all its revenues to the City of London as a hospital for the insane. It subsequently became infamous for the brutal ill-treatment meted out to the insane. In 1675 the hospital was moved to Moorfields; in 1815 to St. George's Fields in southeast London; and in 1930 to Shirley on the borders of Beckenham and Croydon. Now a part of the national health service, it is known as the Bethlehem Royal Hospital and the Maudsley Hospital.

Bedlington terrier, breed of dog developed in the 1800s in Northumberland, England, and named for Bedlingtonshire, a mining district in the area. The breed, which established itself locally as a fighting dog and a courageous hunter of badgers and other vermin, was later



Bedlington terrier
Sally Anne Thompson—EB Inc.

popular as a pet. Lamblike in appearance, the Bedlington terrier has an arched back, a topknot, and a thick, curly coat, linty in texture and blue-gray, deep reddish brown, or pale sandy, often with tan markings. It stands 15 to 16 inches (38 to 40.5 cm) and weighs 22 to 24 pounds (10 to 11 kg).

Bedlingtonshire, also called BEDLINGTON, locality, Wansbeck district, county of Northumberland, England, adjacent to the North Sea port of Blyth. Its population grew rapidly with the expansion of coal mining north of the Blyth River in the 19th century. Since World War II mining has declined, but the local economy has been sustained by light industries established to offset the pit closures. Bedlington gives its name to a breed of terrier dogs. Pop. (1981 prelim.) 26,707.

Bedloe's Island (New York, U.S.): *see* Liberty Island.

Bednorz, J(ohannes) Georg (b. May 16, 1950, West Germany), German physicist who, along with Karl Alex Müller (*q.v.*), was awarded the 1987 Nobel Prize for Physics for their joint discovery of superconductivity in certain substances at temperatures higher than had previously been thought attainable.

Bednorz graduated from the University of Münster in 1976 and earned his Ph.D. at the Swiss Federal Institute of Technology at Zürich in 1982. That same year he joined the IBM Zürich Research Laboratory, where he was recruited by Müller into the latter's studies of superconductivity.

In 1983 the two men began systematically testing newly developed ceramic materials known as oxides in the hope that such substances could act as superconductors. In their efforts Bednorz was the experimenter in charge of the actual making and testing of the oxides. In 1986 the two men succeeded in achieving superconductivity in a barium-lanthanum-copper oxide at a temperature of 35 degrees Kelvin (−238° C [−396° F]), 12 K higher than the highest temperature at which superconductivity had previously been achieved in any substance.

Bedny, Demyan, byname of YEFIM ALEKSEYEVICH PRIDVOROV (b. April 13 [April 1, Old Style], 1883, Gubovka, Ukraine, Russian Empire—d. May 25, 1945, Barvikha, near Moscow), Soviet poet known both for his verses glorifying the Revolution and for his satirical fables.

The natural son of a grand duke, Pridvorov began contributing to the Socialist press before the Revolution, adopting the name Demyan Bedny ("Damian the Poor"). In 1912 his satires started to appear. His style was influenced by the 19th-century Russian fabulist Ivan Krylov; his verses often took the form of popular songs and "factory couplets" (a kind of workers' slogan or cheer). Between 1917 and 1930 Bedny was highly popular with the general public, and Lenin himself, while noting their crudeness, lauded their propaganda value. Many of his works, however, were topical, and time diminished their appeal.

In 1936 Bedny composed a new libretto for the comic opera *Bogatyri* ("Heroes"), by Borodin; and his verse text, in the spirit of the original music, satirized Russian history and its epic heroes. Although Bedny had been a longtime favourite of Stalin, the dictator now personally berated him for his cynicism and lack of respect. In 1938 he was expelled from the Communist Party. Even the patriotic verses he wrote during World War II, which were extremely popular among the soldiers, did not regain for him his former status. Only in the 1960s, well after his death, was official approval of Bedny's works revived, and he is now regarded as an outstanding Communist poet, although his popularity with the public remains limited.

Bedouin, also spelled BEDUIN, Arabic BADAWI, plural BADW, Arabic-speaking nomadic peoples of the Middle Eastern deserts, especially of Arabia, Iraq, Syria, and Jordan.

The Bedouin constitute only a small part of the total population of the Middle East but inhabit or utilize a large part of the land area. Most of them are animal herders who migrate into the desert during the rainy winter season and move back toward the cultivated land in the dry summer months. Although the Bedouin, as a matter of caste, traditionally despise agricultural work and other manual labour, many of them have become sedentary as a result of political and economic developments, especially since World War II. In the 1950s, Saudi Arabia and Syria nationalized Bedouin range lands, and Jordan severely limited goat grazing. Conflicts over land use between Bedouin herders on the one hand and settled agriculturists on the other have increased since then.

Bedouin with a young goat in central Qatar
M. Ericson—Ostman Agency

The traditional Bedouin can be classified according to the animal species that are the basis of their livelihood. First in prestige are the camel nomads, who occupy huge territories and are organized into large tribes in the Sahara, Syrian, and Arabian deserts. Beneath them in rank are the sheep and goat nomads, who stay mainly near the cultivated regions of Jordan, Syria, and Iraq. Cattle nomads are found chiefly in South Arabia and in The Sudan, where they are called Baqqārah (Baggara).

Following World War I the Bedouin tribes had to submit to the control of the governments of the countries in which their wandering areas lay. This also meant that the Bedouins' internal feuding and the raiding of outlying villages had to be given up, to be replaced by more peaceful commercial relations. Service in armed forces and even labour in construction became more common, especially after World War II. The tribal character of Bedouin society continued, however, as did the patriarchal order in their extended, patrilineal, endogamous and polygynous families. Among the Arabic-speaking tribes, the head of the family, as well as of each successively larger social unit making up the tribal structure, is called sheikh; the sheikh is assisted by an informal tribal council of male elders.

In addition to the "noble" tribes who trace their ancestry to either Qaysi (northern Arabian) or Yamani (southern Arabian) origin, traditional Bedouin society comprises scattered, "ancestorless," vassal tribal splinter groups who shelter under the protection of the large noble tribes and make a living by serving them as blacksmiths, tinkers, artisans, entertainers, and other workers.

Bedraja (Siamese king): *see* Phetracha.

Bedreddin, byname of BADR AD-DĪN IBN QĀḌĪ SAMĀWNĀ (b. Dec. 3, 1358, Samāwnā, Ottoman Empire—d. December 1416/20, Sérrai), Ottoman theologian, jurist, and mystic whose social doctrines of communal ownership of property led to a large-scale popular uprising.

A convert to Ṣūfism (Islāmic mysticism), in 1383 Bedreddin undertook the pilgrimage to Mecca, and, upon his return to Cairo, he was appointed tutor to the Mamlūk crown prince of Egypt. He then traveled as a Ṣūfī missionary throughout Asia Minor. His communalistic doctrines made him a popular preacher, and in 1410 he was appointed a military judge by Mûsa, a claimant to the Ottoman throne. On the defeat of Mûsa in 1413, Bedreddin was banished to the Ottoman city of İznik.

During his exile Bedreddin further refined his doctrines and maintained contact with a secret society that in 1416 staged a social uprising, of which he became the ideological head. Upon the collapse of the rebellion, he

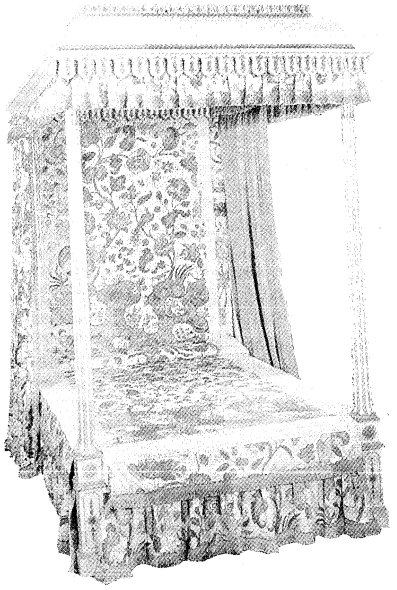
was arrested, and, after a trial of dubious legality, he was convicted and hanged.

Bedřich (Czech personal name): *see under* Frederick.

Bedsonia, any infectious agent formerly assigned to the *Miyagawanella, Chlamydia,* or the psittacosis-lymphogranuloma venereum group. Such intracellular parasitic agents are now consigned to *Chlamydia,* a genus of rickettsias (*see* rickettsia).

bedsore, also called DECUBITUS ULCER, or PRESSURE SORE, an area of disintegrating skin and underlying tissue (ulcer) caused by decreased blood supply to that area and affecting persons who have been bedridden for a long period of time. The interference with normal blood flow is caused by the prolonged pressure of the body upon the bed and the friction against the bedclothes. Bedsores are more likely to affect the skin over the bony prominences of the body, such as the elbows, hips, and the back at the level of the hip bones. Prevention and treatment of bedsores include frequent changes of position of the bedridden person, daily bathing, and topical (local) medication.

bedspread, top cover of a bed, put on for tidiness or display rather than warmth. Use of a bedspread is an extremely ancient custom, referred to in the earliest written sources, for example, the Bible: "I have decked my bed with coverings of tapestry" (Proverbs 7:16). The first bedcovers were probably of fur. Later versions included every sort of refinement that weaving or embroidery could produce. The



Reproduction of early 18th-century chintz bedspread and hangings from India; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

Roman historian Livy wrote in the 1st century BC that luxury, including "valuable bed covers," was first brought to Rome by the armies of Asia. An English account of 1472 speaks of a "counterpane cloth of gold furred with ermine," and there are many similar descriptions in medieval inventories.

The kind of bedspread called counterpane, from the old French word *contrepoinct,* meaning "stitched quilt," was probably made of patched or applied pieces, quilted together. The quilts, or quilted bedspreads, in both appliqué and patchwork, that were made in the United States during the 18th and 19th centuries have come to be considered an important type of American folk art. The colourful stylized or geometric patterns that were used were identified by imaginative, evocative names like Duck's Foot in the Mud, Robbing Peter to Pay Paul, Missouri Puzzle, Broken Dishes, or Delectable Mountains. Each pattern has a story about its origin in symbolism. *See also* quilting.

bedstraw, also called CLEAVERS, any plant from the genus *Galium* of the madder family (Rubiaceae), containing about 300 species of low perennial herbs found in damp woods and swamps and along stream banks and shores throughout the world. The finely toothed, often

Bedstraw (*Galium*)

F.K. Anderson—EB Inc.

needle-shaped leaves are borne in whorls of four to eight. The small flowers, borne in clusters, are green, yellow, or white. The fruit is composed of two rounded nuts that are joined together.

Northern bedstraw (*G. boreale*), marsh bedstraw (*G. palustre*), and goosegrass (*G. aparine*) are common throughout Europe and have become naturalized in parts of North America. Sweet woodruff (*G. odoratum*, formerly *Asperula odorata*), or waldmeister, has an odour similar to that of freshly mown hay; its dried shoots are used in perfumes and sachets and for flavouring beverages. Lady's bedstraw, or yellow bedstraw (*G. verum*), is used in Europe to curdle milk and to colour cheese. The roots of several species of *Galium* yield a red dye.

Beduin (people): *see* Bedouin.

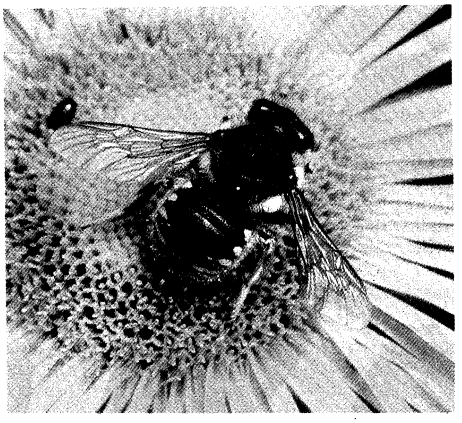
Bedworth, locality, Nuneaton district, county of Warwickshire, England. Coal is mined from two local pits, and there is a growing light engineering industry in a modern trading estate. Tapes, ribbons, and trimmings also are made. Bedworth and neighbouring Nuneaton have grown into a single built-up area. Corley Hall, to the west of Bedworth, is reputed to be the Hall Farm in George Eliot's *Adam Bede.* Pop. (1981 prelim.) 41,991.

Będzin, city, Katowice *województwo* (province), southwestern Poland, just northeast of Katowice city, near the Czarna Przemsza River. Located on the trade route between Wrocław and Kraków, and one of the oldest towns in the Górny Śląsk (Upper Silesia) coal-mining region, it developed as a centre of mining and heavy industry. A castle and surrounding settlement were there as early as the 13th century. In the 17th century the town was noted for its excellent cloth and crafts, and in the 19th zinc extraction and refining and coal mining gave it a stable economic base. During World War II, the Germans constructed a concentration camp there in which more than 10,000 townspeople were exterminated. The 13th-century castle, which was rebuilt (1952–56) in the Gothic style, houses the Dąbrowskie Basin Museum. Industry includes foundries and power generation at the Łagisza plant. Pop. (1982 est.) 76,900.

bee, any member of the superfamily Apoidea (order Hymenoptera), a large and widely distributed group of insects, many of which are important as pollinators of plants. The honeybee (*Apis*), a domesticated insect, has long been important to man for the honey and the beeswax it produces. About 12,000 species of bees have been described, ranging in size from about 1 to 3 centimetres (less than 1/2 to more than 1 inch).

Bees have four stages of development: egg, larva, pupa, and adult. Most are solitary, or nonsocial, in habit—*i.e.,* they do not live in colonies—except bees of the subfamily Apinae, family Apidae. Solitary bees usually dig a burrow in the ground. The female makes cells for depositing eggs and stocks them with honey and pollen as food for the larva before sealing them. After she lays her eggs the female either flies off to make other nests or dies. For the life cycle of social bees, *see* bumblebee; honeybee. The Apoidea includes six families: Colletidae, plasterer bees and yellow-faced bees; Andrenidae and Halictidae, mining bees; Melittidae, melittid bees; Megachilidae, leaf-cutting bees; and Apidae, carpenter bees, cuckoo bees, bumblebees, honeybees, and digger, or mining, bees.

The Colletidae, a group of rather primitive, wasplike bees, consists of two subfamilies: Colletinae (plasterer bees) and Hyalaeinae, or Prosopinae (yellow-faced bees). Plasterer bees are hairy. The abdomen of *Colletes,* the most common North American genus, has white bands. Most species make burrows in the ground, sometimes as deep as 70 cm (about 27 in.). Yellow-faced bees—small, black insects with pale markings—are represented in North America only by the genus *Prosopis*



Leaf-cutting bee (*Anthidium*)

M.W.F. Tweedie from the Natural History Photographic Agency—EB Inc.

(*Hylaeus*), which builds nests in plant stems or by burrowing in the ground.

The Andrenidae are usually small or medium-sized solitary bees, often with metallic colours. They make burrows in level ground or banks. A genus common in Europe, Great Britain, and North America is *Halictus,* certain species of which are called sweat bees because they are attracted to perspiration.

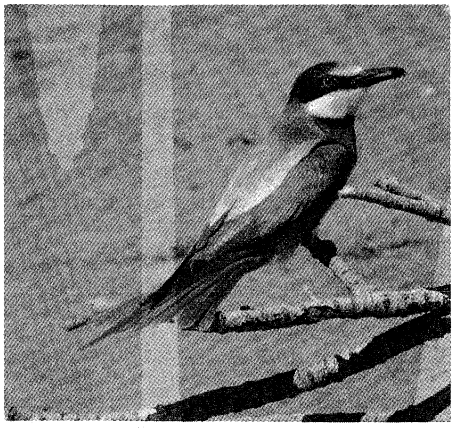
The Melittidae is a small group of rather rare solitary bees similar in habit to the Andrenidae. They are small, dark-coloured, and divided into three subfamilies.

The Megachilidae (leaf-cutting bees), which are rather stout, moderate-sized insects, includes a large number of widely distributed species. Some species cut pieces from leaves to line their cells. Certain members of the genus *Anthidium* line their cells with abandoned snail shells. Some species are parasitic.

The Apidae consists of three subfamilies: Anthophorinae (digger, or mining, bees and cuckoo bees), Xylocopinae (carpenter bees), and Apinae (social bees). The Anthophorinae

includes the large, widely distributed genus *Anthophorus*—usually stout, hairy bees that nest in the ground, often in large colonies. Carpenter bees build nests in plant stems or wood. The small carpenter bees (*Ceratina*), which nest in plant stems, are about 0.6 cm (1/5 in.) long and dark greenish blue in colour. The large carpenter bees (*Xylocopa*), which excavate burrows in solid wood, resemble bumblebees and are about 2.5 cm (1 in.) long. Apinae, the social bees, include the bumblebees, the honeybees, and the Euglossini, a small, tropical group.

bee-eater, any of about 25 species of brightly coloured birds of the family Meropidea (order Coraciiformes). Found throughout tropical

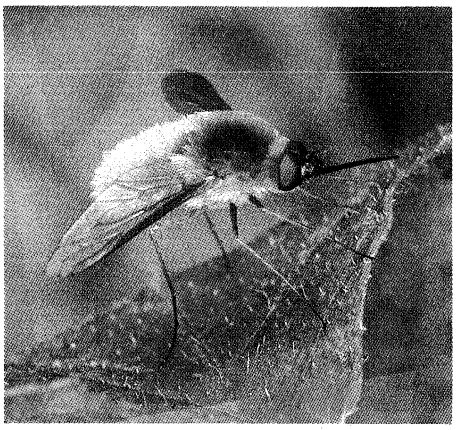


Bee-eater (*Merops apiaster*)
S.C. Porter—Bruce Coleman Ltd.

and subtropical Eurasia, Africa, and Australasia (one species, *Merops apiaster,* occasionally reaches the British Isles), bee-eaters range in length from 15 to 35 centimetres (6 to 14 inches).

The bee-eater's bill is moderately long, slightly downcurved, and sharply pointed. Brilliant plumage is characteristic; green predominates, but many species are partially coloured with red, yellow, blue, or purple. Many have elongated central tail feathers. Bee-eaters feed on bees, wasps, and other insects.

bee fly, any insect of the family Bombyliidae (order Diptera). Many resemble bees, and most have long proboscises (feeding organs) that are used to obtain nectar from flowers. Their metallic brown, black, or yellow colour is attributable to a covering of dense hair; in many species the body and sometimes the wings bear patches of delicate and easily abraded scales. Some bee flies are quite small, and their immature stages are unknown. Many species, including the largest and most showy



Bee fly (*Sparmopolius fulvus*)
J. Miller—De Wys Inc.

ones, are tropical; but some species with a length of more than 1 centimetre (0.4 inch) live in temperate regions. They are usually found on flowers around sunny, grassy places.

The larvae of *Bombylius major,* the large bee fly of the Northern Hemisphere and one of the earliest to appear in spring, are parasitic on solitary bees. Larvae of several species of *Villa* destroy grasshopper eggs; others are parasitic on caterpillars. *Anthrax anale* is a parasite of tiger beetle larvae, and the European *A. trifasciata* is a parasite of the wall bee. Several African species of *Villa* and *Thyridanthrax* are parasitic on the covering of the pupa of tsetse flies. *Villa* (*Hemipenthes*) *morio* is parasitic on the beneficial ichneumonid, *Banchus femoralis.* Some bee mimics in the family Syrphidae are also known as bee flies.

bee louse, any insect of the family Braulidae (order Diptera). The external parasite of the honey bee *Braula caeca* is the only species found in North America. It is of rare occurrence, wingless, about 1.5 millimetres (0.06 inch) long, and lays eggs. Larvae feed on the wax and pollen stored by bees.

bee milk: *see* royal jelly.

bee plant, any of a number of fragrant, nectar-producing flowering plants attractive to bees. The name refers especially to two plants in the caper family (Capparaceae), *Cleome lutea,* or yellow bee plant, and *C. serrulata,* called mountain bee plant and also known as stinking clover, the latter formerly cultivated near apiaries.

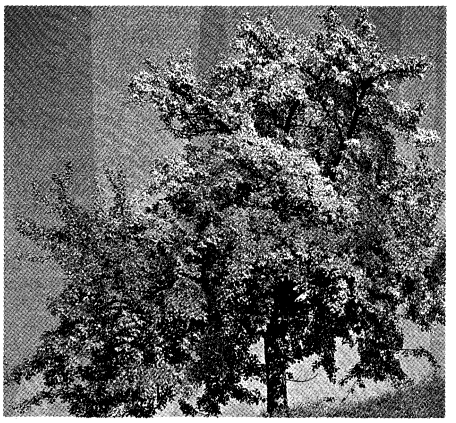
Certain trees, for example lindens, with particularly fragrant flowers, are often called bee trees because bees set up their hives in them, close to the source of nectar.

Beebe, (Charles) William (b. July 29, 1877, Brooklyn, N.Y., U.S.—d. June 4, 1962, Simla Research Station, near Arima, Trinidad), U.S. biologist, explorer, and writer on natural history who combined careful biological research with a rare literary skill.

Beebe was curator of ornithology at the New York Zoological Gardens from 1899 and director of the department of tropical research of the New York Zoological Society from 1919. He led numerous scientific expeditions abroad and in 1934 with Otis Barton descended in his bathysphere to a then record depth of 3,028 feet (923 metres) in Bermuda waters. A noted lecturer, he received numerous prizes and honours for scientific research and for his books, both technical and popular. His books include *Jungle Days* (1925), *Pheasants, Their Lives and Homes* (1926), *Beneath Tropic Seas* (1928), *High Jungle* (1949), *The Edge of the Jungle* (1950), *Unseen Life of New York* (1953), *Half Mile Down* (1951), and *Adventuring with Beebe* (1955).

beech, any of several different types of trees, especially about 10 species of deciduous ornamental and timber trees constituting the genus *Fagus* in the family Fagaceae, native to temperate and subtropical regions of the Northern Hemisphere. About 40 species of superficially similar trees, known as false beech (*Nothofagus*), are native to cooler regions of the Southern Hemisphere. The term beech has been used with a variety of qualifying terms. Australian beech refers to both *Nothofagus moorei,* described below, and red box, a tree of the family Myrtaceae; blue beech and water beech are other names for the American hornbeam (*see* hornbeam); water beech also refers to the American sycamore (*see* sycamore); Malay bush beech is a tree of the family Verbenaceae; red beech is a common name for *N. fusca* and *F. grandifolia,* described below, as well as for the Australian maple of the family Meliaceae.

A beech of the family Fagaceae is tall, round headed, and wide-spreading, with smooth, steel-gray bark and alternate, toothed, paral-



European beech (*Fagus sylvatica*)
Eric G. Carle—Shostal/EB Inc.

lel-veined, shining green leaves. Yellow-green male flowers hang from threadlike stems; the female flowers, usually in pairs on short, hairy stems on the same tree, develop into prickly burs enclosing three-sided, sweet-flavoured nuts.

The American beech (*Fagus grandifolia*), native to eastern North America, and the European beech (*F. sylvatica*), distributed throughout England and Eurasia, are the most widely known species. Both are economically important timber trees, often planted as ornamentals in Europe and North America; they may grow to 30 metres (100 feet). The narrow, coarsely sawtoothed, heavily veined, blue-green leaves of the American beech are about 13 centimetres (5 inches) long and turn yellow in autumn; the slightly shorter, egg-shaped, dark-green leaves of the European beech turn red brown in autumn but, in mild climates, persist through the winter.

An Asian species, the Chinese beech (*F. engleriana*), about 20 m tall, and the Japanese beech (*F. japonica*), up to 24 m tall, divide at the base into several stems. The Chinese and the Japanese, or Siebold's, beech (*F. sieboldii*) are grown as ornamentals in the Western Hemisphere. The Mexican beech, or haya (*F. mexicana*), a timber tree often 40 m tall, has wedge-shaped leaves. The Oriental beech (*F. orientalis*), a pyramidal Eurasian tree about 30 m tall, has a grayish-white trunk and wavy-margined, wedge-shaped leaves up to 15 cm long.

Pale, red-brown beech wood, durable under water, is valued for indoor use, novelty articles, tool handles, and shipping containers. The nuts provide forage for game animals, are used in fattening poultry, and yield an edible oil.

Beeches are often cultivated as ornamental and shade trees, especially varieties of the European beech, such as the copper, or purple, beech, with copper-coloured foliage; the Dawyck beech, a narrow, spirelike, glossy-leaved tree; the fernleaf, or cut-leaved, beech, with narrow, deeply lobed, fernlike leaves; the oak-leaved beech, with deeply toothed, wavy-margined, oaklike leaves; and the weeping beech, with long, pendulous branches and wide-spreading, horizontal limbs.

Beeches grow best in sandy loam. They are slow growing but may live to 400 years or more. Propagation is usually by seed; the shallow, spreading root system often sends up suckers that may grow into thickets.

The wavy-leaved Antarctic beech, or nire (*Nothofagus antarctica*), and the roble beech (*N. obliqua*), both 30-m trees native to Chile and Argentina, differ from other species of false beech in being deciduous; they are planted as ornamentals on other continents. The pink-brown hardwood of the Antarctic beech is used in flooring and cabinetmaking. The remaining false beeches are evergreen

timber trees of the Australasian area. Among the best known are the Australian beech (*N. moorei*), a 46-m-tall tree with leaves seven centimetres long, found in New South Wales; the mountain beech (*N. cliffortioides*), a 12-m-tall New Zealand tree with glossy, toothless leaves about one centimetre long; the myrtle beech, Tasmanian myrtle, or Australian, or red, myrtle (*N. cunninghamii*), a 60-m-tall Tasmanian tree important for its fine-textured wood; the slender, columnar red beech (*N. fusca*) of New Zealand, about 30 m tall; and the silver, or southland, beech (*N. menziesii*), a 30-m-tall New Zealand tree with doubly and bluntly toothed leaves bearing small, hairy pits beneath.

Beecham, Sir Thomas, 2ND BARONET (b. April 29, 1879, St. Helens, Lancashire, Eng.—d. March 8, 1961, London), internationally acclaimed conductor who championed the music of Frederick Delius and used his personal fortune for the improvement of orchestral and operatic performances in England.

Beecham, 1959
Camera Press

He made his London debut as a conductor in 1905 and in 1906 began a series of concerts with his own New Symphony Orchestra. Four years later he initiated a series of opera seasons. He introduced London audiences to Diaghilev's Ballets Russes (1911) and to Fyodor Chaliapin in Russian opera (1913). He founded the British National Opera Company after World War I and the London Philharmonic Orchestra in 1932 and was appointed artistic director at Covent Garden in 1933.

During World War II Beecham toured Australia and Canada, conducted the Seattle Symphony (1941–43) and at the Metropolitan Opera (1942–44) in New York City. He founded the Royal Philharmonic Orchestra in London (1947) and at the age of 78 made a lengthy European tour. His repertory ranged from Handel to the mid-20th century, but he preferred the 18th century and was associated especially with the music of Mozart and Haydn. He also gave special attention to the music of Jean Sibelius.

He was admired generally for the verve and elegance of his interpretations, and he endeared himself to the public by his witty tirades against the insufficiencies of British musical standards. Opposing the introduction of women players in his orchestras, he said if they were pretty they would distract the male players, and if they were ugly they would distract him.

Knighted in 1916, he succeeded to his father's baronetcy later that year. In 1957 he was created a Companion of Honour. His autobiography, *A Mingled Chime,* appeared in 1943; his biography, *Frederick Delius*, in 1959.

Beecher, Catharine Esther (b. Sept. 6, 1800, East Hampton, Long Island, N.Y., U.S.—d. May 12, 1878, Elmira, N.Y.), U.S. educator and author who popularized and shaped a conservative ideological movement to both elevate and entrench woman's place in the domestic sphere of American culture.

Catharine Beecher was a member of an unusually influential family. The daughter of the Presbyterian evangelical minister and temperance activist Lyman Beecher, she was the sister of the writer Harriet Beecher Stowe and of the minister Henry Ward Beecher. As a school teacher, Catherine Beecher urged the training of young women in domestic science and teaching. She founded, with her sister Mary, the Hartford Female Seminary in 1823 and later opened the Western Female Institute in Cincinnati, Ohio, in 1832. She also organized the American Woman's Educational Association in 1852 to establish teachers' colleges for women.

Beecher was most influential as a writer. Her major work, *A Treatise on Domestic Economy*, first published in 1841, went through 15 editions and was the first American work to deal with all facets of domestic life. The *Treatise* helped to standardize domestic practices and reinforce domestic values, arguing that woman's proper role was in the home, where she could powerfully affect American society. Beecher's other publications include "Female Education" (1827), *The Duty of American Women to Their Country* (1845), *Common Sense Applied to Religion* (1857), and, with Harriet Beecher Stowe, *The American Woman's Home* (1869). *Catharine Beecher; A Study in American Domesticity,* by Kathryn Kish Sklar, was published in 1973.

Beecher, Henry Ward (b. June 24, 1813, Litchfield, Conn., U.S.—d. March 8, 1887, Brooklyn, N.Y.), liberal U.S. Congregational minister whose oratorical skill and social concern made him one of the most influential Protestant spokesmen of his time.

He was the eighth of the Rev. Lyman Beecher's 13 children and showed little promise at various schools until he went to Amherst in 1830. Though never distinguished as a scholar, he became a superior speaker and popular leader.

After three postgraduate years in Cincinnati, Ohio, at Lane Theological Seminary, of which his father became president in 1832, Beecher in 1837 became minister to a small Presbyterian congregation at Lawrenceburg, Ind. He gradually cultivated his pulpit technique, there and in a pastorate at Indianapolis, Ind. (1839–47), and came to believe that a sermon succeeds by focussing on the single objective of effecting a moral change in the hearer. A highly successful preacher and lecturer, Beecher furthered his reputation through *Seven Lectures to Young Men* (1844), vivid exhortations on the vices and dangers in a frontier community.

In 1847 he accepted a call to Plymouth Church (Congregational), Brooklyn, N.Y., where he drew weekly crowds of 2,500 by the early 1850s. Though his influence upon public affairs was sometimes exaggerated, both his pronouncements and his personal life were regularly matters of national and even international interest. He gradually became more emphatic in opposing slavery, and his lectures of 1863 in England won over audiences initially hostile to him and to the Northern point of view. Increasingly outspoken after the Civil War, he supported a moderate Reconstruction policy for the South, favoured Grover Cleveland's candidacy in the 1884 presidential campaign, and advocated women's suffrage, evolutionary theory, and scientific biblical criticism. His outlets for these issues, in addition to Plymouth Church, were the *Independent*, a Congregational journal he edited in the early 1860s, and the nondenominational *Christian Union* (later *Outlook*), which he founded in 1870.

Henry Beecher, photographed by Napoleon Sarony
The Granger Collection

Beecher, always considered an emotional and sensual man, became in the 1870s the subject of rumours alleging immoral affairs, and he was sued in 1874 by his former friend and literary protégé Theodore Tilton, who charged him with adultery with his wife. Two ecclesiastical tribunals exonerated Beecher, though the jury in the civil suit failed to reach agreement, as have later students of the evidence. Despite the scandal, however, he remained active and influential until his death.

Besides his sermons, Beecher's many works include *Evolution and Religion* (1885); *Life of Jesus the Christ* (1871–91); *Yale Lectures on Preaching* (1872–74); and a novel, *Norwood: A Tale of Village Life in New England* (1867). Two studies of Beecher as an orator are L.G. Crocker, *Henry Ward Beecher's Art of Preaching* (1934) and *Henry Ward Beecher's Speaking Art* (1937). The Tilton episode is discussed in Robert Shaplen, *Free Love and Heavenly Sinners* (1954).

Beecher, Lyman (b. Oct. 12, 1775, New Haven, Conn.—d. Jan. 10, 1863, Brooklyn, N.Y., U.S.), U.S. Presbyterian clergyman in the revivalist tradition.

A graduate of Yale in 1797, he held pastorates at Litchfield, Conn., and at Boston, during which he opposed rationalism, Catholicism, and the liquor traffic. Turning his attention to evangelizing the West, he became president of the newly founded Lane Theological Seminary in Cincinnati, Ohio (1832–50), and also assumed a new pastorate there (1832–42). His Calvinism, considered strict by Bostonians, proved so mild for western Presbyterians that he was tried for heresy, but his synod acquitted him.

Lyman Beecher, detail of an oil painting by Chester Harding; in the Yale University Art Gallery
By courtesy of the Yale University Art Gallery, gift of W.T.R. Marvin

Beecher was called by a contemporary "the father of more brains than any other man in America." Among the 13 children of his three marriages, Henry Ward Beecher and Harriet Beecher Stowe achieved fame. Five others well known in their day were Catharine (1800–78), a leader in the women's education movement; Edward (1803–95), a minister, college president, and anti-slavery writer; Charles (1815–1900), Florida's superintendent of public instruction; Isabella (1822–1907), a champion of legal rights for women; and Thomas (1824–1900), an early advocate of adapting church life to modern urban conditions.

Beechworth, town, northeastern Victoria, Australia, at the foot of the Victorian Alps. The original settlement (*c.* 1839), called Mayday Hills, was renamed for a place in England. During the mid-19th century it was a centre of the Ovens Valley goldfields; it was the site of some of the earliest hospital and mental health care facilities in Victoria. The valley now produces timber, hops, grapes, tobacco, and livestock. Alluvial deposits of precious and semiprecious gems occur in the vicinity. A rail line leads to Melbourne, 140 mi (225 km) to the southwest.

Beechworth has a mild climate, is a resort for anglers and hikers, and provides access to winter snow areas of the upper valley. It was proclaimed a town in 1856, a borough in 1863, and a shire in 1865. Pop. (1981) 3,154.

Consult the INDEX *first*

Beecroft, John (b. 1790, near Whitby, Yorkshire, Eng.—d. June 10, 1854, Clarence, West Coast of Africa), adventurer, trader, explorer, and as British consul (1849–54) for the Bights of Benin and Biafra (the coastal area from present-day Benin to Cameroon), a forerunner of British imperial expansion in West Africa, both in his personal enthusiasm and in his systematic intervention in local African politics.

Beecroft's career in Africa began as an official on Fernando Po in 1829 when that island was a temporary British anti-slavery base. He remained there after Britain abandoned the island in 1834, and, in 1843, when Spain reasserted its formal rights to Fernando Po, it appointed him official governor of the island. He also acted as an unofficial British consul in the mid-1840s, helping the British anti-slavery squadron make treaties and settle disputes. By that time he had become known and respected by almost all the coastal chiefs.

As consul for the Bight of Benin (1849–54), Beecroft was mainly expected to safeguard the interests of British merchants. In his time in office he was involved in dealings with several major African societies, including those of Dahomey, Lagos (where the issue of the abolition of the slave trade resulted in a de facto British protectorate), and the Nigerian coastal town of Bonny—a complex affair that resulted in the King's exile. These and other actions of Beecroft systematically eroded the old British African policy of laissez-faire.

beef, flesh of mature cattle, as distinguished from veal, the flesh of calves. The best beef is obtained from early maturing, special beef breeds. High-quality beef has firm, velvety, fine-grained lean, bright red in colour and well-marbled. The fat is smooth, creamy white, and well distributed. In young beef the bones are soft, porous, and red; the less desirable mature beef has hard white bones. Beef tenderness and flavour are improved by aging; in one common aging method the carcass is hung for about two weeks at approximately 36° F (2° C), encouraging physical changes in the muscle tissue that enhance the quality of the meat.

Grading standards are somewhat similar in various countries; there is a large international beef trade. In the United States, grades in order of quality are prime, choice, good, commercial, utility, cutter, and canner. Commercial grades are mainly from mature cattle, especially cows. Utility, cutter, and canner grades are used in processed meat products. Beef hide, used for leather manufacture, is a valuable by-product of beef.

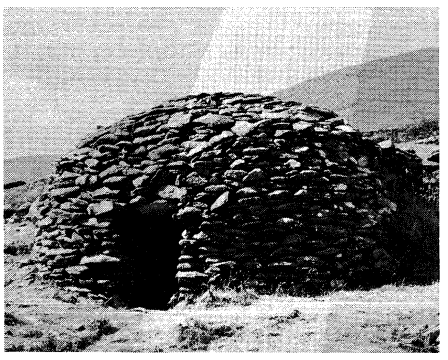
The primary beef-consuming countries of the world (in per capita terms) are Uruguay, Argentina, New Zealand, Australia, and the United States. Beef is relatively scarce—and not particularly popular—in most of Southeast Asia, Africa, and the Indian subcontinent; the sanctity of the cow in the Hindu religion forbids the consumption of its meat by Hindu adherents. Beef is not unusual in the cuisines of Korea and Japan, however; in Kōbe, Japan, near Ōsaka, a highly prized beef is produced from cattle that are vigorously massaged and fed a liberal dietary supplement of beer.

Butchering practices differ among countries, resulting in a variety of names for the different cuts. In the United States, where beef is the most popular meat, steaks—cross-sections from the fleshier parts of the carcass—are among the most desirable cuts. The standing rib roast, called in Britain the best rib, is also a valued cut. Less desirable cuts may be pot-roasted, used in stews, or ground (*see* hamburger). Boiled beef is popular in some cuisines, as in the French dish known as *pot-au-feu.* Corned beef (or salt beef in Britain) is a brisket or rump cut that has been pickled in brine.

Beehive (stars): *see* Praesepe.

Beehive, The, French LA RUCHE, an artists' settlement on the outskirts of Montparnasse (Paris), which in the early 20th century was the centre of avant-garde activity. The Beehive housed the living quarters and studios of many painters and sculptors, among them Marc Chagall, Fernand Léger, Robert Delaunay, Chaim Soutine, Jacques Lipchitz, Henri Laurens, Alexander Archipenko, Albert Gleizes, Jean Metzinger, and André Lhote. In addition, this bohemian colony attracted the poets Guillaume Apollinaire, Max Jacob, Blaise Cendrars, and Pierre Reverdy.

beehive house, primitive type of residence designed by enlarging a simple stone hemisphere, constructed out of individual blocks, to provide greater height at the centre; the form resembles a straw beehive, hence, its name. The beehive house is typical of Celtic dwellings from 2000 BC in Scotland and Ireland. The tomb of Agamemnon at Mycenae, Greece, is also of beehive shape; but it was made of cut stone rather than of the rough unhewn stone of the Celts.



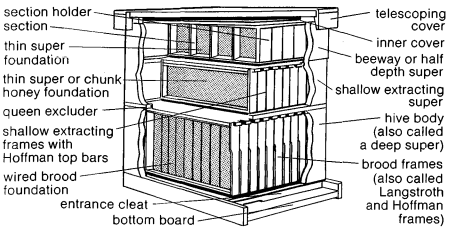
Milesian beehive house, near Ventry, on the Dingle peninsula, Ire.
Peter Baker

beehive tomb: *see* Atreus, Treasury of.

beekeeping, the care and manipulation of colonies of honeybees (*Apis* species) so as to enable them to produce and store a quantity of honey exceeding their own requirements.

A brief treatment of beekeeping follows. For full treatment, *see* MACROPAEDIA. Farming and Agricultural Technology.

Beekeeping is one of the oldest forms of animal husbandry. Man first domesticated honeybees by establishing colonies in cylinders made of such materials as bark, reed, straw, or mud; removal of the honeycombs frequently destroyed the colony. Early American settlers, observing that wild bees preferred hollow logs, developed the bee gum, a section of hollow log providing for comb removal at one end. European beekeepers developed the skep, a woven-straw hive resembling an inverted basket; combs could be removed through the bottom. By the 17th century, European beekeepers were making a hole in the hive and placing a box of straw or wood over the hole; the bees also filled this box with honey.



Cutaway view of a Langstroth hive, a type commonly used in the U.S.
By courtesy of Walter T. Kelly Co.

Two developments in the United States during the mid-19th century led to modern beekeeping methods. A multiple-story beekeeping system, devised by Moses Quinby, employed boxes placed over holes in the tops of box hives. Removal of the boxes as they became filled with honey did not disturb the main chamber. In 1851 the Rev. L.L. Langstroth invented a movable-frame hive that provided a foundation on which the bees could build honeycombs and allowed for simple removal and replacement of the filled combs. With several improvements this hive and similar types are in wide use throughout the world. Such hives consist of a base; a hive body; one or more removable sections, or supers; and a weathertight cover. The hive body is a brood chamber, fitted with frames, where the queen lays eggs and the young are nurtured; the supers are also fitted with frames for the storage of honey. Hives frequently have queen excluders, barriers with small holes allowing passage between the brood chamber and supers to worker bees but not to the larger queen.

When a colony is at the peak of its activity during the summer months, completed honey supers must be replaced with empty ones to prevent overcrowding and, ultimately, swarming (the formation of a new colony). In preparation for swarming, the worker bees select several larvae to be cultivated as potential new queens. Fed copiously with a substance called royal jelly, the new queens emerge shortly after the old queen's evacuation and fight to the death for supremacy of the hive. Drones are produced for the sole purpose of mating with the queen, after which they die. Swarming is undesirable in cultivated hives, since after swarming a colony is too busy hatching new workers to make extra honey. To prevent swarming, the queen cells must be removed and the hive enlarged.

The specialized gear of the beekeeper consists of a veiled helmet, a hive tool for cutting comb, and a smoker for tranquillizing the bees. This device blows smoke into the hive before it is opened. The bees, anticipating fire, instinctively gorge themselves with honey in preparation for rebuilding. Thus engorged, they are easier to handle and less likely to sting.

In modern beekeeping, honey is removed from the completed super by means of an extractor, in which centrifugal force evacuates the cells without damaging them, so that the bees do not have to build new cells before resuming honey production. After extraction, the honey must be slightly heated so that extraneous wax may be removed by skimming. The wax from the comb itself may be rendered by placing the comb in water heated to just over 145° F (63° C); the melted wax rises to the surface and is easily collected.

In addition to maintenance of the hive, beekeeping also requires protection of the colony against disease and predators. Honeybees are

susceptible to a number of parasites, mites, and fungus infections. Other natural enemies include raccoons, lizards, birds, and mice.

Centres for the study of bees and beekeeping have been established throughout the United States and in many other countries. Specific apicultural techniques, such as hive configuration and extraction, may vary according to tradition and scale of operation. *See also* honeybee.

Beelzebul, also called BEELZEBUB, or BAALZEBUB, in the Gospels, the prince of the devils. In the Old Testament, in the form Baalzebub, it is the name given to the god of the Philistine city of Ekron (II Kings 1:1–18). Neither name is found elsewhere in the Old Testament, and there is only one reference to it in other Jewish literature.

The meaning of the word is obscure. Baal is a common title for Semitic gods, and *zebub* derives from a root meaning "flies"—hence, "lord of flies." The form Beelzebub is due to the influence of the Vulgate, while the form used in the Greek text is Beelzebul. *Zebul* is probably a distortion of *zebub,* introducing the stigma of "dung."

beer, any of a variety of alcoholic beverages produced by the fermentation of starchy material derived from grains or other plant sources.

A brief treatment of beer and brewing follows. For full treatment, *see* MACROPAEDIA: Beverage Production.

Known to the Egyptians, Babylonians, and probably to earlier civilizations, beer became the common beverage in northern climates not conducive to grape cultivation. Although beer and wine are both fermented and undistilled, wine is made from basic materials rich in natural sugar, while beer is made from materials high in starch content. Starches must be converted to sugar before fermentation can occur.

Most of the world's beers are made from malted barley and flavoured with hops. They may be produced by employing a bottom-fermenting yeast strain, which falls to the bottom of the container when fermentation is completed, or a top-fermenting strain, which releases carbon dioxide and rises to the surface, forming a head.

Lager beers, preferred in the United States, are aged beers of German origin, taking their name from the German *lagern* ("to store"). Bottom-fermented, they are stored at a low temperature for several months, clearing, acquiring mellowness, and becoming charged with carbon dioxide. Most lagers are light in colour, with high carbonation, medium hop flavour, and alcohol content of 3–5 percent by volume. They include Pilsener, Dortmund, Munich, and California steam beer. Top-fermented beers, popular in Great Britain, include ale, stout, and a brew intermediate between the two, called porter. They have a sharper, more strongly hopped flavour than lagers and alcohol content ranging from 4 to 6.5 percent or more by volume. Bock beer, popular in the United States, is darker, sweeter, and stronger than the lagers; it is brewed during the winter and is available for drinking only in the spring.

Beers made from raw materials other than barley include hundreds of local African drinks made from millet, sorghum, and other available starch crops; Russian kvass, made from fermented rye bread; Chinese samshu, Korean *suk,* and Japanese sake, all brewed from rice; and *pulque,* an indigenous Mexican beer made from the fermented sap of the agave plant. The Mexicans and the Japanese also brew and export several brands of Western-style beer.

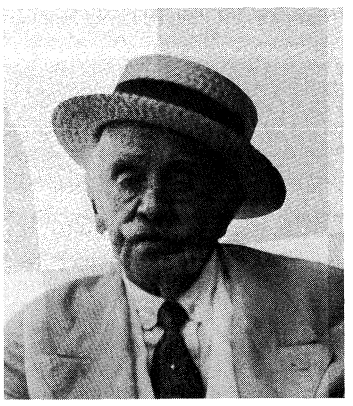
Beer, Sir Gavin (Rylands) de: *see* de Beer, Sir Gavin (Rylands).

Beer, Wilhelm (b. Jan. 4, 1797, Berlin—d. March 27, 1850, Berlin), German banker and amateur astronomer who (with Johann Heinrich von Mädler) constructed the most complete map of the Moon of his time, *Mappa Selenographica* (1836). The first lunar map to be divided into quadrants, it contained a detailed representation of the Moon's face and was accompanied, in 1837, by a volume providing micrometric measurements of the diameters of 148 craters and the elevations of 830 mountains.

The *Mappa Selenographica* remained unsurpassed until 1878, when J.F. Julius Schmidt's more detailed map appeared. Beer and Mädler also published (1830) a description and map of Mars that was the first to depict the light and dark areas.

Beer Hall Putsch, also called MUNICH PUTSCH, German BIERKELLER PUTSCH, MÜNCHENER PUTSCH, or HITLERPUTSCH (Hitler Putsch), Adolf Hitler's attempt to start an insurrection in Germany against the Weimar Republic on Nov. 8–9, 1923. Hitler and his small Nazi Party associated themselves with Gen. Erich Ludendorff, a right-wing German military leader of World War I. Forcing their way into a right-wing political meeting in a beer hall in Munich on the evening of November 8, Hitler and his men obtained agreement that the leaders there should join in carrying the "revolution" to Berlin (after the pattern of Benito Mussolini's march on Rome in the preceding year); but the next day, on a march toward the Marienplatz in the centre of Munich, the approximately 3,000 Nazis were met by a fusillade of gunfire from a police cordon; 16 Nazis and 3 policemen died. The rebels then abandoned the project on thus learning that the government was prepared to counteract forcibly. At the subsequent trial in a sympathetic Bavarian court, Ludendorff was released, and Hitler was given a minimum sentence for treason—five years' imprisonment. He actually served only eight months in the fortress of Landsberg, where he wrote much of his testamentary *Mein Kampf* ("My Struggle"). The abortive *putsch* gave Hitler worldwide fame but led him to decide to achieve power by legal means.

Beerbohm, Sir Max, original name HENRY MAXIMILIAN BEERBOHM (b. Aug. 24, 1872, London—d. May 20, 1956, Rapallo, Italy), English caricaturist, writer, dandy, and wit



Beerbohm, 1951
Kaye Webb—Camera Press, London, from Franz E. Furst

whose sophisticated drawings and parodies were unique in capturing, usually without malice, whatever was pretentious, affected, or absurd in his famous and fashionable contemporaries. He was called by G.B. Shaw "the incomparable Max."

A younger half brother of the actor-producer Sir Herbert Beerbohm Tree, he was accustomed to fashionable society from his boyhood. While still an undergraduate at Merton College, Oxford, he published witty essays in the famous *Yellow Book.* In 1895 he toured the United States as press agent for Beerbohm Tree's theatrical company. His first literary collection, *The Works of Max Beerbohm,* and his first book of drawings, *Caricatures of Twenty-five Gentlemen,* appeared in 1896. In 1898 he succeeded Shaw as drama critic of the *Saturday Review.* His charming fable *The Happy Hypocrite* appeared in 1897 and his only novel, *Zuleika Dobson,* a burlesque of Oxford life, in 1911. *The Christmas Garland* (1912) is a group of Christmas stories that mirror the stylistic faults of a number of well-known writers, notably Henry James. His collection of stories, *Seven Men* (1919), is a masterpiece.

In 1910 Beerbohm married the American-born British actress Florence Kahn and they settled in Rapallo, Italy, where, except for a return to England for the duration of World Wars I and II, they made their home for the rest of their lives. He attracted to Rapallo a constant stream of distinguished visitors who were charmed by his conversation and found in him a living archive of amusing anecdotes of the literary, artistic, and social circles of late Victorian and Edwardian England. Though Beerbohm's caricatures hit home, they remained civilized criticism and seldom alienated their subjects. In spite of the fun he had caricaturing successive generations of the royal family, he was knighted in 1939. The only two targets he attacked with ferocity were British imperialism—in the persona of a blustering John Bull—and Kipling. As a parodist, he is frequently held to be unsurpassed. After his wife's death in 1951, Beerbohm lived with his secretary-companion, Elizabeth Jungmann, whom he married a few weeks before his death at 84.

Max and Will: Max Beerbohm and William Rothenstein, Their Friendship and Letters, edited by Mary M. Lapo and Karl Beckson, was published in 1975.

Beernaert, Auguste-Marie-François (b. July 26, 1829, Ostend, Belg.—d. Oct. 6, 1912, Lucerne, Switz.), Belgian-Flemish statesman and co-winner (with Paul-H.-B. d'Estournelles de Constant) of the Nobel Prize for Peace in 1909.

A lawyer by profession, Beernaert was elected to the Belgian Chamber of Deputies in 1873 and later served as minister of public works. He was prime minister and minister of finance from 1884 to 1894. In 1895 he was elected president of the Chamber of Deputies.

He held the post of president of the International Law Association from 1903 to 1905. He was Belgium's first representative at the Hague peace conferences in 1899 and 1907. In 1909, when he was 80 years old, Beernaert was awarded the Nobel Peace Prize.

Beersheba, Hebrew BE'ER SHEVA', biblical town of southern Israel; now a city, and the principal centre of the Negev (ha-Negev) region and administrative seat of the Southern District (Hebrew Meḥoz ha-Darom).

Beersheba is first mentioned as the site where Abraham, founder of the Jewish people, made a covenant with the Philistine king Abimelech of Gerar (Genesis 21). Isaac and Jacob, the other patriarchs, also lived there (Gen. 26, 28, 46). The name seems to be a Hebrew play on words: *be'er* "well"; *sheva'* "oath" or "seven" (referring to the seven lambs of Gen. 21), though a Canaanite origin has also been suggested. Beersheba was at the southern edge of permanent agricultural cultivation in ancient Palestine and represented the southern extremity of the Israelite country; hence the phrase "from Dan to Beersheba" (first used in Judges 20; Dan is in far northern Israel).

Insignificant for centuries, Beersheba regained importance under Byzantine rule (4th–7th century), when it was a key point on the Limes Palestinae, the fortified line built as a

defense against the desert tribes; however, it fell to the Arabs in the 7th century and to the Turks in the 16th. It long remained a watering place and small trade centre for the nomadic Bedouin tribes of the Negev, despite Turkish efforts at town planning and development around 1900. Its capture in 1917 by the British opened the way for their conquest of Palestine and Syria.

After being taken by Israeli troops in October 1948, Beersheba was rapidly settled by new immigrants and has since developed as the administrative, cultural, and industrial centre of the Negev. It is one of the largest cities in Israel outside of metropolitan Tel Aviv–Yafo, Jerusalem, and Haifa. Principal manufactures are chemicals (including the processing of the mineral deposits of the Dead Sea), porcelain

Tower apartments, Beersheba, Israel
Ronald Sheridan

and tile products, and textiles. Beersheba is the site of the Ben-Gurion University of the Negev and of the Negev Institute for Arid Zone Research. The railway from northern and central Israel, running through the city, is planned to be extended to the port of Elat, at the southern tip of the country on the Gulf of Aqaba. Pop. (1982 est.) 111,200.

Beery, Wallace (Fitzgerald) (b. April 1, 1885, Kansas City, Mo., U.S.—d. April 15, 1949, Los Angeles), U.S. actor who played in more than 250 motion pictures between 1913 and 1949.

Beery's first job in entertainment was as an elephant trainer for the Ringling Brothers Circus. He later joined his brother, the actor Noah Beery, Sr., in New York City, where they both worked in the choruses of theatrical productions. He was given the lead in the play *The Yankee Tourist* and subsequently worked for several years as a dramatic actor in touring and stock theatrical companies.

In 1913 Beery joined the Essanay Studios in Chicago and began his motion-picture career as a director as well as an actor. He worked as a comedian in the Keystone comedies but in 1917 switched to playing villains for several years. He returned to comedy in the 1930s, playing gruff but lovable characters. His most notable performances were in *The Champ* (1931), for which he won an Academy Award as best actor, and *Tugboat Annie* (1933).

Beeston, locality, Broxtowe district, county of Nottinghamshire, England. The community developed during the 19th century as a result of its proximity to the coal measures of western Nottinghamshire and the railways they attracted, in addition to the construction of the Beeston Canal. Beeston has pharmaceutical and telecommunications industries. Pop. (1981 prelim.) 64,599.

Beeston, Christopher (b. 1570?—d. *c.* Oct. 15, 1638, London), actor and theatrical manager, one of the most influential figures in the English theatre in the early 17th century.

Nothing is known of Beeston's early life. In 1598 he appeared in *Every Man In His Humour* with Shakespeare, Augustine Phillips, and Richard Burbage, and in 1602 he was with Worcester's Men. He remained with them after they became Queen Anne's Men in 1603 and succeeded Thomas Greene as their business manager in 1612. In 1616 he established them at his theatre, the Cockpit (later the Phoenix), in Drury Lane, where he remained for the rest of his life as manager to the succeeding companies. Beeston held two-thirds of the shares, owned the costumes, and retained control of the plays he had bought, practices that brought him a reputation for shrewdness. In 1637 he collected together the King's and Queen's Young Company, more popularly known as Beeston's Boys, a company that was established by royal warrant. Beeston was a lifelong friend of Thomas Heywood and produced many of his plays and also contributed verses to the *Apology for Actors* (1612).

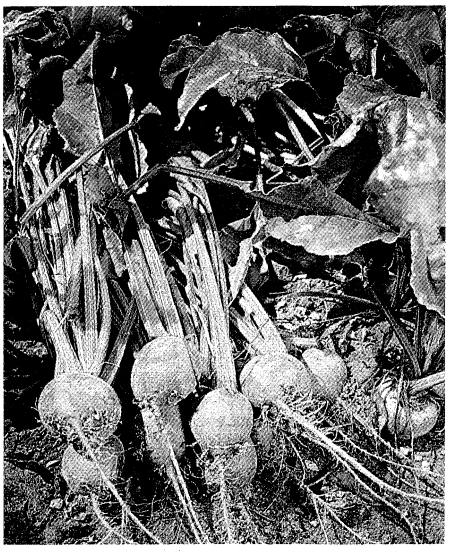
After his death, his son William (1606?–82) managed Beeston's Boys for short periods before the closing of the theatres in 1642 and after their reopening in 1660 at Salisbury Court and the Cockpit. Records of the period suggest he had considerable influence in injecting elements of Elizabethan acting styles into the early Restoration theatre.

beeswax, commercially useful animal wax secreted by the worker bee to make the cell walls of the honeycomb. Ranging from yellow to almost black in colour, depending upon such factors as the age and diet of the bees, it has a somewhat honey-like odour and a faint balsamic taste. It is soft to brittle, with a specific gravity of about 0.95 and a melting point of more than 140° F (60° C) and consists mainly of free cerotic acid and myricin (myricyl palmitate), with some high-carbon paraffins. Although insoluble in water, it can be dissolved in such substances as carbon tetrachloride, chloroform, or warm ether. Wax obtained from bees of the Far East may be somewhat different from that of the common, or Western, honeybee.

It is estimated that a bee consumes 6 to 10 pounds (3 to 4½ kilograms) of honey for each pound of the wax that is secreted in small flakes from glands on the underside of the abdomen. The beeswax is obtained, after removal of the honey, by melting the honeycomb, straining the wax to remove impurities, and pressing the residue to extract any remaining wax. The purified wax is then poured into molds to solidify. Colour and quality are preserved by melting the wax in water, avoiding direct heat; the wax may also be bleached.

Beeswax is used for candles (religious ordinances often specify its use for church ceremonial candles), for artificial fruit and flowers, and for modelling wax. It is also an ingredient in the manufacture of furniture and floor waxes, leather dressings, waxed paper, lithographic inks, cosmetics, and ointments.

beet, cultivated form of the plant *Beta vulgaris* of the goosefoot family (Chenopodiaceae), one of the most important vegetables. Four distinct types are cultivated for four different purposes: (1) the garden beet, or beetroot, or table beet, as a garden vegetable; (2) the sugar beet, a major source of sugar; (3) the mangel-wurzel, or mangold, a succulent feed for livestock; and (4) the leaf beet, or Swiss chard, for its leaves, which may be eaten or used as a seasoning.



Beet (*Beta*)
Grant Heilman—EB Inc.

The garden beet is grown for the thick, fleshy taproot that forms during the first season. In the second season a tall, branched, leafy stem arises to bear clusters of minute green flowers that develop into brown, corky fruits commonly called seedballs. The taproot ranges in shape from flattened oblate, through globular and somewhat conical, to long tapered. Skin and flesh colours are usually dark to dark-purplish red, with some nearly white. On cooking the colour diffuses uniformly through the flesh. In the United States the garden beet is popularly eaten cooked or pickled; borscht is a classic beet soup of eastern Europe.

The sugar beet, commercially the most important type, was developed in Germany in the 18th century; its European cultivation received an impetus from Napoleon as a means of combatting the British blockade of imported sugar. Today it accounts for about two-fifths of the world's sugar production; major producers are the Soviet Union, the United States, France, Poland, West Germany, Turkey, Italy, Romania, East Germany, Czechoslovakia, and the United Kingdom.

Cultivation of the mangel-wurzel and leaf beet, in common with most crop plants, dates from prehistoric times.

Beets grow best on deep, friable soils that are high in organic matter; they respond well to chemical fertilizers and manures. Grown extensively under irrigation, beets tolerate relatively high salt content of the soil but are sensitive to high acidity and to low content of boron. Boron deficiency retards growth and causes black lesions in the root flesh.

Beets are most extensively grown in temperate to cool regions or during the cooler seasons. Growing season varies from 8 to 10 weeks for garden beets in favourable climates to 30 weeks for some mangel-wurzels.

Beet greens, a source of riboflavin, iron, and vitamins A and C, are served cooked, or, if very young, in salads; they should be fresh and tender when selected. Beet roots should be smooth, firm, and unblemished; medium-sized specimens are the most tender. They are frequently canned, either whole or cut up, and often pickled, spiced, or served in a sweet and sour sauce.

Beethoven, Ludwig van (baptized Dec. 17, 1770, Bonn—d. March 26, 1827, Vienna), German composer of Flemish descent, the predominant musical figure in the transitional period between the Classical and Romantic eras.

A brief account of Beethoven's life and works follows; for a full biography, *see* MACROPAEDIA: Beethoven.

Born into a musical family, Beethoven be-

came a professional musician at the age of 11. He was taught by Christian Gottlob Neefe, court organist to the archbishop elector of Cologne, and then successively by Wolfgang Amadeus Mozart (1787) and Joseph Haydn (1792–94) in Vienna, where he made his home. From other composers in Vienna he learned the techniques of counterpoint and vocal composition. In the Austrian capital he first attracted aristocratic patrons with his emotional piano playing rather than with his compositions, but the merit of these was soon recognized, and he received financial support from various private persons for the rest of his life. He is said to have been the first important composer to make a decent living without subsidies from court or church. Tormented by deafness and emotional problems, he composed relatively little in the 1820s.

Beethoven's career in Vienna from 1794 is customarily divided into three periods. Although the initial phase includes his first three piano concerti and is closed by his *Symphony No. 1 in C Major* (1800), most of his output during those years consisted of chamber music. The second period (1801–14) is marked by his *Sonata in C Sharp Minor* (1801; *Moonlight*) and *Sonata in F Minor* (1804; *Appassionata*); his fourth and fifth (Emperor) piano concerti; his second through eighth symphonies, especially *No. 3 in E Flat Major* (1804; *Eroica*); his programmatic *Battle Symphony* (1813; unnumbered); and his only opera, *Fidelio* (final version 1814). His increasing preoccupation with counterpoint is evident in the works of his final period (1815–27), among them the *Ninth Symphony* and several string quartets (1824–26).

beetle, in strict usage, any insect of the order Coleoptera (of at least 250,000 species), the largest order in the animal kingdom, although the weevils are commonly distinguished from beetles. Beetles are easily recognized by their forewings, which are modified into hardened wing covers (elytra) that cover a second pair of functional wings. The order includes some of the largest and smallest insects and is the most widely distributed insect order. Most feed either upon other animals or upon plants, but some eat decaying matter.

Some beetles are of great economic importance; both adults and larvae may destroy crops, timber, and textiles and spread parasitic worms and diseases. Other beetles are valuable because they prey on insect pests. Although the name beetle applies to all coleopterans, some are known by other common names—*e.g.,* weevil, borer, firefly, chafer, and curculio. *See also* coleopteran.

Beets, Nicolaas (b. Sept. 13, 1814, Haarlem, Neth.—d. March 13, 1903, Utrecht), Dutch pastor and writer whose *Camera obscura* is a classic of Dutch literature.

As a student at Leiden, Beets was influenced by reading Byron and was one of the first to write Romantic poetry. His poems—*José* (1834), *Kuser* (1835), and *Guy de Vlaming* (1837)—played a part in the controversy between the Classicists and the Romantics. While still at Leiden, he also wrote the sketches, tales, and essays collected as *Camera obscura* (edited under the pseudonym Hildebrand, 1839; 4th definitive ed. 1854). These works continued the Dutch tradition of presenting domestic scenes realistically but combined with it the whimsical humour he had learned from reading Sterne, Lamb, and Dickens. Beets was ordained in 1839 and held pastorates at Heemstede (1840–53) and Utrecht (1854–74). He was professor at the State University of Utrecht from 1874 to 1884. During his successful career in the church, he produced a great quantity of commonplace prose and verse.

Beets, engraving by D.J. Sluyter

By courtesy of the Iconographisch Bureau, The Hague

Befana, in Italian tradition, the old woman who fills children's stockings with gifts on Epiphany (Twelfth Night). Too busy to see the Three Wise Men on their journey to adore the Saviour, she said she would see them on their return. According to legend, they returned by another way, and she was doomed to look for them forever.

Peasants welcoming the Befana, detail of an engraving, *c.* 1830

Civ. Raccolta delle Stampe A. Bertarelli, Milan

beg (title): *see* bey.

Beg-tse, in Tibetan Buddhism, one of the fierce protective deities, the *dharmapālas*. *See* dharmapāla.

Bega, town of the South Coast region, New South Wales, Australia, where the Bemboka and Brogo rivers unite to form the short Bega River. Settled in 1839 and gazetted a town in 1851, its name is derived from an Aboriginal word meaning either "big camping place" or "beautiful." On the Prince's Highway, Bega serves a district of dairying, mixed farming, pastoralism, and granite quarrying. Bega has a large milk-processing plant, fish canneries, sawmills, and furniture, plaster, tile, and agricultural machinery factories; high-quality cheese comes from area. Bega is 10 mi (16 km) from the small resort port of Tathra, noted for surfing facilities. Pop. (1981) 4,388.

Begas, Reinhold (b. July 15, 1831, Berlin—d. Aug. 3, 1911, Berlin), artist who dominated Prussian sculpture for a generation after 1870. While studying in Italy from 1856 to 1858, he was strongly influenced by the work of Michelangelo and by the art of the Baroque period. The Baroque influence is apparent in his work in, for example, the agitation of draperies and the assymmetrical placement of his figures, in the "Schiller Memorial" (1871; Gendarmen-Markt, Berlin) and the "Bismarck Monument" (1901; Berlin). Although Begas' preference was for mythological and decorative subjects ("Mercury and Psyche"; 1874), he was the most famous German sculptor of his time in portraiture, executing busts of many of his great contemporaries.

Begemdir and Simen, also called BEGEMDER (Ethiopia): *see* Gonder (province).

Beggar-My-Neighbour, children's card game in which an ordinary pack is divided equally between from two to six players and each holds his packet face down. Cards are turned up alternately from the top of the packets and placed in a single pile until an honour (ace, king, queen, or knave [jack]) appears.

The opponent must then cover the honour with four cards for an ace, three for a king, two for a queen, and one for a knave. If in so doing he turns an honour of his own, he stops and the next player repeats the process.

Whenever the full quota of cards is played to an honour, the player of the honour takes all the cards from the table, places them underneath his packet, and then makes a new lead. The player who gets all the cards into his hand is the winner.

Begin, Menachem (Wolfovitch) (b. Aug. 16, 1913, Brest-Litovsk, Russia), Zionist leader and prime minister of Israel from 1977 to 1983.

Begin received a law degree from the University of Warsaw in 1935. Active in the Zionist movement throughout the 1930s, he became (1938) the leader of the Polish branch of the Betar youth movement, dedicated to the establishment of a Jewish state on both sides of the Jordan River. When the Germans invaded Warsaw in 1939, he escaped to Vilnius; his parents and a brother died in concentration camps. The Soviet authorities deported Begin to Siberia in 1940, but in 1941 he was released and joined the Polish Army in exile, with which he went to Palestine in 1942.

Begin joined the militant Irgun Zvai Leumi and was a commander of that group from 1943 to 1948. After Israel's independence in 1948 the Irgun formed the Ḥerut (Freedom) Party with Begin as its head and leader of the opposition in the Knesset (Parliament) until 1967. Begin joined the National Unity government (1967–70) as a minister without portfolio and in 1970 became joint chairman of the Likud (Unity) coalition.

On May 17, 1977, the Likud Party won a national electoral victory and on June 21 Begin formed a government. He was perhaps best known for his uncompromising stand on the question of retaining the territories occupied by Israel during the Arab–Israeli War of 1967. Begin, however, negotiated with Pres. Anwar as-Sadat of Egypt for peace in the Middle East, and a peace treaty between these two countries was signed on March 26, 1979. Begin and Sadat were jointly awarded the Nobel Prize for Peace in 1978.

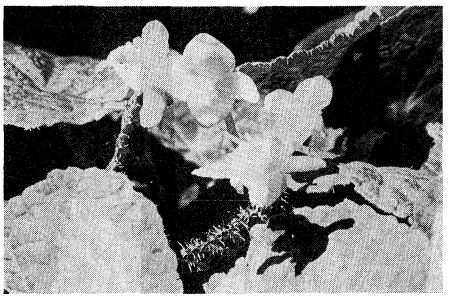
In the early 1980s, his opposition to the establishment of a Palestinian state remained resolute. His party failed to win a clear majority in a general election in 1980, but he was able to form a coalition. Begin resigned from office in 1983.

Consult the INDEX *first*

Begonia, genus of about 1,000 species of mostly succulent (juicy-stemmed) plants, many with colourful flowers or leaves and used as pot plants indoors or as garden plants. They are from the tropics and subtropics. Prominent features are their usually four tepals (petals and sepals together) in two pairs of different sizes and the three wings on the bases of the female flowers. Flower colours are pink, red, yellow, or white, with the ovary below of the same colour. The usually lopsided, alternate leaves are variable in shape and in colour on different forms.

The more than 10,000 recorded types of be-

gonias present a bewildering array of cultivated varieties. They are divided into four large groups: fibrous-rooted, rhizomatous, tuberous-rooted, and odd and rare begonias.



Begonia (*Begonia*)
Dorothea W. Woodruff—EB Inc.

Fibrous-rooted begonias can be further divided into the wax, or bedding, begonias (Semperflorens-Cultorum group), including the offshoots of *B. semperflorens* used most often as summer bedding plants; the so-called cane stem types (angelwing begonias), characterized by their tall stems; and the hairy begonias, which have feltlike leaves.

Rhizomatous begonias include the rex, or beefsteak, begonias (Rex-Cultorum group), including offshoots of *B. rex* and allied species, prized for their brightly coloured and patterned leaves.

Tuberous-rooted begonias include the Tuberhybrida group, grown outdoors for their large and colourful flowers from early summer to first frost, and the greenhouse begonias that bloom during the winter. The latter are subdivided into the Cheimantha group, from crosses between *B. socotrana* and *B. dregei*, and the Elatior group, from crosses between *B. socotrana* and tuberous Andean species.

The Tuberhybrida group includes the following types based on flower characteristics or growth habit: single (single-flowered); crispa, with frilled tepals; cristata, with crested tepals; narcissiflora (daffodil-flowered); camellia (camellia-flowered); ruffled camellia; rosebud, with a raised rosebud-like centre; fimbriata plena (carnation-flowered); picotee, camellia-form with tepals showing colour shading; marginata, tepals edged in colour different from the dominant; marmorata, camellia-form, rose-coloured, and blotched with white; pendula, hanging basket plants; and multiflora, compact bushy plants with many small flowers.

Most begonias are tender plants, intolerant of dry conditions and requiring protection from strong sunlight.

Begoniales, begonia order of flowering plants, belonging to the class known as dicotyledon (*q.v.*; characterized by two seed leaves). The families comprising this order are mainly succulent herbs or subshrubs of the Begoniaceae, with three genera and about 1,000 species; and the Datiscaceae, with one genus. The more recently established Tetramelaceae has two woody genera. The best-known representative of the order is the begonia (*q.v.*).

A brief treatment of Begoniales follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

The Begoniaceae is native to Central America and northern South America. Species belonging to the Datiscaceae and the Tetramelaceae are found from the Mediterranean to India and nearby Asian countries in broad-leaved forests receiving moderate rainfall.

The begonia order is not of major commercial importance, but in southeastern Asia, *Octomeles* (Tetramelaceae) yields wood for packing cases, and the root of *Datisca cannabina* is the source of datiscin, used in the Orient to dye silks. Many species (and hybrids) by the begoniaceae are prized as house and garden plants the world over. In some localities, leaves of a few species are eaten to prevent scurvy. Rhizomes (horizontal stems resembling roots) are used as astringents, as fever medications, and as laxatives.

One method of reproduction in Begoniales is vegetative propagation. A detached begonia leaf roots when placed in water. Stocky stems of tuberous begonias may be divided when large; rhizomatous types are easily multiplied by cutting the rhizomes into segments. Begoniales also reproduce by seeds.

The inflorescence (flower cluster) of the begonia group is an elongate stem arising from the parent plant at the base of a leaf. It bears bracts (scalelike leaves) near which flower buds arise at regular intervals. The male flower has many stamens and its tepals (petals and sepals) are bilaterally symmetrical. The female flower produces a pistil comprised of three longitudinal units (carpels). The upper end of a pistil differentiates into three knobbed stigmas (pollen-receptive units), each with a stalked portion (style). Many ovules are borne in the three-chambered ovary and mature into seeds after pollination and fertilization. The ovary matures into a dry fruit, the capsule, which sheds its seeds by splitting open.

Pollen is presumed to be wind-borne in the woody members of the Begoniales, but in the herbaceous begonias, bees are known to aid pollination. It is likely that pollen of the upper, male flowers sifts down to the stigmas of the female flowers at the lower levels of the inflorescence.

Succulence, number of sepals, and an abundance of small seeds within each ovary are the unifying features among the Begoniales.

Begusarai, town, administrative headquarters of Begusarai district, Bihār state, northeastern India, in the north central part of the state. Its name is derived from *serai* (Persian, meaning "travellers' lodge"), a building in the centre of the town. It is an important commercial centre on the North Eastern Railway and the largest town in the district.

Begusarai district, with an area of 733 sq mi (1,899 sq km), is situated in the Middle Ganges Plain. It is bounded by Samāstipur district on the northwest, Monghyr district on the east, and Patna district on the south. The region is flat, has alluvial soil, and is traversed by numerous streams. The economy is dominated by subsistence agriculture; rice, pulse (legumes), wheat, barley, corn (maize), sugarcane, and oilseeds are grown. Industries produce textiles, canned fruit, dairy products, vegetable oil, chemicals, and paper. Roads and railways connect the district with important towns in the state. Pop. (1981) town, 56,633; metropolitan area, 68,305; district, 1,456,343.

Behaghel, Otto (b. May 3, 1854, Karlsruhe, Baden—d. Oct. 9, 1936, Munich), language scholar who specialized in studies of the German language and whose *Deutsche Syntax,* 4 vol. (1923–32; "German Syntax") is a massive compilation and classification of examples of German linguistic usage from the 8th to the 20th century.

Behaghel
Archiv fur Kunst und Geschichte, West Berlin

He held professorships at Heidelberg, Ger.; Basel, Switz.; and Giessen, Ger.; edited two important journals of Germanic studies; and published two works that remain standard treatises, *Die Deutsche Sprache* (1886, 13th ed. 1958; "The German Language") and *Geschichte der Deutschen Sprache* (1901, 5th ed. 1928; "History of the German Language").

Behaim, Martin, Portuguese MARTIM BEHAIM, or MARTINHO DE BOÉMIA (b. Oct. 6, 1459, Nürnberg—d. July 29, 1507, Lisbon), navigator and geographer whose Nürnberg Terrestrial Globe is the earliest globe extant. Behaim first visited Portugal about 1480 as a merchant in the Flemish trade and, claiming to have been a pupil of the astronomer Johann Müller (Regiomontanus) at Nürnberg, became an adviser on navigation to King John II. He may have introduced the astrolabe of brass to replace wooden models of this instrument, then used in navigation to ascertain the altitudes of the Sun, Moon, and stars in order to deduce time and latitude. He probably voyaged down the west coast of Africa (1485–86) with Diogo Cão.

Returning to Nürnberg (1490), he began constructing his globe with the help of the painter Georg Glockendon and finished it in 1492. In view of the extent of Portuguese exploration, his depiction of the world was surprisingly inaccurate and out of date, especially in relation to the west coast of Africa. It is interesting, nevertheless, for the indication it provides of common geographical suppositions on the eve of the discovery of North America. His globe is in the collection of the Germanisches National-Museum in Nürnberg.

Beham, Hans Sebald (b. 1500, Nürnberg—d. Nov. 22, 1550, Frankfurt am Main), German engraver who was the most prolific of the *Kleinmeister* (German: Little Masters) of engraving, so called because they produced small prints. The group also included his younger brother, Barthel Beham (1502–40), and Georg Pencz (*c.* 1500–50). All three artists, noted for their brilliant work on extremely small copper plates, grew up under the influence of Albrecht Dürer's late classical style. It is likely that they worked in Dürer's studio. In 1525 the trio was banned from Nürnberg for independent religious views, but not for long. Later, Beham moved to Frankfurt am Main. His 252 engravings include biblical and mythological subjects, allegories, genre scenes, and ornaments. Of particular charm were the genre scenes, such as a set entitled "Peasant Festival" (1537). Some of his woodcuts were of very large size, intended as wall decorations.

Behan, Brendan (Francis) (b. Feb. 9, 1923, Dublin—d. March 20, 1964, Dublin), anti-English rebel and author whose earthy satire and powerful political commentary made a significant contribution to the theatre of the absurd.

Reared in a family active in revolutionary and left-wing causes against the British, Behan at the age of eight began what became a lifelong battle with alcoholism. After leaving school in 1937, he learned the house painter's trade while concurrently participating in the Irish Republican Army (IRA) as a courier.

Behan was arrested in England while on a sabotage mission and sentenced (February 1940) to three years in a reform school at Hollesley Bay, Suffolk. He wrote an autobiographical account of this detention in *Borstal Boy* (1958). He was deported to Dublin in 1942 and was soon involved in a shooting incident in which a policeman was wounded. He was captured, charged with attempted murder, convicted, and sentenced to 14 years. He served at Mountjoy Prison, Dublin, the setting of his first play, *The Quare Fellow* (1954), and

Behan
BBC Hulton Picture Library

later at the Curragh Military Camp, County Kildare, from which he was released under a general amnesty in 1946. While imprisoned, he perfected his Irish, the language he used for his delicately sensitive poetry and for *An Giall* (1957), the initial version of his second play, *The Hostage* (1958).

Subsequent arrests followed, either for revolutionary activities or for alcoholism, which also forced various hospitalizations. In 1948 Behan went to Paris to write. Returning to Dublin in 1950, he wrote short stories and scripts for Radio Telefis Éireann and sang on a continuing program, *Ballad Maker's Saturday Night.* In 1953 he began in the *Irish Press* a column about Dublin, later collected (1963) in *Hold Your Hour and Have Another,* with illustrations by his wife, Beatrice Salkeld, whom he had married in 1955.

The Quare Fellow opened at the small Pike Theatre, Dublin, in 1954 and was an instant success. A tragicomedy concerning the reactions of jailors and prisoners to the hanging of a condemned man (the "Quare Fellow"), it presents an explosive statement on capital punishment. The play was subsequently performed in London (1956) and in New York City (1958). *The Hostage,* however, is considered to be his masterwork, in which ballads, slapstick, and fantasies satirize social conditions and warfare with a personal gaiety that emerges from anguish. The play deals with the tragic situation of an English soldier whom the IRA holds as a hostage in a brothel to prevent the execution of one of their own men. A success in London, the play opened in 1960 off Broadway, New York City, where Behan became a celebrated personality.

Behan's last works, which he dictated on tape, were *Brendan Behan's Island* (1962), a book of Irish anecdotes; *The Scarperer* (1964), a novel about a smuggling adventure, first published serially in the *Irish Press*; *Brendan Behan's New York* (1964); and *Confessions of an Irish Rebel* (1965), further memoirs. Alan Simpson's *Beckett and Behan, and a Theatre in Dublin* appeared in 1962; Ulick O'Connor's *Brendan Behan* was published in 1970.

behavioral science, any of various disciplines dealing with the subject of human actions, usually including the fields of sociology, social and cultural anthropology, psychology, and behavioral aspects of biology, economics, geography, law, psychiatry, and political science. The term gained currency in the 1950s in the United States; it is often used synonomously with "social sciences," although some writers distinguish between them. The term behavioral sciences suggests an approach that is more experimental than that connoted by the older term social sciences.

behaviour, also spelled BEHAVIOR: *see* animal behaviour; human behaviour.

behaviour genetics, also called PSYCHOGENETICS, the study of the influence of an organism's genetic composition on its behaviour and the interaction of heredity and environment insofar as they affect behaviour. The question of the determinants of abilities as shown through behaviour has commonly been referred to as the "nature-nurture" controversy.

The relationship between behaviour and genetics, or heredity, dates to the work of the English scientist Sir Francis Galton (1822–1911). Galton studied the families of outstanding men of his day and concluded, like his cousin Charles Darwin, that mental powers run in families. Galton became the first to use twins in genetic research and pioneered many of the statistical methods of analysis that are in use today. He was the first to recognize that acquired behavioral characteristics could not be transmitted genetically. In 1918 the Scot R.A. Fisher published a paper that attempted to prove that Mendel's laws of inheritance can be generalized to show that both genes and environmental factors affect an individual's behaviour.

For more than half a century scientists have been studying the relationship between IQ and genetics, and have arrived at no solid conclusions. In 1937, the U.S. psychogeneticists Horatio Newman, Frank Freeman, and Karl Holzinger studied monozygotic (MZ) or identical twins that were reared by different families to determine the effect of environment on intelligence. They found that, in general, the mental ability of identical twins was influenced far more by genetic factors than by environmental influences. In 1980 another U.S. geneticist Robert Plomin concluded, on the other hand, that genetic differences account for about half of IQ variance.

Methods of study. Any long-term genetic research involving human subjects is complicated by the lengthy period of human development and the need to locate and observe identical (MZ) twins for long periods of time. Animal studies are simpler to control and have provided important results. By mating related animals (*e.g.,* siblings) for as many as twenty generations, scientists obtain a nearly pure strain in which all offspring are genetically highly similar. Through these inbreeding experiments, the U.S. geneticists J.C. DeFries and Robert Plomin reported in 1978 that there exists a genetic component in laboratory animals that affect such diverse behaviours as learning, sexual activity, alcohol preference, aggression, taste perception, and seizure susceptibility.

The geneticist interested in investigating a specific trait or characteristic mates animals that exhibit a high degree of the desired trait in an approach known as selective breeding. Genetic theory predicts that a selectively bred behaviour among groups will become far more separated as the groups become more genetically dissimilar despite the fact that all animals are maintained in a common environment.

Another technique, consanguinity studies, is based on the belief that as the degree of relationship among individuals increases, so should the frequency of the characteristic. Scientists in 1978, for example, used consanguinity studies to show that parents of schizophrenic patients exhibited a higher incidence of schizophrenia than the population at large. The possible hereditary nature of alcoholism, depression, and other mental disorders are being studied extensively. Other behavioral characteristics that are believed to be genetically influenced include introversion-extroversion and activity level.

Genetic controversy. One highly debatable point among behavioral geneticists is the question of genetic influence on racial and ethnic IQ differences. In 1969, for example, the U.S. educator Arthur Jensen concluded that differences in IQ scores of black and white populations may be due to genetic differences. Many scientists have refuted Jensen's arguments claiming that environmental factors and the use of "racially biased" IQ tests were not adequately considered by Jensen. *See also* intelligence.

behaviour therapy, the application of experimentally derived principles of learning to the treatment of psychological disorders. The concept derives primarily from work of the Russian psychologist Ivan Pavlov, who published extensively in the 1920s and 1930s on the application of conditioning techniques and theories to abnormal behaviour. Behaviour-therapy techniques differ from psychiatric methods, particularly psychoanalysis, in that they are predominately symptom (behaviour) oriented and show little or no concern for unconscious processes, achieving new insight, or effecting fundamental personality change.

Behaviour therapy was popularized by the U.S. psychologist B.F. Skinner, who worked with mental patients in a Massachusetts state hospital. From his work in animal learning, Skinner found that the establishment and extinction (elimination) of responses can be determined by the way reinforcers, or rewards, are given. The pattern of reward-giving, both in time and frequency, is known as a "schedule of reinforcement." The gradual change in behaviour in approximation of the desired result is known as "shaping." More recent developments in behaviour therapy emphasize the adaptive nature of cognitive processes.

One of the most prominent behaviour techniques, variously known as systematic desensitization, reciprocal inhibition, extinction, or counter-conditioning, has its experimental basis in work done with animals in the 1950s by psychologists Joseph Wolpe and Arnold Lazarus. In one such experiment, cats were conditioned with electric shock to refuse to eat in a confined space. Their conditioned fear was overcome by feeding them in remotely similar situations and gradually increasing the similarity until all signs of anxiety had disappeared. When the technique, known as desensitization, is applied to human problems, patients may be asked either to imagine anxiety-producing situations or to deal with actual feared objects or situations. The construction of hierarchies of fears is perhaps the most important part of the procedure; the patient's verbalized responses are the primary source of information, although the therapist may also rely on such other sources as diagnostic tests or interviews of family or friends of the patient. Often relaxation training is employed in the presence of the anxiety-producing stimuli. The theoretical question of whether these procedures involve reduction in the habit strength of anxiety responses or establishment of alternative, adaptive responses to the same stimuli remains unresolved.

Much evidence has been collected to demonstrate the effectiveness of structured learning and behaviour therapy in groups. Assertiveness training is the broad term for a structured group situation that facilitates the acquisition of emotionally expressive behaviour. Such training is based on the behavioral concept that once the appropriate overt expressions of emotions are learned, practiced, and reinforced, the correlated subjective feelings will be felt.

In 1975, the U.S. psychologist Robert P. Liberman introduced assertion or personal effectiveness training as a fundamental component of the clinical services offered by community health centres.

A number of other behavioral techniques have been used in therapy. Aversion therapy causes a patient to reduce or avoid an undesirable behaviour pattern by conditioning him to associate the behaviour with an undesirable stimulus. The chief stimuli used in the therapy are electrical and chemical. In the electrical therapy, the patient is given a lightly painful shock whenever the undesirable behaviour is aroused; this method has been used in the treatment of sexual deviations. In the

chemical therapy, the patient is given a drug that produces unpleasant effects, such as nausea, when combined with the undesirable behaviour; this method has been common in the treatment of alcoholism, the therapeutic drug and the alcohol together causing the nausea. Another approach reinforces desired responses with praise, food, or some other reward.

Behaviour-therapy techniques have been applied with some success to such disturbances as enuresis (bed-wetting), tics, phobias, stuttering, obsessive-compulsive behaviour, drug addiction, neurotic behaviours of "normal" persons, and some psychotic conditions. It has also been used in training the mentally retarded.

In addition, behavioral self-control has received great academic attention, particularly learning to control the functions of the autonomic nervous system (*e.g.,* heart rate, blood pressure, and intestinal contractions) by methods such as biofeedback (*q.v.*). The theory and therapy of self-control represents a significant humanistic development within the area of behaviour modification, by enhancing personal responsibility. *See also* behaviourism; conditioning.

behaviourism, a highly influential academic school of psychology that dominated psychological theory between the two world wars. Classical behaviourism concerned itself exclusively with measurable and observable data and excluded ideas, emotions, and the consideration of inner mental experience and activity in general. The organism is seen as "responding" to conditions (stimuli) set by the outer environment and inner biological processes. The dominant school of thought at the time, structuralism, conceived of psychology as the science of consciousness, experience, or mind; while bodily activities were not excluded, their paramount interest was considered to lie in their relations to mental phenomena. The characteristic method of psychology was thus introspection—observing and reporting upon the working of one's own mind.

The early formulations of behaviourism were a reaction by the U.S. psychologist John B. Watson against the introspective psychologies. Watson wrote that "Behaviorism claims that 'consciousness' is neither a definable nor a usable concept; that it is merely another word for the 'soul' of more ancient times. The old psychology is thus dominated by a subtle kind of religious philosophy" (*Behaviorism,* 1924). Behaviourism "attempted to make a fresh, clean start in psychology, breaking both with current theories and with traditional concepts and terminology" (*Psychology from the Standpoint of a Behaviorist,* 3rd ed., 1929). Introspection was to be discarded; only such observations were to be considered admissible as could be made by independent observers upon the same object or event—exactly as in physics or chemistry. In this way psychology was to become "a purely objective, experimental branch of natural science." However abstract these proposals may seem, they have had a revolutionary influence on modern psychology and social science and on man's conception of himself.

Watson's objectivist leanings were presaged by many developments in the history of thought and were in fact symptomatic of strong trends that had been emerging in biology and psychology since the late 19th century. Thus, his desire to "bury subjective subject matter" enlisted widespread cooperation. Between the early 1920s and mid-century, behaviourism in the methodic sense dominated U.S. psychology and had wide international repercussions. Though the chief alternatives to behaviourism (*e.g.,* Gestalt psychology and psychoanalysis) promulgated methods that use experiential data, even these positions accommodated the objectivist emphasis by a steadily increasing stress on the need for objective validation of experientially based hypotheses.

The period 1912–30 (roughly) may be called that of classical behaviourism. Watson was then the dominant figure, but many others were soon at work giving their own systematic twists to the development of the program. Classical behaviourism was dedicated to proving that phenomena formerly believed to require introspective study (*e.g.,* thinking, imagery, emotions, feeling) might be handled in terms of stimulus and response. Classical behaviourism was characterized by a strict determinism based on the belief that behind every response lies a stimulus that elicits it.

From 1930 through the late '40s the derivative form known as neobehaviourism may be distinguished, when psychologists attempted to translate the general methodic program prescribed by Watson into a detailed, experimentally based theory of adaptive behaviour. This era was dominated by learning theorists Clark L. Hull and B.F. Skinner; Skinner's thought was the direct descendant of Watson's intellectual heritage, and became dominant in the field after the mid-1950s. Other important behaviourists included Hull-influenced Kenneth W. Spence; Neal Miller, who felt that neuroscience is the most productive avenue in psychological research; Edward C. Tolman; and Edwin R. Guthrie. Beginning in this period, with people like cognitive theorist Tolman, a tendency toward a liberalization of strict behaviourist doctrine (both methodic and conceptual) occurred. The posture toward objectivism remained fundamentally the same, even while admitting the existence of intervening (*i.e.,* mental) variables, accepting verbal reports, and branching into problem areas such as perception.

A natural outgrowth of behaviourist theory was behaviour therapy (*q.v.*), which rose to prominence after World War II and focussed on modifying observable behaviour, rather than on the thoughts and feelings of the patient (as in psychoanalysis). Emotional problems are considered the consequences of faulty acquired behaviour patterns or the failure to learn effective responses. The aim of behaviour therapy, also known as behaviour modification, is therefore to change behaviour patterns. *See also* conditioning.

Behbehān, chief town and county (*shahrestān*) in Khūzestān *ostān* (province), southwestern Iran, in the foothills of the Zagros Mountains near the Mārūn River. The largely mountainous county extends to Mt. Dīnār and has tribal populations. The town prospers through development of the neighbouring oil fields. It lies on an ancient trade route and connects by road with Ahvāz and Kāzerūn. Nearby ruins include the Sāsānian city of Arajan and a bridge with a single arch. Pop. (1976) town, 79,434; county, 114,372.

Behdet (Egypt): *see* Idfū.

beheading, a mode of executing capital punishment. The ancient Greeks and Romans regarded it as a most honourable form of death. Before execution the criminal was tied to a stake and whipped with rods. In earlier years an ax was used; later a sword, which was considered a more honourable instrument of death, was used in the case of Roman citizens.

Beheading is said to have been introduced into England from Normandy by William the Conqueror in the 11th century. Although some early manuscripts record the beheading of ordinary felons, this punishment was usually reserved for offenders of high rank. Simon, Lord Lovat, was the last person beheaded in England (April 9, 1747). The petition (1760) of the 4th Earl Ferrers to be beheaded was refused, and he was hanged. One consequence of the French Revolution was the extension of the privilege of beheading to criminals of ordinary birth, by means of the guillotine (*q.v.*).

Beheading was only a part of the common-law method of punishing male traitors, which was ferocious in the extreme, including also hanging, mutilation, disembowelling, and quartering. In 1814 the king of England was empowered by royal warrant to substitute hanging as the ordinary mode of executing criminals; but as late as 1820, after traitors were hanged, their heads were cut off by a masked man.

Beheading is now rare in European countries, most of which have abolished or limited capital punishment. It is still used occasionally in some Muslim countries. It was practiced extensively by the Chinese war lords, especially by Sun Ch'uan-fang in Shanghai. Beheading was the method of execution prescribed by the German penal code until the death penalty was virtually abolished after World War II; during the Nazi regime the penalty had been imposed in an extended range of cases.

Beheira (Egypt): *see* Buḥayrah, al-.

Behemoth, in the Old Testament, a powerful, grass-eating animal whose "bones are tubes of bronze, his limbs like bars of iron" (Job 40:18). Among various Jewish legends, one relates that the righteous will witness a spectacular battle between Behemoth and Leviathan in the messianic era and later feast upon their flesh. Some sources identify Behemoth, who dwells in the marsh and is not frightened by the turbulent river Jordan, as a hippopotamus and Leviathan as a crocodile, whale, or snake.

Behistun (Iran): *see* Bīsitūn.

Behn, Aphra (b. July 1640—d. April 16, 1689, London), English dramatist, novelist, and poet, the first Englishwoman to earn her

Aphra Behn, frontispiece to *All the Histories and the Novels,* 1722

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

living by writing. Her novel *Oroonoko* (1688; reprinted 1933), a story of an enslaved African prince whom Aphra knew in South America, unquestionably influenced the development of the novel. Her poems, unequal in merit, have perhaps been underestimated, but in life she attained great popularity and was the centre of much scandal. Though she wrote mostly plays, her fiction is now considered more interesting.

Her origin remains a mystery; an unidentified child named Aphra travelled with a couple named Amis to Surinam (Dutch Guiana), then an English possession. Back in England by 1658, she married a London merchant named Behn, who died in 1666. Her wit and talent having brought her into high esteem, she was employed by Charles II in secret service in the Netherlands. Unrewarded and imprisoned for debt, she began to write to support herself.

In 1671 Behn's first play, *The Forc'd Marriage,* was produced; her witty and vivacious comedies, such as *The Rover* (two parts, pro-

duced 1677 and 1681), were highly successful. She was well read and often adapted work by older dramatists. Her versatility, like her output, was immense.

Behn, Sosthenes (b. Jan. 30, 1882, St. Thomas, Danish Virgin Islands—d. June 6, 1957, New York City), telephone executive, president and founder, with his brother Hernand, of the International Telephone and Telegraph Corporation (ITT), one of the largest communications companies in the world.

Educated on the island of Corsica and in Paris, Behn began his career in 1901 with a New York City bank. Five years later he and his brother Hernand took over the sugar business of their stepfather in Puerto Rico and, while living on that island, purchased the Puerto Rican Telephone Company; they later acquired the Cuban Telephone Company. The brothers' business activities were interrupted by World War I; Behn served in the United States Army Signal Corps.

In 1920 the Behns and a third partner organized ITT, into which they incorporated their Puerto Rican and Cuban holdings. They later obtained telephone concessions for Spain and Romania. The onset of the depression in 1931 brought financial difficulties, but Behn's skillful handling of the firm's indebtedness enabled ITT to survive and grow. Hernand died in 1933, leaving his brother in full control. World War II brought more problems when certain European holdings were seized by Adolf Hitler; nevertheless, the company was able to sell its Romanian holdings and in 1945–46 disposed successfully of properties in Spain and Argentina. Operations in Latin America were expanded both during and after the war. Behn retired in 1956.

Behrens, Peter (b. April 14, 1868, Hamburg—d. Feb. 27, 1940, Berlin), architect noted for his influential role in the development of modern architecture in Germany. In addition, he was a pioneer in the field of industrial design.

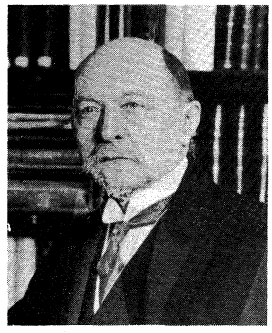
After attending the fine arts school at Hamburg, Behrens went to Munich in 1897 during the time of the renaissance of arts and crafts in Germany. In 1900 the Grand Duke of Hessen called him to his newly founded artists' colony at Darmstadt. There, Behrens built his own house (1901) with all its furnishings. In 1903 he became director of the arts and crafts school in Düsseldorf.

The most important event in Behrens' career occurred in 1907. Emil Rathenau, general director of the AEG (Allgemeine Elektrizitäts-Gesellschaft—one of the largest manufacturing concerns in the world), appointed him as artistic adviser for all AEG products. Rathenau was a farsighted industrialist who recognized the industry's need for the refining hand of an artist. Up to that time Behrens had been a mediocre painter, producing woodcuts, book covers, ceramics, interiors, fabrics, and carpets, but he began to concentrate intensely on creative work in the industrial sphere. His contributions included the hexagonal trademark of the AEG, its catalogs, and its office stationery, products such as electric fans and street lamps, and retail shops and factories. Between 1909 and 1912 he built the AEG factory complex. His turbine assembly works with its glass curtain wall was the most influential building in Germany at that time. During that period Walter Gropius, Ludwig Mies van der Rohe, and Le Corbusier worked in his office.

Behrens, painting by Max Liebermann
Archiv fur Kunst und Geschichte, West Berlin

Behrens' later works included factory and administrative buildings: the Mannesmann-Werke in Düsseldorf (1911–12), Farbwerke at Höchst (1920–24), the classical German embassy at St. Petersburg (1911–12, now Leningrad), and the factory for the Austrian Tobacco Administration at Linz (1930). From 1922 to 1927 he was professor at the Academy of Fine Arts in Vienna. His later buildings demonstrated his belief that a building complex must have a heavy massiveness.

Behring, Emil (Adolf) von (b. March 15, 1854, Hansdorf, Prussia—d. March 31, 1917, Marburg, Ger.), bacteriologist who is considered the founder of the science of immunology; he received in 1901 the first Nobel Prize for Physiology or Medicine for his work on serum therapy, especially its application against diphtheria.



Behring, 1914
Archiv fur Kunst und Geschichte, West Berlin

Behring served with the Army Medical Corps before becoming assistant (1889) at Robert Koch's Institute of Hygiene, Berlin. There, with the Japanese bacteriologist Kitasato Shibasaburo, he showed that it was possible to provide an animal with passive immunity against tetanus by injecting it with the blood serum of another animal infected with the disease. Behring then applied this technique of antitoxic immunity (a term which he and Kitasato originated) to prevent diphtheria. Administration of diphtheria antitoxin, successfully marketed in 1892, became a routine part of the treatment of the disease.

Behring taught at Halle (1894) and at Marburg (1895). He became financially involved with the Farbwerke Meister, Lucius und Brüning in Höchst, a dyeworks that provided laboratories for his researches, which included studies of tuberculosis. He devised a vaccine (bovovaccine) for immunization of calves against the disease. His writings include *Die praktischen Ziele der Blutserumtherapie* (1892; "The Practical Goals of Blood Serum Therapy") and *Ätiologie und ätiologische Therapie des Tetanus* (1904; "The Etiology and Etiological Therapy of Tetanus").

Behrman, S(amuel) N(athaniel) (b. June 9, 1893, Worcester, Mass., U.S.—d. Sept. 9, 1973, New York City), U.S. short-story writer and playwright best known for popular Broadway plays that commented on contemporary moral issues. Behrman wrote about the wealthy, intellectual sector of society, endowing his characters with eloquence and intelligence. He is distinguished among popular playwrights for introducing volatile and complicated issues into his plays and for refusing to create shallow characters.

As a young man, Behrman contributed to newspapers and magazines, including *New Republic* and *The New Yorker,* and studied drama at Harvard. His first play, *The Second Man* (1927), was an immediate success. Behrman followed it with a string of successes, including *Meteor* (1929), *Brief Moment* (1931), and *Biography* (1932). In the 1930s Behrman began to struggle with the incongruity of writing comedy in that grim wartime era. He tackled the subject of Fascism in *Rain from Heaven* (1934). But despite Behrman's increasing treatment of the serious political themes of the day, he was criticized for not making his personal viewpoint known, instead letting the characters speak for him. In response, Behrman wrote *No Time for Comedy* (1939), in which the protagonist, an author of light comedy, criticizes himself for his failure to address effectively serious contemporary problems.

Behrman wrote more than two dozen comedies during his 40-year career, and nearly every one of them was a hit. He also wrote many short stories, two biographies, and a number of screenplays.

Behzād, in full USTĀD KAMĀL AD-DĪN BEHZĀD (b. *c.* 1455?, Herāt, Khorāsān—d. *c.* 1536?, Tabrīz, Azerbaijan), major Persian painter whose style as a miniaturist and work as a teacher were vital influences on Persian Islāmic painting.

Orphaned at an early age, he was raised in the city of Herāt by the painter Mīrak Naqqāsh, who enjoyed the patronage of the Timurid princes who ruled the city. Behzād studied under his guardian and in 1486 became head of the Herāt academy, a post he held until 1506. Under his direction the academy became a greater centre of art than ever.

In 1506 Shāh Esmā'īl I, founder of Iran's Ṣafavid dynasty, conquered the city. In 1514

"The Building of the Famous Castle of Khawarnaq," miniature by Behzād, *c.* 1494, from the *Khamseh* of Neẓāmī; in the British Library (OR. MS. 6810 fol 154v)
By courtesy of the trustees of the British Library

Esmāʿīl's son Ṭahmāsp was made governor of Herāt, and when he returned to Tabrīz in 1522, Behzād returned in his train. At Tabrīz he continued to enjoy royal patronage and was named director of the royal library and placed in charge of the production of the elaborate illuminated and illustrated manuscripts. He held the post until his death.

Both as a teacher and painter Behzād was a leading force in the development of Tabrīz as a centre of art. His students included the painters Qāsim ʿAlī, Mīr Sayyid ʿAlī, Āqā Mīrak, and Muẓaffar ʿAlī.

A major problem in assessing Behzād's work precisely is the difficulty in identifying specific works as coming from his hand. His pupils worked closely to imitate his style. In addition, he became the standard of excellence in his own age and collectors of the time would identify works of excellence as being by Behzād with little or no supporting evidence. Behzād signed few of his paintings, and only 32 have been definitively attributed to him, all executed between 1486 and 1495.

While Behzād's work represents no radical departure from earlier styles, his skill, combined with his originality in picture composition and dramatic presentations and his superb knowledge of colour, made him the master painter of his time. In a style marked by harmony, humanism, and grace, he was able to free the miniature from stiffness in presentation and excessive concern with detail. Behzād injected new energy and realism into Persian painting.

Two of his earliest surviving works are signed illustrations for a manuscript of the Persian poet Saʿdī's classic *Golestān* ("The Rose Garden"). Five miniatures he contributed to a manuscript of Saʿdī's *Būstān,* copied in 1488 and now preserved in the Egyptian National Library at Cairo, are considered by many scholars to be the best surviving examples of his work. His painting of the building of the castle of Khawarnaq, done about 1494, clearly shows Behzād's ability to portray vividly a complex scene in a rich and fluid composition. The work shows careful observation and an ability to display significant detail while stripping away unimportant clutter.

Bei Wei DYNASTY: *see* Wei dynasty.

Beiderbecke, Bix, byname of LEON BISMARCK BEIDERBECKE (b. March 10, 1903, Davenport, Iowa, U.S.—d. Aug. 7, 1931, Long Island, N.Y.), American jazz cornetist, outstanding improviser and composer of the 1920s, and possibly the most original white trumpeter in jazz history.

Bix Beiderbecke
Brown Brothers

After attending Lake Forest Academy in suburban Chicago in 1923, Beiderbecke joined the Wolverines, a group of students whose standards as musicians were soon hopelessly outstripped by his own rapidly maturing sensibilities. He worked in Chicago in 1925, where he first heard and played with the great black innovators Louis Armstrong, King Oliver, and Jimmy Noone. In 1926 Beiderbecke joined Frank Trumbauer in St. Louis, with whom he maintained a close friendship for the rest of his life. He joined Jean Goldkette (1927) and the Paul Whiteman band (1928–30), but the last years of his life were plagued by illness.

His 1927 recordings "Singin' the Blues" and "A Good Man Is Hard to Find," which paired him with saxophonist Trumbauer, remain jazz classics. Beiderbecke's approach lived on in the playing of Jimmy McPartland and Bobby Hackett, as well as many lesser players, many of whom formed what was almost a cult of hero worshippers, possibly fueled by novels and films such as Dorothy Baker's *Young Man with a Horn,* a biographical novel based on Beiderbecke's life. His compositions include "In a Mist," a piano piece inspired by French Impressionist composers. A biography, *Bix: Man and Legend,* by Richard Sudhalter and Phillip Evans, was published in 1974.

Beihai (China): *see* Pei-hai.

Beijing (China): *see* Peking.

Beilby, Sir George Thomas (b. Nov. 17, 1850, Edinburgh—d. Aug. 1, 1924, Hampstead, London), British industrial chemist who developed the process of manufacturing potassium cyanide by passing ammonia over a heated mixture of charcoal and potassium carbonate. This process helped meet the increased demand for cyanide for use in extracting gold from low-grade ores.

After graduating from the University of Edinburgh, Beilby entered the oil-shale industry in 1869 and greatly increased the yield of paraffin and ammonia by introducing the continuous retort. In 1890 he turned his attention to the production of cyanide. Becoming interested in the destruction of metals by ammonia at high temperatures, Beilby undertook research on the flow of solids. He inferred that when a solid is caused to flow, as in polishing, the crystalline surface is broken down to a harder and denser layer. Although much criticized, this theory explained the hardening of metals under cold working and gave valuable stimulus to further research.

Beilby served as director of the Fuel Research Board from 1917 to 1923. He was president of the Institute of Chemistry (1909–12) and of the Institute of Metals (1916–18), was a fellow of the Royal Society of London (1906), and was knighted in 1916.

Beilstein, Friedrich Konrad (b. Feb. 17, 1838, St. Petersburg—d. Oct. 18, 1906, St. Petersburg), chemist who compiled the *Handbuch der organischen Chemie* (2 vol.; 1880–83; "Handbook of Organic Chemistry"), an indispensable tool for the organic chemist.

In 1866 Beilstein was appointed professor of chemistry at the Imperial Technological Institute, St. Petersburg. The first edition of his *Handbuch* gave a full account of the physical and chemical properties of 15,000 organic compounds. The second edition came out in three volumes from 1886 to 1889. Because of the rapid growth of organic chemistry, he turned the task over to the Deutsche Chemische Gesellschaft (German Chemical Society) in 1900. The fourth edition (27 volumes) of the *Handbuch* (commonly known as *Beilstein*) appeared in 1937 and is kept up to date by periodic supplements.

Beinum, Eduard (Alexander) van (b. Sept. 3, 1901, Arnhem, Neth.—d. April 13, 1959, Amsterdam), Dutch conductor, pianist, and violist who led orchestras in Europe and the United States.

At 17 Beinum entered the Amsterdam Conservatory after a year of playing in the string section of the Arnhem Philharmonic Orchestra. A series of minor appointments led to conductorships of the Haarlem Orchestra and Haarlem Roman Catholic Choir, posts that he held until 1931, the year he was made second conductor of the Amsterdam Concertgebouw Orchestra. In 1938 he was promoted to co-first conductor, sharing the position with Bruno Walter. When musical activity resumed after The Netherlands' liberation in 1944, he took over as that organization's conductor-in-chief, which he remained until his death. He also began touring extensively. He led the London Philharmonic from 1949 to 1951, encouraging and promoting the composer and first trumpet player Malcolm Arnold. His U.S. debut occurred in 1954 with the Philadelphia Orchestra, followed by a tour in the U.S. leading the Concertgebouw Orchestra. In 1956 he was named musical director of the Los Angeles Philharmonic.

Beinum conducted with economy, without using a baton or much gesticulation. Though conventional in his programming, his reputation was based on intelligent, uneccentric interpretations that paid careful attention to the score.

Beipiao (China): *see* Pei-p'iao.

Beira, port city, capital of Sofala Province, Mozambique, East Africa. Beira is situated on the Mozambique Channel (Indian Ocean) at the mouths of the Púngoè and Búzi rivers. It was founded in 1891 as the headquarters of the Companhia de Moçambique (Mozambique Company) on the site of an old Muslim settlement. The city's administration passed from the trading company to the Portuguese government in 1942. The port developed as a trade and transportation outlet for the products of Central Africa and as a transshipment point for coastal cargo. The city is the busy ocean terminus of railways from South Africa, Zimbabwe, Zambia, Zaire, and Malawi, and it serves as the main port for Zimbabwe and Malawi. Principal exports passing through Beira are ores, tobacco, food products, cotton, and hides and skins. The main imports are liquid fuels, fertilizers, wheat, heavy equipment, textiles, and beverages. A fishing harbour, which includes canneries, processing plants, and refrigerated stores, was constructed at Beira in the early 1980s. Repeated bombings of the Umtali to Beira railway line, first by Rhodesian guerrillas prior to Zimbabwe's independence in 1980 and then later in the early 1980s by the Mozambique National Resistance Movement (MNRM), resulted in frequent interruptions of rail service. Pop. (1970 prelim.) 113,770.

The railway station, Beira, Mozambique
J. Allan Cash—EB Inc.

Beira, former principality and historical province, north central Portugal, extending from the banks of the Rio Douro in the north

to the upper course of the Tagus in the southeast and from the Spanish frontier in the east to the Atlantic Ocean in the west. The region was reconquered from the Moors in the 8th century, but Moorish attacks continued until the 15th. It was also contested during the Portuguese–Castilian wars. In 1835, Beira was divided into the districts of Aveiro, Coimbra, Viseu, Guarda, and Castelo Branco. In 1936 three new provinces were created from its area of 9,233 sq mi (23,913 sq km); and in 1959 the provinces were replaced with new *distritos* (districts), eight of which compose at least parts of Beira. Aquilino Ribeiro, a regional writer, depicted rustic life in Beira. His last novel, *Quando os Lobos Uivam* (1958; *When the Wolves Howl*, 1963), was banned after its first printing because of his explicit description of working-class and peasant life.

Beirut, Arabic BAYRŪT, French BEYROUTH, city, capital, and chief port of Lebanon. The city, the largest in the country, is situated on the Mediterranean Sea, at the foot of the Lebanon Mountains. Beirut was long the hub of the economic, social, intellectual, and cultural life in the Arab Middle East, but its character has changed dramatically as a result of social and political turmoil, particularly since the 1970s.

The following article treats briefly the modern city of Beirut. Fuller treatment is provided in the following MACROPAEDIA articles. For history and contemporary life, *see* Beirut; for additional perspective on the city in its national context, *see* Lebanon.

Beirut is built on two hills, al-Ashrafīyah (in East Beirut) and al-Muṣayṭibah (West Beirut), which extend into the sea as a roughly triangular peninsula. A narrow coastal plain (as-Sāḥil) runs north–south in the adjacent hinterland. The climate is Mediterranean, with hot, humid summers and a short rainy season in winter.

Between 1952 and 1975 Beirut was an established banking centre for Arab wealth—largely invested in construction, commerce, and industry (food processing, textiles and shoes, and publishing)—and the city's economy flourished despite its political instability. International banking and business firms often based their Middle Eastern operations there, and the port's free zone served as a leading regional entrepôt. Beirut was also a major centre for Arab Middle Eastern and Western tourism.

By the 1950s few traces of the old city remained because of haphazard development, and those scattered remains were largely destroyed during the civil war of 1974–76 and its aftermath. Downtown Beirut (the old city) remains in ruins—a vacant belt between East and West Beirut in which fighting has continued. All business has moved out of this area and has relocated elsewhere. East Beirut emerged from the civil war with a monolithically Christian character, dominated by Christian militia, while predominantly Muslim West Beirut retains a few cosmopolitan areas, notably Ra's Bayrūt. The movement of Palestinian refugees since 1948, in and out of camps or urban enclaves at the edge of the city, has compounded the divided nature of Beirut.

The city's universities, notably the American University of Beirut and Beirut Arab University, have traditionally enjoyed fine reputations. The press has also preserved high standards.

Two principal highways link Beirut with points north and south along the coastline and with points east via al-Biqā' (Bekaa Valley) to Damascus. Rail lines connect with points north, east, and south. Beirut International Airport, located in the southern suburb of Khaldah, handles passenger and freight traffic, as does the port. Area city, 7 sq mi (18 sq km); metropolitan area, 26 sq mi (67 sq km). Pop. (1970 est.) city, 475,000; (1975 est.) metropolitan area, 1,172,000.

Beirut, American University of, private, nondenominational, coeducational international and intercultural university in Beirut, Lebanon, chartered in 1863 by the state of New York as the Syrian Protestant College. Classes started in 1866. Although founded by the American Protestant Mission to Lebanon, the school was set up as an autonomous organization and has no official relationship with any religious body. Its present name was adopted in 1920. The educational philosophy is similar to that of an American university, but its program is adapted to the educational needs of the Middle East; some 80 percent of its students come from the Arab countries of the Middle East and North Africa. A school of medicine was opened in 1867; a school of pharmacy in 1871; and a school of nursing and a hospital in 1905. All are important to the country, and the hospital was the main medical centre of Beirut during the Lebanese civil war of 1974–76.

beisa, African antelope, a race of the species *Oryx gazella. See* oryx.

Beisān (Israel): *see* Bet She'an.

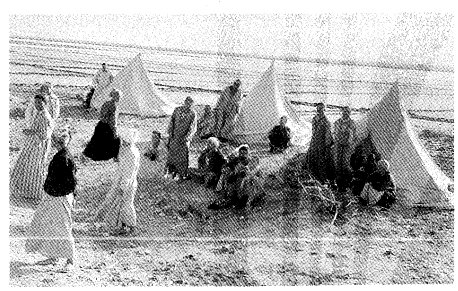
Beissel, (Johann) Conrad (b. April 1690, Eberbach, Palatinate—d. July 6, 1768, Ephrata, Pa.), founder of the Ephrata religious community (1732).

The posthumous son of a German baker, Beissel migrated to America in 1720 and joined the Dunkers in Pennsylvania (1724) but withdrew from them when he became convinced that the day of worship should be the seventh rather than the first day of the week. The community he organized and led followed his view that celibacy was a primary requirement for the religious person. He published several collections of hymns, including *Turtel Taube* (1747; "Turtle Dove"), which influenced American hymnology.

Beit Alpha, Alpha also spelled ALFA (Israel): *see* Bet Alfa.

Beit Bridge, town, Matabeleland South Province, Zimbabwe, near the bridge (named for Alfred Beit, British South African financier) across the Limpopo River. On the Transvaal (South African) border and opposite Messina, it is a port of entry and a customs and immigration post. The town, founded in 1929, was for many years the terminus of the railway from Pretoria, until a rail connection to Rutenga was built in 1974. It is a trading centre for cattle and irrigated crops (potatoes, melons, and tomatoes). Pop. (latest census) 1,920.

Beja, Arabic BUJAH, group of nomadic tribes occupying mountain country between the Red Sea and the Nile and 'Aṭbarah rivers from the latitude of Aswān to the Eritrean Plateau, that is, from southeastern Egypt through the Sudan



Nomad camp near the Red Sea, Egypt
F.Closs—Shostal Assoc./EB Inc.

and into Eritrea. Numbering about 1,100,000 in the 1980s, the Beja tribes are descended from peoples who have lived in the area since 4000 BC or earlier.

Some of the Beja speak a Hamitic language called To Bedawi and some speak Tigre; many also speak Arabic. They were Christian in the 6th century but have been Muslim since the 13th. Most of them prefer to live apart from their neighbours, and they are said to be indifferent to trade and modernization.

Essentially pastoralists, the Beja wander over vast distances with their flocks and herds of cattle and camels on whose produce—milk, butter, and meat—they subsist almost entirely.

The Beja trace their ancestry through the father's line, and their kinship organization resembles that of the Arabs. Authority is vested in the heads of kin groups. Men are permitted under Muslim law to have two or more wives, but only the rich do so. A man is expected to marry his father's brother's daughter, and livestock is presented to the bride's family. Boys are circumcised and girls are subjected to clitoridectomy. Formal groups based on age are lacking.

Beja, city, capital, and *concelho* (municipality), Beja district, southern Portugal, southeast of Lisbon. According to legend Beja was founded by Ulysses and was called Pax Julia by the Romans. Afonso I captured Beja in 1162 in his campaigns against the Muslims to extend his territories. The city has a castle built on Roman foundations and is the site of the convent where Maria Alcoforado (1640–1723), a nun, wrote the *Lettres portugaises,* love letters later important in French literature, to a French officer who had seduced her.

Beja district has an area of 3,948 sq mi (10,225 sq km) and is the largest in Portugal. It is a major producer of olives, olive oil, wheat, rye, cork, and dairy and leather products. Mining is planned to begin in 1986 near Beja city at the Castro Verde project for copper, silver, lead, and zinc. In 1974 the Portuguese government initiated an agrarian reform program by which most of the estate holdings of the district were forcibly reverted into cooperatives farmed by formerly landless agricultural workers. Reversed decisions by a new government, however, returned some of these holdings to their original owners beginning in 1978. Pop. (1981) city, 19,643; *concelho,* 38,246; district, 188,420.

Bejaïa, *wilāyah* (province, or *département*), northeastern Algeria, established in 1974 from a part of Sétif *wilāyah.* Abutting the Mediterranean Sea to the north, the *wilāyah* includes the southwest–northeast oriented valley of the Oued (stream) Soummam bordered by the coastal mountainous regions of Grand Kabylie (west) and the Petite Kabylie (east). It is bounded by the provinces of Tizi Ouzou (west), Bouira and Sétif (south), and Jijel (east) and embraces an area of 1,329 sq mi (3,442 sq km). Olives, citrus fruits, and cereals (wheat and barley) are cultivated in the Soummam Valley. Besides Bejaïa, the *wilāyah* capital and terminus of a Hassi-Messaoud oil pipeline, the major towns are Akbou, Sidi Aïch (Sidi Aiche) (near the Timezrit iron-ore mine), and Kherrata. The mountainous areas of the province are inhabited by the Kabyle, a Berber group. Pop. (1980 est.) 602,294.

Bejaïa, formerly BOUGIE, town, Mediterranean port and capital of Bejaïa *wilāyah* (province, or *département*), Algeria, at the mouth of the Oued (stream) Soummam. Sheltered by Djebel (mount) Gouraya (2,165 ft [660 m]) and Cap (cape) Carbon, it receives an annual average rainfall of 40 in. (1,000 mm) and is surrounded by a fertile plain. The older town, built on the mountain slope, descends to the French-built sector spread along the road to Algiers and containing the business and industrial quarters.

Ruins remain of the small Roman veterans' town of Saldae and of the successive Berber

settlement of the Bejaïa tribe, which gained importance as a fortified Ḥammādid capital in 1067. During the Middle Ages, Bougie was a pirate stronghold and was contested by various powers. It traded with Europe and introduced the wax candle (French: *bougie*). The Spanish occupation (1510–55), the town's subsequent capture by the Turks, and the predominance of Algiers relegated the port to minor importance until the French occupation (1833) and the improvement of its harbour (1905–09).

Bejaïa is a busy market town for the Kabylie area and exports minerals (iron ore, phosphates), foodstuffs (olive oil, wine), and cork. After 1959, with the arrival of the oil pipeline from Hassi Messaoud, it became a leading port for the shipment of Saharan oil. Pop. (1983 est.) mun., 124,122.

Béjart FAMILY, 17th-century French theatrical family closely associated with the playwright Molière. Its members include the brothers and sisters Joseph, Madeleine, Geneviève, Armande, and Louis.

Joseph Béjart (*c.* 1617–59) was a strolling player and later a member of Molière's first company (the Illustre Théâtre). Joseph accompanied Molière in his theatrical wanderings and was with him when he returned permanently to Paris, dying soon after. He created the parts of Lélie in *L'Etourdi* (1653; *The Blunderer*) and Eraste in *Le Dépit amoureux* (1654; *The Amorous Quarrel*).

His brother Louis Béjart (1630–78) was also in Molière's company during the last years of its travels and created many parts in Molière's plays—Valère in *Le Dépit amoureux,* Dubois in *Le Misanthrope* (1666), Alcantor in *Le Mariage forcé* (1664; *The Forced Marriage*), and Don Luis in *Dom Juan, ou le festin de Pierre* (1665; *Don John; or, The Libertine*). He was lamed in a brawl and retired with a pension in 1670.

The more famous members of the family were two sisters: Madeleine Béjart (1618–72) was at the head of the traveling company to which her sister Geneviève (*c.* 1622–75), who played under her mother's name (Hervé), and her brothers belonged, before they joined Molière in forming the Illustre Théâtre (1643). Madeleine remained with Molière until her death on Feb. 17, 1672. She was an excellent actress, particularly in soubrette parts, a number of which Molière wrote for her. Among her creations were Marotte in *Les Précieuses ridicules* (1659; *The Affected Young Ladies*), Lisette in *L'Ecole des maris* (1661; *The School for Husbands*), and Dorine in *Tartuffe* (1664–69).

Madeleine's sister, or possibly daughter, Armande (-Grésinde-Claire-Elisabeth) Béjart (1642–1700), seems first to have joined the company at Lyon in 1653. In 1662 Molière married her, he being then 40 and she 19. Neither was happy; the wife was a flirt, the husband jealous. They separated after the birth of a daughter in 1665 and met only at the theatre until 1671, when they were reconciled. Her portrait is given in Act iii, scene 9 of *Le Bourgeois gentilhomme* (1670; *The Bourgeois Gentleman*). Armande's first appearance on the stage was in 1663, as Élise in *La Critique de l'école des femmes* (*School for Wives*). She was out of the cast for a short time in 1664, when she bore Molière a son, but in the spring she started her long list of important roles. She was at her best as Celimène—really her own portrait—in *Le Misanthrope* and hardly less admirable as Angélique in *Le Malade imaginaire* (1674; *The Imaginary Invalid*). She was Elmire in the first performance of *Tartuffe,* and was Lucile in *Le Bourgeois gentilhomme.*

After Molière's death Armande leased the Théâtre Guénégaud, Paris, and by royal ordinance the residue of her company was combined with the players from the failing Théâtre du Marais. The combination, known as the Troupe du Roi, at first was unfortunate, but in 1679 they secured the services of Marie Champmeslé, one of the leading tragediennes of her time, and absorbed the company of the Hôtel de Bourgogne, in Paris. The combined company became the Comédie Française. In 1677 Armande married the actor Isaac-François Guérin d'Estriché. She retired in 1694 and died six years later.

Béjart, Maurice, pseudonym of MAURICE-JEAN DE BERGER (b. Jan. 1, 1928, Marseille), French-born dancer, choreographer, and opera director known for his style of combining classic ballet and modern dance with jazz, acrobatics, and musique concrète (composition by tape recordings).

After studies in Paris, Béjart toured with the Ballets de Paris de Roland Petit (1947–49), the International Ballet (1949–50), and the Royal Swedish Ballet (1951–52). In 1954 he founded Les Ballets de l'Étoile (later Ballet Théâtre de Maurice Béjart), for which he choreographed his masterwork, *Symphonie pour un Homme Seul.* His other ballets include *Voilà l'homme, Promethée,* and *Sonate à trois.* In 1960, following his successful ballet version of Igor Stravinsky's masterpiece *Le Sacre du printemps* (1959), he became director of ballet at Brussels' Théâtre Royal de la Monnaie, and that same year he became artistic director of the Ballet du XX^{e} Siècle (Ballet of the Twentieth Century), which became one of the foremost dance companies in the world. Béjart's productions with the Twentieth Century troupe were notable for their flamboyant theatricality and their innovative reworking of traditional music and dance materials, often in an unusual and controversial fashion.

In 1961 Béjart launched his career as an opera director with Offenbach's *Tales of Hoffmann,* followed, in 1964, by Berlioz's *Damnation of Faust.* His original works include a musical, *The Green Queen* (1963), and such ballets as *Bolero* (1960), *Ninth Symphony* (1964), *Firebird* (1970), *Nijinsky, Clown of God* (1971), and *Notre Faust* (1975).

bejel, form of endemic (nonvenereal) syphilis occurring among Bedouin tribes and elsewhere in the Middle East.

Although endemic syphilis differs clinically from sporadic (venereal) syphilis, both are diagnosed by the same tests, treated by the same drugs, and caused by the same parasite (*Treponema pallidum*); both cause the same fundamental pathological changes in the tissues. Bejel, however, is rarely transmitted congenitally or through sexual contact; it spreads by contact from child to child in an unhygienic environment. The infection appears first as an eruption on the mouth and skin. The profuse rash, extremely contagious and persisting for a year or more, eventually fades into latency; the blood test remains positive. Later, the early stage may relapse or latency may be terminated by the late stage of the disease, which is characterized by soft, gummy ulcers of the skin, the bones, and the centre of the face, a patchy loss of skin pigment, and other conditions. Involvement of the central nervous system is uncommon.

Bekaa (Lebanon): *see* Biqāʿ, al-.

Bekabad, city, Tashkent *oblast* (province), Uzbek Soviet Socialist Republic. It lies along both banks of the Syr River at the extreme southern tip of the *oblast.* The town arose originally in connection with a cement plant and until World War II was known as a cement and cotton centre. During World War II a small steel plant was constructed in Bekabad. It uses scrap and some pig iron brought from Karaganda and Novokuznetsk to produce steel and rolled products. An important early source of power was the small Farkhad hydroelectric station completed in 1948 (126 megawatts), later augmented by hydroelectric and thermal power stations nearby at Shirin. Pop. (1987 est.) 80,000.

Beke, Charles Tilstone (b. Oct. 10, 1800, Stepney [now in Greater London]—d. July 31, 1874, Bromley, Kent [now in Greater London], English biblical scholar, geographer, and businessman who played an important role in the final phase of the discovery of the sources of the Nile River.

After beginning a business career (1820), Beke turned to the study of law. His interest in ancient and biblical history led him to publish *Origines Biblicae, or Researches in Primeval History* (1834), which examined history in the light of geological principles. In 1840 Beke went to Ethiopia to explore the area, establish commercial relations with the inhabitants, and help abolish the slave trade. His commercial venture was unsuccessful, but he ascertained the approximate course of the Blue Nile, mapped about 70,000 square miles (180,000 square km) of the country, and also compiled vocabularies of 14 Ethiopian dialects. In 1845 he sponsored an expedition that tried to explore the sources of the White Nile from the East African coast. This venture, though uncompleted, may have inspired the Nile explorations of John Hanning Speke of England in the 1850s.

Beke traveled through Syria, Palestine, and Egypt (1861–62) and returned to Ethiopia in 1865, where his knowledge of the interior proved valuable to the British mission of 1868, which had been sent to secure release of the imprisoned consul and other British subjects. In 1873 he went in search of the true Mount Sinai, which he thought to be at the head of the Gulf of Aqaba. Among his writings were *An Essay on the Nile and Its Tributaries* (1847) and *The Sources of the Nile* (1860).

Békés, *megye* (county), southeastern Hungary, occupying 2,175 square miles (5,632 square km) of agricultural flatland on the Great Hungarian Plain. It has hot summers, severe winters, light rainfall, and a sparse natural vegetation. In the northern part of the *megye,* broad areas along the Körös and Berettyó rivers are irrigated. In addition to cereals, specialty crops of poppy seeds and sour cherries are produced. Cattle, pigs, and poultry are raised. Békéscsaba (*q.v.*), the *megye* seat, is a market centre. At Gyula, meat (notably sausage), vegetable, and dairy products are packaged. In the vicinity of Orosháza are several government experimental farms, where hybrid cereal strains have been tested and produced. Békés *megye* is known in Hungarian history as "stormy corner" because of continual agitation by its peasants for land reforms. Pop. (1986 est.) 422,000.

Békéscsaba, town, seat of Békés *megye* (county), southeastern Hungary. A central point for road and rail communications, it is also connected by canal with the Körös River and serves as an agricultural and industrial centre for a large fertile countryside. A 13th-century Roman Catholic church (rebuilt in the 18th century) is evidence of the town's long occupation. The settlement in the 18th century grew into a giant village with extensive territory. Two marked characteristics have been the relatively large size of the Slovak population (more than 50 percent) in the early 20th century and a strong tradition of Lutheranism. In 1950 the surrounding agricultural area was separated from the town in the major administrative restructuring that took place under the People's Republic. To its traditional industries (flour milling, warehousing of foods, tobacco production, and the making of the local *Csabai kolbász* [sausage]) have been added poultry packaging, clothing manufacture, and production of machine tools and bricks. Békéscsaba is a long-established cultural centre for the

large Slovak population in the district. Pop. (1983 est.) 68,000.

Békésy, Georg von (b. June 3, 1899, Budapest—d. June 13, 1972, Honolulu), U.S. physicist and physiologist who received the 1961 Nobel Prize for Physiology or Medicine for his discovery of the physical means by which sound is analyzed and communicated in the cochlea, a portion of the inner ear.

As director of the Hungarian Telephone System Research Laboratory (1923–46), Békésy worked on problems of long-distance communication and became interested in the mechanics of human hearing. At the telephone laboratory, the University of Budapest (1939–46), the Karolinska Institutet, Stockholm (1946–47), and Harvard University (1947–66), he conducted intensive research that led to the construction of two cochlea models and highly sensitive instruments that made it possible to understand the hearing process, differentiate between certain forms of deafness, and select proper treatment more accurately.

Since the mid-19th century, it had been known that the vibratory tissue most important for hearing is the basilar membrane, stretching the length of the snail-shaped cochlea and dividing it into two interior canals. Békésy found that sound travels along the basilar membrane in a series of waves, and he demonstrated that these waves peak at different places on the membrane: low frequencies toward the end of the cochlea and high frequencies near its entrance, or base. He discovered that the location of the nerve receptors and the number of receptors involved are the most important factors in determining pitch and loudness. Békésy became professor of sensory sciences at the University of Hawaii in 1966. His books include *Experiments in Hearing* (1960) and *Sensory Inhibition* (1967).

Bekhterev, Vladimir Mikhaylovich (b. Feb. 1 [Jan. 20, old style] 1857, Sorali, Vyatka, Russia—d. Dec. 24, 1927, Moscow), Russian neurophysiologist and psychiatrist who studied the formations of the brain and investigated conditioned reflexes.

Bekhterev received a doctorate from the Medical-Surgical Academy of St. Petersburg (now Leningrad) in 1881 and then was awarded a fellowship to study and conduct research abroad, working with Jean Charcot and others. He returned to Russia in 1885 to become professor of psychiatric diseases at the University of Kazan, where he established the first laboratory of experimental psychology in Russia the next year. There he began clinical research into mental disorders, which he continued after being named professor of psychiatry at the Military Medical Academy, St. Petersburg (1893). He founded a psychoneurological institute there in 1907 and served as its director even after he was forced to resign his medical school appointment under government pressure in 1913. He was restored to favour following the Russian Revolution of 1917 and chaired the department of psychology and reflexology at the University of Petrograd from 1918 until his death.

An academic competitor of Ivan Pavlov, Bekhterev independently developed a theory of conditioned reflexes, studying both inherited and acquired reflexes in the laboratory. He also accumulated a considerable volume of data on skeletal reflexes that was later applied in neurology. Bekhterev's most lasting work was his research on brain morphology and his original description of several nervous symptoms and illnesses. He discovered the superior vestibular nucleus (Bekhterev nucleus), as well as several other previously unknown brain formations. He also described numbness of the spine (Bekhterev's disease) and new forms of syphilitic-sclerosis, motor ataxia, and spondylitis.

Bekhterev founded the *Nevrologichesky Vestnik* ("Neurology Journal"), the first Russian journal on nervous diseases, in 1896. His insistence on a purely objective approach to the study of behaviour and his conviction that complex behaviours could be explained through the study of reflexes influenced the growing Behaviourist movement of psychology in the United States. Among his more significant writings are *Conduction Paths in the Brain and Spinal Cord* (1882; 2nd ed., 1896) and *Objective Psychology* (1907).

Bekker, August Immanuel (b. May 21, 1785, Berlin—d. June 7, 1871, Berlin), classical scholar who prepared critical editions of many Greek writers.

Appointed professor of philosophy at Friedrich-Wilhelm University, Berlin, in 1810, Bekker travelled over the next decade in France, Italy, England, and Germany, examining classical manuscripts, gathering materials for his editions, and publishing some results of his research in *Anecdota Graeca* (1814–21; "Greek Anecdotes"). He approached nearly the whole of Greek literature, except tragedy and lyric poetry, and relied solely on manuscripts to make his critical revisions. His best known editions include those of Plato (1816–23), Aristophanes (1829), Aristotle (1831–36), and *Corpus Scriptorum Historiae Byzantinae,* 25 vol. (*c.* 1850; "Body of Writings of Byzantine History"). The only Latin authors he edited were Livy and Tacitus.

Bektāshīyah, Order of Turkish dervishes founded, according to their own traditions, by Ḥājjī Bektāsh Walī of Khorāsān in the 13th century and given definitive form by Bālım Sulṭān in the 16th century. Although they proclaim themselves Sunnī Muslims, their doctrine is strongly syncretistic and Shīʿī, with an admixture of Christian elements, apparently as a result of adapting to beliefs of local populations. Bektāshīyah recognize 12 *imāms* (spiritual leaders) and worship ʿAlī, the fourth caliph, as a member of a trinity with Allāh and Muḥammad; they practice a type of communion, distributing wine, bread, and cheese at the acceptance of new members, and confess to their superiors. Individual liberty is highly valued, while the performance of the traditional Islāmic rituals is referred to as "hypocrisy."

The Bektāshīyah acquired political importance in the 15th century, when the order dominated the Janissaries, an elite Ottoman military body, but their influence declined when the corps was dissolved in 1826. The order underwent a revival in the late 19th century, particularly evident in Bektāshī literary activity, and was active in Turkey until 1925, when all dervish orders were dissolved. Most Bektāshīyah emigrated to the Balkans, primarily Albania; there monastery is at Tirana. *See also* dervish; imām.

Bel (Akkadian), Sumerian ENLIL, Mesopotamian god of the atmosphere and a member of the triad of gods completed by Anu (Sumerian An) and Ea (Enki). Enlil meant Lord Wind: both the hurricane and the gentle winds of spring were thought of as the breath issuing from his mouth, and eventually as his word or command. He was sometimes called Lord of the Air.

Although An was the highest god in the Sumerian pantheon, Enlil had a more important role: he embodied energy and force but not authority. Enlil's cult centre was Nippur. Enlil was also the god of agriculture: the Myth of the Creation of the Hoe describes how he separated heaven and earth to make room for seeds to grow. He then invented the hoe and broke the hard crust of earth; men sprang forth from the hole. Another myth relates Enlil's rape of his consort Ninlil (Akkadian Belit), a grain goddess, and his subsequent banishment to the underworld. This myth reflects the agricultural cycle of fertilization, ripening, and winter inactivity.

The name of his Akkadian counterpart, Bel, is derived from the Semitic word *baal,* or "lord." Bel had all the attributes of Enlil, and his status and cult were much the same. Bel, however, gradually took on the character of a ruler and came to be thought of as the god of order and destiny. Ironically, Bel could also be a scourge to man: in Akkadian myth, Bel looses the flood on mankind. Eventually Marduk, the Babylonian god, took on the attributes of the Akkadian Bel. In Greek writings references to Bel indicate this Babylonian deity and not the Syrian god of Palmyra of the same name.

Bel and the Dragon, in full THE HISTORY OF THE DESTRUCTION OF BEL AND THE DRAGON, Greek apocryphal addition to the biblical Book of Daniel. It is a deuterocanonical work in that it is accepted in the Roman canon but not by Jews or Protestants, in which the Jewish hero Daniel refuses to worship the god Bel and kills the dragon, thus being forced into a den of lions from which he is allowed to leave after seven days because he is unharmed. His enemies, advocates of idolatry, are later cast into the lions' den and devoured.

bel canto (Italian: "beautiful singing"), style of operatic singing that originated in Italian singing of polyphonic (multipart) music and Italian courtly solo singing during the late 16th century and that was developed in Italian opera in the 17th, 18th, and early 19th centuries. Using a much smaller dynamic range than became common in the late 19th and 20th centuries, bel canto singing was based on an exact control of the intensity of vocal tone, a recognition of the distinction between the "diapason tone" (produced when the larynx is in a relatively low position), and the "flute tone" (when the larynx is in a higher position), and a demand for vocal agility and clear articulation of notes and enunciation of words.

Among the masters of bel canto were the male soprano Farinelli (1705–82), the tenor Manuel del Popolo García (1775–1832), his daughter, the dramatic soprano Maria Malibran (1808–36), and the soprano Jenny Lind (1820–87). The technique of bel canto had died out by the turn of the 20th century, partly as a result of the demand for louder singing as orchestras became larger.

bel fruit, bel also spelled BAEL, also called BENGAL QUINCE (*Aegle marmelos*), fruit of the bel tree of the family Rutaceae, found wild or cultivated throughout India. The trees bear strong spines; alternate, compound leaves, each with three leaflets; and panicles of sweet-scented white flowers. The tree is valued for its fruit, which is oblong to pyriform in shape

Bel fruit (*Aegle marmelos*)
Walter Dawn

and 50–250 millimetres (2–10 inches) in diameter and has a gray or yellow rind and a sweet, thick, orange-coloured pulp. The unripe fruit, sliced and sun dried, is traditionally used as a remedy for dysentery; the ripe fruit is sweet, aromatic, and cooling. The wood is yellowish white and hard but not durable.

Bel-usur: *see* Berosus.

Béla III (d. 1196), king of Hungary (1173–96) under whom Hungary became the leading power of south central Europe.

Béla was educated at the Byzantine court and placed on the throne by force of arms by the Byzantine emperor Manuel I Comnenus in 1173. He made the Hungarian monarchy hereditary by naming his infant son, Imre, his successor. He also made his court among the most brilliant in Europe. Béla adopted Roman Catholicism, sought the assistance of Rome, and established close ties with France. Upon the death of his first wife, Anne of Châtillon, he married Margaret, sister of Philip II Augustus of France. Many leading Hungarian diplomats were educated in Paris during his reign, and the Cistercian and Premonstratensian monks he invited to Hungary introduced advanced agricultural methods there.

Internationally, Béla was only partly successful in his attempts to recover Dalmatia in two bloody wars with Venice (1181–88 and 1190–91), but he did help the Raskan Serbs gain independence from the Greeks and establish a native monarchy. He tried to make Galicia an appanage of his younger son Andrew, and he aided the Byzantine emperor Isaac II Angelus against the Bulgars. Béla III was one of the stronger rulers from the house of Árpád.

Béla IV (b. 1206—d. May 3, 1270), king of Hungary (1235–70) during whose reign the Mongol invasions left three-quarters of Hungary in ruins. He was the son of Andrew II.

Béla IV, seal, 1251; in the Hungarian National Museum, Budapest

By courtesy of the Magyar Nemzeti Muzeum, Budapest

Routed on the banks of the Sajó River in 1241 by Mongols under Batu Khan, Béla fled to Dalmatia, and for a year the kingdom of Hungary did not exist. So nearly complete was the country's destruction that Hungarians, when referring to total calamity, use the word *tatárjárás,* meaning Tatar invasion.

When the Mongols withdrew because of dynastic troubles, Béla began to reconstruct his realm, a task that occupied the rest of his reign. Particularly difficult was the recovery of western portions of the kingdom seized by Frederick of Austria as the price of the aid he promised against the Mongols but never delivered. Béla defeated Frederick, who died in the battle near the Leitha River on June 15, 1246. Three years earlier Béla had been forced to cede Zadar to Venice, but he retained Split and other Dalmatian provinces. Because of his policy of religious toleration in Bosnia, that province remained quiet for years.

Béla fought wars with the new Serbian kingdom, founded by the Nemanja dynasty, and was frequently in conflict with Otakar II over Styria, which ultimately fell to the Bohemians. Béla turned back a second Mongol invasion of Hungary in 1261, and he resisted the Přemyslid dynasty, which had constructed a new Bohemian empire, absorbing territories of the Austrian Babenbergs and threatening Hungary itself. Among the two sons and seven daughters Béla had by his consort, Maria, daughter of the Byzantine emperor of Nicaea, Theodore II Lascaris, St. Margaret of Hungary was the most famous.

Belaia Tserkov (Ukrainian S.S.R.): *see* Belaya Tserkov.

Bélain, Pierre, SIEUR (sire) D'ESNAMBUC (b. 1585, Alouville, Fr.—d. 1637), French trader who in 1635 established the first colony for the Compagnie des Îles d'Amérique on the Caribbean island of Martinique, the first permanent French colony in the West Indies.

Born in Normandy, Bélain founded (1625 or 1627) a short-lived French colony on St. Kitts, which was then occupied by the British. He landed on the site of Saint-Pierre, Martinique, on Sept. 1, 1635, and on September 17 he formally took possession of Martinique for King Louis XIII and the Compagnie (the island of Guadeloupe was seized by other French traders-explorers the same year). In the year of Bélain's death his nephew Dizel du Parquet became captain general of Martinique.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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Belait River, Malay SUNGAI BELAIT, short stream on the island of Borneo, politically in Brunei, near its far southwest border with the Malaysian state of Sarawak. It flows southeast–northwest through swampy terrain for about 20 mi (32 km), and discharges into the South China Sea. At its mouth is Kuala Belait (*q.v.*), one of Brunei's important towns, and the centre of an oilfield.

Belaja Cerkov' (Ukrainian S.S.R.): *see* Belaya Tserkov.

Belalcázar, Sebastián de, Belalcázar also spelled BENALCÁZAR, or BELAICÁZAR, also called SEBASTIÁN MOYANO (b. *c.* 1495, Benalcázar, Spain—d. 1551, Cartagena, New Granada), Spanish conqueror of Nicaragua, Ecuador, and southwestern Colombia, captured Quito and founded the cities of Guayaquil in Ecuador and Popayán in Colombia.

Going to the New World in 1519, he became an officer in the forces of Pedro Arias Dávila and in 1524 conquered Nicaragua. Joining Francisco Pizarro's expedition to Peru in 1531, he was given command of the supporting base at Piura. In 1533 he set out to conquer what is now Ecuador. Defeating the Inca chief Rumiñahui, Belalcázar occupied the Indian city of Quito on Dec. 6, 1534. In 1535 he founded a settlement that was later moved to a more healthful site and developed into the modern Guayaquil. Leading an expedition in search of Eldorado (a legendary city abounding in gold), he entered the Popayán region of Colombia, founded the city of Popayán in 1537, and became governor of the district.

The close of Belalcázar's life was embittered by disputes with other Spanish leaders. He died while under indictment for the killing of one of them, Jorge Robledo.

Bélanger, François-Joseph (b. 1744, Paris—d. May 1, 1818, Paris), architect, artist, landscape designer, and engineer, best known for his fantastic designs for private houses and gardens in pre-Revolutionary France.

Bélanger was educated at the Collège de Beauvais, where he was taught physics by the Abbé Nollet and studied architecture under J.-D. Leroy. He visited England at least once, and the sketchbook that survives is a rare record of the view by a French architect of late 18th-century England.

Bélanger was an unusually adept manipulator of social connections. He became the lover of Sophie Arnould, the prima donna of the Paris Opéra, and through her met his most important patron, the Comte d'Artois, Louis XVI's youngest brother, who commissioned both the gardens of Beloeil (in Belgium) and Bagatelle. Bélanger completed Bagatelle's pavilion in 64 days in 1777 to win a wager between the Comte and his sister-in-law Marie-Antoinette.

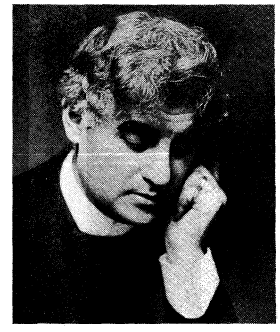
Bélanger's landscaping was a principal force in the development of the so-called English garden in France. His best known gardens are at Beloeil and Bagatelle, and at Neuilly and Méréville. The garden at Bagatelle was described as ridiculous by the Scottish gardener Thomas Blaikie (whose plans Bélanger altered), but Bélanger went even farther in the nearby Folie Saint-James, where he constructed the famous Grand Rocher, an artificial rock with a Doric portico set into it, known in its time as the "eighth wonder of the world."

The major works of Bélanger's last years were the abattoirs at Rochechouart and the immense cupola of the Halle au Blé (1808–13), the first iron and glass dome in architectural history.

Belas Artes, Museu Nacional de (Rio de Janeiro art museum): *see* Museu Nacional de Belas Artes.

Belasco, David (b. July 25, 1853, San Francisco—d. May 14, 1931, New York City), theatrical producer and playwright whose important innovations in the techniques and standards of staging and design were in contrast to the quality of the plays he produced.

As a child actor Belasco appeared with Charles Kean in *Richard III* and later played in stock companies touring the mining camps. During this period he served also as secretary to the playwright Dion Boucicault. From 1873 to 1879 he worked in several San Francisco theatres as actor, manager, and play adapter and in the latter year toured in *Hearts of Oak,* which he wrote in collaboration with James A. Herne.



Belasco

By courtesy of the Library of Congress, Washington, D.C.

Belasco moved to New York in 1880, becoming associated there with the Frohmans as manager of the Madison Square Theatre and later of the Lyceum. In 1890 he leased a theatre and became an independent producer. Feeling the pressure of the monopolistic Theatrical Syndicate, he built his own theatre in 1906.

Belasco was the first U.S. producer whose name, regardless of star actor or play, attracted patrons to the theatre. He chose unknown actors and elevated them to stardom. He also preferred playwrights whose success depended upon his collaboration. He gained a reputation for minute attention to detail,

for sensational realism, for lavish settings, for astonishing mechanical effects, and for his experiments in lighting. Belasco maintained a large permanent staff that worked constantly to perfect surprising effects. This work led to the virtual elimination of footlights and to the first lensed spotlights.

As a result, he brought a new standard of production to the American stage. Many critics, however, deplored his theatricalism, his lack of artistic judgment, and his failure to encourage the better dramatists who were then emerging in the United States and Europe.

Belasco claimed to have been connected with the production of 374 plays, most of them written or adapted by himself. His better known productions include *The Heart of Maryland* (1895); *Madame Butterfly* (1900) and *The Girl of the Golden West* (1905), both turned into the operas by Giacomo Puccini; *Du Barry* (1901); *The Music Master* (1904); and *Lulu Belle* (1926). He also wrote the autobiographical *The Theatre Through Its Stage Door* (1919). Because of his austere, clericlike dress and personal manner he came to be known as the bishop of Broadway.

Belau (country, Pacific Ocean): *see* Palau.

Belaúnde Terry, Fernando (b. Oct. 7, 1912, Lima, Peru), statesman, architect, and president of Peru (1963–68, 1980–85), known for his efforts at democratic reform and his pro-U.S. stance.

Belaúnde
Flash Press

Belaúnde, a member of a distinguished aristocratic Peruvian family, studied architecture in the United States and France in 1924–35 and practiced briefly in Mexico before returning to Peru in 1936, where he became a noted architect and founded the architectural magazine *Arquitecto Peruano.* He served in the Chamber of Deputies (1945–48) while his father, Rafael Belaúnde Diez Canseco, was prime minister. After a military coup in 1948 overthrew the government, the younger Belaúnde returned to his post as dean of the School of Architecture in the National University of Engineering.

With the restoration of free elections in 1956, Belaúnde formed the Acción Popular (Popular Action) and ran unsuccessfully for president as its candidate. Six years later he placed a close second, but the lack of the required one-third of the total vote by any candidate and Belaúnde's charges of fraud led to a temporary military takeover. In the new election of June 1963, Belaúnde received a satisfactory 40 percent of the vote and set about forming a reformist coalition. His program of land reform and road building to open the Amazon Valley to settlement progressed, but he was frustrated in much of the rest of his domestic policy by a Congress under opposition control. His administration sought to maintain close relations with the United States, supporting its Alliance for Progress program for development of Latin America.

Public outcry over an agreement with a U.S. corporation, the International Petroleum Company, on the development of oil fields in northern Peru led to Belaúnde's deposal by a military junta in October 1968. He fled to the United States, returned to Peru in December 1970, and was again exiled from January 1971 until his return in January 1976. In May 1980, in the first presidential elections since his deposal, he defeated 14 other candidates. Although he returned freedom of the press to Peru, Belaúnde was baffled by a high inflation rate, a huge foreign debt, and violent attacks by the Shining Path terrorist group. Resentment over his austerity measures and his inability to control the military in its fight against terrorists led to his crushing electoral defeat in May 1985. Belaúnde, a prolific writer, is the author of *La conquista del Perú por los Peruanos* (1959; *Peru's Own Conquest*).

Belavin, Vasily Ivanovich: *see* Tikhon.

Belawan, also called BELEWAN DELI, the most important port in northeastern Sumatra, on Pulau (island) Belawan, located at the estuary of the Deli and Belawan rivers in Sumatera Utara *propinsi* (North Sumatra province), Indonesia. It exports tobacco, rubber, tea, resin, copra, spices, palm oil, and sisal and imports foodstuffs and manufactured goods. It is 12 mi (19 km) from Medan, which it serves as a port, and is the terminus of a railway that crosses the channel south of the island by bridge. Originally dredged and constructed by the Dutch in the first two decades of the 20th century, the modern port of Belawan is being refurbished to handle the rapidly increasing traffic of Medan. Pop. (1980) 81,165.

Belaya Tserkov, also spelled BELAIA TSERKOV, or BELAJA CERKOV', city, Kiev *oblast* (administrative region), Ukrainian Soviet Socialist Republic, on the Ros River. Founded in the 11th century, Belaya Tserkov (White Church) long remained a minor regional centre. In modern times industry has developed, including machine building, tire production, furniture making, canning, flour milling, and the making of knitwear. A feature of the city is the large Aleksandriya Park, landscaped in the 18th century and containing many exotic botanical species. The city has an agricultural institute. Pop. (1985 est.) 181,000.

Bełchatów, city, Piotrków *województwo* (province), south central Poland, forming part of the industrial triangle of Bełchatów, Szczerców, and Kamieńsk. Bełchatów is 15 mi (25 km) west of the provincial capital, the city of Piotrków Trybunalski. Linen is the city's major product, but it is surrounded by farmlands that produce rye and potatoes.

A major lignite deposit was discovered in 1960 near Bełchatów, and work on a mining and power-generating project was begun there in 1975 as part of the development of an industrial complex. Bełchatów's population quadrupled between the mid-1970s and the mid-1980s. Pop. (1985 est.) 45,400.

Belcher, Sir Edward (b. 1799, Halifax, Nova Scotia—d. March 18, 1877, London), naval officer who performed many coastal surveys for the English Admiralty.

After serving as a surveyor with an expedition to the Pacific and the Bering Strait in 1825, Belcher commanded a surveying ship along the north and west coasts of Africa (1830–33). He undertook a voyage to the west coasts of North and South America, the South Pacific, and China (1836–42) and a subsequent voyage to China, Borneo, the Philippine Islands, and Formosa (1843–46).

Belcher, engraving, *c.* 1875
BBC Hulton Picture Library

In 1852 Belcher was given command of an Arctic expedition to search for the explorer Sir John Franklin, who was lost in attempting to find the Northwest Passage. The hardships of the voyage seemed to tax Belcher beyond his abilities: he ordered four ice-bound ships abandoned in May 1854, apparently without justification. Relieved of further command, he described his Arctic venture in *The Last of the Arctic Voyages* (1855). Knighted in 1867, he became an admiral in 1872.

Belcher, Jonathan (b. Jan. 8, 1682, Cambridge, Mass.—d. Aug. 31, 1757, Elizabethtown, N.J.), colonial governor and merchant who was an early patron of the College of New Jersey (Princeton).

After graduating from Harvard College in 1699, Belcher traveled in Europe before returning to Boston, where he became a prosperous merchant. He formally entered Massachusetts politics in 1718, when he was elected to the Governor's Council, and he was reelected seven times during the next decade.

In 1728 the Massachusetts legislature appointed Belcher to represent them in London in their dispute over Gov. William Burnet's salary, and the Connecticut Assembly then selected Belcher to represent their interests in a judicial matter. When news of Governor Burnet's death reached England shortly after his arrival, Belcher seized the opportunity to obtain a commission in January 1730 for the governorship of both New Hampshire and Massachusetts.

Belcher's tenure as chief executive of those two royal colonies was marked by several contentious issues. They included the continuous conflict with the legislative lower house over the governor's salary, the question of the extent of royal prerogative, land speculation in the eastern counties (Maine), attempts to establish an inflationary "land bank" scheme in Massachusetts, and a serious boundary dispute involving Massachusetts and New Hampshire. The boundary dispute ultimately brought his opponents success in obtaining his removal from both governorships in May 1741.

A few years later Belcher sailed to England. He successfully reingratiated himself with the British government and was appointed governor of New Jersey. He assumed his duties in the royal colony in August 1747. His term as New Jersey's governor was more tranquil than his administration in New England and was perhaps most notable for his assistance to the College of New Jersey, which was founded in 1746.

Belcher Islands, archipelago in southeastern Hudson Bay, north of the mouth of James Bay, and part of Keewatin District, Northwest Territories, Canada. The islands, lowlying and striated, cover an area of about 5,000 sq mi (13,000 sq km), of which 1,118 sq mi (2,896 sq km) is land. The group, first sighted by Henry Hudson in 1610 and named for Sir Edward Belcher, who commanded an Arctic expedition in search of Sir John Franklin, was not explored and mapped until 1915. Large deposits of iron ore underlie the Belcher and neighbouring Nastapoka islands. The sparse population is served by a Hudson's Bay Company trading post (established 1928) at Sanikiluag. There is air service from Timmins, Ont., to the islands.

Belcredi, Richard, Graf (Count) (b. Feb. 12, 1823, Ingrowitz, near Svitavy (Zwittau),

Moravia—d. Dec. 2, 1902, Gmunden, Austria), statesman of the Austrian Empire who worked for a federal constitution under the Habsburg monarchy, taking the Swiss constitution as his model. His "Ministry of Counts" (July 27, 1865–Feb. 3, 1867) advocated conservative federalism under which the Slavs' historic rights would be recognized instead of subsumed by those of the Germans and Magyars.

Belcredi, engraving from a drawing by Fritz Kriehuber

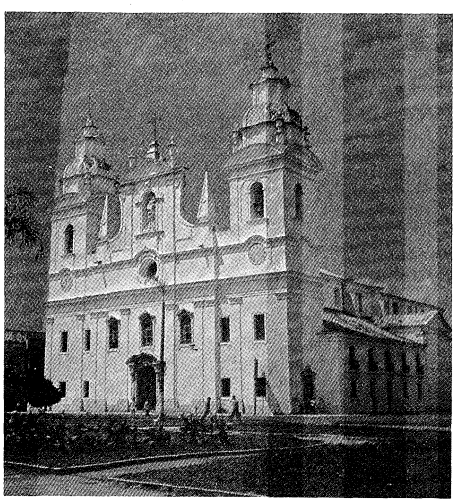
By courtesy of Bild-Archiv, Österreichische Nationalbibliothek, Vienna

Born into a Moravian landowning family, Belcredi entered the civil service (1842) and became governor of Silesia (1860) and *Statthalter* (imperial representative) at Prague (1864). After succeeding Anton von Schmerling as prime minister, he revoked (Sept. 20, 1865) the "February Patent" of 1861 (intended to constitute Austria as a centralized, German-speaking state) as a concession to the Slavic groups, especially the Czechs. He also established Czech as a language of instruction in the Bohemian schools, where only German had been permitted. These measures angered the Germans who had the confidence of the emperor Francis Joseph I.

The success of Belcredi's Slav policy in conciliating the Czechs to rule from Vienna was obscured by Austria's defeat in the Seven Weeks' War with Prussia and Italy (1866). The postwar settlement between Austria and Hungary which precluded Slav autonomy, caused Belcredi to resign. Fearing Belcredi's influence among the Slavs, the Emperor forbade him to return to his home in Moravia. Later (1881–95) he served as president of the Austrian administrative court.

Belcy (Moldavian S.S.R.): *see* Beltsy.

Belém, also called PARÁ, city and port, capital of Pará state, northern Brazil, on the Baía do Guajará (Guajará Bay), part of the vast Amazon Delta), near the mouth of the Rio Guamá, about 80 mi (130 km) up the Rio Pará from the Atlantic. Its climate is equatorial, with an average annual temperature of 80° F (27° C) and an annual rainfall of 86 in. (2,175 mm).



The cathedral at Belém, Braz.

Art Resource—EB Inc.

In 1616 the fortified settlement of Feliz Lusitânia, later called Nossa Senhora de Belém do Grão Pará (Our Lady of Bethlehem of the Great Para River) and Santa Maria de Belém (St. Mary of Bethlehem), was established, consolidating Portuguese supremacy over the French in what is now northern Brazil. Belém was given city status in 1655 and was made the state capital when Pará state was separated from Maranhão in 1772. The early decades of the 19th century were marked by political instability. Uprisings and internecine strife were finally ended in 1836, after considerable loss of life.

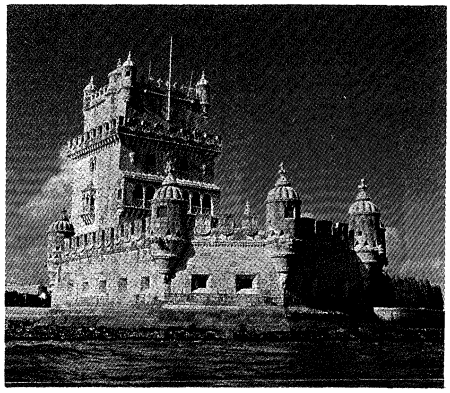
The sugar trade was important in the Belém region until the end of the 17th century. Thereafter the city's economic importance alternately rose and fell. Cattle ranching supplanted sugar until the 18th century, when cultivation of rice, cotton, and coffee became profitable. With the settlement of southern Brazil, where such crops could be produced more reasonably, Belém declined again. The city subsequently became the main exporting centre of the Amazon rubber industry, and by 1866 its position was further enhanced by the opening of the Amazon, Tocantins, and Tapajós rivers to navigation. The rubber era terminated after the boom of 1910–12, but Belém continued to be the main commercial centre of northern Brazil and the entrepôt for the Amazon Valley.

The most valuable products now exported from the Amazon by way of Belém are nuts (chiefly Brazil nuts), black pepper, cassava, jute, wood veneers, and aluminum. Japanese immigration after the 1930s was an important factor in developing jute and black pepper, notably at Tomé-Açu, just south of Belém, and near Santarém. Marajó Island, the largest fluvial island in the world, which lies just across the Rio Pará from Belém, has some livestock grazing.

Belém has a modern appearance with tree-lined streets, several plazas and public gardens, and many noteworthy buildings. The north's leading educational and cultural centre, it is the seat of a bishopric, and its cathedral, founded in 1917, is one of Brazil's largest. Santo Alexandre, the oldest of Belém's churches, was built in 1616. The Museu (museum) Paraense Emílio Goeldi, the Teatro da Paz (a classical theatre), and the public library and archives are other notable institutions. The Universidade Federal do Pará (1957) is in the city, which also has a teachers' training school, an agricultural institute, and an institute for research on tropical diseases.

Belém is the main port for Amazon River craft and is served by international and coastal shipping and by inland vessels south to Brasília. Paved roads extend to Piavi and Goiás states. A railway leads 145 mi east-northeast to Bragança, and Belém's international airport is northern Brazil's largest. Pop. (1980 prelim.) 758,117.

Belém, also called SANTA MARIA DE BELÉM, *freguesia* (parish) within the western limits of the city of Lisbon. A former royal residence, Belém (Bethlehem) is known for its Manueline (early 16th-century) architecture, notably the Jerónimos monastery, founded by Manuel I in 1499 in honour of the explorer Vasco da Gama's discovery of a sea route to India, and the white Tower of Belém, built in 1515–21 to protect the entrance of the Tagus. Also notable are the Paço de Ajuda (begun 1802, never completed), a former royal palace, and the Paço de Belém (1770), the official residence of the president of Portugal. The latter

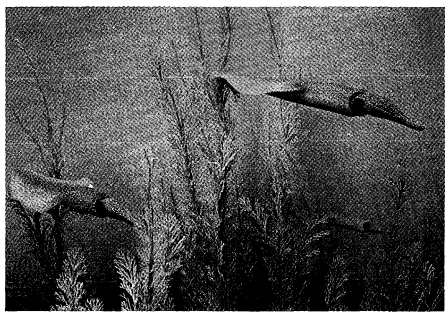


Tower of Belém, Lisbon

Porterfield-Chickering—Photo Researchers

contains the National Coach Museum, and there is also a museum of popular art, with an extensive collection of Portuguese folk art. Pop. (1981 prelim.) 17,299.

belemnoid, also called BELEMNITE, member of an extinct group of cephalopods, animals related to the modern squid and octopus but possessing a large internal shell, that first appeared about 345,000,000 years ago, during the Mississippian Period, and became extinct during the Eocene Epoch, which ended about 38,000,000 years ago. The internal shell was straight in most species but was loosely coiled in some. The shell was complex in structure and served for support and muscle attachment and as a hydrostatic device enabling the animal to compensate for depth and its own body weight.



Reconstruction of squidlike belemnoid cephalopods from the Cretaceous System, southern Tennessee

By courtesy of the American Museum of Natural History, New York

During the Jurassic and following Cretaceous periods, the belemnites reached their greatest diversity and abundance. It is probable that the belemnoids originated from the more primitive simple-shelled nautiloid cephalopods, animals related to the modern pearly nautilus. Many distinctive and easily recognized belemnoids are known. Some are of widespread occurrence and allow correlation of widely separated rocks.

Belenus (Celtic: possibly, Bright One), one of the most ancient and most widely worshipped of the pagan Celtic deities; he was associated with pastoralism. A great fire festival, called Beltine, was held on May 1 and was probably originally connected with his cult. On that day the cattle were purified and protected by fire before being put out to the open pastures for the summer. Despite associations of his name with fire or the sun, Belenus was not a sun god; in fact, there is no Celtic evidence for the worship of the sun as such, even though it was often used in religious imagery.

There are about 31 extant dedications to Belenus, an unusually high number for a religion that specialized in the number and diversity of its divine names and epithets. The cult of Belenus was practiced in northern Italy, Noricum in the eastern Alps, southern Gaul, and probably Britain.

Bélep, Îles, coral island group in the French overseas territory of New Caledonia, southwestern Pacific Ocean. Comprising Île Pott and Île Art (the largest, 10 mi [16 km] by 3 mi) and several islets, they lie within the northern continuation of the barrier reef that surrounds the main island of New Caledonia. Their total land area is 26 sq mi (67 sq km). Pop. (1981 est.) 703.

Belesme, Robert of: *see* Robert of Belesme.

Belfast, Irish BÉAL FEIRSTE, city, district, and capital of Northern Ireland, on the River Lagan, at its entrance to Belfast Lough (inlet of the sea). It became a city by royal charter in 1888. After the passing of the Government of Ireland Act, 1920, it became the seat of the government of Northern Ireland. The district (former county borough) boundaries of Belfast were expanded to 44 sq mi (115 sq km) after the local government reorganization of 1973.

The site of Belfast was occupied during both the Stone and Bronze ages, and the remains of Iron Age forts are discernible on the slopes near the city centre. A castle, probably built there about 1177 by John de Courci, the Norman conqueror of Ulster, seems to have survived until the beginning of the 17th century. The city's name is derived from the Gaelic *Béal Feirste* (Mouth of the Sandbank [or Crossing of the River]). Belfast's modern history began in 1611 when Baron Arthur Chichester built a new castle there. He did much to encourage the growth of the town, which received a charter of incorporation in 1613. Belfast survived the Irish insurrection of 1641, and by 1685 it had a population of about 2,000, largely engaged in brick, rope, net, and sailcloth making. By the late 1730s the castle had been destroyed, but Belfast was beginning to acquire economic importance, superseding both Lisburn as the chief bridge town and Carrickfergus as a port. It became the market centre of the Ulster linen industry, developed by French Huguenot refugees under the patronage of William III of Great Britain at the end of the 17th century. Attempts to establish a cotton industry there were short-lived, but following mechanization of the spinning and weaving of linen, Belfast became one of the greatest linen centres in the world. By the 17th century, the town was a busy port with small shipbuilding interests, which became firmly established after William Ritchie founded a shipyard (1791) and a graving (dry) dock (1796). Since the Industrial Revolution, the chief shipbuilding firm has been Harland and Wolff (builders of the ill-fated "Titanic"), whose yard now covers about 300 ac (120 ha) and contains facilities for building vessels up to 1,000 ft (300 m) in length. Since 1975 the firm has been completely owned by the Northern Ireland department of commerce and produces steel plates for bridges as well as supertankers. At the same time, Belfast has continued to develop as a port. The city was severely damaged by air raids in 1941.

A Roman Catholic civil rights campaign was inaugurated in Ulster in 1968, and from 1969 street riots and increasing violence took place in Belfast. After British troops were called in to police Catholic–Protestant disorders, the riots were marked by an increased use of firearms and bombs by both Catholic and Protestant extremists and by the slaying of civilians, police, and soldiers by the Provisional (radical) faction of the Irish Republican Army (IRA) gangs. Unremitting violence continued into the 1980s.

The city is the shopping, retail, educational, commercial, entertainment, and service centre for Northern Ireland. Chief exports are ships, aircraft, agricultural produce and livestock, and linen textiles. Other industries include tobacco and food processing.

Educational institutions in Belfast include Queen's University at Belfast (founded in 1845 as the Queen's College), the Presbyterian College (1847), and the Royal Belfast Academic Institution (1810). Nearby is Stormont (*q.v.*), the seat of the government of Northern Ireland. From the city's airport at Aldergrove, 13 mi (21 km) northwest, services are maintained with some principal international cities; there are steamship links with Heysham, Liverpool, and Manchester in England, Glasgow and Ardrossan in Scotland, and Holyhead in Wales. Belfast suffered a pronounced population decline between 1971 and 1981 as a result of the sectarian violence and the planned economic development of outlying areas. Pop. (1971) city, 362,082; district (according to post-1973 boundaries), 416,679; (1981) district, 295,223.

Belfast, city, seat (1827) of Waldo County, southern Maine, U.S., on the Passagassawakeag River where it empties into Penobscot Bay on the Atlantic coast, opposite Castine, 34 mi (55 km) south-southwest of Bangor. First settled in 1770 and named for Belfast, Ire., it early developed as a seaport and became a port of entry. Distinguished architecture of the sailing era remains. Its harbour is now used mainly by tugboats and pleasure craft. Tourism, the sardine and poultry industries, ski apparel and shoe factories are its main economic assets. Fort Knox and Lake St. George state parks are nearby. Inc. town, 1773; city, 1853. Pop. (1980) 6,243.

Belfast Lough, inlet of the North Channel that connects the Irish Sea with the Atlantic, 12 mi (20 km) long and 3 to 5 mi (4.8 to 8 km) wide, indenting the northeastern coast of Ireland. Its sheltered harbour facilitated the growth of Belfast as a city and port, and its shores were sites of early settlements, including those at Whiteabbey, Carrickfergus, and Bangor. To the north is the elevated basaltic Antrim Mountains, and to the south are the older Ordovician and Silurian rocks.

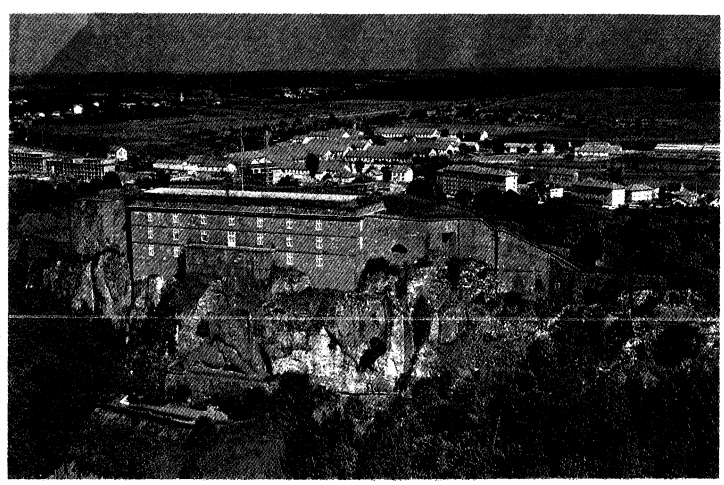
Belfort, town, capital of the Territoire de Belfort, Franche-Comté region, eastern France, on the Savoureuse River, southwest of Mulhouse. Inhabited in Gallo-Roman times, Belfort was first recorded in the 13th century as a possession of the counts of Montbéliard, who granted it a charter in 1307. Passing later to the archdukes of Austria, it was ceded by the Treaty of Aix-la-Chapelle (1648) to Louis XIV, who gave it to Cardinal Mazarin. Because it controlled the strategic Trouée de Belfort, between the Vosges and the Jura, the town was often besieged. In World War I it was successfully defended by the French, but it was occupied by the Germans in World War II. Its fortified old quarter, on the east bank of the Savoureuse, contains the castle and public buildings. In front of the *hôtel de ville* (1721–24) is F.A. Bartholdi's majestic statue, the "Lion of Belfort" (36 ft [11 m] high, 72 ft [22 m] long), which commemorates the 104-day siege of the Franco-German War (1870–71). Belfort has electrical, metallurgical, and textile industries, and trades in Alsatian wines, brandy, and cereals. Pop. (1982) 51,034.

Belfort, Territoire de, *département,* Franche-Comté region, Alsace-Lorraine, eastern France, formed from the southern portion of the Haut-Rhin *département,* bounded on the south by Switzerland and on the north by the Vosges. To the north, the south face of the Vosges rises to 4,094 ft (1,248 m) in the Ballon d'Alsace, and to the south are the wooded hills around Delle that comprise the northernmost part of the Jura. Between the two is the Trouée (depression) de Belfort known as the Belfort Gap or Burgundy Gate, 15–20 mi (24–32 km) wide, a strategic passageway connecting the Rhine Valley with the Paris Basin, which carries the link canal as well as important roads and railroads. A third of the territory's 236 sq mi (610 sq km; one of the smallest administrative units in France—it received its departmental status in 1922) is arable land, forest, and pasture. Industry is centred at the towns of Belfort, Delle, and Beaucourt. The territory comes under the court of appeal, the *académie,* and the bishopric of Besançon. From early times the historic gap has been commanded by the fortress town of Belfort. When the rest of Alsace-Lorraine was ceded to Germany (1871–1919), the territory was retained by France. Pop. (1982) 131,999.

belfry, bell tower, either attached to a structure or freestanding. More specifically, it is the section of such a tower where bells hang, and even more particularly the timberwork that supports the bells.

Etymologically, belfries have nothing to do with bells. The word is derived from the French *berfray* or a similar word used in the Middle Ages to denote a wooden tower employed in besieging fortifications. The word assumed its current use through a popular association of it with "bell."

The belfrey, called by that name, is a prominent feature of Belgian Gothic architecture, especially in Flanders where a flat countryside heightens the dramatic impact of towers. The Halles (Market Hall) and belfrey at Brugge (late 13th century) is typical. Medieval England's best example is the church of St. Andrew, Heckington, Lincolnshire, which displays the familiar attached steeple. This belfry has louver windows allowing the bells to be heard clearly while being sheltered from the weather.



The "Lion of Belfort" built of Vosgian sandstone, in front of the castle and Hôtel de Ville (town hall), Belfort, Fr.

Editions "La Cigogne"—Hachette

A bell cote, or cot, is a bell gable, or turret, a framework for hanging bells when there is no belfry. It may be attached to a roof ridge, as an extension of the gable, or supported by brackets against a wall.

Belgae, any of the inhabitants of Gaul north of the Sequana and Matrona (Seine and Marne) rivers. The term was apparently first applied by Julius Caesar. Evidence suggests that the Romans penetrated into those areas about 150 BC.

The Belgae of Gaul formed a coalition against Caesar after his first Gallic campaign but were subdued the following year (57 BC). One northern tribe, the Eburones, revolted in 53 and slaughtered 15 Roman cohorts; in revenge they were virtually exterminated, and new tribes crossed the Rhine to replace them.

During the first half of the 1st century BC, Belgae from the Marne district had crossed to Britain and had formed the kingdom that in 55 BC was ruled by Cassivellaunus (*q.v.*). After further Gallic victories (54–51 BC) by Caesar, other settlers took refuge across the Channel, and Belgic culture spread to most of lowland Britain. The three most important Belgic kingdoms, identified by their coinage, were centred at Colchester, St. Albans, and Silchester. The chief Belgic contribution to southern Britain was the introduction of the heavy plow, which was used to clear many lands previously untillable.

Belgaum, town, administrative headquarters of Belgaum district, northwestern Karnātaka (formerly Mysore) state, southern India. Located in the Western Ghāts at an elevation of 2,500 ft (760 m) above sea level, the town dates from the 12th century. It later exercised strategic control over the plateau routes to Goa and the western coast. Its early name, Venugrama, is said to be derived from the bamboos characteristic of the region. A melting pot for the Kannaḍa, Koṅkaṇī, Marāṭhī, and Goan cultures, modern Belgaum includes the original cantonment, site of a 16th-century oval stone fortress and of two Jaina temples, and the suburbs of Shāhpur and Mādhavpur.

The town is a busy trading centre on the National Highway, with rail connections north to Pune (Poona) and south to Bangalore. It has cotton weaving, leather, clay, soap, pottery, and metal-utensil works. Shāhpur is known for goldwork and silverwork, and nearby Sambre has an airport. There are colleges of medicine, commerce, science, education, and law affiliated with Karnātak University in Dhārwār, which lies to the southwest.

The district (5,178 sq mi [13,410 sq km]) is drained by the Krishna and Malprabha rivers and has rich bauxite deposits. The Malprabha Project irrigates a wide area (millet, cotton, rice, and tobacco). Ancient temples and sculptured caves at Bādāmi, Aivalli, and Pattadakal are examples of post-Gupta (6th–8th century) architecture. Copper-plate inscriptions of the Kādamba kings of Goa (11th–13th century) were found in the vicinity. Apart from Belgaum town, the main population centres are Khānāpur, Londa, Rāmdurg, Jamkhandi, and Athni. Pop. (1981) town, 274,430; metropolitan area, 300,372; district, 2,980,440.

Belgian Congo, French CONGO BELGE, former colony (coextensive with modern Zaire) in Africa, ruled by Belgium from 1908 until 1960. It was established by the Belgian parliament to replace the previous, privately owned Congo Free State (*q.v.*), after international outrage over abuses there brought pressure for supervision and accountability. The official Belgian attitude was paternalism: the Africans were to be cared for and trained as if they were children. They had no role in legislation, but traditional rulers were used as agents to collect taxes and recruit labour. Uncooperative rulers were deposed. In the late 1950s, when France and the United Kingdom worked with their colonies to prepare for independence, Belgium still portrayed the Congo as an idyllic example of parent-child relationships between Europeans and Africans.

Private European and U.S. corporations invested heavily in the Belgian Congo after World War I. Large plantations (growing cotton, oil palms, coffee, cacao, and rubber) and livestock farms were developed. In the interior, gold, diamonds, copper, tin, cobalt, and zinc were mined; the colony became an important source of uranium for the United States during World War II. Africans worked the mines and plantations as indentured labourers on four- to seven-year contracts, in accordance with a law passed in Belgium in 1922. Roads, railroads, electric stations, and public buildings were constructed by forced labour.

Resistance challenged the colonial regime from the beginning. A rebellion that broke out in several eastern districts in 1919 was not suppressed until 1923. Anti-European religious groups active by the 1920s included Kibangism and the Negro Mission in the west and Kitawala in the southeast. Unrest increased in the depression years (1931–36) and during World War II. Because political associations were prohibited, reformers organized into cultural clubs such as Abako, a Bakongo association formed in 1950. The Congo National Movement was founded in 1958 by Patrice Lumumba, and riots broke out in Leopoldville (now Kinshasa) in January 1959. Belgium suddenly capitulated and arranged for the Congo to become an independent republic on June 30, 1960. *See also* Zaire, Republic of.

Belgian Congo dog: *see* basenji.

Belgian horse, breed of heavy draft horse descended from the Flemish "great horse," the medieval battle horse native to the Low Countries. An old breed, Belgians were considerably improved after 1880. In 1866 the first Belgian was taken to the United States, where the breed was well accepted but was never as popular as the Percheron (*q.v.*).

Docile and patient in nature, Belgians have thick muscles, heavy bodies, and short legs. They average 16 to 17 hands (64 to 68 inches, or 163 to 173 centimetres) tall and weigh 1,800 to 2,200 pounds (820 to 1,000 kilograms). Although the Flemish horse was black, Belgians are usually bay, chestnut, sorrel, or roan in colour. The organization preceding the Belgian Draft Horse Corporation of America was established in 1887.

Belgian literature, the body of written works produced by Belgians and written in Flemish (the Netherlandic language as spoken in Belgium, and equivalent to Dutch), in French, or in Walloon dialects. Culturally speaking, Flemish-language literature in Belgium forms an integral part of Dutch literature, while French-language literature in Belgium is part of French literature.

A brief treatment of Belgian literature follows. For full treatment, *see* MACROPAEDIA: Belgian Literature.

Flemish-language literature in Belgium. The Belgian Territories, where Flemish was spoken, were united with the Netherlands until 1579, when the northern (Reformed) provinces seceded from the Roman Catholic south. Thus until the early 17th century the literatures of Flanders and Holland are considered as a whole (*see* Dutch literature).

As the northern provinces became the independent Dutch Republic, the south remained in Spanish (subsequently Austrian) hands and stagnated economically and culturally, although many Flemish authors still produced works of merit. The revival did not come until the early 19th century, with the Flemish Movement. While Karel Lodewijk Ledeganck was a Romantic poet, the prolific Hendrik Conscience wrote historical and social novels. The Realist novel found able exponents in Anton Bergmann and Virginie Loveling. The outstanding poetic talent of the century, however, was the West Fleming Guido Gezelle. Around the turn of the century the periodical *Van Nu en Straks* ("Of Now and Later") brought together the critic August Vermeylen, the poets Prosper van Langendonck and Karel van de Woestijne, and the novelists Stijn Steuvels and Herman Teirlinck. During and after World War I the regionalist novel flourished and the radical innovator Paul van Ostaijen introduced the poetry of European Modernism. On the whole the novel dominated the interwar period, with the major practitioners being Maurice Roelants, Gerard Walschap, and especially Willem Elsschot and the consummate stylist Maurice Gilliams. Since World War II the traditional novel has been represented by Marnix Gijsen and Piet van Aken and the more experimental novel by Louis-Paul Boon and the versatile Hugo Claus; the latter is also a playwright and, with Hugues Pernath and Paul Snoek, one of the major postwar poets.

French-language literature in Belgium. French literary writings are found early on in Flanders, Picardy, and Wallonia; the 9th-century *Cantilène de Sainte Eulalie* may have originated in what is now Belgium. Among the early texts are the 12th-century novella *Aucassin et Nicolette,* part prose and part verse, and probably from Hainaut; the *Farce du garçon et de l'aveugle* from Tournai; the Liège *Poème moral;* the rhymed chronicles of Philippe Mousket; and the epic works of Jean de Thuin. The satirical *Roman de Renart* went through several versions, of which *Le couronnement de Renart* is the most interesting. The 13th-century Brabant poet Adenet le Roi wrote love lyrics and epic works, such as *Cléomadès.* In the 14th century Jean le Bel's chronicles provided Jean Froissart with a model. It was at the 15th-century Burgundian court that the lively *Cent nouvelles nouvelles* came into being and that the chroniclers Georges Chastellain and Philippe de Commynes wrote. The Reformation found a strong apologist in the bilingual Philips van Marnix.

In contrast to France, however, the 17th and 18th centuries were barren, with the exception of Charles Joseph, prince de Ligne. While André van Hasselt was the poet of Romanticism, the latter half of the 19th century was overshadowed by two novelists, the Naturalist Camille Lemonnier and Charles de Coster. The turn of the century was dominated by the writers who contributed to the reviews *La Jeune Belgique* and *La Wallonie* and by the poets and dramatists of the Symbolist movement such as Georges Rodenbach, Émile Verhaeren, Maurice Maeterlinck, Charles van Lerberghe, and Max Elskamp. In the 20th century the major dramatists are Fernand Crommelynck and Michel de Ghelderode. The novel is represented by Franz Hellens, Charles Plisnier, Marie Gevers, and the popular and prolific Georges Simenon. Among the most noted poets are Marcel Thiry, Jean de Bosschère, Maurice Carême, and the Surrealist Henri Michaux.

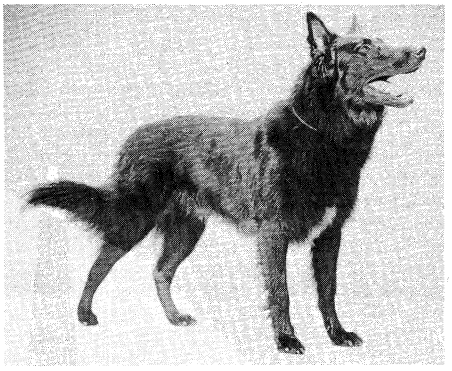
Walloon literature. Local dialects of French and Latin gave rise to a distinct literature in the provinces of Hainaut, Liège, Namur, Luxembourg, and southern Brabant, which formerly were known as Wallonia. The earliest of these vernacular writings date from the 12th century, and for the next three centuries Walloon writers mainly produced local chronicles and religious dramas.

In the 17th century the city of Liège became a centre of Walloon literary activity, and a Walloon theatre company was formed there in the 18th century. The founding in 1856 of the Société Liégeoise de Littérature Wallonne

encouraged the use of the Walloon dialects in literature, and local poets and playwrights in particular reflected the major trends in European literature.

In the 20th century dialect studies undertaken by scholars renewed interest in Walloon dialects, and literary possibilities were expanded by the standardizing of rules of spelling and grammar.

Belgian sheepdog, also called GROENENDAEL, working dog developed in the village of Groenendaal, Belg., in 1885. A long-haired black dog, the Belgian sheepdog has a relatively



Belgian sheepdog
Walter Chandoha

pointed muzzle and erect, triangular ears. It is valued for intelligence and for working ability; in addition to herding sheep, it has been useful as a military dog, guard, and guide for the blind. Typically strong and agile, it stands 22 to 26 inches (56 to 66 centimetres) and weighs 50 to 60 pounds (23 to 27 kilograms). The Belgian sheepdog is one of several shepherd dogs developed in Belgium. As a result of breeding for ability rather than appearance, there were about seven varieties of sheepherding dogs in Belgium in the late 1800s, when attempts were begun to standardize the appearance of the animals. In addition to the black-haired form, the American Kennel Club also recognizes as distinct breeds the Belgian Tervuren, a long-haired dog with black-tipped, reddish brown hair, which has proved to be especially adept at obedience work, and the Belgian Malinois, a short-haired, grayish brown and black dog resembling the German shepherd. The Malinois has been considered to be a particularly excellent sheepdog, both because of its abilities and because it is almost invisible at night.

Belgic Confession, Latin CONFESSIO BELGICA, statement of the Reformed faith in 37 articles written by Guido de Brès, a Reformer in the southern Low Countries (now Belgium) and northern France. First printed in 1561 at Rouen, it was revised at a synod in Antwerp in 1566, was printed that same year in Geneva, and was subsequently translated into Dutch, German, and Latin. It was accepted by synods at Wesel (1568), Emden (1571), Dort (1574), and Middelburg (1581) and was further revised and given final acceptance at the Synod of Dort in 1619.

Originally written in French, the Belgic Confession closely followed the French, or Gallican, Confession of 1559; it is somewhat less elaborate than that creed, however, especially in treating the doctrines of the Trinity, the Incarnation, the church, and the sacraments. It became the standard creed of the Reformed Church of the Netherlands and of Reformed churches of Dutch background in the United States, which adopted a translation of a Latin version prepared for the Synod of Dort. *See also* Gallican Confession.

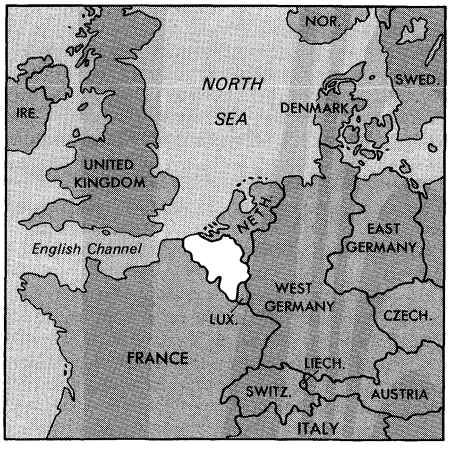
Belgica, in full GALLIA BELGICA, one of the four provinces of Gaul under the Roman Empire. As established by Augustus (27 BC), Belgica stretched from the Seine to the Rhine, including the Low Countries in the north and the Helvetian territory in the south. Its capital was Durocortorum Remorum (now Reims, Fr.). Under the Roman emperor Domitian (AD 81–96) the northern and southernmost parts of Belgica were made into the separate provinces of Germania Inferior and Germania Superior. Under Diocletian (*c.* AD 300) the remainder was divided into Belgica Prima (capital, Augusta Treverorum, modern Trier, W.Ger.) and Belgica Secunda (capital, Durocortorum Remorum). In the 5th century, Belgica was absorbed into the kingdoms of the Salian and Ripuarian Franks.

Belgioioso, town, Pavia province, Lombardia (Lombardy) region, northern Italy, on the left bank of the Po River. Situated in an area of well-irrigated plateaus, the town is the agricultural and commercial centre for an area producing grain, cheese, and swine. A medieval castle, remodelled in 16th-century style but with the original facade preserved, faces the town and an aqueduct constructed during the 14th century by Galeazzo II Visconti of Milan. During the period preceding the unification of Italy, Belgioioso was the seat of a secret political society. Pop. (1981 prelim.) mun., 5,240.

Belgioioso, Baltazarini di (composer and choreographer): *see* Beaujoyeulx, Balthazar de.

Belgium, officially KINGDOM OF BELGIUM, Dutch KONINKRIJK BELGIË, French ROYAUME DE BELGIQUE, one of the smallest nations of Europe, located in the northwestern part of the continent and covering an area of 11,784 sq mi (30,521 sq km). The capital is Brussels. Belgium extends about 120 mi (193 km) from north to south and about 150 mi (at its widest) from east to west. It is bounded by The Netherlands on the north and northeast, West Germany and Luxembourg on the east, France on the south and southwest, and a 41-mi-long stretch of the North Sea on the northwest. The population in 1981 was estimated at 9,863,000.

The article that follows is a summary of significant detail about Belgium. Fuller treatment is provided in the following MACROPAEDIA articles. For geography and history, *see* Low Countries; for information about the country, its history, and its peoples in their regional setting, *see* Europe. For information about its capital city, *see* Brussels.



Belgium

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Geographically, Belgium can be divided into three major (south to north) regions. Upper, or High, Belgium consists of the densely forested Ardennes highland, which extends south of the Sambre-Meuse Valley and includes Mt. Botrange (2,277 ft [694 m] above sea level), Belgium's highest point. Middle Belgium (200 to 600 ft above sea level), comprising undulating loess plains and the Central Plateau, is a fertile region dissected by tributaries of the Schelde (Escaut) River. Lower Belgium, part of the great European Plain, comprises the flat, low-lying (up to 330 ft above sea level) plain of Vlaanderen (Flanders) in the northwest and Kempenland (Campine) plateaus in the northeast. This occasionally marshy and wooded region is crisscrossed by an extensive network of shipping canals and waterways. The North Sea coastal region (10 to 30 mi wide) is a continuous band of sand dunes and polders (land reclaimed from the sea and protected by dikes) and is agriculturally prosperous. There are numerous irrigation and shipping canals. The Meuse and Schelde, the principal rivers, are important commercial arteries; they have large drainage basins (1,400 and 1,232 sq mi, respectively) in the southeast (Upper Belgium) and the northwest (Lower Belgium).

The temperate, maritime climate has relatively cool summers and mild winters and is characterized by wet westerly and southwesterly winds. The average winter temperature varies from 37° F (3° C) in the coastal areas to 32° F (0° C) in the centre and to 30° F (−1° C) in the Ardennes; the corresponding summer temperatures are 61° F (16° C), 66° F (19° C), and 57° F (14° C). The annual average precipitation is about 30 to 40 in. (750 to 1,000 mm). The climate is favourable for abundant growth of grass and for the cultivation of potatoes, green forage, sugar beets, chicory, and flax. Average yields of wheat, sugar beets, potatoes, and milk are considerably higher than those of other European Economic Community (EEC) countries and are among the highest in the world. Livestock breeding and raising and milk production are highly developed.

Belgium is only moderately endowed with natural mineral resources. Its coal deposits are located in the Sambre-Meuse Valley and in the Kempenland region. Small deposits of iron ore, lead, zinc, copper, and antimony exist in the Ardennes. There are also considerable supplies of building stone, including granite, sandstone, and marble.

The people. Because Belgium's birth and death rates (12.7 births and 11.6 deaths per 1,000) are nearly identical and in- and outmigration fairly balanced, the growth rate is only 0.07 percent. Flemish Belgium, the Dutch-speaking region, has a growth rate of 3.2 per 1,000. Since World War II the growth rate of the foreign population has exceeded that of the native Belgian's. Belgium's population older than 60 years (21 percent) is almost as large as its population younger than 15 years (23 percent). Life expectancy is 67.8 years for males and 74.2 for females. Infant mortality is only 11.9 per 1,000 live births.

Ethnic groups consist mostly of Flemings (58 percent of the population) who speak Flemish, a form of Dutch, and Walloons (41 percent) who speak a dialect of French. Approximately one-tenth are bilingual and a tiny minority speak German. Three-quarters of the population is Roman Catholic, the remainder predominantly Protestant.

The Brussels metropolitan area expanded during the 1970s while the rural areas in the provinces of Hainaut, West-Vlaanderen, and Oost-Vlaanderen lost population. Population density averages 842 inhabitants per sq mi (325 per sq km) but varies from fewer than 130 persons per sq mi on the Ardennes and Condroz plateaus to 50,000 per sq mi in certain communes within the Brussels metropolitan area. Belgium is highly urban, with only 7 percent of the population living outside cities. Brussels' metropolitan area had a population of 997,293 and the city 139,678, according to

the 1981 census. Charleroi had 222,343; Lige, 214,119.

The economy. Belgium has a developed market economy largely based on services, international trade, and light and heavy industries. Economic growth has favoured northern Belgium over the south, where mining and heavy industries are in decline. The Société Générale, which was founded in 1822 and is now a holding company, controls much of the country's production of coal, steel, nonferrous metals, and electricity; five other companies control a large portion of Belgium's industrial output. The gross national product (GNP) totalled U.S. $119,770,000,000 in 1980; the GNP per capita, which has grown more rapidly than the population, was $12,180.

The agricultural sector accounts for less than 3 percent of the GNP and employs roughly the same percentage of the work force. The government has sponsored the consolidation of farms, which tend to be small and highly fragmented. Most farms are worked by tenant farmers who are protected by the government; the government and the EEC have subsidized training and retirement programs for farmers. The Boerenbond Belge, Unions Professionelles Agricoles, and Alliance Agricole Belge represent the interests of Belgian farmers and offer members technical and organizational assistance.

The steel industry, which relies on imported iron ore, was reorganized in 1980 and has been subsidized by the government. Large quantities of petroleum are imported from Saudi Arabia.

Manufacturing industries account for one-fourth of the GNP and employ a comparable fraction of the work force. Metalworking is the leading industry and largely produces for export. Other manufactures include beverages, chemicals, rubber, textiles, ceramics, glass, and cement.

Production of electricity reached 53,646,000,000 kW-hr in 1980 and was largely generated from domestic and imported fuels; more than one-fourth was generated from nuclear power. Most electric utilities are privately owned.

The Confédération des Syndicats Chrétiens (CSC) is the chief labour union and is allied with the Social Christian Party. The CSC is particularly strong in Flemish areas, and most members are Roman Catholic. Unemployment exceeded 10 percent in 1981; increased expenditures for unemployment benefits, new jobs, and social services have forced the government to borrow from abroad.

Belgium is heavily dependent on international trade. Other members of the EEC account for approximately 70 percent of the country's external trade; chief trading partners include West Germany, which supplied 20 percent of Belgium's imports in 1980, The Netherlands, and France. The Benelux Economic Union is a customs and economic union encompassing Belgium, Luxembourg, and The Netherlands. Belgium belongs to the European Monetary System, which fixes parities among exchange rates.

Administrative and social conditions. Belgium is a constitutional monarchy with a parliamentary form of government. Its constitution, adopted in 1831, vests legislative power in the hereditary king and the bicameral Parliament, composed of the 212-member Chamber of Representatives and the 181-member Senate. All members of the Chamber of Representatives and about half of the senators are directly elected; some senators are elected by provincial councils and by the rest of the Senate. Members of both houses serve a four-year term. Executive power is nominally vested in the king, but is exercised by the Cabinet under the leadership of the prime minister. The dominant political parties have been the Christian Socialist, the Freedom and Progress, and the Socialist parties. The Socialist Party split into French and Flemish wings in 1979. The independent judiciary is headed by the Supreme Court of Justice. Belgium is a member of the North Atlantic Treaty Organization. The army is the largest component of the armed forces, followed by the air force and navy.

Belgium's social welfare programs, covering almost the entire population, provide health insurance, pensions, family allowances, compensation for work injuries, unemployment relief, and aid for the old and indigent. These provisions have substantially contributed to the improving health of the population; the pattern of disease, average life expectancy of about 70 years, and the infant mortality rate of 12 per 1,000 live births are comparable to those of other developed countries.

Belgium's population is almost entirely literate. A dual educational system is composed of state secular and private denominational, usually Roman Catholic, schools. The level of state subsidization of the school system has been a traditional source of conflict. Attendance is compulsory between the ages of 7 and 15.

Belgium's strong commitment to freedom of the press is expressed by its constitution, which states that "no form of censorship may ever be introduced." The print media have been adversely affected by the expansion of radio and television broadcasting necessitating state financial support.

Cultural life. A basic cultural diversity exists between the Flemish and Walloon sectors. In music, avant-garde tendencies have become influential in Brussels, Liège, Ghent, and Antwerp, while Hainaut remains the centre of the classical and popular traditions. Literary works produced in Vlaanderen have a style peculiar to the region, whereas in the Walloon area and in Brussels, most authors write for a readership that is more inclined to French and, especially, Parisian works. Among the most notable contemporary Flemish writers are the novelist Felix Timmermens and the poet Hugo Claus. The Symbolist writers of the 20th century are exemplified by the poet Emile Verhaeven and the poet, playwright, and essayist Maurice Maeterlinck, both of whom have influenced many generations of French poets. The Surrealist René Magritte is probably the nation's best known painter of the 20th century. In the performing arts Belgium is noted for its Ballet of the 20th Century.

History. Celtic and Germanic tribes inhabited the area of Belgium at the time of the Roman conquest (lst century BC). Roman rule lasted until the early 5th century AD and was followed by that of the Frankish Merovingians (mid-5th to late 7th century) and the Carolingians (early 8th to mid-9th century).

Secular and ecclesiastical principalities emerged between the early 10th and mid-14th centuries. It was during this period that the count of Flanders became a vassal of the king of France. Philip of Burgundy gained control of Flanders in the late 14th century. The houses of Burgundy and Habsburg were united by marriage in the late 15th century, and present-day Belgium came under Spanish Habsburg rule in 1504. In 1579 the southern Spanish provinces formed the Union of Arras (Artois), pledging allegiance to the Spanish king and Roman Catholicism. The Protestant northern provinces formed the United Provinces of the Netherlands.

The Spanish Netherlands remained under Habsburg rule until 1700, when Philip V, grandson of Louis XIV of France, ascended the Spanish throne. In the War of the Spanish Succession (1701–14), which followed, the Spanish Netherlands, including Belgium, was ceded to the Austrian Habsburgs. After the Napoleonic Wars and a brief annexation by France, Belgium was reunited with the Netherlands into one country ruled by the House of Orange. Belgians revolted against Dutch rule in 1830, and in 1831 an independent Belgium was established. Prince Leopold of Saxe-Coburg was elected king and became Leopold I. During the reign of Leopold II (1865–1909) Belgium was caught between French and German rivalry but remained neutral during the Franco-German War (1870–71). Tension between Dutch and French speakers grew as the Flemish equality movement began. Leopold acquired the Congo Free State in 1885 and granted universal suffrage for men over 21 years of age in 1893. In 1898 Flemish (a Dutch dialect) became an official language of Belgium.

The reign of Albert I (1909–34) was characterized by widespread social unrest, resulting in a general strike in 1913. When World War I began, German troops occupied Liège, Namur, and Brussels. The Belgian army retired behind the Yser (IJzer) River in the west of Flanders. The Treaty of Versailles abolished Belgium's neutral status, and in 1920 the country signed a defense agreement with France. In 1930 the Belgian Parliament transformed the country into two linguistic areas with different administrations. Leopold III became king in 1934; he attempted to reassert Belgium's neutrality but was unsuccessful.

In 1940, German troops occupied Belgium. A strong resistance movement existed during the four years of Nazi occupation. Following the war, Leopold abdicated in favour of his son Baudouin I in 1950. During the postwar period, divisions between Flemings and French-speaking Walloons grew, and linguistic regionalization and mutual antagonism increased.

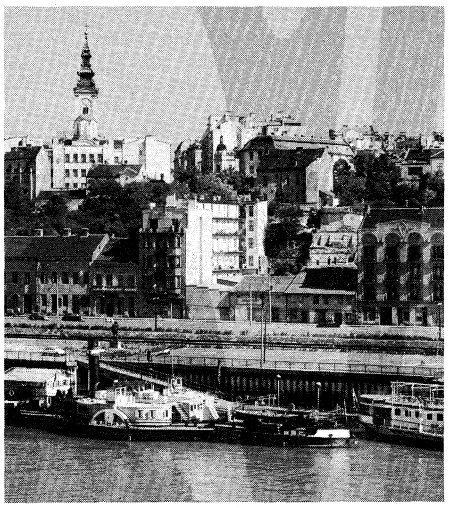
Belgorod, *oblast* (administrative region), western Russian Soviet Federated Socialist Republic, with an area of 10,450 sq mi (27,100 sq km), chiefly in the basins of the upper Vorskla, Donets, and Oskol rivers. The *oblast,* formed in 1954 and centred on Belgorod city, lies in a forest-steppe on rich soils. The natural vegetation of deciduous forest and feather-grass steppe, almost wholly cleared for agriculture since intensive settlement began in the 17th century, survives only as occasional oak groves along the rivers. Agriculture is highly developed, and the population is predominantly rural. Grains—wheat, barley, millet, and corn (maize)—are the main crops, with sugar beets in the west and sunflowers in the east. There are numerous orchards. Huge iron deposits of the Kursk Magnetic Anomaly were opened up in the 1950s and are now exploited on a considerable scale at Gubkin, Lebedi, and Yakovlevo, much by open-pit mining. In the early 1980s a major iron and steel complex was under construction at Stary Oskol. Pop. (1983 est.) 1,319,000.

Belgorod, city and administrative centre of Belgorod *oblast* (region), western Russian Soviet Federated Socialist Republic, on the upper Donets River where it is crossed by the Moscow–Kharkov and Sumy–Donets Basin railways. Archaeological finds indicate the existence of a settlement on the site in the 10th century. First mentioned in 1237, it was founded in 1593 as a fortress, becoming the key stronghold in the elaborate Belgorod defensive line set up in 1635–58 to protect Russia's southern frontier against Tatar attack. It maintained its military and administrative significance until the late 18th century. Modern Belgorod has a range of light engineering, building materials (chalk and slate), cement and food-processing industries, as well as a teacher-training institute. Pop. (1983 est.) 268,000.

Belgorod-Dnestrovsky, also spelled BELGOROD-DNESTROVSKIJ, Turkish AKKERMAN, Romanian CETATEA ALBĂ, city, Odessa *oblast* (administrative region), Ukrainian Soviet So-

cialist Republic, on the southwestern shore of the broad, shallow Dnestr Estuary. In the 6th century BC, Greeks from Miletus established the colony of Tyras on the site. It later came under the Scythians, and it was settled by Slavs in early Kievan times (9th century). After the fall of Kiev to the Tatars, Belgorod became a republican city-state under Moldavian princes, and the Genoese established their factory of Mauro Castro there. Stormed by the Turks in 1484, it remained Turkish under the name Akkerman until 1812, when it was ceded to Russia. From 1918 to 1940 it was included in Romania with the name Cetatea Albă; its Kievan name was restored in 1944. The modern town is a minor regional centre with light industries, notably fish canning. Pop. (1974 est.) 37,000.

Belgrade, Serbo-Croatian BEOGRAD (White Fortress), capital of Yugoslavia and of the component republic of Serbia, situated at the confluence of the Danube and Sava rivers. It is located at the convergence of three historically important routes of travel between Europe and the Balkans.



Old Belgrade on the Sava, with the Orthodox cathedral in the background
Toni Schneiders

There are evidences of Stone Age settlements in the area. The city grew up around an ancient fortress built on the Kalemegdan headland. The first fortress was built by the Celts in the 4th century BC and was known by the Romans as Singidunum. It was destroyed by the Huns in 442 and changed hands among the Sarmatians, Goths, and Gepidae before it was recaptured by the emperor Justinian. It was later held by the Franks and the Bulgars, and in the 11th century became a frontier town of Byzantium. In 1284 it came under Serbian rule, and in 1402 Stephen Lazarević made it the capital of Serbia. The Turks besieged the city in 1440, and after 1521 it was in their hands except for three periods of occupation by the Austrians (1688–90, 1717–39, and 1789–91).

During the Turkish period Belgrade was a lively commercial centre. After the first Serbian uprising under Karageorge in 1804, Belgrade became the Serbian capital during 1807–13, but the Turks recaptured it. The Serbs were given control of the citadel in 1867, when Belgrade once more became the capital of Serbia.

In 1921, Belgrade became the capital of Yugoslavia. The rapid population growth since World War II can be attributed primarily to the migration from rural areas of Serbia, as a consequence of industrialization. Most of the inhabitants are Serbs; the largest non-Serb groups are Croats and Montenegrins.

Belgrade is an industrial city. It produces motors, tractors and combines, machine tools, electrical equipment, chemicals, textiles, and building materials. It is the largest commercial centre in Yugoslavia, handling more than half of the country's foreign trade. Three international railroad lines pass through Belgrade, which is also served by highways and by river vessels. The airport is located west of the city at Surčin.

Belgrade is the seat of numerous cultural and educational institutions, including the University of Belgrade, founded in 1863. There are many museums and galleries, of which the oldest, the National Museum (Narodni Muzej), was founded in 1844. Pop. (1981 prelim.) city, 936,200; metropolitan area, 1,400,000.

Belgrade, Treaty of (September 1739), either of two peace settlements achieved by the Ottoman Empire that ended a four-year war with Russia and a two-year war with Austria.

Disputes arising from ill-defined frontiers between the Ukraine and the Ottoman-dominated Crimean Tatars provided the pretext in 1735 for a new Russian attempt to establish itself on the northern Black Sea. Austria entered the war as Russia's ally in 1737. Because of military failures, however, Austria made a separate peace in September 1739, ceding northern Serbia (with Belgrade) and Little Walachia (in southern Romania) to the Ottomans and thus renouncing the strong position in the Balkans it had obtained under the Treaty of Passarowitz (1718). With Austria's defection, the militarily successful Russians had to make a disappointing peace that same month: Azov, which they had captured, was to be demilitarized, Russia was to have no warships on the Sea of Azov or the Black Sea, and it was to depend entirely on Ottoman shipping for its commerce on the Black Sea.

The treaties, mediated and guaranteed by France, provided relatively stable conditions until 1768.

Belgrano, Manuel (b. June 3, 1770, Buenos Aires—d. June 20, 1820, Buenos Aires), military leader in the Argentine war for independence.

After studying law in Spain, Belgrano was appointed secretary of the Buenos Aires official merchants' guild (1794), a position in which he advocated liberal ideas, particularly in education and economic reform. He received his first military experience during the unsuccessful British invasion of the Viceroyalty of Río de la Plata in 1806–07. When Río de la Plata broke with Spain in 1810, Belgrano became a member of the junta that tried to maintain its integrity. After outlying portions were lost, Belgrano was sent with a small army to bring what is now Paraguay under the authority of the junta but was unsuccessful. He later defeated pro-Spanish forces at Tucumán and Salta in the Argentine northwest, only to be defeated in Upper Peru (now Bolivia) in 1813. He was superseded in 1814 by José de San Martín as commander of the army.

Belgrano, like many other leaders of the South American independence movement, favoured establishment of a monarchical type of government. To find a ruler, he went to Europe with Bernardino Rivadavia, who later became the first president of the Argentine republic. The European mission was unsuccessful.

Belice (Belize): *see* Belize City.

Belidor, Bernard Forest de (b. 1698, Catalonia, Spain—d. Sept. 8, 1761, Paris), military and civil engineer and author of a classic work on hydraulics.

After serving in the French Army at an early age, he developed an interest in science and worked on the measurement of an arc of the Earth. The study of ballistics also attracted him, and he became professor of artillery at the French military school at La Fère and eventually rose to become inspector of artillery. He wrote several notable books on engineering, artillery, ballistics, and fortifications, but his fame rests primarily on *Architecture hydraulique,* in four volumes (1737–53), covering engineering mechanics, mills and waterwheels, pumps, harbours, and sea works.

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belief, a mental attitude of acceptance or assent toward a proposition without the full intellectual knowledge required to guarantee its truth. Believing is apparently an introspectional occurrence, either an intellectual judgment or, as the 18th-century Scottish Skeptic David Hume maintained, a special sort of feeling with overtones that differ from those of disbelief. Beliefs have been distinguished according to their degree of certainty: a surmise or suspicion, an opinion, or a conviction. Belief becomes knowledge only when the truth of a proposition becomes evident to the believer. Belief *in* someone or something is basically different from belief *that* a proposition is true.

Belin, Édouard (b. March 5, 1876, Vesoul, Fr.—d. March 4, 1963, Territet, Switz.), French engineer who in 1907 made the first telephoto transmission, from Paris to Lyon to Bordeaux and back to Paris, using an apparatus of his own invention. The first transatlantic transmission was made in 1921 between Annapolis, Md., and Belin's laboratories at La Malmaison, Fr. His equipment was adopted in Britain in 1928. It was used almost exclusively by European news media during the 1930s and 1940s, when the term "Belino" came into general use for all kinds of picture transmission.

Belinga, mine site, Ogooué-Ivindo province, northeastern Gabon, western Africa. Iron ore has been found in the vicinity and a railroad, designed to connect Belinga to the port of Owendo on the coast, was constructed in the 1970s and 1980s. Wood and other forest products are important to the economy.

Belinsky, Vissarion Grigoryevich (b. June 11 [May 30, old style], 1811, Viapori, Russian Empire—d. June 7 [May 26, O.S.], 1848, St. Petersburg), eminent Russian literary critic, often called the "father" of the Russian radical intelligentsia.

Expelled from the University of Moscow (1832), he earned his living as a journalist. His first substantial critical articles, "Literaturnyye mechtaniya" (published in the newspaper *Molva,* 1834), expounded F.W.J. Schelling's view of national character, applying it to Russian culture, though Belinsky later embraced Hegel's philosophy of history. He obtained a

Belinsky, drawing by an unknown artist
Novosti Press Agency

permanent post (1839) with the journal *Otechestvennye zapiski.* By 1840 he was showing signs of revolt against orthodox Hegelianism.

Some Soviet critics, taking his rare political utterances out of context, consider his almost

accidental contribution to the Russian "national" type of Socialism his principal achievement. In 1846 Belinsky joined the review *Sovremennik,* for which he wrote about literature's slow task of helping the still embryonic Russian nation to develop into an adult civilized society. In 1847 he wrote a famous letter to the author Gogol, denouncing the latter's *Vybrannye mesta iz perepiski s druzyami* ("Selected Passages from Correspondence with My Friends") as a betrayal of the Russian people because it preached submission to church and state.

His analyses of Pushkin, Lermontov, Gogol, and Dostoyevsky laid the foundation for much of modern Russian literary criticism.

Belisarius (b. *c.* 505, Germania, Illyria?—d. March 565), Byzantine general, the leading military figure in the age of the Byzantine emperor Justinian I (527–565). As one of the last important figures in the Roman military tradition, he led imperial armies against the Sāsānian Empire (Persia), the Vandal kingdom of North Africa, the Ostrogothic regime of Italy, and the barbarian tribes encroaching upon Constantinople.

Little is known of Belisarius' early years. Some traditions assign him an unlikely Slavic background, but his exact origins and the precise date of his birth are undocumented. As a member of Justinian's bodyguard, he came to the Emperor's attention, and he was appointed to a command at about the age of 25. His public career thereafter is thoroughly described by the historian Procopius, who was a member of his personal staff for the first 15 years of his campaigns and who observed the general's activities personally.

Belisarius won his first laurels as commander on the Mesopotamian front against the empire's eastern neighbour and rival, Sāsānian Persia. He won a brilliant victory at Dara in 530; despite a subsequent defeat the following year at Sura (Callinicum), he emerged as the hero of the war by the time Justinian negotiated its end. Belisarius was in Constantinople, the capital, when the Nika Insurrection broke out there in January 532, and he further gained the Emperor's confidence by commanding the troops that ended the episode by massacring the rioters. About this time, meanwhile, Belisarius married the widowed Antonina, who, as an old friend to the empress Theodora, had influence at court that was later to be of great importance to him.

Justinian next chose Belisarius to begin the reconquest of the western Roman territories occupied by Germanic peoples. In 533 he was sent with a small force to attack the Vandals in North Africa. In two stunning victories he shattered the Vandal kingdom within a few months. Returning to Constantinople, he was granted a triumphal celebration. The recovery of Italy from the Ostrogoths began in 535. Belisarius quickly took Sicily and moved steadily northward on the mainland, seizing Naples by storm and occupying Rome. Revitalized under their new king, Witigis, the Goths besieged Rome in 537–538, but Belisarius held out there brilliantly. Hampered by conflicts within his command, his advance further northward was delayed, but by 540 the Goths, hard-pressed, offered to surrender if Belisarius would rule over them as emperor. Justinian had already come to fear that so popular a commander might win sufficient prestige to aim at his throne. Dissembling, Belisarius accepted the Goths' capitulation and then refused the title, which would have proved dangerous, thus antagonizing the Goths without relieving Justinian's suspicions.

The Emperor recalled him from Italy in temporary disfavour but sent him in the following year to fight again in Mesopotamia against the Sāsānians. Despite some successes, Belisarius had difficulties with his unruly soldiers, and then he was stripped of his command on charges of disloyalty. Only Theodora's intervention, out of friendship for Antonina, relieved his disgrace and ruin. Imperial rule had broken down in Italy under Belisarius' incompetent successors. He was reassigned there in 544, but Justinian, more suspicious and niggardly than ever, would not back him with sufficient men and money. Belisarius operated insecurely around the Italian coasts for the next few years, even briefly holding Rome once more, but effective opposition to the Ostrogoths was impossible. Theodora died in 548, and he was soon recalled. The Italian wars were left to be completed by other generals, notably the eunuch Narses, who would receive Justinian's fuller support.

Returning to Constantinople, Belisarius was allowed to retain his wealth and large household bodyguard. When marauding Hun tribes menaced the city in 559, the Emperor summoned Belisarius back into service. Adding what men he could find to his private retinue, he frightened the Huns away by clever strategems and then resumed his retirement. Three years later he was accused of involvement in a plot against Justinian's life and, though probably innocent, was disgraced. Partially restored to favour in 563, he was left in peace until his death, a few months before the death of the ungrateful emperor he had served so well.

Belisarius' character is elusive. Two primary impulses guided his life: loyalty to Justinian and passion for his wife, Antonina. Despite the treatment he often received from Justinian, Belisarius never wavered in his obedience, contributing one of the nobler dimensions to Justinian's era. Antonina seems to have utterly captivated him, but her reckless and immoral behaviour brought him embarrassment and humiliation.

In Procopius' *Secret History* (*Historia arcana),* Belisarius is given the least unfavourable treatment of the age's leading personalities. His reputation endured for centuries, and later legends, often mixed with stories about others, developed about him. The most famous had him actually blinded by Justinian and forced to beg in the streets in his old age. The 18th-century French writer Jean-François Marmontel used the story of Belisarius as a vehicle for an oblique attack on Louis XV and for a plea for tolerance and justice, in his philosophical novel *Bélisaire* (1767). Robert Graves's vivid novel *Count Belisarius* (1938) is the best fictionalized treatment of the general's life.

(J.W.Ba.)

BIBLIOGRAPHY. The chief contemporary record of Belisarius' life is in the *History of the Wars* and *Secret History* by Procopius of Caesarea. The only recent biography is L.M. Chassin, *Bélisaire, généralissime byzantin (504–565)* (1957); the most detailed among general narratives is still that in T. Hodgkin's classic, *Italy and Her Invaders,* vol. 3 and 4 (1885).

Belit (Akkadian), Sumerian NINLIL, Mesopotamian goddess, the consort of the god Bel (Sumerian Enlil) and a deity of destiny. She was worshipped especially at Nippur and Shuruppak and was the mother of the moon god, Sin (Sumerian Nanna). In Assyrian documents Belit is sometimes identified with Ishtar (Sumerian Inanna) of Nineveh and sometimes made the wife of either Ashur, the national god of Assyria, or of Enlil (Bel), god of the atmosphere.

The Sumerian Ninlil was a grain goddess, known as the Varicoloured Ear (of barley). She was the daughter of Haia, god of the stores, and Ninshebargunu (or Nidaba). The myth recounting the rape of Ninlil by her consort, the wind god Enlil, reflects the life cycle of the grain: Enlil, who saw Ninlil bathing in a canal, raped and impregnated her. For his crime he was banished to the Underworld, but Ninlil followed. In the course of their journey Enlil assumed three different guises, each one ravishing and impregnating Ninlil. The myth seems to represent the process of wind-pollination, ripening, and the eventual withering of the crops and their subsequent return to the earth (corresponding to Ninlil's sojourn in the Underworld).

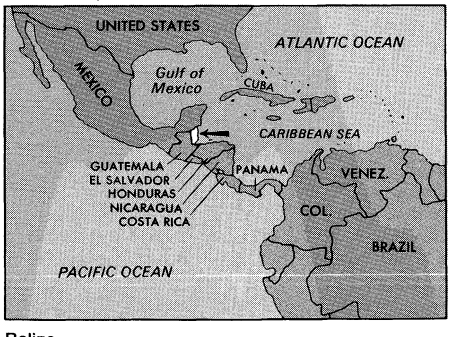
Belit-ili (Mesopotamian goddess): *see* Ninhursag.

Belitoeng, also spelled BELITONG, or BELITUNG (Indonesia): *see* Billiton.

Beliveau, Jean (Marc A.), byname LE GROS BILL (b. Aug. 31, 1931, Trois Rivières, Que., Can.), professional ice hockey centre who was noted for scoring winning goals in Stanley Cup playoff games. He played his entire career (1953–71) with the Montreal Canadiens of the National Hockey League (NHL).

Beliveau attracted the attention of the Canadiens while playing in the Quebec Senior League, which they bought to get his services. Beliveau was team captain from 1961. His 507 career goals was a record for centres. He played in 17 Stanley Cup playoffs and was on 10 Stanley Cup winning teams. His career records of most points scored in Stanley Cup playoff games (162) and most assists (97) persisted into the 1980s. He was awarded the Art Ross Trophy as leading scorer (1956), the Hart Trophy as most valuable player (1956, 1964), and the Conn Smythe Trophy as most valuable player in the playoffs (1965). After his retirement as a player, he became a vice president of the Canadiens. He is a member of the Hockey Hall of Fame.

Belize, Spanish BELICE, country in the northeast of Central America, covering an area of 8,867 sq mi (22,965 sq km). The capital is Belmopan. It is bounded by Mexico to the north and northwest, by Guatemala to the south and west, and by the Caribbean Sea along its 174-mi (280-km) coastline to the east. The population in 1981 was estimated to be 167,000.



Belize

The article that follows is a summary of significant details about Belize. Fuller treatment is provided in the following MACROPAEDIA articles. For geography and history, *see* Central America; for information about the country in its continental setting, *see* North America; for information about regional aspects of Belize's history, *see* Latin America, The History of; and for information about Belize's peoples and their traditional cultures, *see* American Indians.

For current history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the *Britannica Book of the Year.*

The land. Belize is a land of mountains, swamps, and tropical jungle. The northern half consists of largely swampy lowlands less than 200 ft (60 m) above sea level. They are drained by the navigable Belize River, the New River, and the Honda River; the latter forms the northern frontier with Mexico. The southern half of Belize is dominated by the

Maya Mountains, a limestone (karst) plateau cut by erosion into hills and valleys extending northeastward from the Guatemalan boundary. The Cockscomb Mountains, a spur of the Maya range, run toward the sea, rising to 3,681 ft (1,112 m) at Victoria Peak, the highest point in Belize. Off the coast lies the world's second largest barrier reef.

The climate is subtropical, with a distinct dry season from late February to May and a wet season from June to November; the latter is interrupted from August to September by a shorter dry period. The average temperature at Belize City is 74° F (23° C) in December and 85° F (29° C) in July. The average annual rainfall increases sharply from 53 in. (1,350 mm) in the north to 180 in. in the south, but there are considerable yearly variations at all locations. Hurricanes are an annual threat from July through November, and were largely responsible for the shift of the capital from Belize City, devastated by a hurricane in 1961, to Belmopan.

Roughly 45 percent of Belize is forested, with at least 50 different tree species. In the north the forest is deciduous, and sapote (date plum), mahogany, and ironwood predominate. In the south the forest is taller and is mainly oak, pine, and cedar. The rivers are largely bordered by swamp forests. On the coastal plain open savanna is marked by scattered oaks, pines, and palmetto palms. The coast is fringed with mangrove trees. The country's abundant wildlife includes the jaguar, tapir, a variety of deer, American crocodile, and manatee, as well as many species of turtles, birds, and fish.

Belize is poor in resources, with plentiful supplies only of limestone, sand, and gravel. Petroleum was discovered in northern Belize during exploratory drilling in 1981.

The people. Belize's population density is about 19 persons per sq mi (7 per sq km). Much of the population is racially mixed. Blacks and people of black ancestry predominate in the coastal regions, while Maya Indians predominate in the more sparsely inhabited interior. Black Caribs—descendants of Africans and the Carib Indians exiled from the British West Indies in the 18th century—live in settlements on the southern coast. There also are small numbers of Europeans, East Indians, and Salvadorans living in the coastal area. English is the official language, but a creole is commonly spoken. Indians speak Spanish or one of several Indian languages. Roman Catholicism is the principal religion, but there are sizable minorities of Methodists and Anglicans; groups of Mennonites have established settlements inland on the Belize River.

The country's birth rate in the late 1970s was 40 per 1,000, the death rate was 14 per 1,000, and the annual rate of growth was estimated to be 2.7 percent (augmented by refugees from El Salvador).

The economy. Belize has a developing free-market economy with some government participation. The gross national product (GNP) was estimated (1980) at U.S. $160,000,000, about $1,080 per capita, with an annual growth rate (1970–79) of 4.1 percent. Agriculture, trade, and manufacturing are its principal components.

Only about one-seventh of the land area is cultivated, and about one-third of the labour force is involved in farming. Cash crops grown include sugarcane, oranges, grapefruit, and bananas. Commercial cultivation of cacao, coconuts, peanuts (groundnuts), and bananas was introduced in the early 1980s. Domestic crops include corn (maize), rice, kidney beans, sweet potatoes, yams, and vegetables.

Pastures occupy about 2 percent of the land; the principal livestock include cattle and pigs, and the Mennonite population has started a dairy industry. Commercial apiaries produce honey.

The prolonged decline in timber production was reversed by 1978; about two-thirds of the wood cut annually is used for fuel. The government has introduced reforestation with fast-growing gmelina, eucalyptus, and pine, and encourages cutting of nontraditional species for furniture and construction. Belize also produces chicle, extracted from sapodilla trees.

Fishing, mainly by cooperatives, catches mostly lobster, shrimp, fish, and sea turtles, much of which is frozen or canned for export.

Manufacturing generates about one-sixth of the GNP and produces some exports. The principal industries include food products, clothing, sawn wood and wood products, and fertilizer and animal feed. Electric energy production (1980) was 54,000,000 kW-hr, all from thermal power plants.

Construction accounts for about one-eighth of the GNP and is coordinated by the Ministry of Works, using its own work force with private contractors.

The labour force is about one-fourth of the population. The United General Workers Union is the largest federation. Cooperatives and credit unions are common in agriculture, fishing, marketing, and housing. With industrial development, shortages of skilled workers have become the principal labour problem.

The government regulates the economy through multiyear economic plans, investment, and part ownership or control of certain industries, and a central planning unit sets quotas, prices, and goals for production. Belize depends on foreign development aid, mainly from the United Kingdom, the United States, and Canada. By carefully regulating domestic policy, the government has generated annual surpluses in recurrent budgets while using foreign assistance for the capital budget, thereby keeping the public debt under control.

The Belizean dollar (BZ$) is subdivided into 100 cents, with the same fractional coins as the U.S. dollar. In 1982 legislation was introduced to create a central bank with regulatory powers and promotional and developmental functions. As a member of the Commonwealth, Belize has favourable access to United Kingdom markets, and membership in the Caribbean Common Market has given it access to Caribbean nations.

Only about one-seventh of Belize's roads are paved. Inland waterways, usable by shallow-draft vessels, total about 500 mi. Belize City has a deepwater port, and Commerce Bight has a pier for oceangoing vessels. Belize has a share in the West Indies Shipping Corporation. Belize International Airport is located near Belize City.

Exports fell $11,000,000 short of imports in 1980, a substantial improvement over previous years. Sugar, clothing, fish, molasses, and citrus fruits are the principal exports, while imports consist mostly of machinery and transport equipment, food, manufactured goods, and refined fuels. Belize's major trading partners are the United States, the United Kingdom, and Trinidad and Tobago. The trade deficit is partly reduced by remittances from Belizeans abroad.

Administrative and social conditions. Belize is a constitutional monarchy. Its nominal head of state is the British monarch, represented in Belize by a governor general. Belize's constitution of 1981 vests legislative responsibility in the bicameral National Assembly, which consists of an 8-member Senate and an 18-member House of Representatives. Executive power is held by the prime minister, who is appointed by the governor general and is the leader of the majority party in the House. The cabinet is also appointed by the governor general, on the advice of the prime minister. Representatives are elected by universal adult suffrage (age 18 and over), but senators are appointed by the governor general on the advice of the prime minister (who recommends five members), the leader of the opposition party in the House (two members), and the Belize Advisory Council (one member). The dominant political party is the People's United Party. Belize's national security is threatened by Guatemala, which views Belize as a "lost province" to be regained by force. To counter this threat, Belize relies on a British military force stationed in the country.

Social security benefits are provided to sick, disabled, and unemployed workers, and to survivors of deceased insured workers. Medical care is free, and the government operates and staffs hospitals, dental clinics, and child care facilities, as well as rural health centres and mobile clinics. Sanitary conditions, however, are poor; polluted water and gastrointestinal disease are major factors in the high infant mortality rate of about 40 per 1,000 live births. Life expectancy is about 60 years.

Education is compulsory for children between the ages of 6 and 14. Most schools are church-operated; all are jointly funded by the government and their respective church organizations. The literacy rate among citizens over 15 years of age is about 90 percent.

The press in Belize is free from censorship. The nation's only radio station is operated by the government.

Cultural life. Mayan antiquities are exhibited in the Baron Bliss Institute in Belize City. Belize's most important indigenous festival is Dangriga's Settlement Day, which features Caribbean songs and dances. Belize by and large associates itself culturally with the English-speaking Caribbean states.

History. Mayan civilization flourished in Belize from about 300 BC to AD 900. The ruins of Mayan ceremonial centres can still be seen, particularly those of Caracol and Xunantunich. Sometime after the 6th century Mayan settlement reached its peak with an estimated population of 25,000.

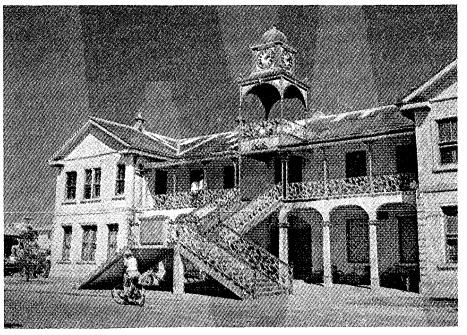
The Spanish, though holding nominal sovereignty, never attempted to settle Belize, but they always regarded as interlopers the British who did settle there. Sometime in the mid-17th century a group of English seamen, mostly pirates and adventurers, settled St. George's Cay and began cutting logwood, a material used for dyeing; it remained Belize's main export until it was surpassed by mahogany in the late 18th century.

British settlement was recognized in a number of treaties, and Spain's last attempt to take the settlement by force was defeated in 1798. British settlers began to penetrate the interior as coastal timber became exhausted. The Indians resisted this penetration, and the 19th century was punctuated by clashes between the two. Slavery was also a factor in the logging enterprises, but conditions were superior to those of the Caribbean sugar plantations and emancipation was accomplished by 1838.

In 1862 British Honduras, as Belize was then called, became a crown colony, but an unfulfilled provision of a treaty made between Britain and Guatemala in 1859 led Guatemala to claim British Honduras. When the British granted Belize independence in 1981, Guatemala continued to press its claims. Though Belize joined the Commonwealth, it was not admitted to the Organization of American States.

Belize City, Spanish BELICE, former capital and chief seaport of Belize (formerly British Honduras) and administrative headquarters of Belize district (area 1,663 sq mi [4,307 sq km]). It occupies both banks of the Haulover Creek, a delta mouth of the Belize River on the Caribbean coast. Its name was probably derived from an ancient Maya Indian word for the Belize River, which was until the 10th century a heavily populated trade artery of the

Maya Empire. British adventurers apparently settled the area in the 17th century and engaged in logwood cutting. Belize City, built on ground only slightly above sea level and surrounded by mangrove swamps, was severely damaged by Hurricane "Hattie" and the accompanying tidal wave on Oct. 31, 1961, and by Hurricane "Greta" in 1978. In May 1970 the capital was moved to Belmopan (*q.v.*), an inland site not liable to flooding.



Supreme Court Building, Belize City
Charles May—Shostal/EB Inc.

Exports include sugar, mahogany, cedar, and other timbers (both mill wood and in the round), citrus fruits, coconuts, copra, bananas, and corn (maize). Furniture, boats, and wood products are manufactured, and livestock (hogs and cattle) are raised in the surrounding area. Fisheries and sawmilling are local activities. Water and sewage facilities for the city have been improved. The harbour is well sheltered, but large ships have had to anchor about a mile offshore because of sandbanks. The first phase of a deepwater port closer to Belize City was completed in 1980. The Belize International Airport is located northwest of the city.

Belize City has an institute for arts and drama and technical and teachers' training colleges. Notable landmarks include St. John's Anglican Cathedral (built 1812) and the Government House (1814). Pop. (1980) city, 39,771; district, 50,801.

Belize River, also called OLD RIVER, river rising in northeastern Guatemala as the Río Mopán and flows about 180 mi (290 km) northeast past Benque Viejo, San Ignacio (El Cayo), and Roaring Creek (site of Belmopan, capital of Belize [formerly British Honduras]) into the Caribbean Sea at Belize City. During the pre-Columbian era, it served as one of the main trade arteries of the Maya Indians. It is navigable for small craft with enclosed propellers from Belize City as far as the Guatemalan border and is used to carry lumber for export and chicle to market areas.

Belkis (Turkey): *see* Aspendus.

bell, hollow vessel usually of metal, but sometimes of horn, wood, glass, or clay, struck near the rim by an interior clapper or exterior hammer or mallet to produce a ringing sound. Bells may be categorized as idiophones, instruments sounding by the vibration of resonant solid material, and more broadly as percussion instruments. The shape of bells depends on cultural environment, intended use, and material of construction. The walls vary from straight to convex, concave, hemispherical, barrel shaped (as in East Asia), and tulip shaped with sound bow (the bulge near the rim), as are all tower bells in the West. In cross section they may be round, square, rectangular, elliptical, or many-sided. Chinese bells often have lotus-shaped rims.

The strongest sound-producing vibrations of bells occur near the rim (in Western bells, in the sound bow), in contrast to hollow gongs, the vibrations of which are strongest in the centre. The acoustical structure of bell sound is complex and has been completely understood only in modern times. All bells contain an array of partials, or sound-wave frequencies of various pitches, but the tone of a musical bell consists of both harmonious partials and higher inharmonious partials. Western bells are invariably rung by a metal striker; Asian bells, except for metal-clappered hand and wind bells, are normally struck by a wooden hand mallet or swinging horizontal beam that engages the exterior wall. Asian bells are also devoid of the sound bow and never swing.

Bells are widely distributed geographically and usually possess a clearly defined cultural status. Legends surround them, and beliefs abound concerning their special powers—to induce rain or to dissolve storm clouds; to thwart demons when worn as amulets or when placed on animals, buildings, or conveyances; or to invoke curses and lift spells. The concept of their purifying action is ancient, as is their use in ritual, especially in the religions of eastern and southern Asia. The Chinese rang bells to communicate directly with spirits, and in Russian Orthodoxy, bells directly addressed the deity—hence, huge ones were cast by both peoples to lend greater authority. In both Buddhism and Christianity, bells are consecrated before being used liturgically, and in East Asia the fading tone of the bell is considered spiritually significant. In Roman Catholicism, bells have symbolized paradise and the voice of God.

Among the most basic and widespread uses of bells is signalling—marking significant points of ritual, calling to worship, tolling the hours, announcing events, rejoicing, warning, and mourning. In Christian and Asiatic Buddhist monasteries, bells regulate daily routine, and medieval and Christian bells were named according to purpose: *squilla* for the refectory, *nola* for the choir, and so forth.

Bells have also been treasured as patriotic symbols and war trophies, and invaders quickly silenced those of the conquered in order to eliminate the most vivid symbol of resistance. Most cultures have made bells into artistic objects, with respect to shape, material, and ornamentation, and both Eastern and Western religions have incorporated symbolic motifs in the ornamentation of bells.

The ancient Chinese were the first to employ sequences of bells musically; such sequences are termed chimes, or *pien chung.* In the West since the 9th century, small sets of bells (chimes) in stationary suspension and generally tuned diatonically (to the seven-note scale) have been common (*see* bell chime). Sets of tuned bells numbering at least 23 are termed carillons. Groups of two or more free-swinging bells peal; a single stationary bell in slow repetition tolls. All today may be operated electrically. Change ringing is a British form of pealing whereby 5 to 12 bells are rung in mathematical permutations. The *zvon* ("chime") of the Russian Orthodox Church sounds repetitious rhythmic patterns. Sets of handbells ranging up to five octaves have been popular in England and the U.S. since the 19th century as a group method for producing melodies and simple harmonies. In the main the liturgical and utilitarian functions of bells have greatly diminished, whereas their musical usage has increased.

Chinese bell, cast bronze, Eastern Chou dynasty, about 5th century BC; in the Art Institute of Chicago
By courtesy of the Art Institute of Chicago

Forged and riveted metal bells antedate those of cast metal. The earliest bell founding (*i.e.*, the casting of bells from molten metal) is associated with the Bronze Age. The ancient Chinese were superb founders, their craft reaching an apex during the Chou dynasty (*c.* 1122–221 BC). Characteristic were elliptical temple bells with exquisite symbolic decorations cast onto their surfaces by the cire perdue, or lost wax, process.

European bell making was originally a monastic craft. The earliest Christian bells were of iron plates hammered square and riveted (resembling cowbells). Although bronze casting was practiced in pre-Christian Europe, it was not resumed to any extent until the 8th century.

In bell founding, molten metal (usually bronze) is poured into a mold consisting of an inner core and outer mold or cope contoured to a bell's profile. Most molds are faced with loam, those for handbells with sand. The liquid metal, heated to about 1,100° C (2,000° F) enters a hole at the top while being tamped (driven by a series of light blows) down through another. To avoid undesirable porosity, gases formed are allowed to escape. Cooling is carefully controlled to prevent the outer surface from cooling faster than the inner, thereby setting up a tension leading to later cracking. Large bells require a week or two to cool. When the mold is removed the rough casting of the bell is sandblasted and polished. If a certain pitch is required, small amounts of metal are ground from the bell's inner wall as it revolves. Bell metal, or bronze, is an alloy of copper and tin. Tin content may range from 13 percent in weight to 25 percent, rarely more. Tin increases brittleness, and large bells contain less than small ones do. Most carillon bells contain 20 percent.

Casting produced better toned bells by permitting greater wall thickness and more precise control of contour (now round). For centuries bells had a convex wall of uniform thickness, a shape termed a beehive or primitive bell. The wall was elongated for use in bell towers, and the rim was reinforced for more resonance and strength. Pitch was successfully controlled by the 9th century, when tuned sets of small bells (called *cymbala*) appeared.

By the 11th century, secular bell founders—often itinerant—were active, becoming dominant by the Renaissance. The lofty towers of Gothic architecture led to much larger, more resonant bells and gave rise to an archaic version of the present campaniform bell: tulip-shaped with a narrow, rounded top; a long, straight waist spreading outward at the bottom; and a flared mouth, or sound bow. By the 13th century this shape predominated. Until the 15th century, when a shape similar to the modern Western one emerged, it was slowly transformed, the waist becoming proportionately shorter and concave, the top broader, the shoulder squared, and the sound bow thickened.

Bell founding attained considerable prestige, and the introduction of gunpowder in the 14th century added cannon making to the founder's output. The founders of Belgium and the Netherlands surpassed all others, their stature growing as the carillon spread in that area in the 15th–18th century, their craft culminating

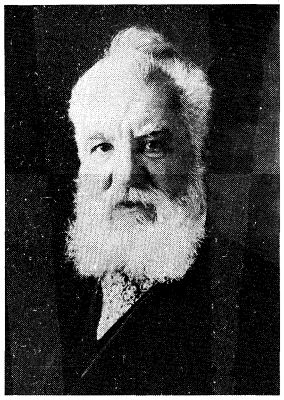
with the 17th-century Dutch founders François and Pierre Hémony. The craft declined in the 19th century, particularly in the ability to tune accurately, but regained its excellence by the 20th.

Russian bell founding dates from the 13th century, and by the 16th, bells weighing many tons were made. The world's largest bell, the Tsar Kolokol (Tsar Bell) in Moscow, was cast in 1733–35, weighing more than 400,000 pounds (180,000 kilograms); broken by fire in 1737, it never rang. English founders traditionally paid little attention to their bells' inner tuning of the partials, because their bell usages—change ringing and chimes—did not involve harmony. In the 20th century they adopted the partial tuning used in Belgium and The Netherlands.

The pellet bell, or crotal (a term also having many other meanings), a spherical vessel with loose pellets, has been historically regarded as a type of bell, but modern authorities now classify it as a rattle; jingle and sleigh bells are familiar examples. Of great antiquity, it shares many of the ritual and magical functions of bells.

Bell, Adam Schall von: *see* Schall von Bell, Adam.

Bell, Alexander Graham (b. March 3, 1847, Edinburgh—d. Aug. 2, 1922, Beinn Bhreagh, Cape Breton Island, Nova Scotia, Can.), Scottish-born American audiologist best known as the inventor of the telephone (1876). For two generations his family had been recognized as leading authorities in elocution and speech correction, with Alexander Melville Bell's *Standard Elocutionist* passing through nearly 200 editions in English. Young Bell and his two brothers were trained to continue the family profession. His early achievements on behalf of the deaf and his invention of the telephone before his 30th birthday bear testimony to the thoroughness of his training.



Alexander Graham Bell
Culver Pictures

Alexander (“Graham” was not added until he was 11) was the second of the three sons of Alexander Melville Bell and Eliza Grace Symonds Bell. Apart from one year at a private school, two years at Edinburgh's Royal High School (from which he was graduated at 14), and attendance at a few lectures at Edinburgh University and at University College in London, Bell was largely family trained and self-taught. His first professional post was at Mr. Skinner's school in Elgin, County Moray, where he instructed the children in both music and elocution. In 1864 he became a resident master in Elgin's Weston House Academy, where he conducted his first studies in sound. Appropriately, Bell had begun professionally as he would continue through life—as a teacher-scientist.

In 1868 he became his father's assistant in London and assumed full charge while the senior Bell lectured in America. The shock of the sudden death of his older brother from tuberculosis, which had also struck down his younger brother, and the strain of his professional duties soon took their toll on young Bell. Concern for their only surviving son prompted the family's move to Canada in August 1870, where, after settling near Brantford, Ont., Bell's health rapidly improved.

In 1871 Bell spent several weeks in Boston, lecturing and demonstrating the system of his father's *Visible Speech,* published in 1866, as a means of teaching speech to the deaf. Each phonetic symbol indicated a definite position of the organs of speech such as lips, tongue, and soft palate and could be used by the deaf to imitate the sounds of speech in the usual way. Young A. Graham Bell, as he now preferred to be known, showed, using his father's system, that speech could be taught to the deaf. His astounding results soon led to further invitations to lecture.

Even while vacationing at his parents' home Bell continued his experiments with sound. In 1872 he opened his own school in Boston for training teachers of the deaf, edited his pamphlet *Visible Speech Pioneer,* and continued to study and tutor; in 1873 he became professor of vocal physiology at Boston University.

Never adept with his hands, Bell had the good fortune to discover and inspire Thomas Watson, a young repair mechanic and model maker, who assisted him enthusiastically in devising an apparatus for transmitting sound by electricity. Their long nightly sessions began to produce tangible results. The fathers of George Sanders and Mabel Hubbard, two deaf students whom he helped, were sufficiently impressed with the young teacher to assist him financially in his scientific pursuits. Nevertheless, during normal working hours Bell and Watson were still obliged to fulfill a busy schedule of professional demands. It is scarcely surprising that Bell's health again suffered. On April 6, 1875, he was granted the patent for his multiple telegraph; but after another exhausting six months of long nightly sessions in the workshop, while maintaining his daily professional schedule, Bell had to return to his parents' home in Canada to recuperate. In September 1875 he began to write the specifications for the telephone. On March 7, 1876, the United States Patent Office granted to Bell Patent Number 174,465 covering “The method of, and apparatus for, transmitting vocal or other sounds telegraphically . . . by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds.”

Within a year followed the commercial application and, a few months later, the first of hundreds of legal suits. Ironically, the telephone—until then all too often regarded as a joke and its creator-prophet as, at best, an eccentric—was the subject of the most involved patent litigation in history. The two most celebrated of the early actions were the Dowd and Drawbaugh cases wherein the fledgling Bell Telephone Company successfully challenged two subsidiaries of the giant Western Union Telegraph Company for patent infringement. The charges and accusations were especially painful to Bell's Scottish integrity, but the outcome of all the litigation, which persisted throughout the life of his patents, was that Bell's claims were upheld as the first to conceive and apply the undulatory current. In 1877 Bell married Mabel Hubbard, 10 years his junior.

The Bell story does not end with the invention of the telephone; indeed, in many ways it was a beginning. A resident of Washington, D.C., Bell continued his experiments in communication, which culminated in the invention of the photophone—transmission of sound on a beam of light; in medical research; and in techniques for teaching speech to the deaf.

In 1880 France honoured Bell with the Volta Prize; and the 50,000 francs (roughly equivalent to U.S. $10,000) financed the Volta Laboratory, where, in association with Charles Sumner Tainter and his cousin, Chichester A. Bell, Bell invented the Graphophone. Employing an engraving stylus, controllable speeds, and wax cylinders and disks, the Graphophone presented a practical approach to sound recording. Bell's share of the royalties financed the Volta Bureau and the American Association to Promote the Teaching of Speech to the Deaf (since 1956 the Alexander Graham Bell Association for the Deaf). May 8, 1893, was one of Bell's happiest days; his 13-year-old prodigy, Helen Keller, participated in the ground-breaking ceremonies for the new Volta Bureau building—today an international information centre relating to the oral education of the deaf.

In 1885 Bell acquired land on Cape Breton Island in Nova Scotia. There, in surroundings reminiscent of his early years in Scotland, he established a summer home, Beinn Bhreagh, complete with research laboratories.

In 1898 Bell succeeded his father-in-law as president of the National Geographic Society. Convinced that geography could be taught through pictures, he sought to promote an understanding of life in distant lands in an age when travel was limited to a privileged few. Again he found the proper hands, Gilbert Grosvenor, his future son-in-law, who transformed a modest pamphlet into a unique educational journal reaching millions throughout the world.

As interest in the possibility of flight increased after the turn of the century, he experimented with giant man-carrying kites. Characteristically, Bell again found a group of four willing young enthusiasts to execute his theories. Always an inspiration, Mabel Hubbard Bell, wishing to maintain the stimulating influence of the group, soon founded the Aerial Experiment Association, the first research organization established and endowed by a woman. Deafness was no handicap to the wife of Professor Bell. At Beinn Bhreagh, Bell entered new subjects of investigation, such as sonar detection, solar distillation, the tetrahedron as a structural unit, and hydrofoil craft, one of which weighed more than 10,000 pounds and attained a speed record of 70 miles per hour in 1919.

Apart from his lifelong association with the cause of the deaf, Bell never lingered on one project. His research interests centred on basic principles rather than on refinements. The most cursory examination of his many notebooks shows marginal memos and jottings, often totally unrelated to the subject at hand—reminders of questions and ideas he wanted to investigate. It was impossible for him to carry each of his creative ideas through to a practical end. Many of his conceptions are only today seeing fruition; indeed, some undoubtedly have yet to be developed. The range of his inventive genius is represented only in part by the 18 patents granted in his name alone and the 12 he shared with his collaborators. These included 14 for the telephone and telegraph, 4 for the photophone, 1 for the phonograph, 5 for aerial vehicles, 4 for hydroairplanes, and 2 for a selenium cell.

Until a few days before his death Bell continued to make entries in his journal. During his last dictation he was reassured with “Don't hurry,” to which he replied, “I have to.”

(T.K.B.)

BIBLIOGRAPHY. Two general biographies are R.V. Bruce, *Alexander Graham Bell and the Conquest of Solitude* (1973), the best account of Bell and his work; and Catherine MacKenzie, *Alexander Graham Bell* (1928). The most detailed published account of Bell's telephonic work is his own last deposition (1892), published in 1908 by American Bell Telephone, *The Deposition of Alexander Gra-*

ham Bell; the original patents of 1876 and 1877 are printed in full. Thomas B. Costain, *Chord of Steel* (1960), is limited largely to the telephone.

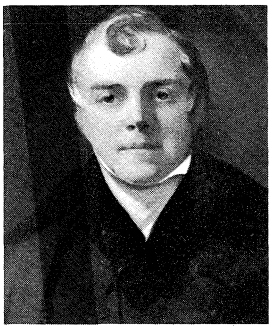
Bell, Andrew (b. 1726, Edinburgh—d. May 10, 1809, Edinburgh), Scottish engraver, and cofounder, with the printer Colin Macfarquhar, of the *Encyclopædia Britannica.*

Bell was born in Edinburgh and lived there all his life. He began work humbly by "engraving letters, names, and crests on gentlemen's plate, dog's collars and so forth." He was never greatly admired as an engraver, and many of his plates for the first, second, and third editions of the *Britannica,* and for William Smellie's translation of the Comte de Buffon's *Natural History* (1781 *et seq.*), are more highly regarded today than in his own time. How the arrangement between Bell and Macfarquhar to produce an encyclopaedia was made is not known; but it was Bell who wrote to William Smellie to engage his services as compiler of the first edition (1768–71), and his interest in the publication never flagged. He shared proprietorship with Macfarquhar and in 1793, after Macfarquhar's death, he became sole proprietor.

Bell, Andrew (b. March 27, 1753, St. Andrews, Fife, Scot.—d. Jan. 27, 1832, Cheltenham, Eng.), Scottish clergyman who developed popular education by the method of supervised mutual teaching among students.

Bell graduated from St. Andrews and went as a tutor to Virginia, where he made a small fortune growing tobacco. After ordination in the Church of England, he went to Madras, where he introduced into an orphan school a "monitorial" plan that overcame the problem of shortage of teachers by having the better pupils instruct the slower ones. On his return to London in 1797 he published *An Experiment in Education,* which explained his system, but his ideas had little popularity in England until they were adapted by Joseph Lancaster (*q.v.*) in a school opened at Southwark in 1801 and by Robert Owen (*q.v.*) in New Lanark. Meanwhile, Bell was made rector of Swanage, Dorset, in 1801. In 1811 he became superintendent of the National Society for Promoting the Education of the Poor in the Principles of the Established Church, a society formed to put his ideas into effect. He was master of Sherburn Hospital, Durham (1809), canon of Hereford Cathedral (1818), and prebend of Westminster (1819). He died in 1832, leaving a large fortune to endow educational schemes in Scotland.

Bell, Sir Charles (b. November 1774, Edinburgh—d. April 28, 1842, North Hallow, Worcestershire, Eng.), anatomist whose *New Idea of Anatomy of the Brain* (1811) has been called the "Magna Carta of neurology." Later research produced an expanded version, *The Nervous System of the Human Body* (1830). In these books Bell distinguishes between sensory nerves that conduct impulses to the central nervous system and motor nerves that convey impulses from the brain or from other nerve centres to a peripheral organ of response. He announced that the anterior roots of the spinal nerves are motor in function, while the posterior roots are sensory—an observation that was confirmed and more fully elaborated 11 years later by François Magendie.



Sir Charles Bell, detail of a portrait by J. Stevens; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

A graduate of the University of Edinburgh, Bell went to London (1804), where he held surgical and teaching posts. In 1829 he received the first medal awarded by the Royal Society; he was knighted in 1831. He returned to Edinburgh in 1836 to accept the chair of surgery at the university.

Bell, Charles Frederic Moberly (b. April 2, 1847, Alexandria, Egypt—d. April 5, 1911, London), British journalist who played an outstanding part in the management of *The Times* (London) during a troubled period.

Educated privately in England, Bell returned to Alexandria in 1865 to work for a commercial firm but soon established an informal connection with *The Times;* in 1875 he became its official correspondent. In 1880 he helped to found the *Egyptian Gazette.*

It was after a visit to Egypt by A.F. Walter, chief proprietor of *The Times,* that Bell was invited, in 1890, to assist in the paper's management. *The Times* was then at a low ebb following its erroneous reporting about the Irish nationalist Charles Parnell. Although Bell was somewhat out of touch with technical developments, his strong will, courage, and industry enabled him to keep the paper alive. He reorganized the foreign department, writing personally to correspondents abroad, formed a publications department, and founded *The Times Literary Supplement* (1902) and *The Times Educational Supplement* (1910). He was associated with H.E. Hooper in the sale of the reprintings of the ninth (1898) and tenth (1902–03) editions of the *Encyclopædia Britannica.* He was also an enthusiastic supporter of Hooper in the formation of the Times Book club in 1905. In 1908, despite much opposition, he brought about the sale of *The Times* to Lord Northcliffe. He became managing director of the newly formed publishing company, a post he retained until his death.

Bell, Clive, full name ARTHUR CLIVE HEWARD BELL (b. Sept. 16, 1881, East Shefford, Berkshire, Eng.—d. Sept. 17, 1964, London), English art critic who helped gain popular acceptance in Great Britain for the art of the Post-Impressionists during the early 20th century.

Bell graduated from Trinity College, Cambridge, in 1902 and spent the next several years studying art in Paris and then back in London. In 1907 he married Vanessa Stephen, the sister of Virginia Stephen (Virginia Woolf after her marriage to Leonard Woolf), and these four personalities formed the nucleus of the circle of English writers and artists called the Bloomsbury group (*q.v.*). Clive Bell also formed an important friendship with the English art critic Roger Fry in 1910, and together they organized the landmark Second Post-Impressionist Exhibition that was held in London in 1912.

Bell's most important contribution to art criticism was the theory of "significant form" as described in his books *Art* (1914) and *Since Cézanne* (1922). He asserted that purely formal qualities, *i.e.,* the relationships and combinations of lines and colours, are the most important elements in works of art. The aesthetic emotion aroused in the viewer by a painting springs primarily from his apprehension of its significant form, rather than from his "reading" of its subject matter. Bell pointed to the works of Paul Cézanne as those in which formal properties were manifested most purely, and Bell also attacked the public's preoccupation with the anecdotal, narrative, and morally didactic functions of traditional realistic painting.

Bell's assertion that art appreciation involves an emotional response to purely formal properties proved widely influential for several decades, though he was later seriously criticized for his sweeping assertion of the primacy of form over content in art. Among Bell's other publications are *Landmarks in Nineteenth-Century French Painting* (1927) and a volume of reminiscences, *Old Friends: Personal Recollections* (1956).

Bell, Cool Papa, byname of JAMES THOMAS BELL (b. May 17, 1903, Starkville, Miss., U.S.), American professional baseball player, reputedly the fastest baserunner of all time.

Bell began as a pitcher for the St. Louis Stars in the Negro National League at the age of 19 and earned the nickname Cool when he struck out legendary Oscar Charleston; Bell's manager added "Papa." He played centre field for the Stars (1922–28), for the Pittsburgh Crawfords (1933–37), in the Mexican League (1938–42), for the Homestead Grays in the Negro National League (1943–45), and as player-manager of the Kansas City Monarchs in that same league (1948–50). He also played in the California Winter League and in Cuba and the Dominican Republic, as well as on occasion with other Negro teams. A right-handed batter who later became a switch hitter, his average ranged from .308 to .480. He reputedly stole 175 bases in a 200-game season. (Statistics in Negro baseball were not carefully kept.) Playing against all the greats of Negro baseball and against white All-Star teams, Bell batted .391 over a five-year period.

After his retirement from baseball, he was first a custodian and later a night watchman in St. Louis. He was elected to the Baseball Hall of Fame in 1974.

Bell, Daniel (b. May 10, 1919, New York City), American sociologist and journalist who used sociological theory to reconcile what he believed were the inherent contradictions of capitalistic societies.

Educated at City College of New York, where he received his B.S. (1939), Bell was a journalist for more than 20 years. As managing editor of *The New Leader* (1941–45) and labour editor for *Fortune* (1948–58), he wrote voluminously on various social subjects. After serving in Paris (1956–57) as director of the seminar program of the Congress for Cultural Freedom, he received his doctorate at Columbia University (1960), where he was appointed professor of sociology (1959–69). Bell became professor of sociology at Harvard University in 1969.

Bell's extensive output reflected his concern with political and economic institutions and the ways in which they shape the individual. Among his books are *Marxian Socialism in America* (1952; reprinted 1967) and *The Radical Right* (1963). *The Reforming of General Education* (1966) won the Borden Award. *The Coming of Post-Industrial Society* (1973) and *The Cultural Contradiction in Capitalism* (1976) attempt to define the relationship between science, technology, and capitalism in society. His views of the nonconforming individual in contemporary society are expressed in *The Winding Passage* (1980).

Bell, Eric Temple (b. Feb. 7, 1883, Aberdeen, Aberdeenshire, Scot.—d. Dec. 21, 1960, Watsonville, Calif., U.S.), Scottish-American mathematician, educator, and writer who discovered several important theorems in the field of number theory, a branch of mathematics dealing with the properties of integers.

Bell immigrated to the United States at the age of 19 and immediately enrolled at Stanford University, where, after only two years, he earned his bachelor's degree. He received his master's degree from the University of

Washington in 1908. Receiving his doctorate in mathematics from Columbia University in 1912, Bell immediately accepted a position at the University of Washington teaching mathematics. He held this position until 1926, when he was named professor of mathematics at the California Institute of Technology. Bell combined his teaching with mathematical research, developing and publishing his ideas on the theory of numbers. From 1931 to 1933 he served as president of the Mathematical Association of America.

Bell published approximately 250 scholarly articles, many dealing with the theory of numbers. For his work "Arithmetical Paraphrases" he received the Bôcher Prize in 1921. Two of his books, *Algebraic Arithmetic* (1927) and *The Development of Mathematics* (1940), became standards in the field, the latter outlining in clear, concise language what Bell believed to be the most significant trends in mathematics.

Bell's works for the layman include *Men of Mathematics* (1937), which related important mathematical discoveries to the men responsible, and *Mathematics, Queen and Servant of Science* (1951), which popularized mathematics as both a practical and an esoteric discipline. He also wrote *The Last Problem* (1961), which based the history of the theory of numbers around the accomplishments of the 17th-century mathematician Pierre Fermat. Under the pen name of John Taine, Bell wrote many books of science fiction, including *The Time Stream* (1946).

Bell, Sir Francis Henry Dillon (b. March 31, 1851, Nelson, N.Z.—d. March 13, 1936, Lowry Bay, near Wellington), New Zealand lawyer and statesman who had a leading role in the Cabinets of Prime Minister William Ferguson Massey (1912–25). He himself also served for a short time as prime minister of New Zealand (1925).

Bell was initially a successful lawyer, and upon entering politics he served three terms as mayor of Wellington, N.Z. During a term in the House of Representatives (1893–96), he formed a close attachment with W.F. Massey. When Massey became prime minister as head of the Reform Party in the general elections of 1912, he asked Bell to lead the Legislative Council. Bell proved an able administrator and legislator, particularly during the coalition government of World War I. He was knighted in 1915. After the war, Bell was effectively Massey's deputy, serving three times as acting prime minister. He also held several ministerial portfolios in Massey's postwar administration. Upon Massey's death in 1925, Bell served as prime minister only until the Reform Party chose a new leader.

Bell, George Kennedy Allen (b. Feb. 4, 1883, Hatling Island, South Hampshire, Eng.—d. Oct. 3, 1958, Canterbury, Kent), Anglican bishop of Chichester, outstanding ecumenicist, and leading British churchman during World War II.

George Bell, *c.* 1944
BBC Hulton Picture Library

Ordained in 1907, Bell was curate of Leeds (Yorkshire) parish church from 1907 to 1910. In 1914 he ceased studies at Christ Church and became chaplain to Archbishop Randall Davidson. He was made dean of Canterbury Cathedral in 1924 and bishop of Chichester in 1929. After Adolf Hitler came to power in Germany, Bell secured asylum in England for Jews and non-Aryan Christians fleeing from the Nazi regime. During the decade from 1929 to 1939 he was prominent in movements seeking church reunion, and he developed close relations with the German Confessing Church, which opposed Hitler's regime. During World War II, Bell was a well-known critic of saturation bombing.

After the war Bell traveled widely on behalf of the ecumenical movement and the World Council of Churches, which he served as chairman and president. He expressed his views in the House of Lords on numerous issues, including his opposition to Britain's decision to make nuclear weapons. Among his works are *Randall Davidson* (1935), *Christian Unity, The Anglican Position* (1948), and four volumes of *Documents on Christian Unity.*

Bell, Gertrude (Margaret Lowthian) (b. July 14, 1868, Washington Hall, Durham, Eng.—d. July 12, 1926, Baghdad), English traveler, administrator in Arabia, and writer who played a principal part in the establishment in Baghdad of the Hāshimite dynasty.

Gertrude Bell's brilliant career at Oxford, where she took a first in history in 1887, was followed by some time spent in Tehrān, where her uncle Sir Frank Lascelles was British minister. Returning to the political and intellectual salons in England and Europe for a decade, she did not until 1899 embark on the career of Arabian activities that made her famous. She visited Palestine and Syria in that year and was often back in the Middle East during the next decade, extending her travels to Asia Minor. But her heart was set on an Arabian journey, which she began in 1913, being the second woman (after Lady Anne Blunt) to visit Ha'il, where she was not favourably received, although she ever afterward favoured Ibn Rashid as against the Ibn Sa'ūd dynasty. She never wrote a full account of this journey, though her literary output during the 20 years preceding World War I had been considerable, including *Safar Nameh* (1894), *Poems from the Divan of Hafiz* (1897), *The Desert and the Sown* (1907), *The Thousand and One Churches* (1909), and *Amurath to Amurath* (1911). Her vast correspondence was published in an edited form in two volumes by her stepmother in 1927.

Perhaps her greatest work was a masterly official report on the administration of Mesopotamia during the difficult period between the Armistice of 1918 and the Iraq rebellion of 1920. After a short period of war work in England and France, she plunged into the rough-and-tumble of Middle East politics, mainly in Mesopotamia, where she served in turn under Sir Percy Cox and Sir Arnold Wilson. She helped place the Hāshimite ruler Fayṣal I on the throne of Iraq in 1921. The last three years of her life were devoted to the creation of an archaeological museum in Baghdad. She insisted, for the first time, that antiquities excavated should stay in the country of their origin, thereby ensuring that the National Museum of Iraq, which is her monument in the land she loved, has a splendid collection of Iraq's own antiquities.

Bell, Henry (b. 1767, Torphichen, Linlithgowshire, Scot.—d. Nov. 14, 1830, Helensburgh, Dumbartonshire), Scottish engineer who launched the first commercially successful steamship in Europe.

After serving apprenticeships as a millwright and a ship modeler, he went to London, where he worked and studied under the Scottish engineer John Rennie. Bell returned to Scotland in 1790, settled in Glasgow as a carpenter, and later moved to Helensburgh. In 1800 he submitted proposals to the British Admiralty for

Henry Bell, detail of an oil painting by James Tannock, 1840; in the Science Museum, London
By courtesy of the Science Museum, London

steam-propelled vessels. Bell's own steamship, the 28-ton *Comet,* was launched from Port Glasgow in 1812 and subsequently carried passengers and cargo along the Clyde River. The success of this vessel heralded the era of steam navigation in Europe.

Bell, John (b. 1691, Antermony, Stirlingshire, Scot.—d. July 1, 1780, Antermony), Scottish physician and traveler whose vivid account of his journeys did much to awaken Westerners to the way of life of the peoples of Russia and the East, particularly China.

In 1714 Bell set out for St. Petersburg, where he joined a Russian diplomatic mission departing for Persia. Returning to St. Petersburg in 1718, he spent the next four years on a diplomatic mission to China and passed through Siberia and Mongolia. In 1722 he accompanied Peter the Great on an expedition to the city of Derbent, on the western shore of the Caspian Sea. Sent on a mission to Istanbul in 1737, he remained there as a merchant before returning to Scotland in 1747. He was advised to use Jonathan Swift's *Gulliver's Travels* as a model for his *Travels from St. Petersburg in Russia to Various Parts of Asia* (1763), which went through a number of editions and was also translated into French.

Bell, John (b. 1745—d. 1831, Fulham, London), English publisher who was one of the first to organize a book-publishing company on a joint-stock basis. Beginning in 1777 he issued the 109 volumes of *The Poets of Great Britain complete from Chaucer to Churchill* series. He influenced later publishing practice by introducing into his books illustrations prepared by competent artists and related to the text. In addition he founded a weekly newspaper, a monthly illustrated magazine, and various other periodicals.

Bell, John (b. Feb. 15, 1797, near Nashville, Tenn., U.S.—d. Sept. 10, 1869, Dover, Tenn.), American politician and nominee for president on the eve of the American Civil War.

Bell entered the U.S. House of Representatives in 1827 and served there as a Democrat until 1841. He broke with Pres. Andrew Jackson in 1834 and supported Hugh Lawson White for president in 1836. After White's defeat Bell became a Whig and, in March 1841, as a reward for party services, was made secretary of war in Pres. William Henry Harrison's Cabinet. A few months later, after the death of President Harrison, he resigned in opposition to Pres. John Tyler's break with the Whigs.

After six years' retirement from political life, Bell was elected as a U.S. senator for Tennessee in 1847, serving in the Senate until 1859. Although a large slaveholder, Bell opposed efforts to expand slavery to the U.S.

territories. He vigorously opposed Pres. James Knox Polk's Mexican War policy and voted against the Compromise of 1850, the Kansas–Nebraska bill (1854), and the attempt to admit Kansas as a slave state. Bell's temperate support of slavery combined with his vigorous defense of the Union brought him the presidential nomination on the Constitutional Union ticket in 1860, but he carried only Virginia, Kentucky, and Tennessee. He initially opposed secession; however, following Pres. Abraham Lincoln's call for troops, he openly advocated resistance and henceforth classed himself a rebel. Bell spent the war years in retirement in Georgia, returning to Tennessee in 1865.

Bell, Lawrence Dale (b. April 5, 1894, Mentone, Ind., U.S.—d. Oct. 20, 1956, Buffalo), U.S. aircraft designer whose experimental X-1 rocket-propelled airplane in 1947 was the first to break the sound barrier in level flight.

In 1912 Bell entered the aviation business as a mechanic for his brother, Grover. When his brother was killed in an airplane accident in 1913, Bell decided to quit, but the attraction of flying proved too great. He went to work

Lawrence Bell

By courtesy of the National Air and Space Museum, Smithsonian Institution, Washington, D.C.

for another aviation pioneer, Glenn L. Martin, remaining in the field for the rest of his life. He was actively running Bell Aircraft Corporation, Buffalo, at the time of his death. The Bell P-39 Airacobra and the P-63 Kingcobra fighters were widely used in World War II. Bell designed the first U.S. jet aircraft, the XP-59A Airacomet fighter. Originally powered by two British Whittle engines, it made its first flight on Oct. 1, 1942.

Bell Bay, port and site of a large aluminum-production facility, northern Tasmania, Australia, on the east bank of the River Tamar estuary in George Town municipality. Electric power is supplied from the Trevallyn station on the South Esk River, supplemented by an oil-fired thermal plant. The first metal was produced there in 1955, and operations combine the reduction of alumina from bauxite received from Weipa and Gladstone, Queen., and the production of aluminum. The capacity is more than 90,000 tons annually. Other activities include the manufacture of aluminum paint, as well as aluminum powder and paste for explosives. The port also has a ferromanganese plant and a bulk oil terminal. Large ore carriers approach Bell Bay via deep-water channels. Some processed materials are shipped through Launceston, 30 mi (50 km) south.

bell, book, and candle, in Roman Catholicism, a ceremony formerly used in pronouncing the "major excommunication" or "anathema" (*see* excommunication). Its origins are not clear, but it dates back certainly to the late 9th century. The bell represented the public character of the act, the book the authority of the words spoken by the presiding bishop. The candle was believed to symbolize the possibility that the ban might be lifted by the repentance and amendment of its victim. The ceremony was performed in some conspicuous place, and, upon its termination, letters were written to bishops of other sees to report the fact. When the assemblage had been convoked, a bishop appeared with 12 priests, and all 13 held lighted candles. The bishop, wearing violet vestments, then recited the formula, ending thus: "We separate him, together with his accomplices and abettors, from the precious body and blood of the Lord and from the society of all Christians; we exclude him from our holy mother the church in heaven and on earth; we declare him excommunicate and anathema; we judge him damned, with the devil and his angels and all the reprobate, to eternal fire until he shall recover himself from the toils of the devil and return to amendment and to penitence." Those present answered, "So be it!" Then the bishop and the 12 priests extinguished their candles by dashing them to the ground, and (as a general rule) the ceremony then ended.

bell chime (from medieval Latin *cymbala*: "bells"), set of stationary bells tuned in a musical series, traditionally in diatonic sequence (seven-note scale) plus a few accidentals (sharps and flats). The bells generally number from 2 to 20 and, in the *voorslags* (automatic clock chimes) of Belgium and The Netherlands, can have a range of up to three octaves or more. The bell chime's primary function is the automatic play preceding the hour strike of a church or town-hall tower clock to alert to its imminence; it may also play on the half, quarter, and, sometimes, eighth hour. A secondary role is the human play of simple unharmonized melodies. From the 13th century this was done manually by pulling ropes attached to clappers ("clocking," now rare); from the late 18th century by a keyboard of levers and sometimes pedals, called a chime stand; and in the 20th century by an ivory keyboard with electric action, often in conjunction with automatic roll-play. To chime also refers to the clock's striking of the bells or chimes and to their music; in England, change-ringing bells swinging in a limited arc rather than a full-circle arc are said to chime.

The chime differs from a carillon in that its range is more limited and may not have a full 12-note (chromatic) scale. Until the 20th century its bells generally lacked an inner tuning, or fixed mathematical relationship of partials (component tones of a bell's complex sound) to permit use of harmony; it also lacks dynamic variation. But in Belgium and The Netherlands, automatic clock chimes produce fully harmonized music of considerable complexity, their bells having an inner tuning. Universally, the clock-chiming mechanism has been a drum pegged to trip levers wired to the bell hammers; rotated by a suspended weight, it is actuated by the clockworks.

The chime tune most commonly heard in English-speaking countries is the "Westminster Quarters" (originally "Cambridge Quarters"), consisting of the four notes E–D–C–G in various combination each quarter hour. Composed at Cambridge University by an organ student, William Crotch, for use with the new clock at Great St. Mary's Church, in 1793, its subsequent use in the clock tower of the Houses of Parliament, London (1859), resulted in its present name. Also frequently heard is the "ting-tang," or repeated alternation of two notes, adopted at St. Paul's Cathedral, London. Other chime tunes of note are the "Bells of Aberdovey," "Turn Again, Whittington," and "Holsworthy Tune."

The earliest chimes were Chinese stone chimes, sets of L-shaped marble slabs suspended in wooden frames and struck by mallets. Chinese bell chimes appeared sometime before 2000 BC. From the Chou period (*c.* 1122–221 BC) both stone and bell chimes, suspended in two rows of eight, have been prominent in Chinese temple worship and in secular music. Later, bell chimes were used in Korea, India, and Japan.

In the 9th century, sequences of small beehive-shaped bells, numbering 4 to 15, were introduced in Western monasteries. Western chime bells, like the Chinese ones, were mounted on horizontal supports to be struck with mallets. The instrument itself, like the bells, was called a *cymbala.* In the 12th century, *cymbala* were wired to organ keys, thus forming the first organ chimes. The knowledge of tuning acquired with the *cymbala* resulted in the design of differently pitched bells placed in towers and struck by *jacquemarts,* or clock jacks (usually a pair of knights in armour), to mark the hours. The introduction of the weight-driven tower clock led to the invention of the pegged chiming barrel in the 14th; by the 17th century about 500 European chimes utilized this automatic action.

Late in the 18th century a chime of 10 to 20 bells playable from a wooden keyboard became fashionable in France and Great Britain. In the U.S. between about 1850 and 1930, hundreds of such chimes were installed in churches, town halls, and other towers.

The Russian *zvony* ("chimes") are sets of stationary bells rung by pulling ropes attached to clappers. They date from the 9th century but are rarely heard today. The *zvon* plays repetitious rhythmic patterns that form a part of the liturgy of the Orthodox Church. *See also* bell; carillon; change ringing.

Bell Island, island in southeastern Newfoundland, Canada; it lies in Conception Bay 3 mi (5 km) off the Avalon Peninsula. Bell Island is 6 mi long and 3 mi wide, and has an area of 11 sq mi (28 sq km). Named after a large bell-shaped rock off its west end, it was one of the world's major iron-ore producers from 1895 to 1966. Fishing and subsistence agriculture are now the main economic activities on the densely populated island. Regular ferry service connects Wabana, its largest town, with the Avalon Peninsula.

Bell Laboratories, formal title AT&T BELL LABORATORIES, INC., byname BELL LABS, research and development company, whose stock is owned by American Telephone and Telegraph Company (AT&T). It develops the telecommunications equipment manufactured by AT&T. It also does defense-related research and development under military contracts. Headquarters for the laboratories are in Murray Hill, N.J.

The company was incorporated in 1925 as Bell Telephone Laboratories, Inc., but its history can be traced at least to 1907, when the engineering departments of AT&T and Western Electric were centralized in New York City, or even to 1883, when AT&T's Mechanical Department was formed. Since its founding the organization has produced thousands of scientific and engineering innovations. In 1926, for example, it issued the first synchronous-sound motion-picture system. In 1937 it constructed the pioneer electrical-relay digital computer; in the same year, a Bell researcher, Clinton Davisson, shared the Nobel Prize for Physics for demonstrating the wave nature of matter. In 1947 the laboratories invented the transistor for which Bell researchers John Bardeen, Walter H. Brattain, and William B. Shockley were awarded the 1956 Nobel Prize for Physics. In 1978 two more Bell researchers, Arno Penzias and Robert W. Wilson, shared the Nobel Prize for the discovery of cosmic microwave background radiation. These and other achievements—together with the publication of technical and scientific papers by its staff—make Bell Labs one of the world's most prestigious research facilities.

bell-magpie, Australasian songbird belonging to the family Cracticidae (order Passeriformes), named for its loud, metallic voice and magpie-like black-and-white plumage. Most authorities consider the bell-magpies to represent a single widespread species, *Gymnorhina tibicen*; some recognize three species, the white-backed (*G. hypoleuca*), the western (*G. dorsalis*), and the black-backed (*G. tibicen*). Bell-magpies are 35–50 centimetres (14–20 inches) long and (unlike the true magpies) rather short-tailed. They feed on lizards, snakes, and large insects in open country. All are aggressive, especially during the breeding season, attacking larger birds and even man. In rural areas the open nest may include large amounts of wire, as well as grass and sticks.

bell moth: *see* leaf roller moth.

bell pepper, any of various thick-fleshed, mild peppers of the genus *Capsicum*. *See* pepper.

Bell Rock, also called INCHCAPE ROCK, sandstone reef in the North Sea off the coast of Scotland, 12 mi (19 km) southeast of Arbroath. It is 2,000 ft (600 m) long and is exposed for a few feet at low tide but submerged at high tide. A peril to navigation, the rock lies in the fairway of vessels entering or leaving the rivers Tay and Forth as well as ports farther north. During a storm in 1779, 70 ships were wrecked on the reef. A lighthouse tower, designed by Robert Stevenson and built 1807–11, stands 100 ft high there.

According to tradition, an abbot of Arbroath had ordered a warning bell—whence the name of the rock—to be fastened to the reef so as to respond to movements of the waves. This was destroyed by the pirate Ralph the Rover, whose ship was later wrecked at the same spot. Robert Southey made the incident the subject of his ballad "The Inchcape Rock." Pop. (1981) 6.

Bell System, a former American telephone system, governed by American Telephone & Telegraph Company (*q.v.*; AT&T) and including Western Electric Company (*q.v.*), the system's manufacturer; Bell Laboratories (*q.v.*), the research and development facility; and other departments and 22 operating companies. The system was dismantled in 1983, when the 22 operating companies were divested by AT&T under court order.

Bell Trade Act, formally PHILIPPINE TRADE ACT OF 1946, an act passed by the U.S. Congress specifying the economic conditions governing the emergence of the Republic of the Philippines from U.S. rule; the act included controversial provisions that tied the Philippine economy to that of the United States.

When the Philippines became independent on July 4, 1946, its economy had been thoroughly devastated by World War II. Payment of war damage claims by the U.S. government and an influx of capital were both desperately needed. The Bell Act set quotas on Philippine exports to the U.S., pegged the Philippine peso to the U.S. dollar at a rate of 2:1, and provided for free trade between the two countries for a period of 8 years, to be followed by gradual application of tariffs for the next 20 years. Many Filipinos objected to the so-called Parity Amendment, which required an amendment to the Philippine constitution allowing U.S. citizens equal rights with Filipinos in the exploitation of natural resources and operation of public utilities; nonetheless, some powerful Filipinos who were involved in these negotiations stood to benefit from the arrangement.

A strong incentive for Philippine acquiescence was the fact that American payment of $800,000,000 in war damage claims was made contingent upon Filipino ratification of the Bell Act. The act remained extremely unpopular in the Philippines. It was later superseded by an agreement more favourable to Filipino interests, the Laurel–Langley Agreement, which took effect in 1956.

Bella, Stefano della (Italian), French ÉTIENNE DE LA BELLE (b. May 18, 1610, Florence—d. July 12, 1664, Florence), Baroque printmaker noted for his engravings of military events, in the manner of Jacques Callot.

Stefano was initially apprenticed to a goldsmith but turned his attention to engraving, studying under Remigio Cantagallina. Through Lorenzo de' Medici he was enabled to spend three years in study at Rome. In 1642 he went to Paris, where Cardinal de Richelieu engaged him to make drawings of the siege of Arras and the taking of that town by the French Army. In 1647 he journeyed to Amsterdam; while there he was influenced by the Dutch school of landscape painting and the graphics of Rembrandt. His works after this period grew more atmospheric and delicate, often being executed in small formats. About 1650 he returned to Florence. His prints number more than 1,400 and include a wide variety of subjects.

Bella Coola, North Pacific Coast Indians whose villages were located in what is now the central British Columbia coast, along the upper Dean and Burke channels and the lower parts of the Bella Coola River Valley. They spoke a Salishan language related to that of the Coast Salish (*q.v.*) to the south. Their ancestors probably separated from the main body of Salish and migrated northward. Although their material culture, ceremonials, and mythology resembled those of their Heiltsuq neighbours (*see* Kwakiutl), their social organization was similar to that of the more distant Salish. The Bella Coola probably numbered about 5,000 at the time of their first contacts with Europeans, but were reduced by disease in the 19th century to less than 1,000, who lived in a single village. In the late 20th century the population was increasing.

The Bella Coola lived in permanent villages of large plank-built houses occupied by a number of families. They used wood for houses, canoes, and watertight boxes which served a variety of domestic purposes. Shredded cedar bark provided clothing, baskets were made of cedar and spruce, and alder and cedar were carved into masks and other ceremonial objects, including the spectacular totem poles of the 19th century. Fish was their basic food supply, supplemented by hunting and by collecting berries and roots. Salmon, taken in the summer, were eaten fresh or smoked; oil extracted from eulachon (candlefish) was used as a condiment. Life was essentially on a village basis, with status dependent both on hereditary rank and on wealth, measured by ostentatious giving at potlatches (*q.v.*). There was no formal tribal cohesion, but rather a strong feeling of unity based on common language, common origin, and pride in respect to neighbouring tribes. Secret societies were important, with an unusually well-developed pantheon of deities and great dependence on numerous oral traditions.

belladonna, tall bushy herb, the deadly nightshade (*Atropa belladonna*), of the family Solanaceae (order Scrophulariales), and the crude drug consisting of its dried leaves or roots. The plant, which grows to about 1½ metres (4 or 5 feet) tall, is a native of wooded or waste areas in central and southern Eurasia. It has dull green leaves; violet or greenish flowers in the axils of the leaves or in the forks of branches; shiny black berries, about the size of cherries; and a large tapering root.

Belladonna is highly poisonous and is cultivated in France and elsewhere for the medicinal alkaloids hyoscyamine, hyoscine, and atropine, which are derived from the crude drug and are used in sedatives, stimulants, and antispasmodics. Because of toxicity and undesirable side effects, these alkaloids are being superseded by synthetic drugs.

Bellamy, Edward (b. March 26, 1850, Chicopee Falls, Mass., U.S.—d. May 22, 1898, Chicopee Falls), American writer known chiefly for his Utopian novel *Looking Backward, 2000–1887*.

Son of a Baptist minister, Bellamy first realized the plight of the urban poor at 18 while studying for a year in Germany. He studied law, was admitted to the bar in 1871, but soon turned to journalism, first as an associate editor for the *Springfield Union* (Massachusetts) and then as an editorial writer for the *New York Evening Post*. Bellamy's early essays and stories sometimes indirectly criticized conventional American attitudes.

In *Looking Backward* (1888), set in Boston in the year 2000, he described the United

Bellamy

By courtesy of the Library of Congress, Washington, D.C.

States under an ideal socialist system that featured cooperation, brotherhood, and an industry geared to human need. The novel, which sold more than 1,000,000 copies, appealed to a public still suffering the effects of the depression of 1883 and disturbed by such industrial clashes as the Haymarket Riot in Chicago (1886). Bellamy became an active propagandist for the nationalization of public services, and his ideas encouraged the foundation of Nationalist clubs. Political groups inspired by Bellamy's works also appeared in Europe, especially in The Netherlands. He influenced the Populist Party platform of 1892 through his magazine *The Nationalist* (1889–91), but its successor, the *New Nation* (1891–94), saw the movement in decline. Bellamy's *Equality* (1897), a sequel to *Looking Backward*, was less successful. Additional writings were published in *Edward Bellamy Speaks Again!* (1937) and as *Talks on Nationalism* (1938). Critical biographies were published by Arthur E. Morgan in 1944 and by Sylvia E. Bowman in 1958.

Bellanca, Giuseppe Mario (b. March 19, 1886, Sciacca, Italy—d. Dec. 26, 1960, New York City), airplane designer and builder who created the first monoplane in the United States with an enclosed cabin.

Bellanca graduated with an engineering degree from the Politecnico di Milano and in 1911 came to the United States, where he thought the future was bright for aircraft design. He had experimented unsuccessfully with design and construction in his student days, but he built and learned to fly his first plane on Long Island, New York, where he had a flying school from 1912 through 1916. In 1917 he designed and built the first enclosed-cabin monoplane, which succeeded in air races. After World War I the premier flying circus pilot Clarence D. Chamberlin commissioned a plane from him and remained his friend, getting him a job at the Wright Aircraft Corporation (1924–26). In 1927 Chamberlin flew a Bellanca plane on the first transatlantic flight

with a passenger to set a new long-distance record, from New York to Eisleben, Ger. Bellanca planes were favorites of long-distance flyers in the late 1920s and early 1930s. (A Bellanca had been Lindbergh's first choice.) In 1931 a Bellanca plane made the first Japan-to-U.S. nonstop flight.

The Bellanca Aircraft Company (1927–54) specialized in making executive private planes. Bellanca became a naturalized U.S. citizen in 1929. After selling his company in 1954, he remained active in design and construction with Bellanca Aircraft Engineering, which he operated with his son.

Bellarmine, Saint Robert, Italian in full SAN ROBERTO FRANCESCO ROMOLO BELLARMINO (b. Oct. 4, 1542, Montepulciano, Tuscany—d. Sept. 17, 1621, Rome; canonized 1930; feast day May 17), Italian cardinal and theologian who, as an outstanding opponent of the Protestant doctrines of the Reformation, was regarded by the Roman Catholic Church as one of its most powerful defenders.

Bellarmine entered the Society of Jesus in 1560. After study in Italy at Rome, Mondovì, and Padua, he was sent to Louvain, where he was ordained in 1570 and began to teach theology. He was forced by the strength of Protestantism and the Augustinian doctrines of grace and free will prevailing in the Low Countries to define his theological principles. He returned to Rome, where he lectured at the new Jesuit College. Made a cardinal by Pope Clement VIII in 1599, he was subsequently appointed archbishop of Capua (1602). As a consultor of the Holy Office, he took a prominent part in the first examination of Galileo's writings. Bellarmine, somewhat sympathetic to Galileo's views, granted him an audience in which he warned him not to defend the Copernican theory but to regard it only as a hypothesis. Acting on the part of the Holy Office, and fearing scandal at a time when Catholicism and Protestantism were embroiled, Bellarmine thought it best to have the Copernican theory, which Galileo supported, declared "false and erroneous." The church so decreed in 1616.

Bellarmine took a passionate, personal interest in the relief of the poor, to whom he gave all his funds. He died a pauper. During his lifetime he gave impartial attention to Protestant works and was regarded as one of the most enlightened of theologians. He was named a doctor of the church by Pope Pius XI in 1931.

Bellarmine's most influential writings were the series of lectures published under the title *Disputationes de controversiis Christianae fidei adversus huius temporis haereticos* (1586–93; "Lectures Concerning the Controversies of the Christian Faith Against the Heretics of This Time"). They contained a lucid and uncompromising statement of Catholic doctrine. He took part in the preparation of the Clementine edition (1591–92) of the Vulgate, in which the inaccuracies of the previous edition produced under Pope Sixtus V were carefully corrected. His catechism of 1597 greatly influenced later works. In 1610 he published *De Potestate Summi Pontificis in Rebus Temporalibus* ("Concerning the Power of the Supreme Pontiff in Temporal Matters"), a reply to William Barclay of Aberdeen's *De Potestate Papae* (1609; "Concerning the Power of the Pope"), which denied all temporal power to the pope. Bellarmine's autobiography first appeared in 1675. A complete edition of his works was published in 12 volumes (1870–74).

BIBLIOGRAPHY. E.A. Ryan, *The Historical Scholarship of Saint Bellarmine* (1936); J. Brodrick, *Saint and Scholar* (1961).

Bellary, town, administrative headquarters of Bellary district, east central Karnātaka (formerly Mysore) state, southern India. Of medieval origin, it is dominated by a 16th-century fort on a granitic rock, 2 mi (3 km) in circumference, which rises abruptly from the surrounding plain to a height of 450 ft (140 m). Haidar (Hyder) Ali, the 18th-century Muslim ruler of Mysore, reputedly expanded the fortifications with the aid of a French engineer, whom he later hanged for not building the fort on an adjacent, higher rock. A rail and road centre, the town processes cotton, the district's main cash crop, and has distillery and sugar-refining enterprises. Its colleges of medicine, law, and education are affiliated with Karnātak University in Dhārwār.

Bellary district (3,822 sq mi [9,898 sq km]) occupies part of the Deccan Plateau at heights of 800–1,000 ft above sea level. A dry region of low rainfall, its black soil is extensively irrigated by the Tungabhadra River Project (dam and power plant). Chief crops are cotton, millet, pulses, and peanuts (groundnuts). There are large iron-ore reserves and smaller deposits of copper in the Bellary–Hospet area, particularly at Copper Mountain.

Main population centres, apart from the town of Bellary, are Sandūr, Kottūru, and Samehalli. A Neolithic Period settlement and stone implements have been excavated at Sangankal. The district was within the Mauryan empire of Aśoka (3rd century BC); later it was ruled by a succession of dynasties. Hampi, about 30 mi west of Bellary town, is the traditional centre of the kingdom of Kiṣkinda (Kishkinda) visited by the Hindu god Rāma in the *Rāmāyaṇa* epic; it also has extensive ruins marking it as the capital site (Vijayanagar) of an empire that flourished from 1336 to 1565 and whose rulers were great patrons of the arts. Pop. (1981) town, 201,579; district, 1,489,225.

Bellas Artes, Museo de (Spanish: Museum of Fine Arts), museum in Caracas containing a variety of international and Venezuelan art, and also possessing fine gardens. It adjoins the Gallery of National Art (Galeria del Arte Nacional), one of the few museums in South America founded to show the national cultural identity of the country; opened in 1976, the gallery contains works by more than 40 Venezuelan painters in the contemporary and popular arts sections. Oriental ceramics and carvings of wood and marble, among other exhibits, are in the Museum of Fine Arts, which also contains a representative collection of European art.

Bellas Artes, Palacio de (Spanish: Palace of Fine Arts), in Mexico City, cultural centre built between 1904 and 1934. The palace contains an opera house, concert hall, museum of popular arts, and halls and galleries for paintings and other works of art. Balcony lobbies display murals by Diego Rivera, José Clemente Orozco, and other Mexican artists. Examples of 19th- and 20th-century Mexican painting and special displays of paintings and sculpture are featured.

A national showplace, the Palace of Fine Arts has interior architectural decorations representing Mexican plant and animal life and masks recalling pre-Hispanic traditions. A huge dome surmounts the structure, which sank more than 15 feet into the ground after its completion.

Bellay, Guillaume du, SEIGNEUR (lord) DE LANGEY (b. 1491, Montmirail, Fr.—d. Jan. 9, 1543, Lyon), soldier and writer known for his diplomatic exploits during the reign of King Francis I of France.

The eldest of six brothers of a noble Angevin family, du Bellay was educated at the Sorbonne. He fought in Flanders and in Italy and was eventually, with Francis I, taken prisoner by the Holy Roman emperor Charles V's troops at the Battle of Pavia (1525). Afterward he was employed by Francis as a diplomat, at first concerned with the drawing up of the Treaty of Cambrai (1529) between Francis

Guillaume du Bellay, detail of an engraving, 16th century

Giraudon—Art Resource/EB Inc.

and Charles V. From 1532 to 1536 he was employed principally in uniting the German princes against Charles V.

Without joining the Protestants, du Bellay defended them against their opponents. In 1534–35 he tried to bring about a meeting between Francis and Philip Melanchthon, Luther's colleague; he was also the friend of many writers and scholars, some of whom were Protestants. Du Bellay himself wrote in the style of the Roman historian Livy. His most important work was the *Ogdoades,* a history of the rivalry between Francis I and Charles V. Only fragments remain: the first part (published 1905), covering the years 1515–21, is written in Latin. The rest is in French and is incorporated in his brother Martin's *Mémoires* (1569). The first four books of a history covering the early years of France were published as *Épitome de l'antiquité des Gaules et de France* (1556; "Abridgment of the Early Times of Gaul and France").

Bellay, Joachim du (b. *c.* 1522, Liré, Fr.—d. Jan. 1, 1560, Paris), French poet, leader with Pierre de Ronsard of the literary group known as La Pléiade. Du Bellay is the author of the Pléiade's manifesto, *La Défense et illustration de la langue française* (1549; *The Defence and Illustration of the French Language,* 1939), in which he asserts that French is capable of producing a modern literature at least equal to that of the Italians.

Du Bellay was born into a noble family of the Loire Valley. His cousin Jean was a prominent cardinal and diplomat. Joachim studied law and the humanities in Poitiers and Paris, and in 1549–50 his first sonnets, inspired by those of the Italian poet Petrarch, were published.

Joachim du Bellay, pencil drawing, 16th century; in the Bibliothèque Nationale, Paris

By courtesy of the Bibliotheque Nationale, Paris

In 1553 he went with Jean on a mission to Rome. By this time he had started to write on religious themes, but his experience of court

life in the Vatican seems to have disillusioned him. He turned instead to meditations on the vanished glories of ancient Rome in the *Antiquités de Rome* and to melancholy satire in his finest work, the *Regrets* (both published after his return to France in 1558).

Throughout his life du Bellay suffered ill health and intermittent deafness. His portraits show a withdrawn and austere figure and reinforce the impression of a man totally dedicated to his art. He had a sincere affection for his country and determined that it should have a literature to rival that of any other nation. He introduced new literary forms into French, with the first book of odes and the first of love sonnets in the language. Abroad, he influenced the English lyric poets of the 16th century, and some of his work was translated by Edmund Spenser as *Complaints . . .* (1591).

bellbird, any of several unrelated birds named for their ringing voices. All belong to the order Passeriformes.

Naked-throated bellbird (*Procnias nudicollis*)
Wolfgang Lummer

Procnias, four species of cotingas (family Cotingidae), chiefly of tropical South America, are more or less white; three wear fleshy ornaments. The white bellbird (*P. alba*) has a tapering black spike, sparsely feathered, on the forehead. The mossy-throated, bearded, or black-winged bellbird (*P. averano*) has many thin wattles hanging from the throat. The three-wattled bellbird (*P. tricarunculata*) confined to Central America, has three bill wattles. The naked-throated bellbird (*P. nudicollis*) has a green face and throat. These jay-sized, fruit-eating birds produce calls that can be heard for surprising distances.

Anthornis melanura, of New Zealand, is a honeyeater (family Meliphagidae). Both sexes of this 23-centimetre (9-inch) dark-green species, which lives in virgin forest, sing in beautifully chiming choruses.

Manorina melanophrys, often called the bellminer, is an Australian honeyeater (family Meliphagidae).

Oreoica gutturalis, also of Australia, usually called the crested bellbird, is a thickhead (subfamily Pachycephalinae of the family Muscicapidae).

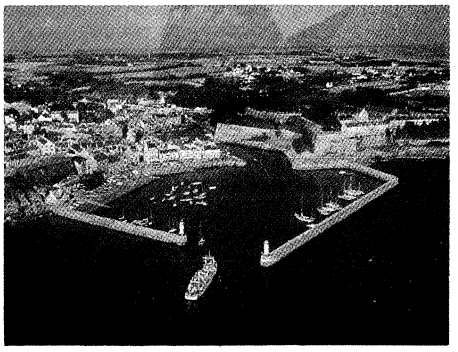
Certain shrike species are also known as bellbirds or bell-shrikes. *See* shrike.

Belle, Étienne de la: *see* Bella, Stefano della.

Belle Fourche, city, seat (1883) of Butte County, western South Dakota, U.S., at the confluence of Red Water Creek and Belle Fourche River, near the Wyoming border. The site was selected by the Fremont, Elkhorn, and Missouri Valley Railroad; it was settled in 1878 and was named for the Belle Fourche (French: "beautiful fork") River. Since its early days the city has been an important market and shipping centre for livestock. Industries include beet-sugar refining, bentonite mining and processing, lumbering, and brick manufacturing. The Belle Fourche (Orman) Dam impounds a reservoir (10 mi [16 km] long and 2 mi wide) used for irrigation and recreation. The city is at the northern entrance to the Black Hills National Forest, and holds the Black Hills Roundup, an annual July rodeo. Inc. 1903. Pop. (1980) 4,692.

Belle Glade, city, Palm Beach County, southeastern Florida, U.S. It originated as the Hillsborough Canal Settlement on the southeast shores of Lake Okeechobee and in 1921 was renamed Belle Glade (from "Belle of the Glades"), selected from an informal poll. A hurricane (1928) caused widespread damage, but the community was rebuilt and incorporated as a town in the same year. It developed as a truck-farming centre, noted for winter vegetables grown on the surrounding rich Everglades muckland, which also supports citrus, sugarcane, and other tropical crops. Sugar processing is significant and a beef cattle industry has been established. Belle Glade became a city by referendum (1945). The Everglades Experiment Station is 3 mi (5 km) east. Pop. (1980) 16,535.

Belle-Île-en-Mer, Breton ENEZ AR GERVEUR, island (area 32 sq mi [83 sq km]) off the south coast of Brittany, France, 8 mi (13 km) southwest of Presqu'Île de Quiberon and administratively part of Morbihan *département,* Bretagne region. As an outpost of the mainland ports of Saint-Nazaire and Lorient, a citadel on the island was strategically important to France from 1572 to the 19th century. Occupied by the British in 1761–63, it was returned to France by the same treaty that yielded Nova Scotia to Great Britain. It has several fishing settlements, the largest being Le



Belle-Île-en-Mer and its harbour, France
Editions d'Art JOS Le Doare

Palais. Its economic basis is agricultural, especially grains, supplemented by fishing. Pop. (1982) 4,191.

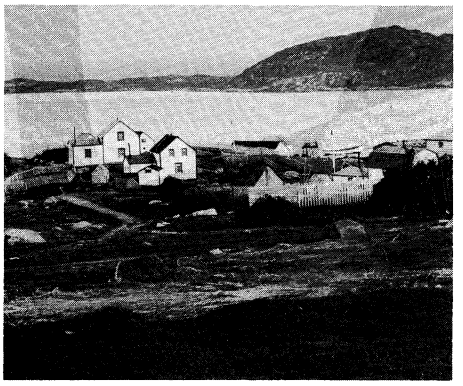
Belle-Isle, Charles (-Louis-Auguste) Fouquet, duc de (duke of), DUC DE GISORS (b. Sept. 24, 1684, Villefranche, Fr.—d. Jan. 26, 1761, Versailles), marshal of France and statesman chiefly important for his role in involving France in the War of the Austrian Succession.

A grandson of the notorious Nicolas Fouquet, finance minister under Louis XIV, Belle-Isle joined the army as a youth and fought in the War of the Spanish Succession and in the war of 1718–19 against Spain. He made his fortune by speculation in a financial system developed by John Law, Scottish monetary reformer and originator of the "Mississippi Scheme." He was disgraced and exiled to his estates by the Duc de Bourbon, head of the regency council. He recovered his position at court under Cardinal Fleury and enhanced his military reputation by successes in the Rhineland during the War of the Polish Succession. Hoping to succeed Fleury as prime minister, Belle-Isle engaged in various court intrigues. He led an anti-Austrian faction at court that forced Fleury into offensive operations against Maria Theresa in the interest of Charles Albert, elector of Bavaria. France ended by repudiating Fleury's recognition of the Pragmatic Sanction and by forgoing a chance to concentrate on naval and colonial rivalry with Great Britain.

Belle-Isle was influential in securing the election of Charles Albert as emperor (Charles VII) on Jan. 24, 1742, for which he was created duc de Gisors in March. Later, as military commander, he skillfully led the withdrawal of French forces from Prague (1742) and successfully defended Provence against the Austrians and Sardinians (1746–47). In 1748 his duchy was made a peerage of France, and in 1749 he was elected to the Académie Française.

Belle-Isle served as minister of war (1758–60) during the Seven Years' War; he carried out minor administrative reforms but was criticized for his failure to reinforce the French troops at Quebec, thereby losing Canada.

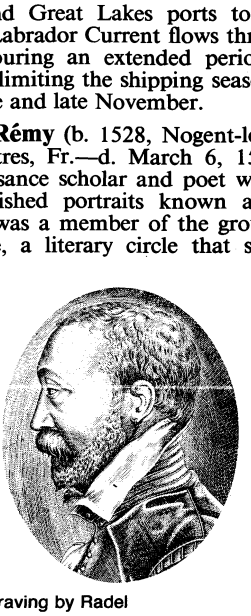
Belle Isle, Strait of, northern entrance from the Atlantic Ocean to the Gulf of St. Lawrence,



Red Bay, fishing village on the Strait of Belle Isle, Labrador
National Film Board of Canada Phototheque

eastern Canada. The strait, 90 mi (145 km) long, 10 to 17 mi wide, and lying between Newfoundland (east) and Labrador (west), is the most direct route from the St. Lawrence Seaway and Great Lakes ports to Europe. The cold Labrador Current flows through the strait, favouring an extended period of ice cover and limiting the shipping season to between June and late November.

Belleau, Rémy (b. 1528, Nogent-le-Rotrou, near Chartres, Fr.—d. March 6, 1577, Paris), Renaissance scholar and poet who wrote highly polished portraits known as miniatures. He was a member of the group called La Pléiade, a literary circle that sought to



Belleau, engraving by Radel
H. Roger-Viollet

enrich French literature by reviving classical tradition.

A contemporary of the poet Pierre de Ronsard at the Collège de Cocqueret, Belleau at first gained the patronage of the Abbé Chretophle de Choiseul and later of Charles IX and Henry III, who made him secretary of the king's chamber. He took part in a campaign against Naples in 1557 and from about 1563 lived at Joinville as tutor and counsellor to the Guises, a powerful Catholic family. Living at the Château de Guise inspired Belleau to write *La Bergerie* (1565–72), a collection of pastoral odes, sonnets, hymns, and amorous verse. Belleau's detailed descriptions of nature and works of art earned him a reputation as a miniaturist in poetry and prompted Ronsard to characterize him as a "painter of nature." His other poetic works include didactic verse; *Les Amours et nouveaux échanges des pierres précieuses* (1576), a commentary on exotic stones and their inherent secret virtues written in the tradition of the medieval lapidaries; and *La Reconnue* (1577), a comedy in verse based on Plautus' *Casina.* His erudite translations of Anacreon's *Odes* (1556) won him the seventh seat or "star" in the constellation of La Pléiade, a name the group adopted in imitation of a group of eminent Greek poets of *c.* 250 BC. Belleau's collected works were edited by A. Gouverneur and published in 1867.

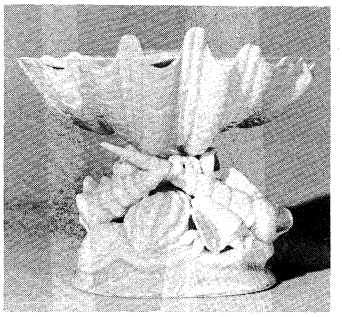
Bellecour, original name JEAN-CLAUDE-GILLES COLSON (b. Jan. 16, 1725, Paris—d. Nov. 19, 1778, Paris), playwright who also was one of the leading comic actors of the Comédie-Française (*q.v.*).

The son of a portraitist, he was a painter in his youth, while concurrently appearing in various amateur theatrical productions. His success on stage caused him to set aside painting and become an actor. After playing in the provinces, he made his debut at the Comédie-Française on Dec. 21, 1750, as Achilles in Racine's *Iphigénie.* Bellecour established his reputation, however, in comic roles. He had entered the Comédie-Française concurrently with the famous French tragedian Lekain. Because of his superb stage presence, Bellecour was preferred. Upon Lekain's formal admission to the company, however, Bellecour forfeited the tragic roles and thus became an outstanding comedian, for which he was more suited. He wrote a successful play, *Les Fausses Apparences* ("The False Appearances"), in 1761.

Bellecour, Madame, original name ROSE-PERRINE LE ROY DE LA CORBINAYE, also called MADEMOISELLE BEAUMÉNARD (b. Dec. 20, 1730, Lamballe, Fr.—d. Aug. 5, 1799, Paris), French actress noted for her performances in works of Molière and Regnard.

The daughter of an aged artillery captain of noble ancestry, Rose-Perrine left home at the age of 13 and took up with an itinerant comedian called Beauménard. She decided to adopt both his name and his calling, and under his auspices she made her debut in 1743 at the Opéra-Comique of the fair at Saint-Germain. Beautiful and flirtatious she was immediately successful. She toured for several years with a variety of companies, entertained troops of the Marshal de Saxe—and, it is said, the Marshal himself—and flitted through numerous amatory encounters. In 1749 she made her debut at the Comédie-Française, first appearing there as Dorine in Molière's *Tartuffe;* her success was immediate. She excelled in the role of soubrette, becoming extremely popular with the public. She retired from the public eye in 1756 and did not reappear until 1761, by which time she had married Bellecour. She resumed a highly successful career as Madame Bellecour, appearing to wide acclaim in soubrette parts in the plays of Molière and Jean-François Regnard. She retired again in 1790. The French Revolution terminated her pension, forcing her to attempt a final comeback. Her failure was pathetic, and she died in poverty.

Belleek ware, porcelain from the factory at Belleek, in Fermanagh, Ire. Extensive local deposits of white feldspar and Cornish china clay and the use of skilled labour from England contributed to the early success of this factory, established by David McBinney and Robert Williams Armstrong in 1857. The white lustreware and the large Parian statuary associated with Belleek both appeared in that first year. Belleek ornate figures, busts in the classical style, ware in natural forms (*e.g.,* shells), and utilitarian ware were among the finest of Victorian eggshell porcelain. The factory became noted for its highly polished iridescent glaze (made under license from the patentee Jules-Joseph Brianchon of Paris) with a frostlike appearance; for a characteristic delicacy and subtlety, evident in the famous Belleek openwork baskets, which, in oval or round form, were hand modelled and embellished with flowers and foliage; and for ornamental motifs taken from marine life. Production continues to the present day, including traditional 19th-century designs.



Belleek porcelain shell ornamental dish probably modelled by Robert Williams Armstrong, *c.* 1868; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

American, or Lenox, Belleek, a successful imitation that developed its own warm and restrained perfection, was initiated by Walter Scott Lenox in about 1889 at the Ceramic Art Company and has been made by Lenox, Inc., since 1906.

Bellefontaine, city, seat (1820) of Logan County, west central Ohio, U.S., 45 mi (72 km) northwest of Columbus. The site was once occupied by a Shawnee village called Blue Jacket's Town (for a white youth [Marmaduke Swearingen] captured while wearing a blue jacket, who later became a Shawnee chief and was one of the tribal leaders at the Battle of Fallen Timbers [1794]). First settled by white men in 1806 and named Bellefontaine ("beautiful fountain") for the local natural springs, it became a service centre for a farming area, but its early importance as a railroad town has declined. Industries include the manufacture of power tools, circuit breakers, electric motors, machinery, and plating. The first concrete street in America was laid around the courthouse in 1891. The state's highest point, Campbell Hill (1,549 ft [472 m]), is 1 mi east. Also in the vicinity are Indian Lake State Park, the Ohio and Zane caverns, the Castle Piatt Mac-A-Cheek (1864, built in the style of a French chateau), and the Mac-O-Chee Castle (1879, modelled after a Flemish castle). Inc. village, 1835; city, 1895. Pop. (1980) 11,888.

Bellême, Robert II, seigneur de (lord of): *see* Robert of Belesme.

Bellenden, John, Bellenden also spelled BALLENDEN, BALLENTYNE, BALLANTYNE, or BANNATYNE (fl. 1533–87), Scottish writer whose translation of Hector Boece's *Scotorum historiae* had a profound influence on Scottish national feeling.

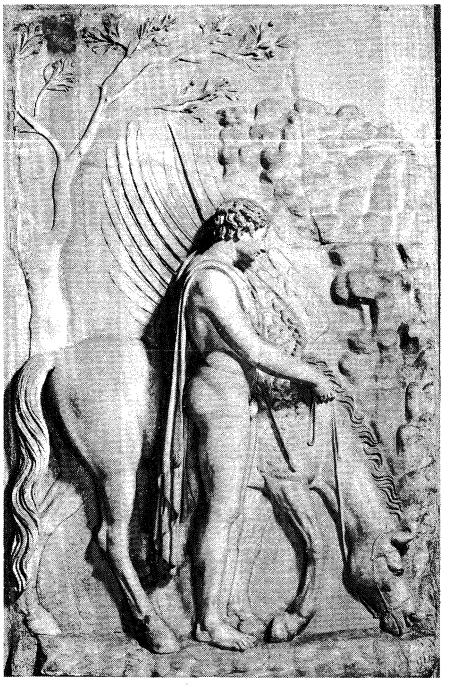
Educated at the universities of St. Andrews (Scotland) and Paris, he was in the service of James V as clerk of accounts from the King's earliest years and at his request translated the *Historiae,* which had just appeared in Paris (1526). It was published as *The History and Chronicles of Scotland* in 1536, prefaced by an original poem entitled *A Proheme to the Cosmographe* and later reprinted separately under the various titles of *Vertue and Vyce* and *An Allegory of Virtue and Delyte.* Written in a fluent and vivid style, the *History* is one of the earliest pieces of literary Scottish prose extant. Among other stories of interest, it made accessible the first account of Macbeth's meeting with the witches.

Also, at the King's request, Bellenden translated the first five books of Livy's *Roman History,* prefacing them with *The Proheme of the History,* another original poem. It was not publicly printed until 1822.

In 1533 Bellenden had become archdeacon of Moray and a canon of Ross. Later, however, he appears to have lost the King's favour, and his strenuous opposition to the Reformation caused him to go into exile. Some authorities say that he died in Rome in 1550, but others that he was still alive in 1587.

Bellenden Ker Range, granitic massif, in the Eastern Highlands, northeastern Queensland, Australia, extending for 40 mi (65 km) along the coast northeast from Nerada to Gordonvale, just south of Cairns. Bounded by the Mulgrave River (east), the Innisfail Downs (south), and the Atherton Plateau (west), the range was named after the Scottish botanist John Bellenden-Ker and culminates at Mt. Bartle Frere, 5,287 ft (1,611 m). In 1921 the area was made a national park, which encompasses 125 sq mi (325 sq km) and is accessible via the Bruce Highway from Brisbane (830 mi southeast). Features include Aboriginal *bora* (ringlike mounds of earth used for tribal rites), varied wildlife (including kangaroo), and vegetation ranging from tropical rain forests to scrub-covered peaks.

Bellerophon, also called BELLEROPHONTES, hero in Greek legend. In the *Iliad* he was



Bellerophon with his horse Pegasus, stone bas-relief; in the Palazzo Spada, Rome

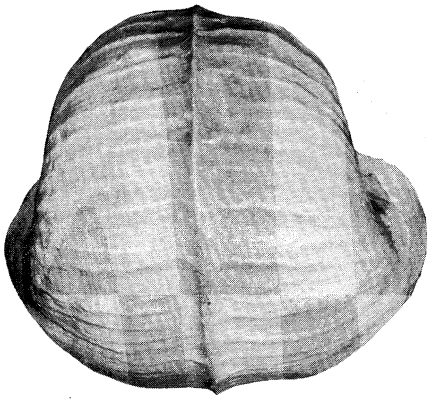
Alinari—Art Resource/EB Inc.

the son of Glaucus, who was the son of Sisyphus of Ephyre (traditionally Corinth). Anteia (or Stheneboea), wife of Proetus, the king of Argos, loved him; when her overtures were rejected, she falsely accused him to her husband. Proetus then sent Bellerophon to the King of Lycia with a message that he was to be slain. The King, repeatedly unsuccessful in his assassination attempts, finally recognized Bellerophon as more than human and married him to his daughter. Bellerophon lived in prosperity until he fell out of favour with the gods, lost two of his children, and wandered grief-stricken over the Aleian Plain.

Later authors added that, while still at Corinth, Bellerophon tamed the winged horse Pegasus (*q.v.*) with a bridle given to him by Athena and that he used Pegasus to fight the Chimera and afterward to punish Anteia. He supposedly earned the wrath of the gods by trying to fly up to heaven and was thrown from Pegasus and lamed.

Bellerophon's adventures were frequently represented in ancient art and formed the subject of the *Iobates* of Sophocles and of the *Bellerophontes* and *Stheneboea* of Euripides.

Bellerophon, extinct genus of gastropods (snails) found as fossils in rocks of Ordovician to Triassic age (between 190,000,000 and 500,000,000 years old). *Bellerophon* is characteristic of the bellerophontids, a large group of snails. The shell of *Bellerophon* was primitive in that it was coiled with the midline in a single plane; the upper half of the shell was the mirror image of the lower half. In *Bellerophon,* growth lines angled away from a raised ridge along the midline of the shell. The anterior margins of the shell were flared outward and separated by a narrow slit, the selenizone.



Bellerophon

By courtesy of the trustees of the British Museum (Natural History); photograph, Imitor

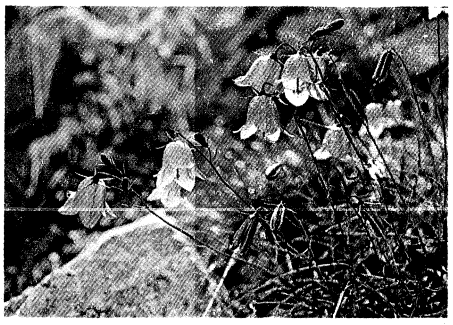
Belleville, city, seat (1792) of Hastings County, southeastern Ontario, Canada, on the Bay of Quinte, an inlet of Lake Ontario, at the mouth of the Moira River. The site was first visited by the French explorer Samuel de Champlain in 1615; it was settled after 1776 by Loyalists from the U.S. and named Meyers' Creek for John Meyers, an early gristmill operator. In 1816 the city was renamed Belleville in honour of Arabella Gore, wife of Francis Gore, lieutenant governor of Upper Canada. Reached by the railroad in 1855, it soon became an important terminal and service centre. Economic activities include dairying (especially cheese making), meat-packing, and the manufacture of cement, conveyor machinery, plastics, and electronic equipment. Belleville is also a vacation resort and the site of Albert College (founded in 1854), the Loyalist College of Applied Arts and Technology, and a school for the deaf. Both national transcontinental railroads and the Macdonald-Cartier Freeway, which links Windsor, Toronto (113 mi [182 km] west), and Montreal (232 mi east), serve the city. Inc. town, 1850; city, 1877. Pop. (1981) 34,881.

Belleville, city, seat (1814) of St. Clair County, southwestern Illinois, U.S., adjoining East St. Louis. Located on bluffs forming the eastern rim of a floodplain along the Mississippi River, it was founded in 1814 and given the French name for "beautiful town." Originally an agricultural centre, by the mid-1850s, after the opening of coal mines in the vicinity and the resulting influx of German immigrants, its economy became diversified, with coal mining and manufacturing (beverages and cooking and heating equipment) as the main factors. Scott Air Force Base (1917) is just east. The National Shrine of Our Lady of the Snows (1958) is nearby. Belleville Area (junior) College was established in 1946. Inc. town, 1819; city, 1850. Pop. (1980) 42,150.

Bellevue, city, Sarpy County, eastern Nebraska, U.S., on the Missouri River, immediately southeast of Omaha. Established in the early 1800s as a fur trading post, it is the state's oldest continuous settlement and was an important missionary centre and Indian agency. It became a river port but moved its site in 1835 to bluffs overlooking the river valley. The state's first newspaper, the *Nebraska Palladium,* was published there in 1854. It served as county seat (1857–75). The Old Settler's Home and the old city hall (1856) are preserved. The establishment nearby of the Martin bomber plant (1941) at Fort Crook and of Offutt Air Force Base (1948), site of the Strategic Aerospace Museum and Strategic Air Command headquarters, boosted residential growth. Bellevue College opened in 1966. Fontenelle Forest Natural Landmark adjoins the city to the northeast. Inc. 1855. Pop. (1980) 21,813.

bellflower, any of about 300 annual, perennial, and biennial herbs that compose the genus *Campanula* (family Campanulaceae). Bellflowers bear bell-shaped, usually blue flowers. They are native mainly to northern temperate regions, Mediterranean areas, and tropical mountains. Many are cultivated as garden ornamentals.

Tall bellflower (*Campanula americana*), native to moist woodlands of North America, has flowering spikes that may reach 2 metres (6 feet) high and has saucer-shaped flowers with long, curved styles. Tussock bellflower, or Carpathian harebell (*C. carpatica*), with lavender to white, bowl-shaped, long-stalked flowers, several to the stem, has many forms. The plants, 15 to 25 centimetres (6 to 10 inches) tall, form clumps in east European meadows and woodlands. Fairy thimbles (*C. cochleariifolia*), named for its deep, nodding, blue to white bells, forms loosely open mats on alpine screes. Bethlehem stars (*C. isophylla*), a trailing Italian species often grown as a pot plant, bears sprays of star-shaped violet, blue, or white flowers. Canterbury bell (*C. medium*), a southern European biennial, has large pink, blue, or white spikes of cup-shaped flowers. Peach-leaved bellflower (*C. persicifolia*), found in Eurasian woodlands and meadows, produces slender-stemmed spikes, 30 to 90 cm tall, of long-stalked, outward-facing bells. Rampion (*C. rapunculus*), a Eurasian and North African biennial grown for its turnip-like roots and leaves, which are eaten in salads for their biting flavour, produces ascending clusters of long-stalked lilac bells. It has narrow stem leaves and untoothed, broadly oval basal leaves that form a rosette around the stalk. Rover, or creeping, bellflower (*C. rapunculoides*), a European plant named for its spreading rhizomes, has become naturalized in North America. Throatwort, or bats-in-the-belfry (*C. trachelium*), a coarse, erect, hairy Eurasian plant naturalized in North America, bears clusters of lilac-coloured, funnel-shaped flowers. Other common European plants of the genus *Campanula* that often are cultivated in gardens are Adria bellflower (*C. garganica,* sometimes classified as a variety of *C. elatines*); clustered bellflower (*C. glomerata*); milky bellflower (*C. lactiflora*); great bellflower (*C. latifolia*); and *C. zoysii. See also* harebell.



Bellflower (*Campanula*)

W.H. Hodge

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Belli, Carlos Germán (b. Sept. 15, 1927, Lima), poet noted for the nihilistic outlook of his work and for the orderly precision of his language. Belli also worked as a translator and sometime journalist. He travelled widely in South America, and lived at various times in Spain, Italy, and the United States. He taught literature at San Marcos University in Lima and in the United States.

Poemas (1958) and *Dentro y fuera* (1960; "Within and Without"), despite their Surrealist tone, have a syntax and diction that recall the orderly precision of the Spanish Golden Age. This language couched in the immediacy of the present strives to comprehend a basically inhuman world. *¡Oh hada cibernética!* (1961; "O Cybernetic Fairy") is a sarcastic and ironic denunciation of reality. Alienating and oppressive forces fragment the individual, leading to total disintegration. The sterile, dehumanizing language of technology with its "cybernetic fairy" has trapped mankind in a world from which there is no escape.

Belli's collections *El pie sobre el cuello* (1967; "The Foot on the Throat") and *Sextinas y otros poemas* (1970; "Sestinas and Other Poems") continue to present a nihilistic vision of the world. Some critics have suggested that Belli's insistence on the negative aspects of life conceals his desire for communion, fraternity, and order. Some of his poems have been anthologized in English translation collections.

Belli, Giuseppe Gioacchino (b. Sept. 10, 1791, Rome—d. Dec. 21, 1863, Rome), poet whose satirical sonnets present a vivid picture of life in papal Rome in the early 19th century.

After an unhappy childhood he was a clerical worker until, in 1816, marriage to a rich widow enabled him to devote much time to poetry. His conservative political views as a papal civil servant were jolted by the Revolution of 1848 and the formation of the Roman republic of 1849. He stopped writing satiric verses, and in his final hours asked that his sonnets be burned. Throughout his life he was troubled by moral and religious scruples.

His more than 2,000 sonnets in Roman dialect contrast with his conformist way of life. Composed mainly during 1830–39, they seem to have provided an outlet for his repressed feelings. Although he also wrote conventional

poems in Italian, his originality lies in the sonnets, which express his revolt against literary tradition, the academic mentality, and the social injustices of the papal system. The ritualism of the church and the accepted principles of commonplace morality were also objects of his derision. But just as when he writes in his most erotic vein Belli is never obscene, so he is never really impious in his apparently most profane sonnets; in them, rather, he registers a passing mood of rebellion.

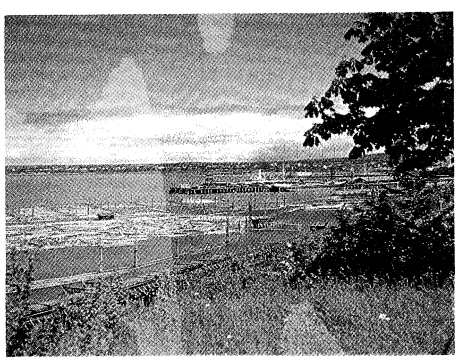
Belli's greatest gift is for observing and describing the people of Rome with the range of a major novelist. An edition of Belli's sonnets (introduction by G. Vigolo) appeared in three volumes in 1952. An English translation of 46 of the sonnets by Harold Norse appeared in 1960 and 1974.

Belli, Pierino (b. March 20, 1502, Alba, Montferrat—d. Dec. 31, 1575, Turin, Savoy), Piedmontese soldier, jurist, and an authority on the law of war who is considered one of the founders of modern international law.

After serving as commander in chief of the army of the Holy Roman Empire in Piedmont, he was appointed (1560) a councillor of state by Emmanuel Philibert, duke of Savoy. His book *De re militari et de bello* (1563) was for its time an unusually thorough treatment of military law and the rules for conducting war.

belligerency, the condition of being in fact engaged in war. A nation is deemed a belligerent even when resorting to war to withstand or punish an aggressor. A declaration of war is not necessary to create a state of belligerency. The United States and the People's Republic of China were belligerents during the Korean conflict though both parties avoided characterizing the hostilities as war. The 1949 Geneva Convention Relative to the Treatment of Prisoners of War (Geneva Convention III) applies not only to declared war but to any armed conflict between parties to the Geneva conventions and to the occupation of the territory of a party even if unresisted. Under Geneva Convention III, lawful belligerents comprise members of the armed forces as well as the members of militias, voluntary corps, and organized resistance groups who are commanded by a person responsible for his subordinates, have a distinctive sign, carry arms openly, and conduct operations lawfully. A nation departing from strict neutrality by giving assistance to one of the contending factions in a war may still be considered a nonbelligerent under certain circumstances. *See also* Geneva conventions; neutrality.

Bellingham, city, seat (1854) of Whatcom County, northwestern Washington, U.S., on Bellingham Bay (named in 1792 by Capt. George Vancouver for Sir William Bellingham). The site was settled in 1852, when Capt. Henry Roeder built a sawmill at the lower Whatcom Falls. Coal-mining operations began in 1854 and the bay was a temporary "staging area" for the ill-fated Fraser River gold rush (1857–58). Four communities (Whatcom, New Whatcom, Sehome, and Fairhaven) known as the Bellingham Bay Settlements were established by the 1880s. By 1903 they had merged to form the present city. With railroad connections and improved harbour facilities, timber-pulp operations, fish canneries, and pleasure-boat building developed. Mount Baker-Snoqualmie National Forest is near Bellingham, which is also a gateway to the San Juan Islands. Western Washington University was founded there in 1899 and Whatcom Community College in 1967. The Lummi Indian Reservation is 5 mi (8 km) northwest. Pop. (1980) city, 45,794; metropolitan area (SMSA), 106,701.

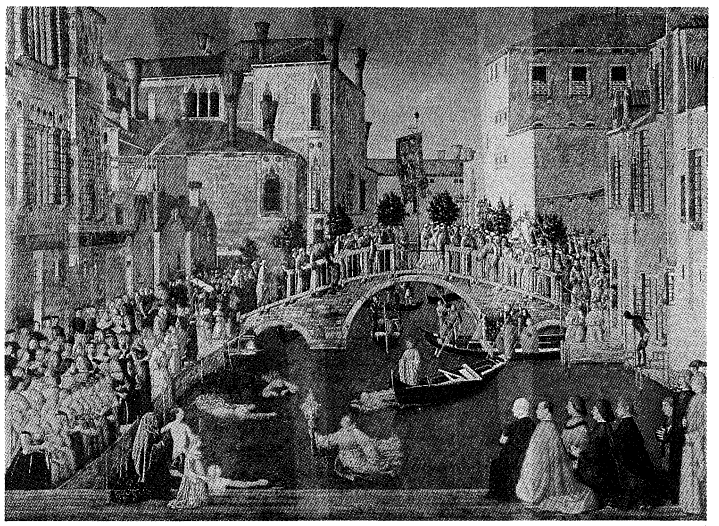


Log storage pond, Bellingham, Wash.
Whitmire

Bellini, duct of: *see* renal collecting tubule.

Bellini, Gentile (b. *c.* 1429, Venice—buried Feb. 23, 1507, Venice), painter, member of the founding family of the Venetian school of Renaissance painting, best known for his portraiture and scenes of Venice.

He was trained by his father, Jacopo Bellini, a painter who introduced the Renaissance style into Venice. Jacopo's influence may be seen in Gentile's early "Madonna" (Staatliche Museen Preussischer Kulturbesitz, Berlin). As an independent artist, he contracted with the officers of the Scuola di San Marco in 1466 to decorate the doors of their organ. These paintings represent four saints, colossal in size and designed with the harsh austerity and daring perspective that characterized the style of his brother-in-law, Andrea Mantegna, then the most prominent painter of the Paduan school. The same influence may be seen in his "Banner of Blessed Lorenzo Giustiniani" (1465; Accademia, Venice), with its sharp, incisive outlines and stiff drapery.



"Recovery of the Holy Cross," oil painting by Gentile Bellini, 1500; in the Accademia, Venice
SCALA—Art Resource/EB Inc.

In 1479 the Doge sent Gentile to Constantinople as a painter to Sultan Mohammad II. The most important of the extant works Gentile painted there is the "Portrait of Mohammad II" (*c.* 1480; National Gallery, London), a masterful characterization of the shrewd, cultivated ruler. In his pen and gouache drawing "Portrait of a Turkish Boy" (1479–80; Isabella Stewart Gardner Museum, Boston), Gentile employs a flat patterned style similar to that of the Turkish miniatures that influenced such later works as his "Portrait of Doge Giovanni Mocenigo" (1478–85; Civico Museo Correr, Venice).

Among Gentile's best known works are the scenes of Venice painted for the Scuola di San Giovanni Evangelista, a religious fraternal organization. These works deal with episodes related to a relic of the Holy Cross that the Scuola owned. Those events are all but lost in the panorama of "Procession in St. Mark's Square" (1496) and the "Recovery of the Holy Cross" (1500; both in the Accademia, Venice), huge canvases painted with fastidious attention to the smallest detail and crowded with small, rigid figures, including many portraits. A similar but lesser known work is his "St. Mark Preaching in Alexandria" (1493–1507; Brera, Milan), which was finished after Gentile's death by his brother, Giovanni, one of the great Venetian painters of the Renaissance. These paintings are of interest today primarily as records of Venetian life and architecture during the 15th century.

Bellingshausen, Fabian Gottlieb von, Russian FADDEY FADDEYEVICH BELLINSGAUZEN (b. Aug. 18 [Aug. 9, old style], 1778, Ösel, Estonia, Russian Empire—d. Jan. 13 [Jan. 2, O.S.], 1852, Kronshtadt), Russian explorer who was the first to circumnavigate Antarctica (1819–21), and for whom was named the Bellingshausen Sea, an area of the Antarctic waters.

Bellingshausen
Novosti Press Agency

Bellingshausen entered the Russian Navy at age 10 and was an admiral and the governor of Kronshtadt at the time of his death.

Commanding the "Vostok" and "Mirny," sloops of about 500 tons each, on his Antarctic voyage, he discovered Peter I (Jan. 22, 1821) and Alexander I (January 29) islands in the South Sandwich Island group. These were the first sightings of land within the Antarctic Circle, thought at first to be part of the mainland. His account of the voyage was translated into English in 1945.

Bellini, Giovanni (b. *c.* 1430, Venice—d. 1516, Venice), Italian painter who made

Venice a centre of Renaissance art comparable to Florence and Rome. Although the paintings for the hall of the Great Council in Venice, considered his greatest works, were destroyed by fire in 1577, a large number of altarpieces (such as that in the church of SS. Giovanni e Paolo, Venice) and other extant works show a steady but adventurous evolution from purely religious, narrative emphasis to a new naturalism of setting and landscape.

Little is known about Bellini's family. His father, Jacopo, a painter, was a pupil of Gentile da Fabriano, one of the leading painters of the 15th-century Gothic revival, and may have followed him to Florence. In any case, Jacopo introduced the principles of the Florentine Renaissance to Venice before either of his sons. Apart from his sons Gentile and Giovanni, he had at least one daughter, Niccolosa, who married the painter Andrea Mantegna in 1453. Both sons probably began as assistants in their father's workshop.

Giovanni's earliest independent paintings were more strongly influenced by the severe manner of the Paduan school, and especially of his brother-in-law, Mantegna, than they were by the graceful style of Jacopo. This influence is evident even after Mantegna left for the court of Mantua in 1460. Giovanni's earliest works date from before this period. They include a "Crucifixion," a "Transfiguration," and a "Dead Christ Supported by Angels." Several pictures of the same or earlier date are in the United States and others at the Museo Civico Correr in Venice. Four triptychs, a set of three panels used as an altarpiece, are still in the Venice Accademia, and two "Pietàs," both in Milan, are all from this early period. His early work is well exemplified in two beautiful paintings now in the National Gallery of London, "The Blood of the Redeemer" and "The Agony in the Garden."

In all his early pictures he worked with tempera, combining the severity and rigidity of the Paduan school with a depth of religious feeling and human pathos all his own. His early Madonnas, following in his father's tradition, are mostly sweet in expression, but he substituted for a mainly decorative richness one drawn more from a sensuous observation of nature. Although the pronounced linear element—*i.e.,* the dominance of line rather than mass as a means of defining form, derived from the Florentine tradition and from the precocious Mantegna—is evident in the paintings, the line is less self-conscious than Mantegna's work, and, from the first, broadly sculptured planes offer their surfaces to the light from a dramatically brilliant sky. From the beginning Giovanni Bellini was a painter of natural light, as were Masaccio, the founder of Renaissance painting, and Piero della Francesca, its greatest practitioner at that time. In these earliest pictures the sky is apt to be reflected behind the figures in streaks of water making horizontal lines in a mere strip of landscape. In "The Agony in the Garden," the horizon moves up, and a deep, wide landscape encloses the figures, to play an equal part in expressing the drama of the scene. As with the dramatis personae, the elaborately linear structure of the landscape provides much of the expression, but an even greater part is played by the colours of the dawn, in their full brilliance and in the reflected light within the shadow. This is the first of a great series of Venetian landscape scenes that was to develop continuously for a century or more. To a city surrounded by water, the emotional value of landscape was now fully revealed.

The great composite altarpiece with St. Vincent Ferrer, which is still in the church of SS. Giovanni e Paolo in Venice, was painted perhaps 10 years later, toward the mid-1470s. But the principles of composition and the method of painting had not yet changed essentially; they had merely grown stronger in expression. It seems to have been during a voyage down the Adriatic coast, made probably not long afterward, that Bellini encountered the influence that must have helped him most toward his full development: that of Piero della Francesca. Bellini's great "Coronation of the Virgin" at Pesaro, the first Venetian picture in the full style of the Renaissance, probably reflects and carries still further in composition the ideas expressed by Piero in an unrecorded "Coronation of the Virgin," the lost centrepiece of a polyptych originally in the church of S. Agostino at Borgo Sansepolcro. Christ's crowning of his Mother beneath the effulgence of the Holy Ghost is a solemn act of consecration, and the four saints who stand witness beside the throne are characterized by their deep humanity. Every quality of their forms is fully realized: every aspect of their bodies, the textures of their garments, and the objects that they hold. As with work by Masaccio and Piero della Francesca, the perspective and the polychrome of pavement and throne help to establish the group in space, and the space is enlarged by the great hills behind and rendered infinite by the luminosity of the sky, which envelops the scene and gathers all the forms together into one. Harmony is the aim of all art, but the significance of the harmony depends upon the significance of its parts, as well as upon the degree of its intensity. Here, Bellini has provided humanity with the full grandeur of nature, and it is nature endowed with all that is religious in man. The unity achieved has an emotional warmth that is uniquely his.

A new degree of technical achievement is implied. The fact that at this point Giovanni painted mainly in oil does not completely explain his greatness. Piero was one of many Italian painters who were already using the oil medium. A legend that Giovanni ceased to paint in tempera only after he was introduced to oils by Antonello da Messina, who was in Venice in 1475/76, is without point, for much the same effects can be produced in either medium.

It is the way of using the medium that makes the difference—and that depends upon the painter's intentions and upon his vision. It was Bellini's richer and wider vision that determined his future development. Oil paint is inclined to be the more transparent and fusible and therefore lends itself to richer colour and tone by allowing a further degree of glazing, the laying of one translucent layer of colour over another. It is this technique and the unprecedented variety with which he handled the oil paint that gives his fully mature painting the richness associated with the Venetian school.

Giovanni's brother Gentile was chosen by the government to continue the painting of great historical scenes in the hall of the Great Council in Venice; but in 1479, when Gentile was sent on a mission to Constantinople, Giovanni took his place. From that time to 1480 much of Giovanni's time and energy was devoted to fulfilling his duties as conservator of the paintings in the hall, as well as painting six or seven new canvases himself. These were his greatest works, but they were destroyed when the huge hall was gutted by fire in 1577. We can now only gain an approximate idea of their design from "The Martyrdom of St. Mark" in the Scuola di S. Marco in Venice, finished and signed by one of Giovanni's assistants, and of their execution from Giovanni's completion of Gentile's "St. Mark Preaching in Alexandria" after his brother's death in Venice in 1507.

Yet a surprisingly large number of big altarpieces and comparatively portable works have survived and show the steady but adventurous evolution of his work. The principles and the technique of the Pesaro altarpiece find their full development in the still larger Madonna altarpiece from S. Giobbe in the Venice Accademia, where the Virgin enthroned in a great apse and the saints beside her seem ready to melt into the reflected light. This seems to have been painted before the earliest of his dated pictures, the half-length "Madonna degli Alberetti," also in the Venice Accademia, of 1487.

While for the first 20 years of Giovanni's career the subject matter was limited mainly to Madonnas, Pietàs, and Crucifixions, toward the end of the century it began to be greatly enriched not so much by the wider choice of subjects, which were still mainly religious, as by the development of the mise-en-scène, the physical setting of the picture. He became one of the greatest of landscape painters. His study of outdoor light was such that one can deduce not only the season depicted but almost the hour of the day.

Bellini also excelled as a painter of ideal scenes; *i.e.,* scenes of primeval as opposed to individualized images. For the "St. Francis in Ecstasy" of the Frick Collection or the "St. Jerome at His Meditations," painted for the high altar of Sta. Maria dei Miracoli in Venice, the anatomy of the earth is studied as carefully as those of human figures; but the purpose of this naturalism is to convey idealism through the realistic portrayal of detail. In the landscape "Sacred Allegory," now in the Uffizi, he created the first of the dreamy enigmatic scenes for which Giorgione, his pupil, was to become famous. The same quality of idealism is to be found in his portraiture. His "Doge Leonardo Loredan" in the National Gallery, London, has all the wise and kindly firmness of the perfect head of state, and his "Pietro Bembo" (?) in the British royal collection portrays all the sensitivity of a poet.

Both artistically and personally the career of Giovanni Bellini seems to have been serene and prosperous. He lived to see his own school of painting achieve dominance and acclaim. He saw his influence propagated by a host of pupils, two of whom surpassed their master in

"Enthroned Madonna from S. Giobbe," panel painting by Giovanni Bellini, 1480s; in the Accademia, Venice

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world fame: Giorgione, whom he outlived by six years, and Titian.

The only personal description extant of Giovanni is from the hand of Albrecht Dürer, who wrote to the German humanist Willibald Pirkheimer from Venice in 1506 "... everyone tells me what an upright man he is, so that I am really fond of him. He is very old, and still he is the best painter of them all."

(P.He.)

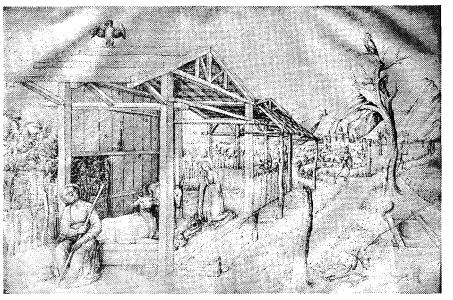
MAJOR WORKS. "Annunciation" (1450s; Thyssen-Bornemisza Collection, Castagnola, Switz.); "Transfiguration" (1450s; Museo Civico Correr, Venice); "Christ Blessing" (1450s; Louvre, Paris); "Virgin and Child" (1450s; Philadelphia Museum of Art, Philadelphia); "Pietà" (1460s; Museo Poldi Pezzoli, Milan); "The Agony in the Garden" (1460s; National Gallery, London); "The Blood of the Redeemer" (1460s; National Gallery, London); "Pietà with Virgin and St. John" (1460s; Brera, Milan); "St. Vincent Ferrer Polyptych" (mid-1470s; SS. Giovanni e Paolo, Venice); "Madonna with Sleeping Child" (1470s; Accademia, Venice); "Coronation of the Virgin" (1470s; Museo Civico, Pesaro); "St. Jerome" (1470s; Contini Bonacossi Collection, Florence); "Madonna with the Greek Inscription" (1470s; Museo di Castelvecchio, Verona); "Madonna and Child" (1470s; National Gallery of Art, Washington, D.C.); "Madonna with Standing Child" (1470s; Accademia, Venice); "Portrait of Georg Fugger" (1474; formerly Contini Bonacossi Collection, Florence); "St. Francis in Ecstasy" (*c.* 1480; Frick Collection, New York City); "Enthroned Madonna from S. Giobbe" (1480s; Accademia, Venice); "Transfiguration" (1480s; Museo e Gallerie Nazionali di Capodimonte, Naples); "Resurrection" (1480s; Staatliche Museen Preussischer Kulturbesitz, Berlin); "Madonna degli Alberetti" (1487; Accademia, Venice); "Madonna and Child with Saints" (1488; Sta. Maria dei Frari, Venice); "Madonna with Doge Agostino Barbarigo" (1488; S. Pietro Martire, Murano); "Madonna of the Pomegranate" (*c.* 1490; National Gallery, London); "Madonna and Child with St. Paul and St. George" (*c.* 1490; Accademia, Venice); "The Allegory of the Souls in Purgatory" (1490s; Uffizi, Florence); "Portrait of a Young Man" (1490s; National Gallery of Art, Washington, D.C.); "Doge Leonardo Loredan" (*c.* 1501; National Gallery, London); "Enthroned Madonna with Four Saints" (1505; S. Zaccaria, Venice); "The Madonna of the Meadow" (*c.* 1505; National Gallery, London); "Madonna" (1510; Brera, Milan); "St. Jerome with St. Christopher and St. Augustine" (1513; S. Giovanni Crisostomo, Venice); "The Feast of the Gods" (landscape overpainted by Titian, 1500s; National Gallery of Art).

BIBLIOGRAPHY. The earliest biography of Bellini is by Giorgio Vasari in *The Lives of the Painters,...* (1568; Eng. trans. by E.H. and E.W. Bashfield and A.A. Hopkins, 4 vol., 1913). By the end of the 19th century, notable studies in English, more concerned with his painting than his life, had appeared in J.A. Crowe and G.B. Cavalcaselle, *A History of Painting in North Italy,...*, vol. 1 (1871); Bernhard Berenson, *The Venetian Painters of the Renaissance* (1894); and Roger Fry, *Giovanni Bellini* (1899). In the 20th century the study of Bellini's work has been extensive—the contributions of the Italian art historians Adolfo Venturi and, later, Roberto Longhi and of the German G. Gronau marking advances in knowledge—and it received special impetus from the 1949 Bellini exhibition in Venice. Rodolfo Pallucchini, who prepared the catalog for that exhibition, has written a standard work, *Giovanni Bellini* (1959; Eng. trans. 1962), tracing the development of Bellini's painting, with notes relating to the 285 plates and with a bibliography. Fritz Heinemann, *Giovanni Bellini e i Belliniani,* 2 vol. (trans. into Italian, 1962), is an annotated catalog of 1,902 works by Bellini and his followers, including copies of lost works and works once wrongly attributed to Bellini, with 910 illustrations. Philip Hendy and Ludwig Goldscheider, *Giovanni Bellini* (1945), is an introductory essay. A later important work is Giles Robertson, *Giovanni Bellini* (1968), an account of Bellini's career and oeuvre.

Bellini, Jacopo (b. *c.* 1400, Venice—d. *c.* 1470, Venice), painter who introduced the principles of Florentine early Renaissance art into Venice.

He was trained under the Umbrian artist Gentile da Fabriano, the most influential International Gothic painter in Italy. By 1423 he had accompanied his master to Florence. There the progress made in fidelity to nature and in mastery of classic grace by such masters as Donatello and Ghiberti, Masaccio and Paolo Uccello offered Jacopo further instruction.

By 1429 Jacopo was settled at Venice and had established himself as the city's most important painter. The use of gold pigment in highlights of such works as his "Madonna" (*c.* 1438; Accademia, Venice) shows that Jacopo long retained elements derived from Byzantine art, while the Child's rich robes and the patterned background of angels reveal his continued interest in the decorative International Gothic style. The modelling of the figures, the



"The Nativity," leadpoint by Jacopo Bellini, *c.* 1450; in the Louvre, Paris

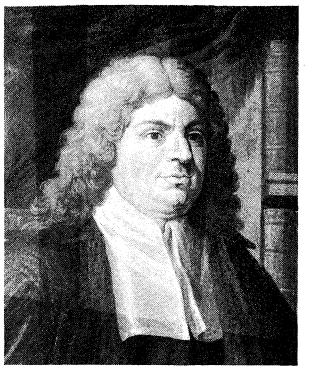
Giraudon—Art Resource/EB Inc.

confident rendering of folds of cloth, and the accurate perspective, however, indicate an excellent understanding of the progressive art of 15th-century Florence. In the life-sized "Crucifixion" (Museo di Castelvecchio, Verona), the spare and sombre scene strictly conforms to the Florentine Renaissance style of Masaccio and repudiates the rich colouring and courtly grace of Bellini's earlier known works.

More important than his paintings are his two books of drawings (*c.* 1450). The Louvre in Paris and the British Museum in London each own one of these sketchbooks. The drawings depict a great variety of scenes, and artists used them as models for compositions well into the 16th century. In such drawings as the "Nativity," the "Flagellation," and "St. John the Baptist Preaching," Jacopo experimented with linear perspective and was among the first to make figures diminish in space using rules of perspective formerly applied only to depictions of architecture. The "Crucifixion" (British Museum, London) is among Jacopo's boldest compositional experiments. Possibly for the first time in art, the three crosses are viewed at an angle instead of frontally, and the soldiers' backs are turned to the viewer, lending a spontaneity and immediacy rare in Italian art of the time. Jacopo's great influence upon Venetian art was heightened through the work of his sons, Gentile and Giovanni, and his son-in-law, Andrea Mantegna, all of whom were prominent painters in the vicinity of Venice.

Bellini, Lorenzo (b. Sept. 3, 1643, Florence—d. Jan. 8, 1704, Florence), physician and anatomist who described the collecting, or excretory, tubules of the kidney, known as Bellini's ducts (tubules).

In *Exercitatio anatomica de structura et usu renum* (1662; "Anatomical Exercise on the Structure and Function of the Kidney"), published when he was a 19-year-old student at the University of Pisa, Bellini showed for the first time that the kidney consists of an immense number of tiny canals. A professor at Pisa for 30 years, Bellini described the taste organs (1665) and stressed the value of urinalysis as an aid to diagnosis (1683). After retiring from the university to Florence (1693 or 1694), he became physician to Duke Cosimo III and Pope Clement XI.



Lorenzo Bellini, detail of an oil painting by an unknown artist

Alinari—Art Resource/EB Inc.

Bellini, Vincenzo (b. Nov. 3, 1801, Catania, Sicily—d. Sept. 23, 1835, Puteaux, near Paris), operatic composer with a gift for creating vocal melody at once pure in style and sensuous in expression; his influence is reflected not only in later operatic composers, including the early works of Richard Wagner, but also in the instrumental music of Chopin and Liszt.

Born into a family of musicians, Bellini produced his first works while still a student at the Naples Conservatory, where he had been sent by his father, an organist. Bellini gained the patronage of an important impresario, who commissioned *Bianca e Fernando* for the Naples opera. The success of this early work led to other commissions. *Il pirata* (1827), written for La Scala, the opera house at Milan, earned

Vincenzo Bellini, portrait by an unknown artist; in the Museo Teatrale alla Scala, Milan

By courtesy of the Museo Teatrale alla Scala, Milan

Bellini an international reputation. He was fortunate in having as librettist the best Italian theatre poet of the day, Felice Romani, with whom he collaborated in his next six operas. The most important of these were *I Capuleti ed i Montecchi* (1830), based on Shakespeare's *Romeo and Juliet; La sonnambula* (1831; *The Sleepwalker*); and *Norma* (1831). *La sonnambula,* an opera semiseria (serious but with a happy ending), became very popular, even in England, where an English version appeared. His masterpiece, *Norma,* a tragedy set in ancient Gaul, achieved lasting success despite an initial failure.

Bellini lived briefly in London in 1833, then went to Paris, where the composer Gioacchino Rossini's influence secured for him a commission to write an opera for the Théâtre-Italien. The result was *I puritani di Scozia* (1835), the last of Bellini's nine operas; although handi-

capped by an inept libretto, it is in many ways his most ambitious and beautiful work.

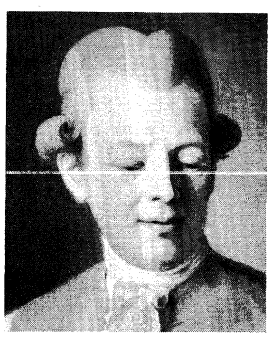
Bellini's fame was closely bound up with the bel canto style of the great singers of his day. He was not a reformer; his ideals were those of Haydn and Mozart, and he strove for clarity, elegance of form and melody, and a close union of words and music. Yet with perseverance he corrected some of the grosser abuses of opera then current. While he subordinates the orchestra accompaniment to the singers and places upon their voices the responsibility for dramatic expression, his harmony is more enterprising than that of his contemporary Gaetano Donizetti, and his handling of the orchestra in introductions and interludes is far from perfunctory. It is, however, for the individual charm and elegance of his luminous vocal melody that Bellini is remembered.

Bellinzona, capital of Ticino canton, southern Switzerland, on the Ticino River, at the junction of roads to the St. Gotthard, Lukmanier, and San Bernardino passes, east of Locarno. Possibly of Roman origin, it was first mentioned in AD 590 and played a considerable part in the early history of Lombardy because of its strategic location. A possession of the bishops of Como in the 8th century, it was the object of continuous conflict between the Lombardian cities of Como and Milan in the 14th and 15th centuries. Occupied by the French (with the other Milanese lands) in 1499, it was taken by Uri canton in 1500, and the French king ceded it to Uri, Schwyz, and Unterwalden cantons in 1503. It became the capital of the Bellinzona canton of the Helvetic Republic in 1798 and in 1803 became the joint capital, with Locarno and Lugano, of the newly formed Ticino canton. It has been the permanent political capital of the canton since 1878.

The town is dominated by three 15th-century castles of the dukes of Milan. There are also remains of the great wall (*murata*) that barred the Ticino Valley *c.* 1500, and it is the location of several 16th-century churches. Tourism, which increased rapidly after the opening of the St. Gotthard railway line (1882), is the most important economic factor, but there are small industries. The population is Italian speaking and Roman Catholic. Pop. (1983 est.) 16,973.

Bellman, Carl Michael (b. Feb. 4, 1740, Stockholm—d. Feb. 11, 1795, Stockholm), outstanding poet-musician of 18th-century Sweden, whose songs have remained popular in Scandinavia, though he is little known elsewhere.

The son of a wealthy civil servant, he studied at Uppsala University and entered the government service, but his salary and a stipend from King Gustav III hardly allowed him to support himself and his family. In early youth he published religious and satirical works and translations from German and French. By the 1760s, his popular drinking songs and biblical parodies were being sung throughout Scandinavia, circulated by word of mouth, handwritten copies, and printed sheets. He borrowed the music for his songs from the works of others, revising the tunes when necessary. He performed them to his own accompaniment on the zither. About 1765, Bellman began to write a cycle of songs, *Fredmans epistlar*, the title alluding to the Pauline Epistles, which were parodied in the early songs. Fredman was modelled after a respected clockmaker who took to drinking and died in poverty. Following the mocking, parodic style of Jean-Joseph Vadé and other French writers, Bellman began by adapting minuets, contredanses, and arias from French musical comedies in a highly original manner, though several songs in this collection were entirely of his own composition.



Bellman, detail of an oil painting by P. Krafft, 1779; in Gripsholm Castle, Sweden

By courtesy of the Svenska Portrattarkivet, Stockholm

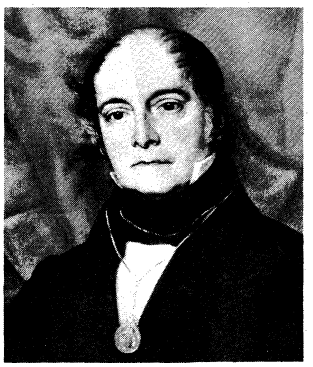
Fredmans epistlar was not published until 1790, when it appeared with an introduction by the famous critic J.H. Kellgren. During this time Bellman had strengthened the narrative and dramatic elements in his work and had added many new figures to his gallery of middle-class Stockholmers. The 82 songs in the final collection reflect his poetic and personal development. The feeling for nature and vivid characterizations in the *epistlar* make it unique in Swedish poetry. It was followed in 1791 by *Fredmans sånger*, also a varied collection, but containing mainly drinking songs. *Bacchi tempel* (1783), a poem in alexandrines, also contained some songs and engravings. Bellman's other works, including plays and occasional poems, were published posthumously.

Bello, city, Antioquia department, northwestern Colombia, on the Río Porce between the Cordilleras (mountains) Occidental and Central of the Andes at 4,905 ft (1,495 m) above sea level. Formerly a commercial and manufacturing centre for a fertile agricultural region, Bello is now part of the industrial complex centring on Medellín, 6 mi (10 km) south by highway and railroad. The principal industrial activity is textile milling; brushes are also manufactured. Pop. (1973) 103,039.

Bello, Andrés (b. Nov. 29, 1781, Caracas—d. Oct. 15, 1865, Santiago, Chile), poet and scholar, regarded as the intellectual father of South America.

His early reading in the classics, particularly Virgil, influenced his style and theories. At the University of Venezuela in Caracas he studied philosophy, jurisprudence, and medicine. Acquaintanceship with the German naturalist and traveller Alexander von Humboldt (1799) led to the interest in geography so apparent in his later writings. He was a friend and teacher of the South American liberator, Simón Bolívar, with whom he was sent to London in 1810 on a political mission for the Venezuelan revolutionary junta. Bello elected to stay there for 19 years, acting as secretary to the legations of Chile and Colombia and spending his free time in study, teaching, and journalism.

Bello's position in literature is secured by his *Silvas americanas*, two poems, written during his residence in England, which convey the majestic impression of the South American landscape. These were published in London (1826–27) and were originally projected as part of a long, never-finished epic poem, *América*. The second of the two, *Silva a la agricultura de la zona tórrida*, is a poetic description of the products of tropical America, extolling the virtues of country life in a manner reminiscent of Virgil. It is one of the best known poems in 19th-century Spanish-American letters. In 1829 he accepted a post in the Chilean Ministry of Foreign Affairs, settled in Santiago, and took a prominent part in the intellectual and political life of the city. He was named senator of his adopted country and founded the University of Chile (1843), of which he was rector until his death. Bello was mainly responsible for the Chilean Civil Code, promulgated in 1855, which was also adopted by Colombia and Ecuador and had much the same influence throughout South America as the Code Napoléon in Europe.



Bello, detail of an oil painting by Raymond-Auguste Quinsac Monvoisin, *c.* 1845; in the Biblioteca Nacional, Caracas

By courtesy of Organization of American States

Bello's prose works deal with such varied subjects as law, philosophy, literary criticism, and philology. Of the last, the most important is his *Gramática de la lengua castellana* (1847; "Grammar of the Spanish Language"), long the leading authority in its field.

Belloc, (Joseph-Pierre) Hilaire (b. July 27, 1870, La Celle-Saint-Cloud, Fr.—d. July 16, 1953, Guildford, Surrey, Eng.), French-born poet, historian, and essayist who was among the most versatile English writers of the first quarter of the 20th century. He is most remembered for his light verse, particularly for children, and for the lucidity and easy grace of his essays, which could be delightfully about nothing or decisively about some of the key controversies of the Edwardian era.

Belloc, detail of a pencil drawing by B. Partridge from the "Mr. Punch's Personalities" collection, 1926–29; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Belloc was educated at the Oratory School, Birmingham, and then worked as a journalist. After military service, as a French citizen, he entered Balliol College, Oxford, in 1894. He graduated with first-class honours in history, was president of the Union (debating society), and in 1896 married Elodie Hogan (1870–1914) of Napa, Calif. He became a naturalized British subject in 1902 and sat as a member of Parliament for Salford (1906–10), first as a Liberal and then as an Independent.

Verses and Sonnets (1895) and *The Bad Child's Book of Beasts* (1896) launched Belloc on his literary career. *Cautionary Tales*, another book of humorous verse for children, which parodied some Victorian pomposities, appeared in 1907. His *Danton* (1899) and *Robespierre* (1901) proved his lively historical sense and powerful prose style. *Lambkin's Re-*

mains (1900) and *Mr. Burden* (1904) showed his mastery of satire and irony. In *The Path to Rome* (1902) he interspersed his account of a pilgrimage on foot from Toul to Rome with comments on the nature and history of Europe. Born and brought up a Roman Catholic, he showed in almost everything he wrote an ardent profession of his faith. This coloured with occasional inaccuracy and overemphasis most of his historical writing, which includes *Europe and the Faith* (1920), *History of England*, 4 vol. (1925–31), and a series of biographies ranging in period from *James II* (1928) to *Wolsey* (1930). But he had the power of bringing history to life.

The Four Men (1912) described a walk through Sussex, the county where he made his home, and his love of sailing was vividly illustrated in *The Cruise of the "Nona"* (1925). In political and economic matters Belloc was a follower of William Cobbett, English author, journalist, and radical influential in the early 19th century.

Among his volumes of lighter verse are *The Modern Traveller* (1898) and the *Heroic Poem in Praise of Wine* (1932). He also wrote a number of satirical novels, which were illustrated by his close friend, the novelist G.K. Chesterton.

Belloc engaged in much heated controversy, particularly with H.G. Wells, whose *Outline of History* he vigorously attacked, and with the Protestant scholar and historian G.C. Coulton. Belloc is one of the masters of modern English prose, a good poet, and a deeply interesting literary personality.

He suffered a stroke in 1941 which forced him into retirement.

Bellona, original name DUELLONA, in Roman religion, goddess of war, identified with the Greek Enyo. Sometimes known as the sister or wife of Mars, she has also been identified with his female cult partner Nerio. Her temple at Rome stood in the Campus Martius, outside the city's gates. There the Senate met to discuss generals' claims to triumphs and to receive foreign ambassadors. In front of it was the *columna bellica*, where the ceremony of declaring war by the *fetiales* (a group of priestly officials) took place.

Bellotto, Bernardo, also called CANALETTO BELOTTO, or CANALETTO THE YOUNGER (b. Jan. 30, 1720, Venice—d. Oct. 17, 1780, Warsaw), *vedute* (view) painter of the Venetian school known for his carefully drawn topographical paintings of central Italian and eastern European cities.

He studied under his uncle, Canaletto, and was himself known by that name when painting outside Italy. His urban scenes have the same carefully drawn realism as his uncle's Venetian views but are marked by heavy shadows and are darker and colder in tone and

"View of Dresden," oil on canvas by Bernardo Bellotto, last half of the 18th century; in the National Gallery of Ireland, Dublin

By courtesy of the National Gallery of Ireland, Dublin

colour. The fidelity of his views are in part attributable to the use of the camera obscura.

He painted scenes of Venice until 1742, when he left for Rome and, after travelling in northern Italy for a time, permanently left the country and went to Munich in 1747. He became court painter to the elector Frederick Augustus II and lived in Dresden from 1747 to 1766, except for a brief period (1758–60) when he worked for the empress Maria Theresa in Vienna. In 1767 he went to St. Petersburg (now Leningrad) and was invited by Stanisław II of Poland to come to Warsaw and become his court painter. Bellotto's accurately detailed views of the Polish capital were used after World War II to restore the historic sections of the city.

Bellow, Saul (b. June 10, 1915, Lachine, Que., Can.), U.S. novelist whose characteri-

Bellow, 1971

Jill Krementz

zations of modern urban man, disaffected by society but not destroyed in spirit, earned him the Nobel Prize for Literature in 1976. Brought up in a Jewish household and fluent in Yiddish—which influenced his energetic English style—he was representative of the Jewish-American writers whose works became central to U.S. literature after World War II.

Bellow's parents emigrated in 1913 from Russia to Montreal. When he was nine they moved to Chicago. He attended the University of Chicago and Northwestern University, from which he graduated in 1937, and afterward combined writing with a teaching career at various universities, including the University of Minnesota, Princeton, New York University, Bard College, and the University of Chicago.

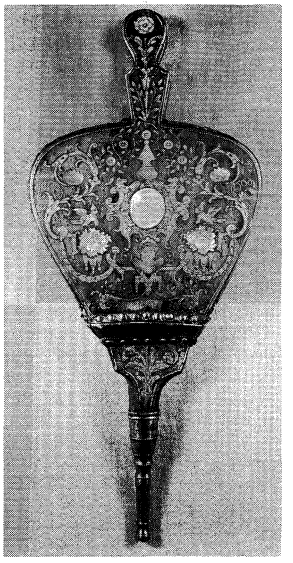
He won a reputation among a small group of readers with his first two novels, *Dangling Man* (1944), a story in diary form of a man waiting to be inducted into the army, and *The Victim* (1947), a subtle study of the relationship between a Jew and a Gentile, each of whom becomes the other's victim. *The Adventures of Augie March* (1953) brought wider acclaim and won the National Book Award (1954). It is a picaresque story of a poor Jewish youth from Chicago, his progress, sometimes highly comic, through the world of the 20th century, and his attempts to make sense of it. In this novel Bellow employed for the first time a loose, breezy style in conscious revolt against the preoccupation of writers of that time with perfection of form. *Henderson the Rain King* (1959) continued the picaresque approach in its tale of an eccentric American millionaire on a quest in Africa. *Seize the Day* (1956), a novella, is a unique treatment of a failure in a society where the only success is success. He also wrote a volume of short stories, *Mosby's Memoirs* (1968), and *To Jerusalem and Back* (1976) about a trip to Israel.

In his later novels—*Herzog* (1964; National Book Award, 1965), *Mr. Sammler's Planet* (1970; National Book Award, 1971), *Humboldt's Gift* (1975; Pulitzer Prize, 1976), and *The Dean's December* (1982)—Bellow arrived at his most characteristic vein. The heroes of these works are Jewish intellectuals whose interior monologues range, sometimes brilliantly, sometimes comically, from the sublime to the absurd. At the same time, their surrounding world, peopled by energetic and incorrigible realists, acts as a corrective to their intellectual speculations. It is this combination of cultural sophistication and the wisdom of the streets that constitutes Bellow's greatest originality.

bellows, mechanical contrivance for creating a jet of air; consisting usually of a hinged box with flexible sides, it expands to draw in air through an inward opening valve and contracts to expel the air through a nozzle. The bellows was invented in the Middle Ages and was commonly used to speed combustion, as in a blacksmith's or ironworker's forge, or to operate reed or pipe organs.

In its simplest form, a hand bellows consists of two flat boards of rectangular, circular, or pear shape, hinged at one end and connected around their edges by a wide band of flexible leather to form an airtight joint. Wire rings keep the leather from collapsing when the boards are separated suddenly and the pressure in the chamber is less than atmospheric. One of the boards has a hole in the centre, covered inside by a leather flap or valve that can open only inward. The outlet nozzle has a relatively small opening.

When the boards are separated, the partial vacuum created causes the air to rush into the chamber through the valve; when the boards are brought together, the valve closes and the



Bellows inlaid with mother-of-pearl and pewter, Dutch, 17th century; in the Victoria and Albert Museum, London

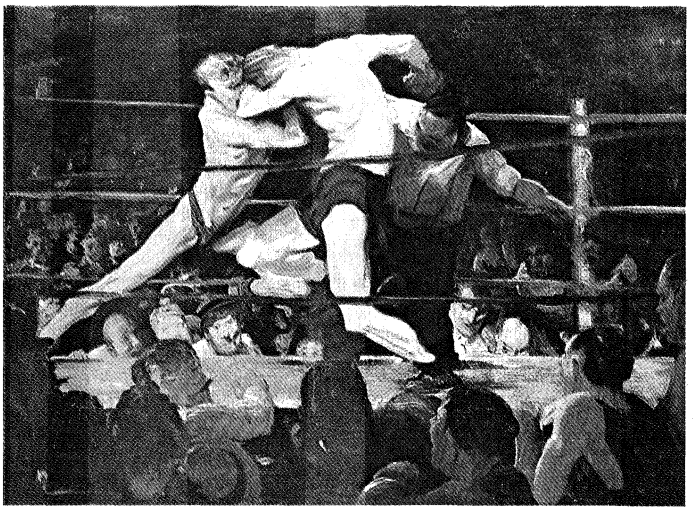
By courtesy of the Victoria and Albert Museum, London

air in the chamber is discharged through the open nozzle.

Bellows, George Wesley (b. Aug. 12, 1882, Columbus, Ohio, U.S.—d. Jan. 8, 1925, New York City), painter and lithographer noted for his portrayals of sports and action scenes.

An outstanding athlete in his youth, Bellows was later able, through his vital and energetic brushwork, to capture sporting life with the stop-action quality of a high-speed photograph. He caused a sensation with his series of prizefight pictures begun in 1907 (*e.g.*, "Stag at Sharkey's"; "Both Members of This Club"). Although associated with the group of painters whose seamy subject matter—back alleys, garbage cans, prostitutes—earned them the title "Ashcan School," Bellows also painted groups of women and children. He established his reputation with his oil painting, "42 Kids" (1907), which portrays an old dock teeming with the energetic activities of children swimming and diving. His portraits were also notable.

Bellows attended Ohio State University before moving to New York City, where he studied under Robert Henri. He taught at the



"Stag at Sharkey's," oil painting by George Bellows, 1907; in the Cleveland Museum of Art, Ohio

By courtesy of the Cleveland Museum of Art, Ohio, Hinman B. Hurlbut Collection

Art Students League in New York City and the Art Institute of Chicago. He was elected to the National Academy of Design at the age of 27—the youngest man to achieve the honour at the time.

Bellows Falls, village in Rockingham town (township), Windham County, southeastern Vermont, U.S., on the Connecticut River. It was settled in 1753 and named for Col. Benjamin Bellows, an early property owner from Walpole, N.H.

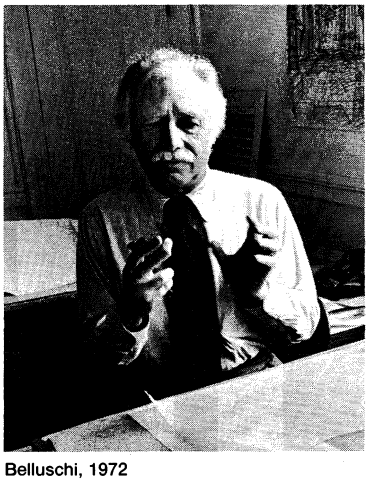
The first bridge across the Connecticut River was built at Bellows Falls in 1785 by Col. Enoch Hale. Between 1792 and 1802, one of the nation's first canals was constructed around the 50-ft (15-m) waterfall at the site in order to accommodate river traffic. Power from the falls and from the river helped the community develop industrially. The chief manufactures are wood products, paper, and wire cord. Steamtown, U.S.A. (a museum featuring locomotives), and Rockingham Meeting House (1787; restored 1909) are nearby. Pop. (1982 est.) 3,326.

bells of Ireland: *see* shell flower.

Belluno, city, capital of Belluno province, in the Veneto region of northeastern Italy, at the confluence of the Piave and Ardo rivers, in the Alpi Dolomiche (Dolomites), north of Venice. Of pre-Roman origin and known to the Romans as Bellunum, it was a medieval free commune before voluntarily joining Venice in 1404. Taken by the French in 1797, it passed to Austria in 1813 and to the Italian kingdom in 1866. Notable buildings include the 16th-century cathedral, partly rebuilt after an earthquake in 1873; the Renaissance Palazzo dei Rettori (1491–96), housing the prefecture; the church of S. Stefano (1980–86); and the Palazzo dei Giuristi (1664), housing the civic museum with a fine art gallery. Agriculture and tourism are the main sources of income. Pop. (1984 est.) mun., 36,450.

Belluschi, Pietro (b. Aug. 18, 1899, Ancona, Italy), architect identified first with regional architecture of the U.S. Northwest, from which his influence spread throughout the world. He was noted for his use of indigenous materials, especially woods for residential buildings and aluminum for tall office buildings, following his own dictum of "eloquent simplicity."

Graduating in 1922 as a civil engineer from the University of Rome, Belluschi went to the United States on a scholarship and continued civil engineering studies at Cornell University. He practiced architecture until 1950, when he became dean of the School of Architecture and Planning, Massachusetts Institute of Technology. After retirement in 1965, he continued to lecture and served as adviser to the U.S. State Department in South Korea and the Philippines. Among his regional works in Portland, Ore., are the Sutor House and Zion Lutheran Church. His other well-known buildings (some in association with other architects) include: the Portland Art Museum (1931); the Boston and Keystone buildings, Boston; the Bank of America World Headquarters, San Francisco



Belluschi, 1972

Paul Connell

(1969); and the Juilliard School, Lincoln Center for the Performing Arts, New York City (1969).

Bellville, town, southwestern Cape Province, South Africa, east of Cape Town within the Cape Peninsula urban area. Originally a village called Twelfth Mile Stone, Bellville was established by proclamation in 1861 and named after Charles D. Bell, surveyor general of the Cape (1848–72). It is built on the slopes of the Tygerberg (1,362 ft [415m]).

Bellville became a town in 1940. The Elsies River runs through Bellville, and there is a park in the river's valley. Bellville South, an industrial zone of Bellville, produces paper and food products, bricks and tiles, and fertilizers. Bellville is located on the main railway from Cape Town to Johannesburg, and Bellville South has the largest marshalling yard in Cape Province. The University of Western Cape (founded 1960) at Bellville is South Africa's principal university for Coloureds (racially mixed South Africans). A gravel track from the suburb of Welgemoed leads to the Tygerberg summit, giving magnificent views of Cape Flats and the interior mountains. D.F. Malan (international) Airport is 5 mi southwest. Pop. (1983 est.) mun., 82,000.

belly (musical instrument): *see* soundboard.

Belmont, city, San Mateo County, western California, U.S. First settled in 1850 as a stagecoach station, it was known for its association with William C. Ralston, Bank of California magnate, who in 1866 transformed Count Lussetti Cipriani's hillside villa into an ornate rambling mansion—now the main building of the College of Notre Dame (founded 1851 in San Jose, moved 1923). Belmont became a shipping point for flowers. Several sanitariums, including a neuropsychiatric centre, were built there, and after 1950 the community developed as a southeastern residential suburb of San Francisco. Nearby is the tourist attraction Marine World/Africa U.S.A. Inc. 1926. Pop. (1982 est.) 24,427.

Belmont, village, Lafayette County, southwestern Wisconsin, U.S., 50 mi (80 km) southwest of Madison. The original village (Old Belmont) was the first seat of the Territory of Wisconsin (created 1836), and the first legislature met there for 42 days in one of four hastily constructed frame buildings (a Council House, Supreme Court building, governor's residence, and boarding house for the legislators). The old village of Belmont (Beautiful Mound, now called Leslie) died after it was bypassed by the Platteville branch of the Mineral Point Railroad, and the legislature moved to Burlington, Iowa (then in the Territory of Wisconsin), and later (1838) to Madison.

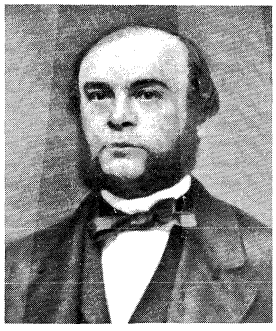
The present agricultural village of Belmont was established on the railroad line and was incorporated in 1894. In the First Capitol State Park, 3 mi northwest on the old village site, are the restored (1924) Council House and Supreme Court building. Mineral Point (now restored), a centre of lead-mining activities in the mid-19th century, is a few miles northeast. Pop. (1980) 826.

Belmont FAMILY, family prominent in American banking and finance, politics, and patronage of the arts.

The family's founder in the United States was August Belmont (b. Dec. 8, 1816, Alzey, Rhenish Prussia—d. Nov. 24, 1890, New York City), a Jewish-born banker and diplomat. At age 14 August Belmont entered the banking house of the Rothschilds at Frankfurt am Main, and his remarkable abilities won him a transfer to a more important post in the Rothschilds' Naples office three years later. In 1837 he moved to New York City and opened a small office on Wall Street, where he served as American agent for the Rothschilds and laid the foundation for his own banking house, August Belmont & Company. Though he started with practically no capital, within a few years Belmont had built his firm into one of the largest banking houses in the country. He also began taking an active interest in politics as a Democrat. From 1853 to 1855 he was charge d'affaires for the United States at The Hague, and from 1855 to 1857 he served as resident minister there. Belmont was strongly opposed to slavery; although he initially supported Stephen A. Douglas, after the American Civil War began he became a loyal supporter of President Lincoln. He exerted a strong influence upon merchants and financiers in England and France in favour of the Union during the war. He also served as chairman of the national committee of the Democratic Party from 1860 to 1872. In his later years Belmont was a noted art collector and sportsman. He introduced Thoroughbred horse racing into the United States and was a long-time president of the American Jockey Club.

August Belmont married Caroline Sidell Perry, the daughter of Commo. Matthew C. Perry, in 1849. They had three sons and one

daughter. Perry Belmont (b. Dec. 20, 1850, New York City—d. May 25, 1947, Newport, R.I., U.S.) was their eldest son. He at-



August Belmont
By courtesy of the Library of Congress, Washington, D.C.

tended Harvard University (A.B., 1872) and Columbia Law School, where he earned a law degree in 1876. He practiced law from then until 1881, when he was elected to the U.S. House of Representatives as a Democrat from New York. He served four consecutive terms and chaired the House Committee on Foreign Affairs from 1885 to 1888, after which he was U.S. minister to Spain until 1889. Perry Belmont was the author of several books on American history and politics.

August Belmont, Jr. (b. Feb. 18, 1853, New York City—d. Dec. 10, 1924, New York City), another son of August Belmont, graduated from Harvard in 1874 and then entered his father's firm, August Belmont & Company. He took full control of the banking house upon his father's death in 1890, and under his guidance it remained one of the largest and most powerful banking firms in the country. The younger August became deeply involved in financing public transportation, and in 1900 he organized the Rapid Transit Construction Company to finance and build the New York City subway. He too was active in Democratic Party national affairs.

Eleanor Belmont, *née* Robson (b. Dec. 13, 1879, Wigan, Lancashire, Eng.—d. Oct. 24, 1979, New York City), was the wife of August Belmont, Jr. She began her career as a successful actress in San Francisco and then achieved a series of triumphs on the Broadway stage beginning in 1903 with her leading role in *Merely Mary Ann.* She retired from the theatre when she married August Belmont in 1910 and plunged into social and philanthropic work for the next five decades. She took a special interest in opera, and in 1935 she organized the Metropolitan Opera Guild to oversee the troubled financing of New York City's Metropolitan Opera. The couple's son, August Belmont III, and his son, August Belmont IV, also became prominent bankers.

Belmont, Alva Erskine Smith Vanderbilt, *née* ALVA ERSKINE SMITH (b. Jan. 17, 1853, Mobile, Ala., U.S.—d. Jan. 26, 1933, Paris), American socialite who provided critical financial support for the woman suffrage movement in the United States.

She was married in 1875 to William K. Vanderbilt (died 1895), grandson of Cornelius Vanderbilt, and in 1896 to Oliver Hazard Perry Belmont (died 1908). In 1908 Belmont, who was then a wealthy widow, became a militant feminist. She subsequently donated hundreds of thousands of dollars to the suffrage cause, supporting the National American Woman Suffrage Association and founding the Political Equity League, a New York suffrage organization. In 1913 she joined the more militant Congressional Union—later the Woman's Party—and became its president in 1921. Belmont also supported other reform and benevolent causes, including the Women's Trade Union League and children's hospitals.

Belmont Stakes, oldest of the three classic U.S. horse races (with the Kentucky Derby and the Preakness) that comprise the Triple Crown of U.S. horse racing; it originated in 1867 and is named after the U.S. financier, diplomat, and sportsman August Belmont. The Belmont has been run at various distances and tracks in its history. Since 1905, however, it has been held at Belmont Park, near New York City; and the course has been 1½ miles (about 2,400 metres) in length since 1926. The race is held early in June. For winners since 1947, *see* Sporting Record: *Horse racing.*

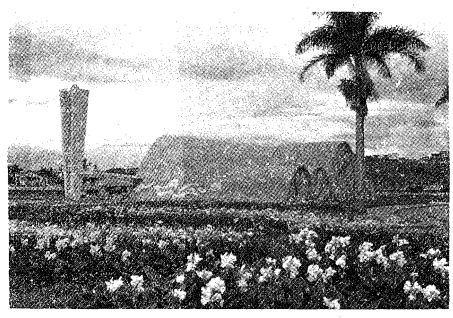
Belmonte (y García), Juan (b. April 14, 1892, Triana, near Seville—d. April 8, 1962, Utrera, Spain), Spanish bullfighter, one of the greatest toreros and the most revolutionary in his style.

In about 1914, early in his career (which extended from 1910 to 1935), Belmonte introduced the technique of standing erect, nearly motionless, and much closer to the bull's horns than earlier matadors had dared. Rather than using footwork to escape injury (accepted as the standard procedure before his time, but considered a sign of cowardice afterward), he diverted the bull with skillful capework so that the horns would barely miss him. The American novelist and aficionado Ernest Hemingway wrote (in *Death in the Afternoon,* 1932) that Belmonte "would wind a bull around him like a belt."

In 1919 Belmonte set a Spanish bullfighting record (unbroken at his death 43 years later) for a single season by appearing in 109 corridas (bullfights). The next year he met the great Joselito (José Gómez), his chief rival and close friend, in a *mano-a-mano* (competitive corrida) in which Joselito was killed. Belmonte himself survived numerous gorings. After his retirement he reared fighting bulls on his *ganadería* (ranch) at Utrera. His autobiography, *Juan Belmonte, su vida y sus hazañas,* as told to Manuel Chaves Nogales, was translated into English as *Juan Belmonte, Killer of Bulls* (1937) by the novelist Leslie Charteris.

Belmopan, capital of Belize (formerly British Honduras), located near Roaring Creek, on the Belize River, 50 mi (80 km) inland from Belize City, the former capital. The new capital was conceived after Hurricane Hattie and an associated tidal wave did extensive damage to Belize City in 1961. The site was chosen to be far enough inland to avoid a recurrence of disastrous flooding. Construction was begun in 1966, with funds from a United Kingdom grant. In May 1970 government offices were moved to the new capital; housing construction went on through the 1970s. Pop. (1980) 2,940.

Belo Horizonte, city, southern Minas Gerais state, southeastern Brazil. It lies on the western slope of the Serra de Espinhaço, at an elevation of 2,720 ft (830 m). The first of Brazil's planned cities, Belo Horizonte occupies a wide plateau encircled by the Serra do Curral del Rey, a hilly ridge forming the "beautiful horizon" the city was named for, located on the eastern edge of the *sertão,* or dry interior, of Brazil. The site was chosen in the late 1800s after the city of Ouro Preto, enclosed within a narrow valley 50 mi (80 km) to the southeast, was abandoned as the state capital because it could not accommodate the necessary expansions. Belo Horizonte was laid out on a grid plan, modeled after Washington, D.C., in the United States and La Plata in Argentina. The city was inaugurated as the capital of Minas Gerais in 1897 under the name Cidade de Minas, adopting its present name in 1901. Originally designed with an area of 8 sq mi (20 sq km), Belo Horizonte is now 10 times that size, having surpassed a target population of 200,000 people by 1925.



Chapel of São Francisco, designed by Oscar Niemeyer, in Belo Horizonte, Braz.
Loren McIntyre—Woodfin Camp

Belo Horizonte is the hub of a large agricultural region, growing mainly sugarcane and cotton, and is the centre for extensive mining and livestock activity conducted throughout the *sertão* west of the city. It is the regional commercial centre as well, with vigorous activity in banking, commerce, and administration. The older, longer established industries include publishing, textiles, furniture, and food processing. The steady growth of heavy industry since 1950, however, has made Belo Horizonte one of the largest industrial centres in Brazil. Electrical generating facilities and plants manufacturing and working iron and steel have been established, primarily in the industrial suburb of Contagem, and a large oil refinery and a Fiat automobile factory have been constructed in nearby Betim.

Despite the upsurge in industrial activity, Belo Horizonte has remained relatively pollution free, and a considerable number of tourists are attracted by the impressive buildings and the wide, tree-lined avenues radiating from the city centre like the spokes of a wheel. Pampulha, a garden suburb, is noted for its bold architecture, exemplified by Oscar Niemeyer's chapel of São Francisco, decorated by Cándido Portinari.

Belo Horizonte is an important cultural centre, having several museums, including the Pálacio das Artes and the Museu Mineiro, as well as a music conservatory, a ballet school, a technical college, and a wide range of secondary and primary schools. The Universidade Federal de Minas Gerais (1927) and the Universidade Católica de Minas Gerais (1958) are situated in Belo Horizonte, and the Mineirão stadium, also located in the city, is the second largest football (soccer) stadium in the nation, after the Maracanã stadium in Rio de Janeiro. Major highways and railroads extend from the city in all directions, linking it to communities in the *sertão* as well as to the main population centres of Brazil's Atlantic coast. A domestic airport in Pampulha serves the Belo Horizonte metropolitan area. Pop. (1980) 1,441,567.

Beloeil, village, Hainaut province, Belgium, situated between Mons and Tournai. It has been known since the 14th century as the seat of the princely family of Ligne, the most famous member of which was the writer and field marshal Charles-Joseph (1735–1814). The family's collections of tapestries, portraits, and precious artifacts are maintained in the castle, which is open to the public. Much of the present castle is of 20th-century construction, rebuilt on its old foundations after a fire in 1900; the old (1682–95) wings and entryway, however, are intact. The extensive grounds form a grandiose park, with a lake and fountains; laid out by Charles-Joseph's father, Prince Claude Lamorel, and later adapted to 18th-century taste by the French architect Chevotet, it is sometimes compared to the gardens of Versailles. Pop. (1983 est.) mun., 13,591.

Beloit, city, Rock County, southern Wisconsin, U.S., on the Illinois state line at the confluence of Rock River and Turtle Creek. Settled in 1837 by the New England Emigrating Company, it was known as Blodgett Settlement, The Turtle, New Albany, and finally Beloit. The village pledged land, labour, and money for a college, and Beloit College was founded in 1846. The centre of a rich farming and dairying area and focal point of area commerce, the town developed industrially; manufactures include papermaking and woodworking machinery, diesel engines, electrical equipment, and shoes. Inc. 1856. Pop. (1980) city, 35,207; metropolitan area (SMSA), 139,420.

Belomorsko-Baltiysky Kanal (Russian S.F.S.R.): *see* White Sea–Baltic Canal.

Belon, Pierre (b. 1517, near Le Mans, Fr.—d. April 1564, Paris), French naturalist whose

Belon, detail from an engraving
By courtesy of the Ashmolean Museum, Oxford

discussion of dolphin embryos and systematic comparisons drawn between the skeletons of birds and humans constitute the beginnings of modern embryology and comparative anatomy.

He studied botany at the University of Wittenberg (1540) and, under the patronage of François, cardinal de Tournon, embarked on a tour of eastern Mediterranean countries (1546–48) in order to identify animals, plants, places, and objects described by ancient writers. In the resulting work, *Les Observations de plusieurs singularitez et choses mémorables* . . . (1553; "Observations of Several Curiosities and Memorable Objects . . ."), he described many animals, plants, drugs, customs, arts, and ruins previously unknown to Europeans and established an itinerary followed by scientific travellers for nearly three centuries afterward.

Although based on the taxonomy of Aristotle, Belon's natural histories *L'histoire naturelle des éstranges poissons marins* (1551; "Natural History of Unusual Marine Fishes"), much of which is devoted to a discussion of the dolphin, and *L'histoire de la nature des oyseaux* (1555; "Natural History of Birds"), illustrating, classifying, and describing about 200 species, include original observations and concepts that made a deep impression on contemporary and later science. Belon was murdered by unknown assailants in the Bois de Boulogne.

Beloretsk, city, Bashkir Autonomous Soviet Socialist Republic, west central Russian S.F.S.R., near the headwaters of the Belaya River, a tributary of the Kama. It was founded as a mining settlement in 1762 when a metallurgical factory was constructed nearby. Beloretsk remains a metallurgical centre and has medical and teachers colleges. It became a city in 1923. Pop. (1983 est.) 74,000.

Belorussian, also spelled BYELORUSSIAN, any speaker of the Belorussian language of the Slavic family; the Belorussians constitute the majority (80 percent) of the population of the Belorussian Soviet Socialist Republic. Many have also migrated to Siberia or overseas to such countries as the United States. They are largely descendants of East Slavic tribes who settled the area of Belorussia between the 6th and 8th century AD and who were later subjugated by Lithuania and then Poland, before coming under Russian suzerainty in the late 18th century. Between 1921 and 1939 western Belorussia was under Polish rule.

Belorussian Catholic Church, an Eastern Catholic church of the Byzantine rite, in communion with Rome since the Union of Brest-Litovsk in 1596.

There were several million Belorussians in the 17th–18th century belonging to the Kievan metropolitanate. After the annexation of their territory to Russia, the union was persecuted and finally abolished in 1839. After 1918 several thousands of former Eastern Catholics in Belorussia, which was then under Poland, returned to the Catholic Church, and an apostolic visitor was appointed for them. After 1945 this group was dispersed. A few, however, emigrated to the West, and in 1960 they were given a bishop residing in London.

Belorussian language, also spelled BYELORUSSIAN, Belorussian BELORUSKA MOVA, English WHITE RUSSIAN, East Slavic language closely related to Ukrainian and Russian. Belorussian, which received official status in 1918, is the major language of the Belorussian Soviet Socialist Republic. Although two dialect areas exist, the standard language is based on the dialect of Minsk, the capital city of the Belorussian S.S.R. The language contains many Polish loanwords and is written in a form of the Cyrillic alphabet. An older form of Belorussian was used by the Lithuanians as the official language of administration during the 14th century, when they were in control of the area.

Belorussian Ridge, Russian BELORUSSKAYA GRYADA, also spelled BELORUSSKAJA GR'ADA, upland region, Belorussian Soviet Socialist Republic. From Poland the ridge runs southeast into the U.S.S.R. and then, in western Belorussia, swings northeast. Its total length is 320 mi (520 km). The ridge, covered by marine sands and clays, is in reality a series of separate uplands, of which the highest is the Minsk Elevation, at 1,135 ft (346 m). To the south of the ridge lie the extensive Pripet Marshes.

Articles are alphabetized word by word, not letter by letter

Belorussian Soviet Socialist Republic, also called BELORUSSIA, Russian BELORUSSKAYA SOVETSKAYA SOTSIALISTICHESKAYA RESPUBLIKA, Akademiya Nauk romanization BELORUSSKAJA SOVETSKAJA SOCIALISTIČESKAJA RESPUBLIKA, union republic of the U.S.S.R., one of 15.

The following article summarizes the administrative history, geography, demographic patterns, economy, and culture of the modern Belorussian S.S.R.; for additional treatment of its geography and history, *see* MACROPAEDIA: Union of Soviet Socialist Republics.

Belorussia, whose name means White Russia, is bounded on the west by Poland, on the northwest by Latvia and Lithuania, on the north and east by the Russian S.F.S.R., and on the south by the Ukraine. Its capital is Minsk, the industrial hub of the western Soviet Union.

Belorussia has flat landscapes, with extensive, hilly tablelands alternating with plains and lowlands. Forests cover about a third of its area. The Belovezhskaya Pushcha Reserve astride the Polish border is a remnant of the forest that covered much of prehistoric Europe, and is an example of binational ecological cooperation. Jointly administered by the two countries, it is the oldest nature preserve on the continent, harbouring animals that have vanished elsewhere, notably the European bison, or wisent. The animal life of Belorussia includes elk, deer, wild pig, hare, squirrel, wolf, fox, badger, ermine, marten, otter, mink, and beaver.

The environment is favourable to crop production, especially fodder crops. The main commodity crops are grains, flax, potatoes, and sugar beets. Livestock production and fur farming are also very important; there is fish farming. Agriculture is fully collectivized.

Formerly considered poor in mineral resources, Belorussia has found high quality petroleum in the south, and elsewhere coal, brown coal, oil shale, potash, limestone, dolomite, marl, quartz sand, and ferrous and nonferrous metals are being extracted.

Almost two-thirds of the republic's income is provided by industry, most of which processes imported raw materials and semimanufactured goods. New industries after World War II include tool and instrument making, oil extraction and refining, and synthetic fibre production. Manufactures include construction equipment, computers, television sets, wristwatches, bicycles and motorcycles, and sewing machines.

Belorussia, with the Ukraine, is a charter member of the United Nations and one of its two member nations that are not fully sovereign. The highest body of state power is the Supreme Soviet which elects from its body a Presidium to act between sessions, and the Council of Ministers or cabinet. Members of the Supreme Soviet are selected by the Communist Party of Belorussia and ratified in a general election in which there is a single list of candidates.

Literacy is universal and public education between the ages of 7 and 17 is free and compulsory. There are 30 institutions of higher learning. The Belorussian Academy of Sciences coordinates the work of scientific research centres, such as one that operates a nuclear reactor and another with an economic planning computer centre.

World War II caused the destruction of three-quarters of urban housing and almost all industrial buildings; postwar reconstruction was speeded by extensive use of prefabricated units. Health services are widely available.

Belorussians make up four-fifths of the republic's population. They have ancient traditions in the arts. Outstanding church architecture can be seen in the 11th-century Cathedral of St. Sophia in Polotsk. Literature also dates back to the 11th century. The classics of modern Belorussian literature include the works of the poets Maksim Bahdanovich, Ales Harun, and, spanning the pre-Soviet and early Soviet period, the poets Yanka Kupala and Yakub Kolas, and the fiction writer Maksim Haretsky.

Soviet poets and writers who emerged after the literary upheaval of the 1920s include the fabulist, satirist, and science fiction writer Kondrat Krapiva.

Since World War II there has been intensive musical development in Belorussia. Notable composers include Dzmitry Lukas, Ryhor Pukst, and later composers such as Yauhen Hlebau, Yauhen Tsikotksi, and Yury Semyanyaka. The republic has a conservatory of music and a number of folk music companies. There is a State Theatre of Opera and Ballet in Minsk and two state theatres. Area 80,200 sq mi (207,600 sq km). Pop. (1983 est.) 9,807,000.

Belotsarsk (Russian S.F.S.R.): *see* Kyzyl.

Belousov, Vladimir Vladimirovich (b. Oct. 30 [17, old style], 1907, Moscow), Soviet geologist and geophysicist who in 1942 advanced

the theory that the Earth's material has gradually differentiated according to its density to produce the present internal structure of the Earth and that this gradual movement is the basic cause of movements of the Earth's crust.

Belousov
Novosti Press Agency

Belousov assumed direction of the department of geodynamics at the Academy of Sciences of the U.S.S.R., Moscow, in 1942 and served as chairman of the Soviet Joint Geophysical Committee from 1961. He was also vice chairman of the International Geophysics Committee (1960–64) and president of the International Committee for Upper Mantle of the Earth Projects (1964–70).

Belovezhskaya Pushcha (Russian), Polish PUSZCZA BIAŁOWIESKA, English BIAŁOWIEŻA FOREST, one of the largest surviving areas of primeval mixed forest in Europe, occupying about 450 sq mi (1,165 sq km). It is located in Brest and Grodno *oblasti* (administrative regions) of the Belorussian S.S.R. and in the Białystok, Suwałki, and Łomza *województwa* (provinces) of eastern Poland in the drainage areas of the headstreams of the Narev and Lesna (Polish Leśna), tributaries of the Bug. The forest has a wide range of flora and fauna from western and eastern Europe and is a breeding ground for the rare European bison, or wisent. Both Poland and the U.S.S.R. have established nature reserves in the forest, once the property and hunting preserve of Polish kings and, later, of Russian tsars.

Belovo, city, Kemerovo *oblast* (administrative region), south central Russian Soviet Federated Socialist Republic, on the small Bachat River. Incorporated in 1930, it is an important coal-mining town of the Kuznetsk Basin. A large zinc works, built in 1931, uses concentrated ore from Eastern Siberia. Sulfuric acid and cinema apparatuses are manufactured. Pop. (1983 est.) 115,000.

Beloye more (U.S.S.R.): *see* White Sea.

Belper, parish (town), Amber Valley district, county of Derbyshire, England, on the east bank of the River Derwent. Belper is probably a corruption of Beaurepair, the name given to his hunting seat (and variously spelled) by Edmund Crouchback, earl of Lancaster and son of Henry III (reigned 1216–72). Jedediah Strutt, inventor of an important ribbing machine, built the town's first cotton mills about 1780. The production of nails was formerly the staple industry of the parish, but it has given way to cotton and hosiery manufacture, with some engineering. Pop. (1981 prelim.) 16,453.

Belsen (German Nazi concentration camp): *see* Bergen-Belsen.

Belsen, Beast of: *see* Kramer, Josef.

Belshazzar, Greek BALTASAR, or BALTHASAR (d. *c.* 539 BC), co-regent of Babylon at whose feast the prophet Daniel, interpreting the handwriting on the wall ("*mene, mene, tekel* and *parsin*"), foretold the destruction of the city (539).

Belshazzar had been known only from the Book of Daniel (chapter 5) and from Xenophon's *Cyropaedia* until 1854, when references to him were found in contemporary Babylonian inscriptions. He was the eldest son of Nabonidus, king of Babylon (555–539), and of Nitocris, who was perhaps a daughter of Nebuchadrezzar. When Nabonidus went into exile (550), he entrusted Belshazzar with the throne and the major part of his army.

Belshazzar administered the government, his own estates, and those of his father, though famine and economic setbacks occurred prior to his father's return (*c.* 540). Belshazzar died after Babylon fell without resistance to the Persian general Gobryas (Oct. 12, 539).

belt drive, in machinery, a pair of pulleys attached to usually parallel shafts and connected by an encircling flexible belt (band) that can serve to transmit and modify rotary motion from one shaft to the other. Most belt drives consist of flat leather or fabric belts running on cylindrical pulleys or of belts with a V-shaped cross section running on grooved pulleys. To create an effective frictional grip on the pulleys, belts must be installed with a substantial tension. Because of the wedging action of the belts in the grooves, V belts require less tension than flat belts and are particularly suitable for connecting shafts that are close together. Flat and V belts slip when overloaded, and in some applications this condition may be more desirable than a rigid drive because it limits the transmitted torque and may prevent breakage of parts.

When flat belts are used to connect nonparallel shafts, the pulleys are located in such a way that the belt does not run off the pulleys; in some cases it may be necessary to use additional, or idler, pulleys to guide the belt. With an open flat belt, both shafts rotate in the same direction; with a crossed belt they rotate in opposite directions.

Another type of belt used on some internal combustion engines for connecting the crankshaft and camshafts is the toothed, or timing, belt. This is a flat belt with evenly spaced transverse teeth that fit in matching grooves on the periphery of the pulley. The positive drive provided by these belts has many advantages, but it lacks overload protection.

Belt Series, major division of Late Precambrian rocks in North America (the Precambrian began about 4,600,000,000 years ago when the Earth's crust formed and ended 570,000,000 years ago). The Belt Series was named for prominent exposures that occur in the Belt Range in southwestern Montana. The thickness of Beltian rocks, which extend northward into Canada, ranges from about 11,000 metres (about 35,000 feet) on the west to about 4,000 metres (12,000 feet) in the east. The upper portions of the Belt Series grade into undoubted Cambrian rocks without apparent interruption, whereas the lower portions are at least 1,500,000,000 years old, as determined by radiometric dating techniques.

Four divisions of the Belt Series are recognized. The uppermost, or youngest, of these is the Missoula Group, which is underlain in turn by the Piegan Group and the Ravalli Group; older Beltian rocks are termed Pre-Ravalli. Beltian rocks rest on a basement of gneisses and consist of thick deposits of sandstones, shales, sandy shales, and limestones. Although mud-cracked reddish shales occur, gray shales predominate. Limestones and shales are dominant in the east, whereas to the west sandstones and shales are dominant; it is probable that this coarsening of sediment types to the west indicates the presence in Beltian time of a major landmass still farther to the west, perhaps in the region of what is today the state of Washington or British Columbia. Ripple marks in the gray shales show that most of the Beltian rocks were deposited in shallow water; the reddish shales, however, were probably deposited on low-lying flood plains, but their mode of origin is disputed. The remains of Precambrian organisms have been found in the Belt Series and include stromatolites (carbonate-secreting algal mats) and the burrows of wormlike creatures; more advanced fossils attributed to the Beltian are probably of Cambrian age.

Belter, John Henry, original name JOHANN HEINRICH BELTER (b. 1804, Germany—d. 1863, New York City), cabinetmaker and designer considered to have created superb Victorian Rococo pieces.

Belter served as a cabinetmaker's apprentice in Württemberg, a former kingdom now in West Germany, where he was trained in the Black Forest tradition of rich carving so admired during the 19th century. Settling in New York City in 1844, he married and opened a fashionable shop on Broadway. Although he also worked in walnut and mahogany, his favourite medium was rosewood (then popular in the U.S.), with which he experimented. In 1856 he patented his invention of processing laminated rosewood in many layers to achieve thin panels that, once shaped in molds through steam heating, were finely carved. This rather personal Louis XV revival style, a somewhat heavy, florid Rococo called *zweites Rokoko,* succeeded the uniquely Neoclassical and functional Biedermeier period created in his homeland and reflected the more nostalgic tastes then evolving in Europe.

Marble-top rosewood parlour table by Belter, 1856–61; in the Museum of the City of New York
By courtesy of the Museum of the City of New York

The large factory Belter opened in New York City in 1858 employed many apprentices; and his furniture became known for its rich carving, handsome brocades, and bold asymmetry. Competitive French imports that were esteemed by the elite and economic problems attending the U.S. Civil War (1861–65) combined to impair his business; production continued for a while after his death, but the firm failed completely in 1867. Representative pieces of his work are in the Metropolitan Museum of Art, New York City.

Beltrami, Eugenio (b. Nov. 16, 1835, Cremona, Lombardy, Austrian Empire—d. Feb. 18, 1900, Rome) Italian mathematician known for his concepts of non-Euclidean geometry, his theories of surfaces, and his theory of space of constant curvature.

Following his studies at the University of Cermona, in 1862 Beltrami was invited to join the faculty at the University of Bologna as an associate professor of algebra and geometry; four years later he was appointed professor of rational mechanics. He also held professorships at universities in Pisa, Rome, and Pavia.

Beltrami's four-volume work, *Opere Matematiche* (1902–1920), published posthumously, contains his comments and concepts on a broad range of physical and mathemat-

ical subjects, including thermodynamics, elasticity, magnetism, optics, and electricity, plus various branches of mathematics. Beltrami was a member of the Accademia dei Lincei, serving as president in 1898; he was elected senator a year before his death.

Beltrán, Pedro Gerado (b. Feb. 17, 1897, Lima, Peru—d. Feb. 16, 1979, Lima), Peruvian economist, diplomat, and publisher whose brief term as prime minister and minister of finance stabilized the Peruvian economy when it was edging toward disaster.

He gained his economic expertise at the London School of Economics (1915–18). Beltrán, who once served as Peruvian ambassador to the U.S. (1944–46), was the longtime owner (1934–74), and publisher of the independent and influential Lima newspaper *La Prensa*. His strong advocacy of press freedom brought him into conflict with the autocratic regime of Pres. Manuel Odria in the 1950s. When Beltrán asked for free elections, *La Prensa* was shut down and Beltrán was jailed for one month (1956) on the island prison of El Frontor. He emerged from jail a national hero.

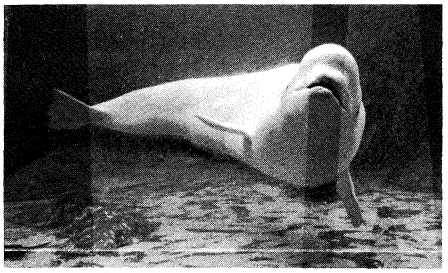
The new president, Manuel Prado Ugarteche, appointed him prime minister and minister of finance in a desperate move to rebuild the economy. During his two years as prime minister (1959–61), Beltrán repaid Peru's debt to the International Monetary Fund, cut inflation, and strengthened the country's foreign reserves and its balance of trade. After an unsuccessful bid for the presidency (1961), he returned to editing *La Prensa* until the newspaper was expropriated (1974) by Pres. Juan Velasco Alvarado.

Beltsy, also spelled BELCY, city, Moldavian Soviet Socialist Republic, on the Reut River. Beltsy, dating from the 15th century, is an important railway junction and the centre of the rich agricultural Beltsy Steppe. Most of its industries are concerned with processing farm produce, notably flour milling, sugar refining, and wine making, but furniture, agricultural machinery, and fur clothing also are made. Beltsy has a teacher-training institute and a medical school. Pop. (1983 est.) 139,000.

Beluchi (group of tribes): *see* Baluchi.

Beluchi rug: *see* Baluchi rug.

beluga, also called WHITE WHALE (*Delphinapterus leucas*), widely distributed whale of the family Monodontidae, found in the Arctic Ocean and adjacent seas, both in deep offshore waters and along coasts. It also occasionally enters rivers that empty into the far north seas. A medium-sized toothed whale with a rounded forehead and no dorsal fin, the beluga is usually about 4 metres (13 feet) long. It is born dark blue-gray or blackish but fades to white or cream by the time it is four or five years old. The beluga feeds on fish, cephalopods, and crustaceans and usually



Beluga, or white whale (*Delphinapterus leucas*)
E.R. Degginger—EB Inc.

lives in groups of about 5 to 10. It is taken commercially for its oil, hide, and flesh and is used in the Arctic as food for humans and dogs.

beluga, also called HAUSEN, large species of sturgeon (*q.v.*).

Belukha, Mount, also spelled BELUCHA, Russian GORA BELUKHA, one of the Katun Mountains, a series of snowcapped peaks in the Russian Soviet Federated Socialist Republic. The highest mountain in the Soviet portion of the Altai Mountains, Belukha reaches a height of 14,783 ft (4,506 m) in one of its twin peaks. Glaciers cover some 27 sq mi (70 sq km) of its surface; the largest, Berel, ascends to a height of 6,396 ft (1,950 m). The mountain lies in a region of year-round snows.

belvedere (Italian: "beautiful view"), architectural structure built in an elevated position to command a fine view. Roofed but open on one or more sides, a belvedere may be located in the upper part of a building or may stand as a separate structure. It often assumes the form of a loggia, or open gallery. The belvedere has been used in Italy since the Renaissance;

Twin towered belvedere atop the Villa Medici, Rome, by Annibale Lippi, 1574–80
H. Roger-Viollet

in the colder climate of northern Europe the belvedere is largely an architectural ornamentation. The term is sometimes applied to an entire building with a planned view, as the Belvedere gallery in the Vatican or the Belvedere palace in Vienna. The gazebo (*q.v.*) is a freestanding belvedere, usually open on all sides but often enclosed by wire screening.

Belvedere Torso, Hellenistic sculpture fragment of a male nude (5 ft 2⅝ in. high) in the Vatican Museum; the work is signed by the Athenian sculptor Apollonius the son of Nestor and was long thought to be a 1st-century-BC original. It is now believed that Apollonius copied a 2nd-century original. The dynamic pose of the torso was influential on the development of the energetic figure style of Michelangelo and was subsequently much studied by many artists of the Mannerist or Late Renaissance and Baroque periods.

Belvidere, city, seat (1837) of Boone County, northern Illinois, U.S., on the Kishwaukee River. Founded in 1836 by settlers from the state of New York, it was important as a stopping place on the Chicago–Galena stage route and developed as an agricultural trading centre, shipping milk and grain to Chicago. With the building of a large Chrysler Corporation plant there in 1965, Belvidere became an important industrial community. Inc. 1852. Pop. (1980) 15,176.

Bely, Andrey, pseudonym of BORIS NIKOLAYEVICH BUGAYEV, or BUGAEV (b. Oct. 26 [Oct. 14, old style], 1880, Moscow—d. Jan. 7, 1934, Moscow), leading theorist and poet of Russian Symbolism, a literary school deriving from the modernist movement in western European art and literature and indigenous Eastern Orthodox spirituality, expressing mystical and abstract ideals through allegories from life and nature.

Reared in an academic environment as the son of a mathematics professor, Bely was closely associated with Moscow's literary elite, including the late 19th-century philosopher-mystic Vladimir Solovyov, whose eschatological thought (concerning the world's purpose and final resolution) he absorbed. Carried by his idealism from harsh reality to speculative thought, Bely completed in 1901 his first major work, *Severnaya simfoniya* (1902; "The Northern Symphony"), a prose poem that represented an attempt to combine prose, poetry, music, and even, in part, painting. Three more "symphonies" in this new literary form followed. In other poetry he continued his innovative style and, by repeatedly using irregular metre (the "lame foot"), introduced Russian poetry to the formalistic revolution that was brought to fruition by his aesthetic colleague Aleksandr Blok.

Bely's first three books of verse, *Zoloto v lazuri* (1904; "Gold in Azure"), *Pepel* (1909; "Ashes"), and *Urna* (1909; "Urn"), are, like Blok's, diaries in poetry. In 1909 Bely completed his first novel, *Serebryany golub* (1910; *The Silver Dove*). His most celebrated composition, *Peterburg* (published serially 1913–14; *St. Petersburg,* 1959), is regarded as a Baroque extension of his earlier "symphonies." In 1913 he became an adherent of the Austrian social philosopher Rudolf Steiner and joined his anthroposophical colony in Basel, Switz., a group advocating a system of mystical beliefs derived from Buddhist contemplative religious experience. While in Switzerland Bely began writing his *Kotik Letayev* (1922; *Kotik Letaev,* 1971), a short autobiographical novel suggestive of the style of James Joyce. Bely returned to Moscow in 1916 and, like other Symbolists, he at first greeted the 1917 Bolshevik Revolution ecstatically. His brief poem "Khristos voskrese" (1918; "Christ Has Prevailed") lauded the messianic promise of Russian Socialism; however, after Blok's death and the execution by the Soviets of his literary colleagues, the dispirited Bely went abroad, although he returned to Russia in 1923. His development of new techniques of writing significantly affected later Russian verse and prose style.

Bely Gorod, also spelled BELYI GOROD, fortress and settlement comprising the third defense belt around Moscow, which joined the Kremlin and Kitay-gorod on the left bank of the Moskva River. Built between 1585 and 1593 of stone walls, the fortifications of Bely Gorod (White City) were important in providing defense for the Moscow settlement. In the 1770s and 1780s its walls and defense towers were taken down and replaced by boulevards.

Belyayev, Pavel Ivanovich (b. June 26, 1925, Chelishchevo, Russian S.F.S.R.—d. Jan. 10, 1970, Moscow), cosmonaut who piloted the Voskhod 2 spacecraft during the Soviet Union's eighth manned space mission,

Belyayev, 1965
Sovfoto

launched March 18, 1965, the flight on which Aleksey Leonov, Belyayev's copilot, became the first man to walk in space.

Belyayev began training as a fighter pilot in 1943 and saw combat against the Japanese late in World War II. After the war he remained in naval aviation. While attending the Soviet Air Force Academy, Moscow, in late 1959, he was selected for training as one of the original group of cosmonauts. For his part in the Voskhod 2 flight, he was proclaimed a Hero of the Soviet Union.

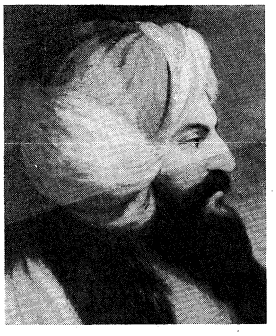
Belyi Gorod (Russian S.F.S.R.): *see* Bely Gorod.

Belzec, Polish BEŁŻEC, German Nazi system of concentration camps and extermination camp in and near the village of Bełżec in Lublin province, Poland. The first forced-labour camp for Polish Jews was established at this site in early 1940, and by the autumn of the year there were three camps in the village itself and a number of satellite camps in surrounding areas, accommodating more than 11,000 prisoners at a time. Hundreds died from overwork, starvation, disease, and brutal living conditions. The camps were closed in December 1940, and the population dispersed.

In early 1942 an extermination camp was set up at Bełżec, receiving Jews from Poland and later from Germany, Czechoslovakia, and Romania. Originally victims were exterminated in cells filled with diesel fumes; but, in August 1942, Zyklon-B, the quick-acting hydrogen cyanide gas, was first demonstrated at Belzec. The camp was closed in the spring of 1943, and traces of it were obliterated; a farm was established on the site. Probably more than 600,000 persons died at Belzec; only one known survivor was discovered at war's end. *See also* Holocaust.

Belzoni, Giovanni Battista (b. Nov. 5, 1778, Padua, Republic of Venice—d. Dec. 3, 1823, Gwato, Benin), excavator of Egyptian archaeological sites.

Originally planning to join a religious order, Belzoni went to England in 1803 where he turned his powerful six-foot seven-inch physique to earning a living as a circus strong man. He also exhibited models of hydraulic engines and in 1815 he went to Cairo to offer to Muḥammad ʿAlī Pasha, the founder of modern Egypt, hydraulic engines for use in irrigation. Two years later he had embarked on a new career, excavating Egyptian tombs and temples for their treasures with scant regard for incidental damage to less desirable items. Many of his archaeological feats might today be regarded as pillage.



Belzoni, oil painting by W. Brockedon; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

At Thebes he obtained the colossal sculpture of the head of Ramses II ("the Young Memnon") for the British Museum; in the nearby Valley of the Tombs of Kings, he discovered the tomb of Seti I and removed the aragonite sarcophagus for the Sir John Soane's Museum, London. Though he managed to make off with an obelisk from the Nile island of Philae (Jazīrat Fīlah), near Aswān, it was taken from him at gunpoint by agents working for French interests. He explored Elephantine (Jazīrat Aswān) and the temple of Edfu (Idfu), cleared the entrance to the great temple of Ramses II at Abu Simbel, was first to penetrate the pyramid of Khafre at Giza, and identified the ruins of the city of Berenice on the Red Sea. He returned to England in 1819 and published an account of his adventures, *Narrative of the Operations and Recent Discoveries Within the Pyramids, Temples, Tombs and Excavations, in Egypt and Nubia . . .*, 2 vol. (1820). He died in western Africa as he began a journey to Timbuktu. In 1825 his widow exhibited in Paris and London his drawings and models of the royal tombs of Thebes. *Great Belzoni,* a biography written by Stanley Mayes, appeared in 1959.

B.E.M., recipient of the British Empire Medal. *See* British Empire, The Most Excellent Order of the.

Bem, Józef Zachariasz, also called MURAD PASHA (b. March 14, 1794, Tarnów, Galicia, Austrian Empire—d. Dec. 10, 1850, Aleppo, Syria, Ottoman Empire), Polish army officer whose military feats in Transylvania and the region of Banat made him a hero of the Hungarian Revolution of 1848–49.

Bem, detail from a portrait by an unknown Polish artist, 19th century; in the National Museum, Warsaw

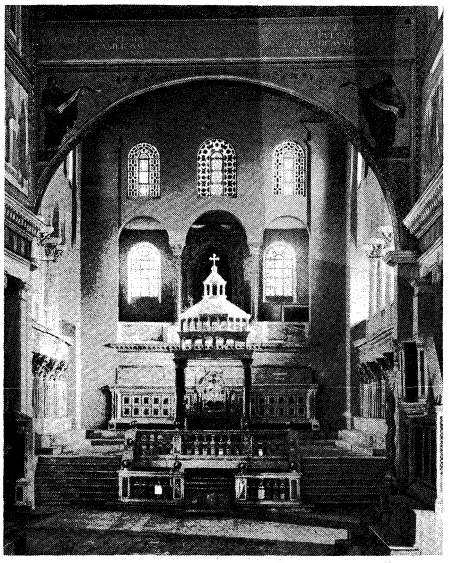
By courtesy of the National Museum, Warsaw

Educated at the Warsaw Military School, he distinguished himself with a Polish artillery regiment in Napoleon's Russian campaign (1812) and in the defense of Danzig (1813). He returned to Polish service in 1815 and fought with distinction in the rebellion against Russia (1830–31).

In 1848 he offered his services to the Hungarian leader Lajos Kossuth and was assigned the defense of Transylvania. With a small army he performed prodigiously against the Austrians, especially in his stand at the bridge of Piski (Feb. 9, 1849), where he repulsed superior forces. Bem occupied the Banat region but had to return to the defense of Transylvania when the Russians invaded. Finally, on July 31, overwhelming forces wiped out his army. Bem escaped only by feigning death.

On the collapse of the Hungarian rebellion he fled to Turkey, adopted Islām, and, as Murad Pasha, became governor of Aleppo, where, at the risk of his life, he saved the Christian population from being massacred.

bema (Greek *bēma,* "step"), raised platform; in antiquity it was probably made of stone, but in modern times it is usually a rectangular wooden platform approached by steps. Originally used in Athens as a tribunal from which orators addressed the citizens as well as the courts of law, the bema later became a standard fixture in Christian churches. In Early Christian basilicas it functioned as a stage for the seating of clergy, first in the chancel and later in the apse. The bema also appears in synagogues, and from it the Pentateuch and Torah are read. Rabbinical authorities disagree about its placement, however, and it has no fixed position.



Bema, S. Lorenzo Fuori le Mura, Rome, begun 4th century

Alinari—Art Resource/EB Inc.

Bemba, also called BABEMBA, or AWEMBA, Bantu-speaking people inhabiting the northeastern plateau of Zambia and neighbouring areas of Zaire and Zimbabwe. The Bantu language of the Bemba has become the lingua franca of Zambia.

The people practice shifting cultivation, pollarding the forest trees and planting the staple, finger millet, in the ash derived from burning the branches. The poor soil and inadequate transportation have hindered cash crops, and in the 1960s and 1970s many men left the area to find work in the copper mines more than 400 miles to the south.

The Bemba claim to be an offshoot of the Luba empire (*see* Luba-Lunda states) and are thought to have left the Congo in the 18th or early 19th century. They achieved a centralized government under a supreme chief, the Chitimukulu, who was a member of a single, matrilineal, royal clan. The power of members of this clan rested on the sacredness of their persons and on their prayers to ancestral spirits at relic shrines, which were thought to have influence on the fertility of the land and on the general welfare of the people. Their burial and accession ceremonies are among the most elaborate found among the Bantu speakers.

The Bemba are divided into 40 matrilineal, exogamous clans, with members dispersed over the country. The local group is the village, which is largely composed of the matrilineal relatives of the headman. It contains about 30 huts and moves every four or five years when the soil is exhausted. Polygyny is practiced, the first wife enjoying special status, but each co-wife occupying a separate hut.

Bembo, Pietro (b. May 20, 1470, Venice—d. Jan. 18, 1547, Rome), Renaissance cardinal who wrote one of the earliest Italian grammars and assisted in establishing the Italian literary language.

Of an aristocratic family, Bembo was educated principally by his father, a man of great authority in the Venetian republic. In 1513 the son became secretary to Pope Leo X in Rome. On Leo's death (1521), he retired to Padua. He accepted the office of historiographer of Venice in 1529, and was shortly thereafter appointed librarian of St. Mark's Cathedral. Created a cardinal in 1539, Bembo returned to Rome, where he devoted himself to theology and classical history.

Bembo wrote Latin lyric poetry of formal excellence and then turned to the vernacular,

modeling his poetry on that of Petrarch. His way of making direct imitations of Petrarch was widely influential and became known as *bembismo.* A collected edition of his Italian poems, *Rime,* appeared in 1530. His other vernacular works include: *Gli Asolani* (1505), dialogues on platonic love, the systemization of which influenced Ariosto, Castiglione, and Tassa; a history of Venice; and *Prose della volgar lingua* (1525; "Discussions of the Vernacular Language"). In the *Prose,* Bembo codified Italian orthography and grammar, essential for the establishment of a standard language, and recommended 14th-century Tuscan as the model for Italian literary language. His view, opposed by those who wanted Latin and by others who wanted a more modern Italian as the model, had triumphed by the end of the 16th century.

Bemidji, city, seat of Beltrami County, north central Minnesota, U.S., on Lake Bemidji. The city developed around a trading post established in 1888. The name, first applied to the lake, honours an Ojibwa Indian chief. In the 1890s large-scale lumbering operations were begun, and for 30 years Bemidji was a major logging and sawmilling centre. As the largest city within a radius of 100 miles (160 km), it is now an important trading centre. Its chief industries include creameries and woodworking plants. The surrounding scenic lake and forest region attracts a summer and winter resort trade. Bemidji State University was opened in 1919. Nearby is Lake Bemidji State Park, and Paul Bunyan State Forest is to the south. An 18-foot (5.5-metre) statue of the mythological lumberjack Paul Bunyan, with Babe, his blue ox, stands on the lake shore. Inc. village, 1896; city, 1905. Pop. (1982 est.) 11,034.

Bemmelen, Reinout Willem van (b. April 14, 1904, Batavia, Dutch East Indies [now Jakarta]), Dutch geophysicist whose studies of the regional geology of Indonesia led to recognition of the importance of island areas in the development of the Earth's crust.

A member of the Geological Survey of Indonesia (1927–46), for which he served as chief of its volcanological survey (1940–46), he became a member of the staff at the Geological Institute of the State University of Utrecht, Neth., in 1949, retiring in 1969. He also conducted research on continental drift and determination of winds in the equatorial stratosphere. He wrote *The Geology of Indonesia* (1949), *Mountain Building* (1954), and *Geodynamic Models* (1972).

Ben Barka, Mehdi (b. 1920, Morocco—d. October 1965?, Paris?), Moroccan revolutionary politician exiled to Paris whose abduction and presumed murder in October 1965 caused a political crisis for the government of French President Charles de Gaulle and led to ruptured diplomatic relations between France and Morocco for almost four years.

Ben Barka, the son of a Moroccan policeman, taught mathematics before he entered political life. He joined the Istiqlal Party, becoming speaker of the National Consultative Assembly, and in 1959 left the party to found the left-wing National Union of Popular Forces (UNFP). He was widely considered as a likely president for a possible Republic of Morocco. When Morocco and Algeria had a brief war in 1963, Ben Barka sided with Algeria and went into exile. He was subsequently accused of high treason for an alleged plot against King Hassan II and was sentenced to death *in absentia.* He moved to Paris and became leader-in-exile of the opposition to Hassan.

On Oct. 29, 1965, Ben Barka disappeared. He was never found, and investigators concluded that gangsters were paid to kidnap and murder him. It was suggested several times that the plot was headed by Gen. Muhammad Oufkir, Hassan's minister of the interior. A formal inquiry and trial in France showed that Morocco had violated French national sovereignty and, worse yet, that French police officers and members of French intelligence had been involved in the affair. France issued an international warrant for Oufkir's arrest, which was ignored. Relations between the two countries deteriorated steadily over the incident until January 1966, when diplomatic relations were severed.

Ben Bella, Ahmed (b. Dec. 25, 1918, Maghnia [Marnia], Alg.), principal leader of the Algerian War of Independence against France, the first prime minister (1962–63) and first elected president (1963–65) of the Algerian republic, who steered his country toward a Socialist economy.

Ben Bella was the son of a farmer and small businessman in Maghnia in the department of Oran. There, he successfully completed his early studies at the French school and continued his education in the neighbouring city of Tlemcen, where he first became aware of racial discrimination and also mingled with the fringes of the nationalist movement.

He was conscripted into the French Army in 1937, served in World War II, and was awarded the Croix de Guerre (1940) and the Médaille Militaire (1944). On his return to Maghnia, Ben Bella resumed his nationalist activities—refusing to be intimidated by the confiscation of his farm by the French authorities. He left Maghnia, joined Messali Hadj's underground movement, and soon became one of the "Young Turks" who, after the rigged election of Gov. Marcel-Edmond Naegelen (1948), considered as illusory any hope of achieving independence democratically. He founded with his friends within Messali Hadj's party the Organisation Spéciale (OS), whose aim was to take up arms as quickly as possible.

After robbing the post office at Oran (1950) to obtain funds for the nationalist movement, Ben Bella was sentenced to prison, but he managed to escape after serving only two years of his term. He went underground again and moved to Egypt, where he was promised help by the revolutionary supporters of Gamal Abdel Nasser.

In November 1954 Ben Bella and the Algerian émigré leaders resident in Egypt, who had met secretly in Switzerland with those leaders who were still living in Algeria, came to two major decisions: to create the Front de Libération Nationale (FLN) and to order an armed insurrection against the French colonists.

Ben Bella played an important political role in the leadership of the FLN, simultaneously organizing the shipment of foreign arms to Algeria. In 1956 he escaped two attempts on his life, one at Cairo and the other at Tripoli. In the same year he was arrested in Algiers by the French military authorities while in the process of negotiating peace terms with the French premier, Guy Mollet.

His imprisonment (1956–62) kept him disassociated from those errors of military conduct committed by the FLN and, when he was freed after the Évian agreements with France were signed in 1962, his reputation was intact.

The situation in independent Algeria was chaotic. The leaders of the FLN had formed a conservative provisional government (Gouvernement Provisoire de la République Algérienne), while the party's congress at Tripoli had elected a Socialist-oriented government at the end of the war. It was this latter "Bureau Politique" that Ben Bella ran.

The intervention on his behalf by Col. Houari Boumedienne, chief of the Armée de Libération Nationale (ALN), assured both the success of the Bureau Politique and of Ben Bella, who was elected unopposed and with an immense majority to the presidency of the Algerian republic in 1963.

Ben Bella reestablished order in a country disorganized both by the massive departure of French colonists and by the clashes of armed groups. He created a state out of nothing and set aside one-quarter of the budget for national education. Above all else he inaugurated, under the title autogestion, a series of important agrarian reforms, among which was the nationalization—but not direct state control—of the former colonists' huge farms.

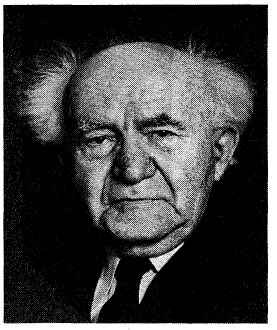
Ben Bella allied himself with the anti-Zionist Arab states and developed cultural and economic relations with France. He also extricated the country from an important border dispute with Morocco.

Ben Bella's humane, merciful, and youthful method of government pleased the Algerian people, but the effects of his policies were not always as beneficial as his generous intentions. Through lack of either time, political lucidity, or planning, Ben Bella governed from day to day in a series of improvised acts, some of which—like his appeal to Algerian women to donate their jewelry to the state—were more spectacular than useful. Ben Bella was unable to restore the FLN, nor was he able to win for it that popular support that would have helped to keep Boumedienne in check.

On June 19, 1965, Ben Bella was deposed in a coup led by Boumedienne, who installed himself as president; Ben Bella was imprisoned and had little contact with the outside world for nearly 15 years. Following the death of Boumedienne in 1978, Ben Bella was removed to house arrest in 1979, and on Oct. 30, 1980, he was freed. (Ro.M./Ed.)

BIBLIOGRAPHY. Robert Merle, *Ahmed Ben Bella* (1965; Eng. trans. 1967), is an authorized biography.

Ben-Gurion, David, original name DAVID GRUEN (b. Oct. 16, 1886, Płońsk, Pol., Russian Empire [now in Poland]—d. Dec. 1, 1973, Tel Aviv–Yafo, Israel), Zionist statesman and political leader, the first prime minister (1948–53, 1955–63) and defense minister (1955–63) of Israel. It was Ben-Gurion who, on May 14, 1948, at Tel Aviv, delivered Israel's declaration of independence. His charismatic personality and fighting spirit won him the adoration of the masses, and after his retirement from the government and, later, from the Knesset (the Israeli house of representatives), he was revered as the "Father of the Nation."



Ben-Gurion
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Ben-Gurion, born David Gruen, was the son of Victor Gruen, one of the leaders in Płońsk of the "Lovers of Zion," a movement that was disseminating among the oppressed Jews of eastern Europe the idea of the return to their original homeland of Israel. Zionism fascinated the young David Gruen, and he became convinced that the first step for the Jews who wanted to revive Israel as a nation was to immigrate to Palestine and settle there as farmers. In 1906 the 20-year-old Gruen arrived in Palestine and for several years worked as a farmer in the Jewish agricultural settlements in the coastal plain and in Galilee, the north-

ern region of Palestine. There he adopted the ancient Hebrew name Ben-Gurion. Suffering all the hardships of the early pioneers, including malaria and hunger, he never lost sight of his goal. It was owing to his efforts that the 1907 convention of his Zionist socialist party, Poale Zion (Workers of Zion), included the following declaration in its platform: "The party aspires to the political independence of the Jewish people in this land."

With the outbreak of World War I, the Turkish governors of Palestine, their suspicions aroused by his Zionist activity, arrested Ben-Gurion and expelled him from the Ottoman Empire. During the height of the war, he travelled to New York, where he met and eventually married the Russian-born Pauline Munweis. In the last stages of World War I, the British supplanted Turkish rule in the Middle East; and with this change the Jewish settlers and their friends and supporters abroad began to realize that Zionism could rely for future assistance on Britain as well as on the wealthy and influential segments of U.S. Jewry. After the British government published the Balfour Declaration on Nov. 2, 1917, which promised the Jews a "national home" in Palestine, Ben-Gurion enlisted in the British army's Jewish Legion and sailed back to the Middle East to join the war for the liberation of Palestine from Ottoman rule.

The British had already defeated the Turks when the Jewish Legion reached the battlefield and, when Britain received the mandate over Palestine, the work of realizing the "Jewish national home" had begun. For Ben-Gurion, the "national home" was a step toward political independence. To implement it, he called for accelerated Jewish immigration to Palestine in the effort to create a Jewish nucleus that would serve as the foundation for the establishment of a Jewish state. That nucleus was the Histadrut—the confederation of Jewish workers in Palestine founded in 1920 by Ben-Gurion—who was elected its first secretary general—and his colleagues. The Histadrut rapidly became a central force in social, economic, and even security affairs, attaining the position of a "state within a state." Ten years later, in 1930, a number of labour factions united and founded Mapai, the Israeli Workers Party, with Ben-Gurion at its head. In 1935 he was elected chairman of the Zionist Executive, the highest directing body of world Zionism, and head of the Jewish Agency, the movement's executive branch.

As the Jewish settlement strengthened and deepened its roots in Palestine, anxiety mounted among the Palestinian Arabs, resulting in violent clashes between the two communities. In 1939 Britain radically changed its Middle East policy, abandoning its sympathetic stand towards the Jews and adopting a pro-Arab line that led to severe restrictions on Jewish immigration and settlement in Palestine. Ben-Gurion reacted by calling upon the Jewish community to rise against England, thus heralding the decade of "fighting Zionism." On May 12, 1942, he assembled an emergency conference of U.S. Zionists in New York; the convention decided upon the establishment of a Jewish commonwealth in Palestine after the war. At the end of World War II, Ben-Gurion again led the Jewish community in its successful struggle against the British mandate; and in May 1948, in accordance with a decision of the United Nations General Assembly, with the support of the United States and the Soviet Union, the State of Israel was established.

David Ben-Gurion was elected prime minister and minister of defense. Through internal political struggles that incensed both the right and the left, he succeeded in breaking up the underground armies that had fought the British and in fusing them into a national army, which became a model and symbol of the maturing Israeli nation and an effective force against the invading Arab armies from Syria, Jordan, Iraq, and Egypt. Although the fighting ended with an Israeli victory, the Arab leaders refused to enter into formal peace negotiations with the Jewish state.

Ben-Gurion viewed the newborn state as the direct continuation of Jewish history that, in his opinion, had been interrupted 2,000 years earlier when the Roman legions had crushed the Hebrew freedom fighters and banished the Jews from Palestine. He saw the Jews' period of exile as a prolonged interlude in the history of Israel and declared that they had now regained their rightful home. In order to strengthen and develop the young nation, Ben-Gurion presented the people of Israel with a series of challenges: the absorption of mass immigration from all over the world; the assimilation of newcomers of diverse communities and backgrounds; the creation of a unified public education system; the settlement of the desert lands. In his foreign policy, he adopted an independent and pragmatic course. He used to say: "What matters is not what the Gentiles will say, but what the Jews will do." His defense policy was firm, and he answered violations of the cease-fire agreements by neighbouring Arab states with military reprisals. His stronghanded policy inspired little sympathy for him from the governments of the United States and Britain, for both feared that their support of Israel would injure their standing with the oil-exporting Arab governments. They preferred more moderate leaders such as Chaim Weizmann, first president of Israel, and Moshe Sharett, who was elected prime minister for a brief term (1953–55) when Ben-Gurion temporarily retired from office. Striving to gain a foothold in the Middle East, the U.S.S.R. alienated Israel by providing the Arabs with vast quantities of arms. At that time, Ben-Gurion found an ally in France. During the war in Algeria, France encountered the opposition of the united Arab front, led by Egyptian President Nasser, and consequently drew closer to Israel supplying it with considerable amounts of military equipment; when Nasser nationalized the Suez Canal in July 1956, French initiative brought Israel to join the Franco-British military campaign against Egypt. On Oct. 29, 1956, following a secret visit to France and a meeting with French and British leaders, Ben-Gurion ordered the army to take over the Sinai Peninsula, while France and Britain were making an abortive attempt to seize the canal. Israel subsequently withdrew from Sinai after having been assured freedom of navigation in the Strait of Tiran and de facto peace along the Egyptian-Israeli border, which was to be supervised by a special United Nations force.

Following the Sinai campaign, Israel entered a period of diplomatic and economic prosperity. Ben-Gurion continued as head of government until 1963. During his last years of office, he initiated several plans (which proved fruitless) for secret talks with Arab leaders with a view to establishing peace in the Middle East.

In June 1963 Ben-Gurion unexpectedly resigned from the government for unnamed "personal reasons." His move apparently resulted in part from the bitter internal controversy between his supporters and his rivals in the party, who rose against him for the first time because of the political implications of the 1954 "Lavon Affair," involving Israeli inspired sabotage of U.S. and British property in Egypt. The affair led Ben-Gurion in 1965 to leave Mapai with a number of his supporters and to found a small opposition party, Rafi, at the head of which he fought, with little success, against his successor, Levi Eshkol.

In 1970 Ben-Gurion retired from the Knesset and from all political activity, devoting himself to the writing of his memoirs in Sde-Boqer, a kibbutz in the Negev. He published a number of books, mostly collections of speeches and essays. Through most of his life he had also engaged in researches into the history of the Jewish community in Palestine and in the study of the Bible, for it was from the Bible that he drew his ideals.

(M.Ba.)

BIBLIOGRAPHY. Michel Bar-Zohar, *Ben Gourion, le prophète armé* (1966; *Ben-Gurion: The Armed Prophet,* 1967), is based on the private documents, files, and diaries of Ben-Gurion, as well as on extensive interviews with him, his supporters, and rivals.

Ben ha-Mizraḥ: *see* Oriental Jew.

Ben-hadad I, Assyrian ADAD-IDRI (d. *c.* 841 BC), king of Damascus who led a coalition against the invading forces of the Assyrian king Shalmaneser III, repulsing them at Karkar in 853. In a battle with him King Ahab of Israel was killed (I Kings 22:29–36). Ben-hadad was murdered by the usurper Hazael.

Ben Jelloun, Tahar (b. 1944, Fès, Mor.), African poet, novelist, and dramatist.

Ben Jelloun began his studies in philosophy and later earned a doctorate in social psychology. He taught and was a contributor to a number of magazines and newspapers, including *Souffles, Intégral, Les Lettres Nouvelles,* and *Le Monde.*

Ben Jelloun's first collection of poetry, *Hommes sous linceul de silence* (1971; "Men under the Shroud of Silence"), was followed by *Cicatrices de soleil* (1972; "Scars of the Sun"). *Harrouda* (1973), an erotic, poetic evocation of infancy, youth, and coming to manhood in Fès and Tangier, was his first novel. It was followed by two more poetry collections, *Le Discours du chameau* (1974; "The Discourse of the Camel") and *Grains de peau* (1975; "Particles of Skin").

Les Amandiers sont morts de leurs blessures (1976; "The Almond Trees Are Dead from their Wounds")—essays on his grandmother's death, the Palestinian question, North African immigration to France, love, and eroticism—was awarded the Prix de l'Amitié Franco-Arabe. In the same year, *Chronique d'une solitude* ("Chronicle of Loneliness"), a play about the misery of the North African immigrant worker, was staged at the Avignon Festival and appeared as a novel, *La Réclusion solitaire* ("Solitary Confinement"). A third novel, *Moha le fou, Moha le sage* (1979; "Moha the Fool, Moha the Wise"), a satire of the modern North African state, received the Prix des Bibliothécaires de France et de Radio Monte Carlo that year. *À l'insu du souvenir* (1980; "Unknown to Memory"), a later collection of poetry, and an essay on the intellectual in the Third World, "L'Écrivain public" (1981; "Public Writer"), displayed his power for evoking reality through fantasy, lyric, and metaphor and his long-held conviction that his art must express the struggle for human freedom—political, economic, and social.

Ben Lomond, mountain mass in northeastern Tasmania, Australia, comprising a plateau of 30 sq mi (78 sq km) made up of igneous rock. It mostly lies above 4,500 ft (1,400 m), making it the highest land in the state. The loftiest portion stretches 7 mi (11 km) from Legge Peak (Legges Tor; 5,161 ft) southeast to Stacks Bluff (5,010 ft). The surface is also covered with many small hills and lakes. Ben Lomond lies within a 62-sq-mi national park, the major winter-sports resort for northern Tasmania. Tin and wolfram (tungsten) are mined on the southeastern slopes. It was named in 1804 by the explorer Lieut. Col. William Paterson for a mountain in Scotland.

Ben Nevis, highest mountain of the British Isles, in the district of Lochaber, Highland region, Scotland. Its summit, reaching 4,406 ft

(1,343 m), is a plateau of about 100 ac (40 ha), with a slight slope to the south and a sheer face to the northeast. Snow lies in some

Ben Nevis from Loch Linnhe, Scotland
Colour Library International

parts all year, and permafrost conditions are almost reached. The mountain consists of a superstructure of volcanic rocks surmounting the ancient schists, with granites intruded, of the Highlands.

Ben Slimane, formerly BOULHAUT, town, provincial capital, and province (established 1977), Centre region, north central Morocco. The town, a local market centre, is situated 12 mi (20 km) inland from the Atlantic Ocean between the cities of Rabat and Casablanca. It lies at an elevation of 980 ft (299 m) above sea level, at the edge of the Ziada cork oak forest.

Ben Slimane province is bounded by the prefectures of Rabat-Salé (northeast) and Casablanca (southwest), and by the provinces of Khemisset (east) and Settat (south). It has an area of 1,066 sq mi (2,760 sq km) consisting of low plateaus and valleys that are intensely cultivated near the ocean; cereals (mostly wheat), citrus fruits, and grapes are grown. Farther inland, forests of cork oak, Aleppo pine, eucalyptus, and mimosa predominate. There is some truck gardening for the Rabat and Casablanca city markets, cork is processed, and oceanfront beaches are popular recreation areas. Pop. (1971) town, 17,302; (1981 est.) province, 191,300.

Ben Thuy, town, Nghe Tinh *tinh* (province), northern Vietnam, on the Song (river) Ca, just southeast of the urban centre of Vinh. Just upstream from where the Song Ca enters the Gulf of Tonkin where it meets the South China Sea, Ben Thuy serves as the outport of Vinh, and much of the trade of the central part of the country is funnelled through it.

Ben Tre, city and provincial seat of Ben Tre *tinh* (province) on the flat Mekong River delta, southern Vietnam. Ben Tre city (formerly True Giang), the provincial seat, is linked by highway and ferry boat to Ho Chi Minh City (formerly Saigon) 53 mi (85 km) to the northeast. It is served by a commercial airfield and functions as a link on the My Tho-Phu Vinh river-canal system, which crosses the province generally north to south.

Ben Tre province faces the South China Sea and is principally confined between the Song (river) Cua Dai and Song Co Chien channels of the Mekong. The province was formerly (until 1976) called Kien Hoa. The area of 859 sq mi (2,225 sq km) is devoted largely to irrigated rice and coconuts, although there are wood cutting, shrimp freezing, silk weaving, brick and tile making, and salt pan operations, the latter on the coast. Other crops include dates, corn (maize), potatoes, cotton, tobacco, sugarcane, and pineapples. Cua Dai, Ba Lai, Ham Luong, and Co Chien are ports with connections inland through a wide network of rivers and canals. Pop. (1979) province, 1,041,838.

Ben-Zvi, Itzhak, original name ISAAC SHIMSHELEVICH (b. Nov. 24, 1884, Poltava, Russia —d. April 23, 1963, Jerusalem), second president of Israel (1952–63) and an early Zionist leader in Palestine, who helped create the political, economic, and military institutions basic to the formation of the state of Israel.

A Zionist from his youth, Ben-Zvi in 1905 helped form the Russian Poale Zion, a socialistically oriented Zionist group that set an important ideological precedent for later institutions in Palestine and elsewhere and led to the formation of the Poale Zion World Federation in 1907. He settled in Palestine and in 1908 helped found ha-Shomer, a self-defense organization for Jewish agricultural settlements. In 1909 he founded in Jerusalem the first Hebrew high school in Palestine.

Exiled from Palestine in 1915 by the Turks, Ben-Zvi travelled to the U.S., where with David Ben-Gurion, later prime minister of Israel, he founded Heḥalutz, a Zionist pioneer youth organization, and the Jewish Legion to fight alongside the British against the Germans and Turks in Palestine during World War I. He returned with the legion to Palestine in 1918 and two years later helped create the Histadrut, the General Federation of Labour, which became the dominant labour organization in Israel. He served as a member of Histadrut's secretariat from 1920 to 1929, when he and Ben-Gurion founded the Mapai Party, which became the leading political force in the country. One of the creators of Va'ad Le'umi, the Jewish National Council representing 90 percent of the Jewish community during the British mandate in Palestine (1920–48), he was the council's chairman from 1931 to 1944 and its president from 1944 to 1949.

Ben-Zvi signed Israel's Declaration of Independence on May 14, 1948, and was elected to the Knesset the following year. He became president of the body in 1952, a position he held until his death. Also a noted scholar of Middle Eastern history and archaeology, he founded the Institute for Research of Jewish Middle Eastern Communities (now the Ben-Zvi Institute) in 1948 and directed it until 1960. He wrote a history of the Jews, *The Exiled and the Redeemed* (1958).

Benacerraf, Baruj (b. Oct. 29, 1920, Caracas), immunologist whose contributions to an understanding of the mechanisms and genetic basis of the immunologic response and especially of its role in certain diseases known as the autoimmune diseases brought him a share (with George Snell and Jean Dausset) of the 1980 Nobel Prize for Physiology or Medicine.

From the age of five until the outbreak of World War II Benacerraf lived in Paris. In 1940 he entered Columbia University, from which he graduated in 1942. He became a naturalized U.S. citizen in 1943, while a student at the Medical College of Virginia. After receiving his M.D. in 1945 and interning at Queens General Hospital in New York City, he served in the U.S. Army in 1946–48. After a year of research at Columbia and six at the Hôpital Broussais in Paris, he joined the faculty of New York University School of Medicine in 1956, advancing to professor of pathology in 1960. In 1968–70 he was chief of the immunological laboratory of the National Institute of Allergy and Infectious Diseases, National Institutes of Health. From 1970 he held the Fabyan chair of comparative pathology at Harvard.

Benaco (lake, Italy): *see* Garda, Lake.

Benadir, traditional coastal region, southern Somalia, East Africa. The name, from Persian *bandar,* "port," refers to the voyages of Persian and Arab traders to East Africa across the Arabian Sea in the Middle Ages, assisted by the monsoon winds. Benadir passed to the Sultan of Zanzibar in 1871; it was leased by Italy in 1895 and thereafter shared the political fate of the remainder of Somalia (until World War II, Italian Somaliland). Largely agricultural, Benadir has an area of about 17,000 sq mi (45,000 sq km). Since 1973 Benadir has been divided into the three *gobollada* (administrative regions) of Shabeellaha Dhexe, Shabeellaha Hoose, and Banaadir; the latter is centred on Muqdisho, the national capital.

Benadir (administrative region, Somalia): *see* Banaadir.

Benalla, city, central Victoria, Australia, on the Broken River. Founded in 1848 on an overland stock route after Sir Thomas Mitchell's exploration of the area, its name is derived from an Aboriginal term meaning "crossing place." The city is a rail and highway junction and the commercial centre for a district of livestock, poultry, and grain farming. Local industries include flour milling and sawmilling, food processing, clothing manufacture, and railroad workshops. Close to Mt. Buller (5,919 ft [1,804 m]) and other ski areas, Benalla also is a winter resort. It became a shire in 1869, a borough in 1948, and a city in 1965. Pop. (1981) 8,151.

Benambran orogeny, a mountain-building event in eastern Australia during Late Ordovician time (the Ordovician Period began 500,000,000 years ago and ended 430,000,000 years ago). The uplift and deformation produced a tectonic ridge that separated the Tasman Geosyncline into an eastern and western belt, extending from Tasmania to northern New South Wales.

Bénard, Abraham-Joseph: *see* Fleury.

Benares (India): *see* Vārānasi.

Benaud, Richie, byname of RICHARD BENAUD (b. Oct. 6, 1930, Penrith, N.S.W., Australia), cricketer who is best remembered as one of Australia's most imaginative captains. Benaud made his debut in first-class cricket at the age of 18 and first appeared in Test (international) matches in 1951. He was appointed captain of the Australian national team in 1958. With his leadership and shrewd knowledge of the game, Benaud led Australia to victory in four successive Test series (1958–61) and did much to rekindle public interest in the sport.

Benavente y Martínez, Jacinto (b. Aug. 12, 1866, Madrid—d. July 14, 1954, Madrid), one of the foremost Spanish dramatists of the 20th century, who was awarded the Nobel Prize for Literature in 1922. He returned drama to reality by way of social criticism: declamatory verse giving way to prose, melodrama to comedy, formula to experience, impulsive action to dialogue and the play of minds. Benavente showed a preoccupation with aesthetics and later with ethics.

The extent to which he broadened the scope of the theatre is shown by the range of his plays, *e.g., Los intereses creados* (performed 1903, published 1907; *The Bonds of Interest,* 1917, performed 1919), his most celebrated work, based on the Italian commedia dell'arte; *Los malhechores del bien* (performed 1905; *The Evil Doers of Good*); *La noche del sábado* (performed 1903; *Saturday Night,* performed 1926); and *La malquerida* (1913; "The Passion Flower"), a rural tragedy with the theme of incest, his most successful play in Spain and in North and South America. *Señora Ama* (1908), said to be his own favourite play, is an idyllic comedy set among the people of Castile.

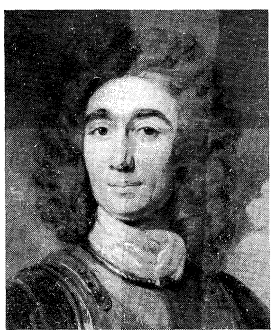
In 1928 his play *Para el cielo y los altares* ("Toward Heaven and the Altars"), prophesying the fall of the Spanish monarchy, was prohibited by the government. During the Spanish Civil War Benavente lived in Barcelona and Valencia and was for a time under arrest. In 1941 he reestablished himself in public

favour with *Lo increíble* ("The Incredible"). His extraordinary productivity as a dramatist (he wrote more than 150 plays) recalled Spain's Golden Age and the prolific writer Lope de Vega. With the exception, however, of the harsh tragedy *La infanzona* (1948; "The Ancient Noblewoman"), and *El lebrel del cielo* (1952), inspired by Francis Thompson's "Hound of Heaven," Benavente's later works did not add much to his fame.

Benbecula, island of the Outer Hebrides, Western Isles area of Scotland. Benbecula ("Mountain of the Fords") lies between the islands of North Uist and South Uist and is connected over the fords by a causeway (1960) to the north and by O'Regan's Bridge (1943) to the south. The island has an area of about 7 square miles (18 square km) and has near its centre a solitary hill, Rueval, which rises to 409 feet (125 m). The eastern portion of the island is moorland, and the western side is fertile grazing and crofting land cut by numerous small lochs. The chief settlements are Creagorry in the south and Balivanich near the airport in the northwest. Gaelic is widely spoken.

Benbow, John (b. March 10, 1653—d. Nov. 4, 1702, Port Royal, Jam.), English admiral who became a popular hero through his exploits against the French and his death in active service.

The son of a tanner of Shrewsbury, Shropshire, Benbow served in the navy and merchant marine before becoming captain of a



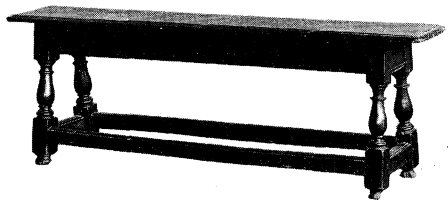
Benbow, detail of an oil painting by Sir Godfrey Kneller, 1701; in the collection of the National Maritime Museum, Greenwich, Eng.

By courtesy of the National Maritime Museum, Greenwich, Eng., Greenwich Hospital Collection

naval vessel in 1689. As master of the fleet under Adm. Edward Russell, he helped destroy the French fleet in the Battle of La Hogue (May 1692), and in November 1693 he bombarded the French port of Saint-Malo.

After serving as commander of the English fleet in the West Indies from 1698 to 1700, Benbow returned there as vice admiral in 1701. On Aug. 19, 1702, his seven ships sighted nine French vessels off Santa-Marta (now in Colombia). He gave chase for five days, but the captains of four of his vessels lagged behind, refusing to engage the enemy. On August 24 the Admiral's right leg was shattered by French fire. Nevertheless, he remained on deck until his captains compelled him to return to Jamaica. There he had two of them court-martialed for insubordination and shot. Benbow died of his wounds and was buried in Kingston.

bench, long seat that may be freestanding, fixed to the wall, or placed against the wall. Paneled benches were used by the Romans, and they were the most common form of seating in medieval halls at a time when a chair was a rare luxury. Benches were not only used as seats but they were normally wide enough to be used for sleeping on or eating from; as



Oak bench, English, mid-17th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

the Frankish ecclesiastic and historian Gregory of Tours recorded, when King Chilperic I was sitting with Bishop Bertrand, he had before him a bench bearing food.

Benches retained their popularity as fitted seats in window alcoves but in the 16th century soon lost favour as freestanding pieces of furniture when chairs became more widely used. Upholstered versions were also made. Some of the most spectacular benches were made in the Spanish colonies in South America in the 17th century, notably in Cuzco, Peru, where benches bore enormous carved crestings and balustraded backs that were painted and gilded.

Bench, Johnny (Lee) (b. Dec. 7, 1947, Oklahoma City, Okla., U.S.), American professional baseball player who, in 17 seasons with the Cincinnati Reds of the National League, established himself as one of the game's finest catchers.

Bench was signed to a contract with the Reds in 1965 and played with its minor league teams until he came up to the Reds late in the 1967 season. From 1968 he was the team's regular catcher, though in the 1980s he caught less and finally switched to playing third base. At his retirement, he held the record for the most home runs by a catcher, 324.

Benchley, Robert (Charles) (b. Sept. 15, 1889, Worcester, Mass., U.S.—d. Nov. 21, 1945, New York City), American drama critic, actor, and humorist noted for his motion-picture short subjects and humorous essays.

A graduate of Harvard University (1912), Benchley joined the staff of the old *Life* magazine in 1920 as drama critic. His monologue "The Treasurer's Report," delivered as a skit in an amateur revue in 1922, was the basis for one of the first all-talking shorts. He subsequently wrote and acted in motion-picture short subjects, his *How to Sleep* winning an award from the Academy of Motion Picture Arts and Sciences in 1935. In all, he made 46 shorts and appeared in minor roles in about 50 feature pictures.

Although films and radio brought him wide public acclaim, his writings constitute his most lasting achievement. Among his essays, collected in 15 books and illustrated by Gluyas Williams' caricatures, are *My Ten Years in a Quandary, and How They Grew* (1936) and *Benchley Beside Himself* (1943). His writing is characterized by its warmth and the often nonsensical and non sequitur quality of its humour; his satire, although sharp, was never cruel. Benchley was drama critic for *The New Yorker* (1929–40), for which he also wrote "The Wayward Press" column under the pseudonym Guy Fawkes. A witty conversationalist, he was a regular member of the Algonquin Round Table. *The Benchley Roundup* (1954) was a selection from his writings edited by his son Nathaniel, who also wrote his biography (1955).

Benckendorff, Aleksandr Khristoforovich, Graf (Count) (b. 1783, Tallinn, Russia [now Estonian S.S.R., U.S.S.R.]—d. Oct. 5 [Sept. 23, Old Style], 1844, St. Petersburg [now Leningrad]), general and statesman who played a prominent role in the Napoleonic Wars and later served as Tsar Nicholas I's chief of police.

Of Baltic-German origin, Benckendorff joined the Russian Army and was one of the officers who assassinated Emperor Paul I in 1801. Between 1806 and 1815 he fought in numerous military campaigns, distinguishing himself particularly when he became commandant of Moscow, joined the pursuit of the French forces as they fled from Russia (1812), and engaged in many battles against the French in Germany (including the Russian drive into Berlin) and the Low Countries and Belgium.

Benckendorff then served as aide-de-camp to Tsar Alexander I (1819–21) and, having been promoted to lieutenant general, was given command of the cuirassier division of the guards (1821). In 1825, when the liberal Decembrists attempted to prevent the succession of Nicholas to the throne and to force the establishment of constitutional government in Russia, Benckendorff commanded the troops that suppressed their uprising; later, he played a leading role in prosecuting them. The relentless way in which he and fellow generals of German origin in Russia tracked down members of eminent Russian noble families who had been connected with the Decembrist movement aroused popular belief that the German generals were trying to liquidate their Slav rivals in the government.

In January 1826 he submitted a plan to Nicholas for organizing a department of political police. When Nicholas then created the third section of the imperial chancellery, Benckendorff was placed in charge of both the gendarmerie and the third section, with responsibility for the work of regular and secret police, posts he held until his death.

Bencoolen (Indonesia): *see* Bengkulu.

Bend, city, seat (1916) of Deschutes County, central Oregon, U.S., on the Deschutes River, in the eastern foothills of the Cascade Range (west) and bordered by Bear Creek Butte (east). Site of a fording place on an overland wagon trail, the name "Farewell Bend" was applied because travelers often parted at the curve in the river. Laid out by the Pilot Butte Development Company in 1904, it grew after the Deschutes Irrigation and Power Company opened farmland for settlement in 1909. Vast timber resources influenced a railroad boom (1911), sawmills were built, and wood industries developed. Headquarters for the Deschutes National Forest, the city is a centre for tourist accommodations because of its proximity to lakes, lava beds, caves, and mountain and ski resorts. Central Oregon Community College was established there in 1949. Inc. 1904. Pop. (1982 est.) 17,122.

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Benda, František (Czech), German FRANZ BENDA (b. Nov. 25, 1709, Staré Benátky, Bohemia [now in Czech.]—d. March 7, 1786, Potsdam, Prussia [now in E.Ger.]), one of the outstanding violinists of 18th-century Germany.

The eldest son of Jan Jiří Benda and his wife Drota Brixi, both talented musicians, he studied under J. Graun and joined the orchestra of Frederick II the Great (then crown prince). On Frederick's accession (1740), Benda settled in Berlin, where the rest of his family joined him in 1742. He became concertmaster of the orchestra in 1771. His compositions include 80 violin solos, 15 concerti, symphonies, trio sonatas, and violin concerti and sonatas. His son Friedrich William Heinrich Benda (1745–1814) also became well known as a violinist and composer.

Benda, Georg (Anton), Czech JIŘÍ ANTONÍN BENDA (b. June 30, 1722, Staré Benátky, Bohemia—d. Nov. 6, 1795, Köstritz, Saxony), composer widely admired during his lifetime for his stage works.

The third son of Jan Jiří Benda and his wife, Dorota Brixi, both musicians, and brother of the violinist František Benda, he went with his family to Berlin in 1742. He played violin in the royal orchestra (1742–49) and for nearly 30 years (from 1750) was chapelmaster to the Duke of Gotha. He toured Italy (1765–66) and composed Italian operas and intermezzi, but the works that won him renown throughout Europe were his melodramas *Ariadne auf Naxos, Medea* (both 1775), and *Pygmalion* (1779), in which an orchestral accompaniment was provided for the action and spoken words. He also wrote several *Singspiele* ("song-play"), of which the most famous was *Der Dorfjahrmarkt* (1775).

Benda's son Friedrich Ludwig Benda (1752–92) was a composer of theatrical music, cantatas, and instrumental works.

Benda, Julien (b. Dec. 26, 1867, Paris—d. June 7, 1956, Fontenay-aux-Roses, near Paris), novelist and philosopher, leader of the anti-Romantic movement in French criticism, persistent defender of reason and intellect against the philosophical intuitionism of Henri Bergson.

Julien Benda
H. Roger-Viollet

Among his first writings, after graduating from the University of Paris in 1894, were articles (1898) on the Dreyfus affair. His lifelong assault on the philosophy of Bergson began with *Le Bergsonisme* in 1912. Literary fame came the same year with the publication of his first novel, *L'Ordination* (1911; *The Yolk of Pity*, 1913). In his most important work, *La Trahison des clercs* (1927; *The Treason of the Intellectuals*, 1928), Benda denounced as moral traitors those who betray truth and justice for racial and political considerations. The evolution of his thought can be traced in two autobiographical works: *La Jeunesse d'un clerc* (1937; "The Youth of an Intellectual"), and *Un Régulier dans le siècle* (1938; "A Regulator in His Century").

bendahara, in the traditional Malay states, the chief minister, second only to the sultan in rank, power, and authority; the office of *bendahara* (a Sanskrit title) grew in importance during the Malacca sultanate after 1400. Its functions included executing the sultan's commands and acting as prime minister and commander in chief. The *bendahara* also supplied the sultan with a palace and with a bride from his own family, thus adding to his independent power. Perhaps this official's most important duty came after a sultan's death, when he gathered the royal regalia and acted as regent during the interregnum until he handed the regalia to the heir. Frequently, the position was occupied by an older relative of the sultan. Befitting the close relationship between these two offices, the *bendahara* was the chief figure in the Council of Four, the administrators of the realm. The office of *bendahara,* often hereditary, existed in all Malay states with minor variation after the decline of Malacca.

Bendel, formerly MID-WESTERN, state, southern Nigeria, occupying an area of 13,700 sq mi (35,500 sq km) and bounded by Kwara State to the north, Rivers State to the southeast, the Bight of Benin to the southwest, Anambra State to the east, and Ondo State to the west. After several years of political agitation, especially by the Mid-West State Movement (founded 1946), its citizens voted in a 1963 referendum in favour of separation from the Yoruba-dominated Western Region. The Mid-West Region, as the new administrative unit was then called (1963), became Mid-Western State following the federal reorganization in 1967; the present name was adopted at the federal reorganization of 1976. The state is inhabited by the Edo (Bini) people in the north, the Ibo in the east, and the Itsekiri (including the Jekri), Urhobo, Isoko, and Ijaw in the Niger River Delta; each of these peoples has a history linked with the slave-trading kingdoms of Benin and Warri. Benin City is the state capital and largest urban centre, and is renowned for its exquisite bronze, brass, and ivory works of art.

Most of the state lies at an elevation below 500 ft (150 m), but in the north it rises to more than 1,800 ft. Tropical rain forest covers much of the area. In the Niger Delta, where mangrove swamps predominate, a maze of interconnected waterways and the Forcados and Escravos rivers, which empty into the Bight of Benin, are used for transportation. Agriculture is the mainstay of the economy; yams, cassava, oil palm produce, rice, and corn (maize) are grown for local consumption. The state is a major exporter of petroleum, rubber (producing more than three-fourths of the nation's total output), timber, and palm oil and kernels via the Niger Delta ports of Burutu, Forcados, Koko, Sapele, and Warri.

Petroleum is exported from the Nun River and Ughelli fields via the Trans-Niger Pipeline and the port of Bonny. Other major oil fields exist near Warri (which possesses an oil refinery), Koko, and off-shore. Other resources include natural gas, limestone, and lignite. Industries include glass and bottle factories; textile mills; and plastics, pharmaceutical, rubber, plywood, natural gas, boat building, saw milling, and cement industries. A major steel producing complex was under development at Aladja, adjacent to Warri, in the early 1980s. A bridge across the Niger from Asaba to Onitsha, a network of trunk roads in the northern part of the state and south to Warri, the southern ports, and an airport at Benin City all facilitate transportation. The Institute of Oil and Palm Research, the Rubber Research Institute, and the University of Benin (founded 1970) are located at Benin City. Pop. (1983 est.) 4,823,700.

Bender-Ereğli (Turkey): *see* Ereğli.

Bendery, Moldavian BENDER, city, Moldavian Soviet Socialist Republic, on the right bank of the Dnestr River below its confluence with the Byk. A settlement, first known as Tigina, has existed on the site since the 2nd century BC. It came successively under Kiev, Moldavia, Genoa, Turkey, and, in 1818, after frequent attacks, Russia. Between World Wars I and II it was in Romania. Today Bendery manufactures textiles, foodstuffs, cables, and electrical equipment. A Turkish fortress dating from the 16th century still stands within the city. Pop. (1983 est.) 114,000.

Bendigo, byname of WILLIAM THOMPSON (b. Oct. 11, 1811, Nottingham, Nottinghamshire, Eng.—d. Aug. 23, 1880, Beeston, Nottinghamshire), pugilist and tavern keeper who became a noted Methodist evangelist and who is one of the very few athletes whose name is borne by a city—Bendigo, Vic., Australia.

His nickname apparently is a corruption of the Old Testament name Abednego, his fellow triplets being nicknamed Shadrach and Meshach. In the course of his pugilistic career (1832–50) he lost only one fight, a defeat by Benjamin Caunt on a foul in 1838. In 1839 he won the English championship by beating James (Deaf) Burke. Bendigo retired, then rewon the honour from Caunt in 1845. His last fight, won by a foul, was in 1850.

Since fistfighting was a breach of the peace, Bendigo was arrested after most of his fights; his religious activity was inspired by a prison chaplain's sermon. The language of his own sermons was described as quaint. He was so highly regarded in Nottingham that a monument to him was dedicated in 1891. The city of Bendigo is believed to have been named after an admirer of the pugilist who adopted the nickname to advertise his own pretensions as a boxer.

Bendigo, city, central Victoria, Australia, in the central upland area of the state. Founded as a sheep run in 1840, its official name was Sandhurst until 1891, when it was formally changed to honour a local prizefighter who compared his own prowess to that of the English pugilist known as Bendigo. An important gold discovery on Bendigo Creek (1851) brought rapid growth and created an impressive city with fine examples of Victorian architecture and tree-lined streets. Mining ceased in 1955. Bendigo is now the commercial focus of a region that raises livestock, fruit, poultry, wheat, and vegetables. Its livestock market, third largest in Australia, handles more than 1,000,000 sheep each year. Diversified industries include iron, clothing, ceramics, armaments, hardboard manufacture, and food processing. A rail centre, the city is also the junction of the Calder, Loddon Valley, Eppalock, and Midland highways. Declared a municipal district in 1855 and a shire in 1863, Bendigo became a city in 1871. Cultural resources include the Bendigo College of Advanced Education. Pop. (1981) 52,741.

Bendigonian Stage, time division of the Ordovician Period in Australia and New Zealand (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years). The Bendigonian Stage precedes the Chewtonian and follows the Lancefieldian. Shorter spans of time zones are recognized within the Bendigonian, based on the vertical ranges of several species of the fossil graptolite genus *Tetragraptus.* The presence of these forms has enabled Australian and New Zealand formations to be correlated with those of North America and Europe.

Bendis, Thracian goddess of warfare and the hunt, in whom the Greeks recognized a figure similar to their own Artemis. Apart from areas adjacent to Thrace, her cult gained prominence only in Athens. At the outbreak of the Peloponnesian War, the Athenians allowed the founding of a sanctuary for the goddess and shortly afterward created a state festival for her. The first celebration, held on the 19th of Thargelion (May–June), 429 BC, provided the dramatic setting for Plato's *Republic.*

Bendix, Vincent (b. Aug. 12, 1882, Moline, Ill., U.S.—d. March 27, 1945, New York City), inventor and industrialist who contributed to the development of automobiles and aircraft.

At the age of 16, Bendix ran away from home to New York City, where he studied engineering at night school. In 1907 he organized the Bendix Company of Chicago, and produced more than 7,000 automobiles before the company failed in 1909. He developed the starter drive, which made the automobile self-starter practicable, and in 1913 sold manufacturing rights to the Eclipse Machine Company of Elmira, N.Y. The Bendix Corporation, founded in 1924 with a factory in South Bend, Ind., producing automobile brake systems, in 1929 became Bendix Aviation Corporation and eventually manufac-

tured a wide range of automotive, aviation, marine, radio, and radar equipment. More than 5,500 patents were held by Bendix or his company. Keenly interested in advancing aviation, he founded the Bendix Transcontinental Air Race in 1931. In 1942 he organized Bendix Helicopters, Inc.

Bendix Corporation, American corporation founded in 1924 to manufacture automobile brake systems. Since 1982 it has been a subsidiary of Allied Corporation. The company is now an international manufacturer and supplier of automotive components, house-building materials, and other equipment.

The company's founder, Vincent Bendix, himself an inventor, joined with French inventor Henri Perrot to manufacture brake systems in South Bend, Ind., in 1924; and by 1928 the Bendix Corporation was producing 3,600,000 brakes per year, chiefly for General Motors Corporation.

In 1928 Bendix Corporation acquired control of Eclipse Machine Company, Elmira, N.Y., which had been producing Vincent Bendix' automotive starter since 1914. In 1929 the company turned to aviation products and changed its name to Bendix Aviation Corporation (not reverting to the name Bendix Corporation until 1960). From 1928 to 1948 General Motors was a major stockholder, but in the latter year GM disposed of all its remaining shares.

bends (syndrome): *see* decompression sickness.

Bene Beraq, city, northeastern suburb of Tel Aviv–Yafo, west central Israel, in the southern Plain of Sharon. In Assyrian texts, Bene Beraq is listed as a city that fell to Sennacherib, king of Assyria, in 701 BC. It is also mentioned in the Bible (Joshua 19) and was a well-known scholarly centre (*c.* 100 BC) during the time of the compilation of the Talmud.

Near the presumed location of ancient Bene Beraq, a modern settlement was founded by Orthodox Polish-Jewish immigrants in 1924. At first chiefly agricultural (citrus groves), it later became industrialized. Bene Beraq has preserved its character as a citadel of Orthodox Judaism; it is the site of several schools for Talmudical study. Inc. 1950. Pop. (1985 est.) 100,400.

Bene-Israel (Hebrew: "Sons of Israel"), Jews of India who for centuries lived in Bombay and adjacent regions totally isolated from other Jewish influences. Their arrival in India is said to have been precipitated by a shipwreck some 2,000 years ago, but this cannot be substantiated any more than the theory that the Bene-Israel are remnants of the Ten Lost Tribes of Israel, who disappeared from history after the northern Kingdom of Israel was overrun by the Assyrians in 721 BC.

When the existence of a Jewish community in India first attracted public attention in the 18th century, the group still adhered to such Jewish practices as circumcision, observance of the sabbath, certain dietary laws, and the celebration of several major festivals.

David Ezekiel Rahabi (1694–1772) and Samuel Ezekiel Divekar (1730–97), both of Cochin, were instrumental in revivifying Judaism among the Bene-Israel as was also contact with Arabic-speaking Jews of Baghdad. The first of numerous Bene-Israel synagogues, all following the Sefardic (Spanish) liturgy, was built in Bombay in 1796.

Though the Bene-Israel speak Marathi rather than Hebrew and differ little from their Hindi neighbours in appearance, they claim pure Jewish blood. This contention created problems when a majority of the Bene-Israel migrated to the State of Israel after 1948, for the chief rabbinate objected to their marriage with other Jews on the grounds that the Bene-Israel could not have properly observed rabbinic laws governing marriage and divorce. A compromise was reached in 1964: the Bene-Israel as a group were declared full-fledged Jews, but the chief rabbinate reserved to itself the right to decide the legitimacy of individual marriages.

Benedek, Ludwig August, Ritter von (knight of) (b. July 14, 1804, Ödenburg, Austrian Empire [now Sopron, Hung.]—d. April 27, 1881, Graz, Austria), Austrian field marshal whose defeat at the Battle of Königgrätz (Battle of Sadowa) on July 3, 1866, was decisive in the emergence of Prussia as the predominant German power and the creation of a Prussian-dominated German Empire.

Benedek entered the Austrian Army in 1822, distinguishing himself in Galicia (1846), Hungary (1849), and especially in Italy (1848, 1849, 1859), where his skillful defense probably saved the Austrian Army after its defeat

Benedek, detail from an engraving by Eduard Kaiser, 1859

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

at Solferino (June 24, 1859). In 1860 he was appointed chief of the general staff and governor of Hungary.

Having returned to Italy by 1861, Benedek commanded the Austrian armies there until 1866, when he reluctantly accepted command of the army facing the Prussians in Bohemia. At Königgrätz, not only good fortune but also the Prussian breech-loading rifle brought about a Prussian victory over the Austrians, who suffered from unimaginative leadership and the employment of muzzle-loading rifles. Court-martial proceedings against Benedek were quashed, but he retired, accepting full responsibility for the defeat.

Beneden, Edouard (Joseph Louis-Marie) van (b. March 5, 1846, Louvain [Leuven], Belg.—d. April 28, 1910, Liège), Belgian embryologist and cytologist best known for his discoveries concerning fertilization and chromosome numbers in sex cells and body cells.

During his early years, van Beneden worked with his father, P.J. van Beneden, a professor of zoology at the Catholic University in Louvain, who was noted for his studies on protozoans, nematodes, and various other animal groups. The younger van Beneden extended this research to dicyemids, a group of wormlike organisms distinguished by their production of two types of embryo. In 1870 he was appointed to the faculty of the University of Liège, where he focused his research on comparative morphology. His work, for example, advanced the theory of the Russian zoologist Aleksandr O. Kovalevsky that marine organisms called tunicates were chordates. Van Beneden established the tunicates' phylogenetic relationship to other animals through an investigation of the segmentation of the embryo.

From 1883 van Beneden published a series of important papers on the egg of *Ascaris megalocephala*, an intestinal worm found in horses. In these studies he showed that fertilization consisted essentially in the union of two half-nuclei—one male (from the sperm cell) and one female (from the egg cell)—each containing only half the number of chromosomes found in the body cells of the species. This union produced a cell containing the full number of chromosomes. Van Beneden revealed the individuality of single chromosomes in his study of a subspecies of *Ascaris* (*A. megalocephala univalens*) having only two chromosomes in its body cells. He further demonstrated that the chromosome number is constant for every body cell of a species. He also developed a theory of embryo formation in mammals that later became a standard scientific principle.

Beneden, Pierre-Joseph van (b. Dec. 19, 1809, Mechelen, Belg.—d. Jan. 8, 1894, Louvain [Leuven]), parasitologist and paleontologist best known for his discovery of the life cycle of tapeworms (Cestoda).

After an apprenticeship with the pharmacist Louis Stoffels, van Beneden studied medicine at the University of Louvain. In 1835 he was appointed professor of zoology at the Catholic University of Louvain, where he remained throughout his career. In 1842 he was elected to the Belgian Academy of Sciences, of which he became president in 1881.

Van Beneden's work on tapeworms began in 1845 and continued for about 15 years. Before his studies, certain life stages of tapeworms had been discovered and named, but their relationship was not suspected; some were even thought to represent aberrant tissues of the animals in which they were found. By studying the digestive tracts of many fishes, van Beneden was able to show that organisms known as cysticerci were larvae of intestinal worms then called taeniae (adult tapeworms). Van Beneden's work covered a wide range of parasites in diverse animals and culminated with his *Les Commensaux et les parasites dans le règne animal* (1875; "Commensals and Parasites in the Animal Kingdom"). About 1859 he began a study of fossil and recent whales, which resulted in a major work, written in collaboration with the Belgian anatomist Paul Gervais, *Ostéographie des Cétacés, vivants et fossiles* (1868–80; "The Osteology of Cetaceans, Living and Fossil").

Benédette, Le: *see* Castiglione, Giovanni Benedetto.

Benedetti, Mario (b. Sept. 14, 1920, Paso de Los Toros, Tacuarembó, Uruguay), Latin-American novelist, short-story writer, poet, and essayist.

Most of Benedetti's early life was spent in Montevideo, where he held a number of bureaucratic positions that allowed him time to write. His first book of short stories, *Esta mañana* (1949; "This Morning"), deals with urban middle-class problems. His first novel, *Quién de nosotros* (1953; "Who of Us"), presents the frustration of three characters whose lives are intertwined. On three different occasions from 1954 to 1960 he directed one of Uruguay's most prestigious weekly journals, *Marcha.* Benedetti's *Poemas de la oficina* (1956; "Office Poems"), written simply and colloquially, was an instant success. In 1957 he visited Europe for the first time as a correspondent for *Marcha* and *El diario.*

With the publication of *Montevideanos* (1959), tragicomical tales of everyday city life, he won recognition as one of Uruguay's most perceptive writers. His second novel, *La tregua* (1960; *The Truce*), is written as the diary of a middle-aged man who becomes romantically involved with a much younger woman. *El país de la cola de paja* (1960; "The Country with the Tail of Straw") is a collection of essays on the decline of Uruguay. *Gracias por el fuego* (1965; "Thanks for the Fire") is a novel with an openly revolutionary message.

From 1967 to 1971 Benedetti lived in Cuba, where he was a member of Cuba's official

international cultural organization. Essays of his impressions of Cuban life appeared in *Cuaderno Cubano* (1969; "Cuban Notebook"). *El cumpleaños de Juan Ángel* (1971; "The Birthday of Juan Angel"), an autobiographical novella published in Mexico, tells of the crisis of political consciousness of the author. He returned to Uruguay in 1971 to help establish a leftist coalition for future elections, but with the military takeover of 1973 Benedetti returned to his former post in Cuba. *Con y sin nostalgia* (1977; "With and Without Nostalgia") is a collection of short stories about violence and exile.

Benedetti, Vincent, Comte (Count) (b. April 29, 1817, Bastia, Corsica—d. March 28, 1900, Paris), French diplomat remembered chiefly for his role in the events leading up to the Franco-German War in 1870.

Benedetti studied law in Paris and in 1840 entered consular service. He served in several embassies in Europe and the Middle East between 1845 and 1864, when he was named ambassador to Prussia with instructions from Napoleon III to prevent an Austro-Prussian alliance. The six-year series of negotiations that followed resulted only in deadlock. In July 1870 a Hohenzollern prince became the candidate for the Spanish throne, and Benedetti was instructed to urge King William I's renunciation of the candidacy and to obtain a guarantee that it would not be renewed. This William would not promise. The record of the meeting's outcome was published in an edited form that made it appear as if Benedetti had been insulted as well as refused. France clamoured for war, and Benedetti was recalled. He retired to Corsica, where he practiced law. In *Ma Mission en Prusse* (1871) he defended his diplomatic actions.

Benedetto DA MAJANO, Majano also spelled MAIANO (b. 1442, Majano, Republic of Venice—d. May 24, 1497, Florence), early Renaissance sculptor whose work is characterized by its decorative elegance and realistic detail.

He was greatly influenced by the Florentine sculptors Desiderio da Settignano and Antonio Rossellino. His earliest surviving work is the shrine of S. Savino (1468–72) in the Faenza cathedral. Between 1470 and 1475 he was engaged on the altar of Sta. Fina in the Collegiata at S. Gimignano, in a chapel designed by his elder brother Giuliano (1468) and decorated with frescoes by Domenico Ghirlandajo. The connection between Benedetto da Majano and Ghirlandajo is reflected in the careful realism of the five narrative reliefs in Benedetto's masterpiece, the pulpit in Sta. Croce in Florence (1472–75). A bust of Pietro Mellini (1474; Bargello, Florence), by whom the pulpit was commissioned, reveals the same accumulation of naturalistic detail as is found in the male portraits of Ghirlandajo.

After this time, Benedetto was employed on two major works for the church of Monte Oliveto in Naples: the tomb of Mary of Aragon (d. 1470), begun by Rossellino, and an altarpiece of the Annunciation (1489). Concurrently, he was employed by the Florentine banker Filippo Strozzi, of whom he made a portrait bust (marble in the Louvre, Paris; terra-cotta in the Berlin-Dahlem Museum) and whose tomb in Sta. Maria Novella, Florence, he completed after 1491.

Benedetto's work depends for its effect less on invention and originality than on unfailing taste and an exceptionally high level of technical skill. The naturalism of his male portrait busts is in marked contrast to his delicate, idealized busts of women. But both types show his virtuosity in the handling of highly polished stone to achieve a jewel-like play of light on surfaces.

Benedict, Latin BENEDICTUS, name of Roman Catholic popes and antipopes, grouped below chronologically and indicated by the symbol •.

• **Benedict I** (b. Rome—d. July 30, 579, Rome), pope from 574/575 to 579.

Little is known about his life. He was elected to succeed John III, probably just after the latter's death (July 574), but was not consecrated until June 575, so that the see of Rome was vacant for almost 11 months. He consecrated 21 bishops during his pontificate and granted the Massa Veneris, an estate near Minturnae (near modern Minturo, Italy), to Abbot Stephen of St. Mark's. He ruled the church during a period made calamitous by invasion and by famine. While working to solve these problems, he died during a siege of Rome by the Lombards.

• **Benedict II,** SAINT (b. Rome—d. May 8, 685, Rome; feast day May 8), pope from 684 to 685.

He was engaged in church government under popes SS. Agatho and Leo II, whom he was elected (683) to succeed. His consecration (June 26, 684) was delayed until the approval of the Byzantine emperor Constantine IV Pogonatus could be obtained, so that the see of Rome was vacant for almost a year. Benedict wanted to eliminate this time gap between the election by the clergy and Roman citizens and corroboration by the Christian emperor, and he persuaded Constantine to decree that future elections would not need imperial consent. Nevertheless, further imperial ratification occurred. Benedict confirmed Agatho's injunctions to restore Archbishop Wilfrid to the see of York. During his pontificate, Benedict restored several Roman churches.

• **Benedict III** (b. Rome—d. April 17, 858, Rome), pope from 855 to 858, who was chosen as successor to Leo IV in July 855. The election was not immediately confirmed by the Holy Roman emperor Louis II the Bavarian, who set up Anastasius the Librarian as antipope. Benedict was imprisoned, but the imperial government's opposition to Benedict was dropped, and he was consecrated pope. He reprimanded the Frankish bishops, whose inaction he blamed as the source of misery in their empire. Benedict also was responsible for the repair of Roman churches damaged by the Saracens in 846.

• **Benedict IV** (b. Rome—d. July 903, Rome), pope from 900 to 903. Benedict reigned during one of the darkest periods of papal history, and little is known of his life or acts. He excommunicated Baldwin II, count of Flanders, for causing the assassination of Fulk, archbishop of Reims, Fr. (June 17, 900); he crowned Louis III the Blind as Holy Roman emperor in February 901.

• **Benedict V,** byname BENEDICT THE GRAMMARIAN, Latin BENEDICTUS GRAMMATICUS (d. July 4, 966, Hamburg), pope, or antipope, from May 22, 964, to July 4, 966. His election by the Romans on the death of Pope John XII infuriated the Holy Roman emperor Otto I, who had already deposed John and designated Leo VIII as successor. Otto forced his way into Rome and convened a synod that deposed and degraded Benedict, reducing him to deacon. After reinstating Leo, Otto brought Benedict to Hamburg. Either Benedict or Leo may be considered an antipope.

• **Benedict VI** (b. Rome—d. July 974, Rome), pope from Jan. 19, 973, to July 974.

He was a cardinal deacon when elected to succeed John XIII the Good (d. Sept. 6, 972), but his consecration was delayed for the ratification of his protector, the Holy Roman emperor Otto I the Great. Otto's death in 973 put Benedict at the mercy of the powerful Roman Crescentii family, whose role in the history of the papacy was dramatized when Crescentius I led a resurgence of the Roman baronage. The Pope was imprisoned in June 974 and replaced by the deacon Franco, later known as antipope Boniface VII, who purportedly, by order of Crescentius, strangled Benedict. Few documents of his pontificate survived.

• **Benedict VII** (b. Rome—d. July 10, 983, Rome), pope from 974 to 983. He furthered the cause of monasticism and acted against simony, specifically in an encyclical letter in 981 forbidding the exaction of money for the conferring of any holy order.

Formerly bishop of Sutri, Papal States, he was elected through the intervention of Count Sicco, representative of Otto II, Holy Roman emperor. Sicco expelled Antipope Boniface VII, who had been intruded on the papal throne by a Roman group that killed Benedict's predecessor, Benedict VI. Benedict's rule was peaceful. He is judged, however, to have been mistaken when, in an agreement with Otto, he dissolved the bishopric of Merseburg (981). The closing of this outpost among the Slavs is considered to have been a setback in the conversion of central Europe. Benedict and Otto worked harmoniously together and died in the same year.

• **Benedict VIII,** original name TEOFILATTO, Latin THEOPHYLACTUS (b. probably County of Tusculum [Italy]—d. April 9, 1024), pope from 1012 to 1024, the first of several pontiffs from the powerful Tusculani family.

The ascendancy of the Tusculani marked the fall of the rival Crescentii family of Rome, which had come to dominate the papacy in the latter half of the 10th century. Benedict's predecessor, Sergius IV, was the choice of the Crescentii, and Benedict ousted another of their candidates when he became pope.

During Benedict's pontificate his brother Romanus became the civil ruler of Rome and later succeeded him as Pope John XIX. Benedict's rule was acceptable to King Henry II of Germany, whom he crowned as Holy Roman emperor in 1014. Benedict appears to have been more of a feudal baron than a pope: he restored papal authority in the Campagna and in Roman Tuscany by force of arms; he defeated the Saracens' attack on northern Italy (1016–17); and he encouraged the Norman freebooters in their attacks on Byzantine power in the south. Benedict also strove for ecclesiastical reform. A friend of St. Odilo, abbot of Cluny, Fr., Benedict supported the monastic reform movement led there by the Benedictine monks.

A council summoned by Benedict at Pavia, Lombardy, in 1022, also attended by Henry, forbade uncelibate clergy and the sale of church offices.

• **Benedict IX,** original name TEOFILATTO, Latin THEOPHYLACTUS (d. 1055/56, Grottaferrata, Papal States [Italy]), pope three times, from 1032 to 1044, from April to May 1045, and from 1047 to 1048. The last of the popes from the powerful Tusculani family, he was notorious for selling the papacy and then reclaiming the office twice.

The son of Count Alberic of Tusculum, he was the nephew of two previous popes, Benedict VIII and John XIX. While still a youth, he was thrust into the papacy by the Tusculani in 1032, and he excommunicated ecclesiastical leaders who were hostile to him. His violent and licentious conduct provoked the Romans to insurrection; he fled Rome, and in January 1045 they elected Bishop John of Sabina to succeed him as Sylvester III. But Sylvester was quickly driven out by Benedict's brothers and retired to his old bishopric in the Sabine hills, whereupon Benedict sold the papacy to his godfather, Giovanni Graziano, a Roman priest, who offered Benedict a pension. Graziano, known as an honest and pious man, is believed to have taken this action to

save the Holy See from Benedict's scandalous conduct; he became pope as Gregory VI (May 1045).

In the following year, however, both Benedict and Sylvester returned to Rome, each claiming to be pope instead of Gregory. None of the three was favoured at the Council of Sutri, held by Henry III of Germany in December 1046. Sylvester was declared a false claimant and imprisoned; Benedict was deposed; and Gregory was charged with simony, deprived of the papacy, and replaced by the Saxon bishop Suidger of Bamberg as Clement II. After Clement's death (Oct. 9, 1047) Benedict reappeared in Rome and installed himself on November 8. Finally, on July 17, 1048, Boniface of Tuscany, by order of Henry, drove Benedict from Rome and replaced him with Bishop Poppo of Brixen as Damasus II. Benedict was never seen in Rome again. He is supposed to have lived until 1055 or 1056, traditionally a penitent at the monastery of Grottaferrata.

• **Benedict (X),** original name GIOVANNI MINCIO, Latin JOHANNES MINCIUS (d. *c.* 1080, Sant'Agnese, Italy), antipope from April 1058 to January 1059. His expulsion from the papal throne, on which he had been placed through the efforts of the powerful Tusculani family of Rome, was followed by a reform in the law governing papal elections. The new law, enacted in 1059, established an electoral body, which subsequently became the Sacred College of Cardinals, charged with sole responsibility for choosing the pope.

Benedict had previously been bishop of Velletri, near Rome, and was intruded in the papacy upon the death of Pope Stephen IX (X). Expelled through the efforts of the reforming monk Hildebrand (later Pope St. Gregory VII) and the German court, he died a prisoner in the monastery of Sant'Agnese.

• **Benedict XI,** BLESSED, original name NICCOLÒ BOCCASINI (b. 1240, Treviso, March of Trevigiana—d. July 7, 1304, Perugia, Umbria; beatified April 24, 1736; feast day July 7), pope from 1303 to 1304. His brief reign was taken up with problems he inherited from the quarrel of his predecessor, Boniface VIII, with King Philip IV the Fair of France and the King's allies (the Colonna family of Rome).

He entered the Dominican order in 1254, becoming its general in May 1296. Created cardinal in 1298, he was legate to Hungary in 1302. He was one of two cardinals who stood by Boniface VIII at his palace at Anagni, near Rome, when the Pope, about to excommunicate Philip, was seized (Sept. 7, 1303) by the King's supporters, who sought to depose him from the papacy. The Pope was freed by the local populace but died shortly thereafter. The quarrel had originated over the King's wish to wrest taxes from the French clergy. The Colonna had become allies of Philip because they viewed the growing power of the Pope's family as a threat to their own.

Benedict was unanimously elected pope (Oct. 22, 1303) and did much to conciliate his predecessor's enemies. While he demanded no retribution for the outrage done to Boniface at Anagni, he refused to pardon both Sciarra Colonna, who led the attack, and Guillaume de Nogaret, Philip's chief adviser, who denounced Boniface at Paris in 1303.

• **Benedict XII,** original name JACQUES FOURNIER (b. Saverdun, near Toulouse, Fr.—d. April 25, 1342, Avignon, Provence), pope from 1334 to 1342; he was the third pontiff to reign at Avignon, where he devoted himself to reform of the church and its religious orders. In the political sphere his efforts, influenced by King Philip VI of France, were generally unsuccessful. One of his most significant

Benedict XII, detail from a bust by Paolo da Siena, 1342; in the Grotto of the Vatican, Rome

Alinari—Anderson/Art Resource/EB Inc.

failures was his inability to curb the conflict between England and France, which began during his pontificate and came to be known as the Hundred Years' War (1337–1453).

Entering the Cistercian order at Boulbonne and graduating as doctor of theology at Paris, he first became abbot of the French monastery of Fontfroide (1311), then bishop of the French diocese of Pamiers (1317), and bishop of Mirepoix (1326). He was made cardinal in December 1327. His distinction as a theologian and the zeal with which he opposed heretics recommended him to the cardinals in Avignon, who elected him (Dec. 20, 1334) to succeed John XXII. He worked to settle a controversy that had agitated the close of John's pontificate—the controversy over the question of the Beatific Vision, a vision of God promised to the redeemed. John had preached in several sermons that this vision would be granted only after Judgment Day. Benedict ended the dispute by issuing a bull, *Benedictus Deus* (1336), in which he formulated the church's teaching that the souls of the just are granted the vision immediately after death.

He attempted to reform the religious orders through the imposition of stringent constitutions. These rigorous measures aroused much hostility, and most of his reforming work was undone by successors. He did not return the papacy to Rome, as the Romans, at least, had hoped he would, but he sent money for the repair of its neglected churches and for the aid of its strife-ridden populace. In Avignon he built a costly papal palace and brought in Sienese artists to decorate the local churches.

• **Benedict (XIII),** original name PEDRO DE LUNA (b. *c.* 1328, Illueca, Kingdom of Aragon—d. 1423, Peñíscola, in Valencia), antipope from 1394 to 1423. He reigned in Avignon, Provence, in opposition to the reigning popes in Rome, during the Western Schism (1378–1417), when the Roman Catholic Church was split by national rivalries claiming the papal throne.

Of noble birth, he was professor of canon law at Montpellier University in southern France before he was made cardinal in 1375. The Schism began in 1378 with the election of Robert of Geneva as Clement VII in opposition to Pope Urban VI. Benedict gave his allegiance to Clement and, upon Clement's death, was elected to succeed him by the cardinals supporting Avignon, with the understanding that he would abdicate voluntarily if that would help to end the division in the church. This he later refused to do, however, when asked to resign by the French princes who had been among his supporters. Eighteen of his 23 cardinals deserted him, and the papal palace in Avignon was besieged by the French (1398). In 1403 Benedict escaped from the palace to Provence, rallied his cardinals, and—largely through the support of Louis, duc d'Orléans—won back the obedience of France. He began negotiations to reach a compromise with the reigning pope Gregory XII (1407), but they came to nothing, and in 1408 the French declared themselves neutral in the dispute. In June 1409 the Council of Pisa, summoned by the rival colleges of cardinals to end the rift, pronounced both popes deposed and elected Alexander V in their stead. Benedict, still possessing the allegiance of some states, refused to submit to the Council of Pisa, but he subsequently had to take refuge in his castle at Peñíscola in 1415. On July 26, 1417, when the Council of Constance pronounced Benedict deposed, he lost all governmental recognition except that of Armagnac (in France) and of Scotland. But Benedict, who had maintained his claims against three Roman popes (Boniface IX, Innocent VII, and Gregory XII) and two antipopes whose claims derived from the Council of Pisa (Alexander V and John XXIII), refused to yield to Pope Martin V, who was elected in November 1417 to achieve unity. Benedict maintained to the end of his life that he was the rightful pope and created four new cardinals as late as November 1422.

• **Benedict (XIV),** original name BERNARD GARNIER (d. *c.* 1433), counter-antipope from 1425 to *c.* 1433.

In 1417 the Council of Constance deposed the antipope Pope Benedict (XIII) and elected Martin V, thus officially terminating the Western Schism between Avignon and Rome. However, Benedict, protected in his castle of Peñíscola in Valencia, resisted until his death in 1423 and even reconstituted his court by creating four new cardinals. The intrigues of King Alfonso V of Aragon, who wanted to prolong the Schism, caused this College of Cardinals in 1423 to elect a new antipope, Clement VIII (who reigned until his abdication in 1429). Meanwhile, Jean Carrier, one of Benedict's cardinals, who had not been invited to the conclave of 1423, held his own conclave in the castle of Peñíscola and elected (Nov. 12, 1425) Bernard Garnier as Benedict XIV, who was thus an antipope countering an already reigning antipope. Garnier had formerly been the sacristan of Rodez, County of Rodez, near Toulouse.

As Benedict XIV, Garnier so secretly conducted his office that even his residence was uncertain, and he thus became known as the "hidden pope." In a letter from the Count of Armagnac to St. Joan of Arc, it is revealed that only Carrier knew Benedict's location. Benedict, having few followers, ended his reign in 1430, naming one Jean Farald as cardinal.

Carrier was captured in 1433 and imprisoned in the castle of Foix, County of Foix, Gascony. Upon Garnier's death, presumably about the same time, Cardinal Farald, continuing the peculiar fanaticism of his uncanonical tradition, elected Carrier as pope. He "reigned" imprisoned as a self-styled Benedict XIV, dying on an unknown date.

• **Benedict XIII,** original name PIETRO FRANCESCO VINCENZO MARIA ORSINI (b. Feb. 2, 1649, Gravina, Kingdom of Naples—d. Feb. 21, 1730, Rome), pope from 1724 to 1730.

Entering the Dominican order in 1667, Orsini taught philosophy at Brescia, Venetian Republic, before Pope Clement X made him cardinal in 1672. He was successively archbishop of Manfredonia (1675), of Cesena (1680), and of Benevento (1686). He had taken part in five conclaves for the election of popes before the conclave that chose him on May 29. His attack on the extravagance of the cardinals and on the worldliness of ecclesiastics, most forcefully asserted at a provincial council at Rome (1725), had little effect. His own mode of living was noted for its simplicity. Unfortunately, he left state

Benedict XIII, pope from 1724 to 1730, detail from his tomb monument by Carlo Marchionni, 1734; in the church of Sta. Maria sopra Minerva, Rome

Alinari—Art Resource/EB Inc.

affairs almost entirely to the unpopular cardinal Niccolò Coscia, whose abuse of his office to amass riches marred Benedict's reign. Papal relations with the Bourbon monarchies of France and Spain, made difficult by the belief in absolutism that prevailed among European kings in the 18th century, were allowed to deteriorate. He continued the opposition of the papacy to Jansenism, a Roman Catholic movement of unorthodox tendencies that had begun in 17th-century France, although he allowed the Dominicans to preach the Augustinian doctrine of grace, which bordered on the Jansenist teaching. A scholar, Benedict wrote many theological works.

• **Benedict XIV,** original name PROSPERO LAMBERTINI (b. March 31, 1675, Bologna, Papal States—d. May 3, 1758, Rome), pope from 1740 to 1758; his intelligence and moderation won praise even among deprecators of the Roman Church at a time when it was beset by criticism from the philosophers of the Enlightenment and its prerogatives were being challenged by absolutist monarchs. Typical of his pontificate were his promotion of scientific learning and his admonition to those in charge of drawing up the *Index Librorum Prohibitorum* (*Index of Forbidden Books*) to act with restraint.

Of a noble family, he received a doctorate in theology and law from the University of Rome. In 1728 he was created a cardinal, and in 1731 he was made archbishop of Bologna by Pope Clement XII, whom on Aug. 17, 1740, he was elected to succeed.

In the Papal States he reduced the burden of taxation, encouraged agriculture, and supported a policy of free trade. He was conciliatory in his relations with the secular powers, making vast concessions to the kings of Spain, Portugal, Sardinia, and Naples in matters of

Benedict XIV, pope from 1740 to 1758, detail from a monument by Gasparo Sibilla, 18th century; in the basilica of St. Peter, Rome

Alinari—Art Resource/EB Inc.

patronage, the right of nomination to vacant sees, and secular jurisdiction over ecclesiastical changes. In his bulls *Ex quo singulari* (1742) and *Omnium sollicitudinum* (1744), he prohibited certain traditional practices that the Jesuits had allowed converts to retain in China and India. This ban set back the winning of converts in Asia and was partially reversed in 1939, when the church allowed acts of ancestor veneration, provided they were without religious significance. In 1756 he condemned the practice of refusing last rites to French ecclesiastics who still opposed the bull *Unigenitus*, directed against certain propositions of Jansenism, a Roman Catholic movement of unorthodox tendencies that had begun in 17th-century France.

Benedict was an active scholar all his life, founding several learned societies and laying the groundwork for the present Vatican Museum. A lively wit, he corresponded with many of the great men of his age, including Voltaire, who dedicated his tragedy *Mahomet* to him.

• **Benedict XV,** original name GIACOMO DELLA CHIESA (b. Nov. 21, 1854, Pegli, Kingdom of Sardinia—d. Jan. 22, 1922, Rome), pope from 1914 to 1922.

After graduating from the University of Genoa, he studied for the priesthood in the Collegio Capranica in Rome and entered the

Benedict XV, 1921

UPI/EB Inc.

papal diplomatic service, later spending four years in Spain before being employed in the department of the secretary of state (1887). Pope Pius X made him archbishop of Bologna, (1907), and cardinal (1914). He was elected pope a month after the outbreak of World War I, and the greater part of his papacy was occupied with war problems.

Trying to follow a policy of strict neutrality, Benedict abstained from condemning any action of the belligerents. He concentrated the church's efforts initially toward the alleviation of unnecessary suffering. Later he made positive efforts toward reestablishing peace, though hampered by the pro-Austrian sentiments of the majority of cardinals. When the United States entered the war and took up the Allies' attitude that peace could not be restored to Europe until Germany had been defeated, his principal attempt to mediate (1917) failed.

By 1919 the papacy lacked the prestige it had enjoyed under Pope Leo XIII, and Benedict was excluded from the peace negotiations. His last years were concerned with readjusting the machinery of papal administration made necessary by the territorial changes that followed the war and with directives on missionary work. During this period official relations were resumed with France, and a British representative was accredited to the Vatican for the first time since the 17th century.

Benedict BISCOP, SAINT, also called BENET BISCOP, or BISCOP BADUCING (b. *c.* 628, Northumbria, Eng.—d. Jan. 12, 689/690, Wearmouth, Northumbria; feast day January 12; for English Benedictines and dioceses of Liverpool and Hexham February 13), founder and first abbot of the celebrated twin monasteries of SS. Peter (at Wearmouth) and Paul (at Jarrow on Tyne, nearby); he is considered to be the father of Benedictine monasticism in England.

Of noble birth, he was a thane of King Oswiu (Oswy) of Northumbria before renouncing (653) a worldly life. In that year he went to Rome, and after a second Roman journey, he became a monk at Lérins, Fr. (666–667), where he took the name of Benedict.

Once more in Rome, he conducted (668–669) St. Theodore of Tarsus, who had just been consecrated archbishop of Canterbury, to England. In 669 Benedict was appointed abbot of SS. Peter and Paul (later St. Augustine's), Canterbury, Kent. He made a fourth journey to Rome in 671 to receive instructions in monastic practices, and in 674 he built on land granted to him by King Ecgfrith of Northumbria the monastery of St. Peter at Wearmouth, where he introduced the Benedictine Rule. With St. Ceolfrith, prior and later his successor at Wearmouth, Benedict went to Rome *c.* 678, returning with an instructor in ecclesiastical music. In 682 he built the sister foundation of St. Paul at Jarrow, returning in 687 to Rome.

These repeated Roman visits enabled him to make a splendid collection of manuscripts, relics, and pictures with which he endowed his monasteries, so that by the late 7th and early 8th century they comprised one of the most flourishing centres of Christian scholarship and art in western Europe. Among his pupils was the celebrated historian the Venerable Bede. The fine library that Benedict had assembled made possible the work of Bede, whose *Historia abbatum* ("Lives of the Abbots") is the best source on Benedict's life.

From the monastic foundations laid by Benedict came a tradition of learning and artistic achievement that influenced the whole of northwestern Europe. Crippled *c.* 686, he remained bedridden until his death. His relics reportedly were translated in 970 to the abbey of Thorney, Isle of Ely.

Benedict OF NURSIA, SAINT, Nursia also spelled NORCIA (b. *c.* 480, Nursia, Kingdom of the Lombards—d. *c.* 547; feast day July 11, formerly March 21), founder of the Benedictine monastery at Monte Cassino and father of Western monasticism; the rule that he established became the norm for monastic living throughout Europe. In 1964, in view of the work of monks following the Benedictine Rule in the evangelization and civilization of so many European countries in the Middle Ages, Pope Paul VI proclaimed him the patron saint of all Europe.

Life. The only recognized authority for the facts of Benedict's life is book 2 of the *Dialogues* of St. Gregory the Great (Pope Gregory I), who said that he had obtained his information from four of Benedict's disciples. Though Gregory's work includes many signs and wonders, his outline of Benedict's life may be accepted as historical. He gives no dates, however. Benedict was born of good family and was sent by his parents to Roman schools. His life spanned the decades in which the decayed imperial city became the Rome of the medieval papacy. In Benedict's youth, Rome under Theodoric still retained vestigial remains of the old administrative and governmental system, with a Senate and consuls. In 546 Rome was sacked and emptied of inhabitants by the Gothic king Totila, and when the attempt of the emperor Justinian I to reconquer and hold Italy failed, the papacy filled the administrative vacuum and shortly thereafter became the sovereign power of a small Italian dominion virtually independent of the Eastern Empire.

Benedict thus served as a link between the monasticism of the East and the new age that was dawning. Shocked by the licentiousness of Rome, he retired as a young man to Enfide (modern Affile) in the Simbruinian hills,

and later to a cave in the rocks beside the lake then existing near the ruins of Nero's palace above Subiaco, 40 miles east of Rome in the foothills of the Abruzzi. There he lived alone for three years, furnished with food and monastic garb by Romanus, a monk of one of the numerous monasteries nearby.

St. Benedict of Nursia, detail of a polyptych, tempera on wood, by Segna di Buonaventura, early 14th century; in the Metropolitan Museum of Art, New York City

By courtesy of the Metropolitan Museum of Art, New York City, Gift of Reinhardt and Co., 1924

When the fame of his sanctity spread, he was persuaded to become abbot of one of these monasteries. His reforming zeal was resisted, however, and an attempt was made to poison him. He returned to his cave; but again disciples flocked to him, and he founded 12 monasteries, each with 12 monks, with himself in general control of all. Patricians and senators of Rome offered their sons to become monks under his care, and from these novices came two of his best known disciples, Maurus and Placid. Later, disturbed by the intrigues of a neighbouring priest, he left the area, while the 12 monasteries continued in existence.

A few disciples followed him south, where he settled on the summit of a hill rising steeply above Cassino, halfway between Rome and Naples. The district was still largely pagan, but the people were converted by his preaching. His sister Scholastica, who came to live nearby as the head of a nunnery, died shortly before her brother. The only certain date in Benedict's life is given by a visit from the Gothic king Totila about 542. Benedict's feast day is kept by monks on March 21, the traditional day of his death, and by the Roman Catholic Church in Europe on July 11.

His character, as Gregory points out, must be discovered from his Rule, and the impression given there is of a wise and mature sanctity, authoritative but fatherly, and firm but loving. It is that of a spiritual master, fitted and accustomed to rule and guide others, having himself found his peace in the acceptance of Christ.

Rule of St. Benedict. Gregory, in his only reference to the Rule, described it as clear in language and outstanding in its discretion. Benedict had begun his monastic life as a hermit, but he had come to see the difficulties and spiritual dangers of a solitary life, even though he continued to regard it as the crown of the monastic life for a mature and experienced spirit. His Rule is concerned with a life spent wholly in community, and among his contributions to the practices of the monastic life none is more important than his establishment of a full year's probation, followed by a solemn vow of obedience to the Rule as mediated by the abbot of the monastery to which the monk vowed a lifelong residence.

On the constitutional level, Benedict's supreme achievement was to provide a succinct and complete directory for the government and the spiritual and material well-being of a monastery. The abbot, elected for life by his monks, maintains supreme power and in all normal circumstances is accountable to no one. He should seek counsel of the seniors or of the whole body but is not bound by their advice. He is bound only by the law of God and the Rule, but he is continually advised that he must answer for his monks, as well as for himself, at the judgment seat of God. He appoints his own officials—prior, cellarer (steward), novice master, guest master, and the rest—and controls all the activities of individuals and the organizations of the common life. Ownership, even of the smallest thing, is forbidden. The ordering of the offices for the canonical hours (daily services) is laid down with precision. Novices, guests, the sick, readers, cooks, servers, and porters all receive attention, and punishments for faults are set out in detail.

Remarkable as is this careful and comprehensive arrangement, the spiritual and human counsel given generously throughout the Rule is uniquely noteworthy among all the monastic and religious rules of the Middle Ages. Benedict's advice to the abbot and to the cellarer, and his instructions on humility, silence, and obedience have become part of the spiritual treasury of the church, from which not only monastic bodies but also legislators of various institutions have drawn inspiration.

St. Benedict also displayed a spirit of moderation. His monks are allowed clothes suited to the climate, sufficient food (with no specified fasting apart from the times observed by the Roman church), and sufficient sleep ($7\frac{1}{2}$–8 hours). The working day is divided into three roughly equal portions: five to six hours of liturgical and other prayer; five hours of manual work, whether domestic work, craft work, garden work, or field work; and four hours reading of the Scriptures and spiritual writings. This balance of prayer, work, and study is another of Benedict's legacies.

All work was directed to making the monastery self-sufficient and self-contained; intellectual, literary, and artistic pursuits were not envisaged, but the presence of boys to be educated and the current needs of the monastery for service books, Bibles, and the writings of the Church Fathers implied much time spent in teaching and in copying manuscripts.

Benedict's discretion is manifested in his repeated allowances for differences of treatment according to age, capabilities, dispositions, needs, and spiritual stature; beyond this is the striking humanity of his frank allowance for weaknesses and failure, of his compassion for the physically weak, and of his mingling of spiritual with purely practical counsel. In the course of time this discretion has occasionally been abused in the defense of comfort and self-indulgence, but readers of the Rule can hardly fail to note the call to a full and exact observance of the counsels of poverty, chastity, and obedience.

Until 1938 the Rule had been considered as a personal achievement of St. Benedict, though it had always been recognized that he freely used the writings of the Desert Fathers, of St. Augustine of Hippo, and above all of John Cassian. In that year, however, an opinion suggesting that an anonymous document, the "Rule of the Master" (*Regula magistri*)—previously assumed to have plagiarized part of the Rule—was in fact one of the sources used by St. Benedict, provoked a lively debate. Though absolute certainty has not yet been reached, a majority of competent scholars favour the earlier composition of the "Rule of the Master." If this is accepted, about one-third of Benedict's Rule (if the formal liturgical chapters are excluded) is derived from the Master. This portion contains the prologue and the chapters on humility, obedience, and the abbot, which are among the most familiar and admired sections of the Rule.

Yet, even if this be so, the Rule that imposed itself all over Europe by virtue of its excellence alone was not the long, rambling, and often idiosyncratic "Rule of the Master." It was the Rule of St. Benedict, derived from various and disparate sources, that provided for the monastic way of life a directory, at once practical and spiritual, that continued in force after 1,500 years. (M.D.K.)

BIBLIOGRAPHY. *Life and spirit.* O.J. Zimmermann and B.R. Avery, *Life and Miracles of St. Benedict* (1949), an Eng. trans. of bk. ii of the *Dialogues* of St. Gregory the Great; E.C. Butler, *Benedictine Monachism,* 2nd. ed. (1924, reprinted 1962), the best account of the Rule and spirit of Benedict.

Rule. Latin-English editions by O. Hunter-Blair, *The Rule of Our Most Holy Father St. Benedict,* 4th ed. (1934); and by J. McCann, *The Rule of St. Benedict, in Latin and English* (1952). For controversy on authorship, see A. de Vogue, *La Règle du Maître,* 3 vol. (Latin text, French trans., excellent introduction and notes, 1964–65). For a short account, see D. Knowles in *Great Historical Enterprises* (1963). The standard critical (but also much criticized) Latin text of the Rule is R. Hanslik, *Regula* (1960).

Benedict, Ruth, *née* FULTON (b. June 5, 1887, New York City—d. Sept. 17, 1948, New York City), anthropologist whose theories had a profound influence on cultural anthropology, especially in the area of culture and personality; *Patterns of Culture* (1934) is her most famous work.

Ruth Benedict

By courtesy of Columbia University, New York

She approached anthropology from a strong humanistic background, having studied English literature at Vassar College, Poughkeepsie, N.Y. (1905–09). Even after entering anthropology in the 1920s, she continued to write poetry under the pseudonym Anne Singleton until the early '30s. From the outset of her career in social science she conceived of cultures as total constructs of intellectual, religious, and aesthetic elements. She received her Ph.D. under Franz Boas at Columbia University for her thesis on a pervasive theme among North American Indians, *The Concept of the*

Guardian Spirit in North America (1923). An assistant professor at Columbia from 1930, she was advanced to professor in 1948.

Fieldwork engaged her among tribes of the southwestern United States, the Serrano of California, and the Canadian Blackfoot; her research on folklore and religion resulted in *Zuni Mythology,* 2 vol. (1935). In *Patterns of Culture,* which was translated into 14 languages, she emphasized how small a part of the range of possible human behaviour is elaborated or emphasized in any one society. She described how these forms of behaviour are integrated into patterns or configurations and she supported cultural relativism, judging any cultural phenomenon in the context of the culture in which it occurs.

As a contribution to questions of human equality, Benedict wrote *Race: Science and Politics* (1940) and, after applying anthropological methods to the study of Japanese culture, *The Chrysanthemum and the Sword* (1946). At the time of her death she was directing an ambitious project on the study of contemporary European and Asiatic cultures. A biography, *Ruth Benedict,* by Margaret Mead, was published in 1974.

Benedictine, member of the ORDER OF SAINT BENEDICT (O.S.B.), the confederated congregations of monks and lay brothers who follow the rule of life of St. Benedict (*c.* 480–*c.* 547) and who are descendants of the traditional monasticism of the early medieval centuries in Italy and Gaul. The Benedictines, strictly speaking, do not constitute a single religious order because each monastery is autonomous.

St. Benedict wrote his rule, the so-called Benedictine Rule, *c.* 535–540 with his own abbey of Montecassino in mind; the rule spread slowly in Italy and Gaul and provided a complete directory for the government and spiritual and material well-being of a monastery; it carefully integrated prayer, manual labour, and study into a well-rounded daily routine. By the 7th century the rule had been applied to women, as nuns, whose patroness was deemed Scholastica, sister of St. Benedict.

By the time of Charlemagne at the beginning of the 9th century, the Benedictine Rule had supplanted most other observances in northern and western Europe. During the five centuries following the death of Benedict, the monasteries multiplied both in size and in wealth. They were the chief repositories of learning and literature in western Europe and were also the principal educators. One of the most celebrated of Benedictine monasteries was the Burgundian Abbey of Cluny, founded as a reform house by William of Aquitaine in 910. The Cluniac reform was often imitated by other monasteries, and a succession of able abbots gradually built up throughout western Europe a great network of monasteries that followed the strict Cluniac customs and were under the direct jurisdiction of Cluny.

The great age of Benedictine predominance ended about the middle of the 12th century, and the history of the main line of Benedictine monasticism for the next three centuries was to be one of decline and decadence.

The 15th century saw the rise of a new Benedictine institution, the congregation. In 1424 the congregation of Santa Giustina of Padua instituted reforms that breathed new life into Benedictine monasticism. Superiors were elected for three years; the monks no longer took vows to a particular house but to the congregation; and ruling authority was concentrated in the annual general chapter, or legislative meeting. This radical reform spread within a century to all the Benedictines of Italy and became known as the Cassinese Congregation. There were similar reforms throughout Europe. These reforms were confronted by the turmoil of the Protestant Reformation in the 16th century. Within a few years (1525–60) the monasteries and nunneries disappeared almost entirely from northern Europe, and, for almost a century, they suffered greatly in France and central Europe. Benedictinism revived in France and Germany during the 17th century, however, and several congregations were founded, notably that of the male Maurists (*q.v.*) in France and the female Perpetual Adoration in Paris (1653) and Our Lady of Calvary (1617). Although the 18th century witnessed a new decline, from the middle of the 19th century Benedictine monasteries and nunneries again began to flourish. Foundations, including Solesmes, with its emphasis on the celebration of the liturgy, arose throughout Europe; monks and nuns returned to England; congregations were established in North and South America; and monasteries scattered all over the world. In the face of this revival, Pope Leo XIII desired to bring about some sort of unity among the traditionally independent Benedictines. In 1893 he created the office of abbot primate as head of the federation of autonomous congregations; and gradually this office, though unwelcomed because of the Benedictine desire for autonomy, has developed in influence.

Benedictines, in addition to their monastic life of contemplation and celebration of the liturgy, are engaged in a variety of activities including education, scholarship, and parochial and missionary work.

Benedictine Armenian Antonine Monks, Congregation of: *see* Mechitarist.

benediction, a verbal blessing of persons or things, commonly applied to invocations pronounced in God's name by a priest or minister, usually at the conclusion of a religious service. The Aaronic benediction (Num. 6:24–26) was incorporated by Luther into his German Mass and is preserved by modern Lutherans because of its impressive dignity; it is also used in the Mozarabic liturgy of Spain before the reception of the Host. The Swedish liturgy appends a trinitarian formula to this same benediction. Some Christian churches, however, prefer the Pauline benediction (II Cor. 13:14).

In the Roman Catholic Church benediction commonly means a blessing of persons (*e.g.,* the sick) or objects (*e.g.,* religious articles). Benediction of the blessed sacrament, a nonliturgical devotional service, has as its central act the blessing of the congregation with the eucharistic Host.

Benedictsson, Victoria, byname ERNST AHLGREN (b. March 6, 1850, Skåne, Swed.—d. July 21, 1888, Copenhagen), writer who in her short literary career produced some of the most natural and unpretentious stories of Swedish folk life and also novels dealing with the social problems of her period, especially the emancipation of women.

Having grown up in a home marred by marital discord, she married, at an early age, a widower much older than herself. Her marriage was unhappy. After an illness that left her permanently crippled, she turned to literature and in 1884 published her first collection of stories of rural life in her native province, *Från Skåne* ("From Skåne"). It was followed by a novel, *Pengar* (1885; "Money"), a critical view of a society that confers status and security on women only through marriage; and another, somewhat contradictory novel, *Fru Marianne* (1887; "Mrs. Marianne"), in which a doll wife outgrows her early romantic notions and finds fulfillment in sharing work and responsibilities with her husband. Her success made her acquainted with the brilliant and influential critic Georg Brandes, whom she had long admired. She fell deeply in love with him, but he was unable to return her feeling. Her posthumously published letters and diaries, describing her thwarted love and the desperation that drove her to suicide, rank with those of August Strindberg in the frankness of their self-revelation.

Benedictus, also called SONG OF ZECHARIAH, hymn of praise and thanksgiving sung by Zechariah, a Jewish priest of the line of Aaron, on the occasion of the circumcision and naming of his son, John the Baptist. Found in Luke 1:68–79, the canticle received its name from its first words in Latin (*Benedictus Dominus Deus Israhel,* "Blessed be the Lord God of Israel").

The hymn is addressed to the Israelite people about their long-cherished messianic hopes, and to John the Baptist as the prophet and forerunner of the Messiah whose kingdom of peace is about to begin.

Scholarly disputes regarding the origin of this canticle have suggested three possible composers: Zechariah, Luke, and followers of John the Baptist. The Benedictus was used as a hymn beginning in the 4th century in both Eastern and Western liturgies.

Benediktsson, Einar (b. Oct. 31, 1864, Ellidhavatn, Ice.—d. Jan. 14, 1940, Herdísarvík), poet called by some the greatest Icelandic poet of the 20th century.

Son of a leader of the Icelandic independence movement, he received a law degree at Copenhagen in 1892 and briefly edited a newspaper, *Dagskrá* (1896–98), advocating the cause of Icelandic independence. Much of his life was spent abroad raising capital to develop Icelandic industries. His five volumes of Symbolist verse—*Sögur og kvaedi* (1897; "Stories and Poems"), *Hafblik* (1906; "Smooth Seas"), *Hrannir* (1913; "Waves"), *Vogar* (1921; "Billows"), *Hvammar* (1930; "Grass Hollows")—showing a masterful command of the language, exemplify his patriotism, mysticism, and love of nature, and the influence of his extensive travels. He translated Ibsen's *Peer Gynt* into Icelandic. A selection of his poems was translated into English as *Harp of the North* (1955) by Frederic T. Wood.

benefice, a particular kind of land tenure that came into use in the 8th century in the kingdom of the Franks. A Frankish sovereign or lord, the seigneur, leased an estate to a freeman on easy terms *in beneficium* (Latin: "for the benefit [of the tenant]"), and this came to be called a *beneficium,* a benefice. The lease normally came to an end on the death of the seigneur or of the tenant, though holders of benefices often succeeded in turning them into hereditary holdings.

Although by the 12th century benefice was dying out as a term for feudal land tenure, it retained an important place in the law of the Western Church and later in that of the Church of England; it came to designate an ecclesiastical office to which the church attached the perpetual right of receiving income. In the early history of the church, all endowments were generally centralized under the administration of the bishop, and there was no endowment attached to a particular ecclesiastical office. By the 8th century, churches were being founded in villages by the seigneurs, usually laymen, who were allowed to appoint the priest. Parish churches thus fell into two groups, the earlier type founded and controlled by bishops and the later type under the control of the lay seigneurs. Both bishops and seigneurs began to treat each church and its endowments as property to be leased like any other part of their estates, and they appointed the priest by leasing to him as a piece of property the church and its endowment in return for his carrying out the spiritual duties and frequently the paying of some rent. The priest held the church for life, unless a term of years was specifically mentioned in the lease.

In the 12th century the procedure for granting

ecclesiastical benefices was made to conform to the ideals of Pope Gregory VII (reigned 1073–85). A lay seigneur could not grant an ecclesiastical office directly to a priest or receive rent or payment for it. The lay seigneur became the patron of the church; he chose the priest but could not lease him the church or receive any rent for it. The church had to be leased or granted to the priest by the bishop. Once inducted or invested with the benefice, the priest held it for life or, if he resigned, until his resignation was accepted by the bishop. Otherwise he was bound to vacate the benefice only if he was deprived of it in a court of law or if he received another benefice, in which case he automatically vacated the first benefice unless he had a dispensation to hold two or more benefices in plurality.

The procedure in the Church of England for giving a benefice to a priest and the terms on which he holds it have been modified in two respects. First, the bishop has wider powers of refusing the patron's nominee, and in a vacancy the parochial church council has the right to be consulted before an appointment is made. Second, the circumstances under which a priest can be removed from his benefice have been enlarged. In the Roman Catholic Church, the law concerning benefices has been set down in great detail in the Code of Canon Law (*Codex Juris Canonici*).

The benefice system, by making the parish priest dependent on no man's pleasure for his income or continuance in office, gave him an immeasurable status and strength in carrying out his duties.

beneficiary, in Anglo-American law, one for whose benefit a trust is created. Beneficiaries of private trusts must be identifiable legal entities (natural persons or corporations) or a class of persons (such as children of the creator of the trust). Whereas the beneficiaries must be described with certainty, provision may be made for the addition of new beneficiaries as persons are born and other events happen, and thus the group may shift in membership from time to time. Beneficiaries of charitable trusts are not identifiable persons, since society is the beneficiary. Thus, in the case of a trust to aid the poor, the individuals chosen yearly to receive trust income are not deemed to be the beneficiaries; rather, society, which is benefitted by the relief of poverty, is the beneficiary.

beneficiation, removal of worthless particles from pulverized metal ore. *See* ore dressing.

benefit of clergy (law): *see* clergy, benefit of.

benefit performance, in theatre, originally a supplemental performance by an actor or actress, who kept all or part of the proceeds to compensate for insufficient salary. In modern times a benefit performance is given by an actor, entertainer, or company of them to benefit a charitable organization, which may sell tickets and keep the proceeds; or, less strictly, it is a performance for which a charitable organization has bought out at a discounted price and raises funds by selling tickets at a full or premium price.

From the Restoration to the close of the 19th century an actor was hired for one or two years with a contracted salary and a guarantee of at least one benefit performance a year. Although each benefit performance was a gamble, the benefit system in England usually increased an actor's income. It also, however, authorized managers to lower salaries. The year 1685 marked the first benefit for an actor, given for a Mrs. Barry, whose performance elicited "extraordinary applause." She remained the sole beneficiary of this new system until ten years later, when financial woes affected many actors' salaries. The benefit system soon became a test of an actor's success or, more likely, of his popularity. The system forced actors to solicit their friends and acquaintances to buy tickets.

The benefit system varied with each theatre, and there were several types of benefit. The clear benefit, coveted by all performers, provided the actor with the full proceeds of his performance, the management agreeing to pay all additional charges. With a half-clear benefit, the actor divided the gross income with the manager. The benefit proper stipulated that the actor pay for use of the theatre, receiving all profits above that. With a half benefit, all profits above the costs of production were split between the actor and manager. Occasionally, several actors shared a benefit in a joint benefit performance. Although these were the most common practices, there were some instances of two-thirds benefits. In some cases, the player had to compensate the manager if ticket sales for a benefit fell below regular box-office returns. The use of benefits declined in the 1860s, when practice in theatrical engagements switched from seasonal contracts to terms based on the length of time a play ran. This change justified managers in paying higher salaries during a profitable run and none when a play's audience disappeared.

Articles are alphabetized word by word, not letter by letter

Beneke, Friedrich Eduard (b. Feb. 17, 1798, Berlin—d. March 1, 1854, Berlin), Prussian philosopher and psychologist who argued that inductive psychology was the foundation for study of all philosophical disciplines. He rejected existing idealism for a learning process that begins with developing inner perceptions before developing generalized concepts.

Beneke's first anti-Hegelian books, *Erkenntnislehre nach dem Bewusstsein der reinen Vernunft* (1820; "Theory of Knowledge According to the Consciousness of Pure Reason") and *Erfahrungsseelenlehre als Grundlage alles Wissens* (1820; "Experiential Theory of the Soul as the Foundation of All Knowledge"), written after theology and philosophy study at Halle and Berlin universities, caused his nonacceptance into academia until his University of Berlin appointment in 1832 as professor of philosophy. Other important works include *Psychologische Skizze*, 2 vol. (1825–27; "Psychological Sketches"), *Grundlinien des natürlichen Systems der praktischen Philosophie* (1837; "Essentials of Natural Systems of Practical Philosophy"), and *Pragmatische Psychologie* (1850; "Pragmatic Psychology").

Benelux Countries (Belgium, The Netherlands, and Luxembourg): *see* Low Countries.

Benelux Economic Union, French UNION ECONOMIQUE BENELUX, Dutch BENELUX ECONOMISCHE UNIE, economic union of Belgium, The Netherlands, and Luxembourg, with the objective of bringing about total economic integration by ensuring free circulation of persons, goods, capital, and services; by following a coordinated policy in the economic, financial, and by social fields; and by pursuing a common policy with regard to foreign trade.

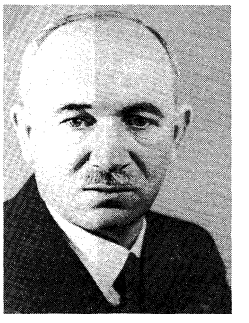
Belgium and Luxembourg had bilaterally formed an economic union in 1921; plans for a customs union of the three countries were made in the London Customs Convention in September 1944 and became operative in 1948. By 1956 nearly all of the internal trade of the union was tariff-free. On Feb. 3, 1958, the Treaty of the Benelux Economic Union was signed; it became operative in 1960. Benelux became the first completely free international labour market; the movement of capital and services was also made free. Postal and transport rates were standardized, and welfare policies were coordinated. In 1970 border controls were abolished.

The day-to-day operations of Benelux are conducted by the Secretariat-General; the executive authority of the organization rests with the Committee of Ministers, which meets quarterly.

Benelux was once regarded as a promising experiment by which neighbouring countries would form customs unions that might then merge into wider economic unions. Following the ratification of the treaty establishing the European Coal and Steel Community in 1952, however, interest in such developments shifted to plans for the European Economic Community, of which Belgium, The Netherlands, and Luxembourg are members.

Benemérita de San Cristóbal (Dominican Republic): *see* San Cristóbal.

Beneš, Edvard (b. May 28, 1884, Kozlany, Bohemia, Austria-Hungary—d. Sept. 3, 1948, Sezimovo Ústí, Czech.), statesman, foreign minister, and president, a founder of modern Czechoslovakia who forged its Western-oriented foreign policy between World Wars I and II but capitulated to Hitler's demands during the Czech crisis of 1938.



Beneš
H. Roger-Viollet

After studying at Prague, Paris, and Dijon, Beneš received a doctorate of laws in 1908 and taught at the Prague Commercial Academy and the Czech University of Prague before World War I. Influenced by the nationalist ideas of Tomáš Masaryk, who wished to liberate the Czechs and Slovaks from Austrian rule, Beneš followed his mentor to Switzerland during World War I and then established himself in Paris. With Masaryk and the Slovak leader Milan Štefánik, Beneš formed a propaganda organization that eventually became a Czechoslovak provisional government on Oct. 14, 1918. With the collapse of Austria-Hungary in November 1918, a new Czechoslovak state was quickly formed. As foreign minister, a post he was to retain until 1935, Beneš headed his country's delegation to the Paris Peace Conference in 1919 and championed the League of Nations throughout the interwar period, serving as its Council chairman six times. Opposed to plans for union between Austria and Germany (after World War I and again in 1931), which he deemed a threat to Czechoslovakia's continued existence, he attempted to reestablish a balance of power in eastern Europe. To fill the partial power vacuum created by the collapse of the Austro-Hungarian monarchy, Beneš negotiated the treaties with Romania and Yugoslavia (1921) that formed the Little Entente, originally aimed at revisionist Hungary. France joined in 1924, and thereafter the alliance became a bloc against Germany and, to a lesser extent, the Soviet Union. In 1935, however, he signed a mutual assistance pact between his country and the Soviet Union.

With the resignation of Masaryk as president in 1935, Beneš was elected to that office. Relations with Poland and Germany, never amicable, steadily worsened. Though he granted substantially the first Sudetenland German autonomy demands in 1938, he was nevertheless unable to avert the crisis that led to the

destruction of the Czechoslovak state. Abandoned by his allies, Beneš capitulated before the German ultimatum, and his country lost the Sudetenland in September 1938. Poland soon occupied the disputed Teschen area. Resigning on Oct. 5, 1938, Beneš went into exile. After the outbreak of World War II he established in France a Czechoslovak national committee, which moved to London in 1940. Reestablishing a government on his native soil on April 3, 1945, Beneš entered Prague on May 16 to the enthusiastic welcome of the population. His was the only eastern European exile government to be allowed to return after the war. Nevertheless, Beneš realized that Czechoslovakia had to cooperate closely with the Soviet Union. Increasingly ill, he suffered two strokes in 1947. When his Communist prime minister, Klement Gottwald, demanded on Feb. 25, 1948, that Beneš accept a Communist-dominated Cabinet, he again had no choice but to capitulate. Refusing to sign the new constitution, he resigned on June 7, 1948. Having witnessed the apparent suicide of his lifelong friend Jan Masaryk (son of Tomáš Masaryk) a few months earlier, Beneš died a broken man in 1948. His unfinished *Memoirs: From Munich to New War and New Victory* appeared in English in 1954.

Benét, Stephen Vincent (b. July 22, 1898, Bethlehem, Pa., U.S.—d. March 13, 1943, New York City), poet, novelist, and writer of short stories, best known for *John Brown's Body*, a long narrative poem on the Civil War.

Born into a military family with literary inclinations, Benét was reared on army posts. His father read poetry aloud to Stephen, an older brother, William Rose, and a sister, Laura, all of whom became writers. Stephen published his first book at the age of 17. Civilian service during World War I interrupted his education at Yale. He received his A.M. degree after the war, submitting his third volume of poems instead of a thesis.

After publishing the much-admired *Ballad of William Sycamore 1790–1880* (1923), three novels, and a number of short stories, he went to France, where he wrote *John Brown's Body* (1928), his most widely read work. Dramatized by Charles Laughton in 1953, it was played across the country.

A Book of Americans (1933), poems written with his wife, the former Rosemary Carr, brought many historical characters to life for U.S. schoolchildren. Benét's preoccupation with historical themes was also the basis for *Western Star*, an ambitious story of America, first planned in 1934 as possibly five books but left uncompleted at the time of his death.

Stephen Vincent Benét

By courtesy of the Library of Congress, Washington, D.C.

Book I, complete in itself and finished in 1942, was published posthumously. In all, Benét published more than 17 volumes of prose and verse. His best known short story, "The Devil and Daniel Webster" (1937), a humorous treatment of a theme from folklore, was the basis for a play, an opera by Douglas Moore, and a motion picture. Charles Fenton's *Stephen Vincent Benét* (1958) is an authorized biography.

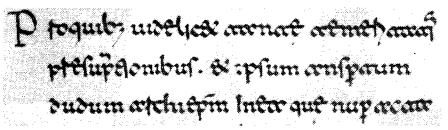
Benet Biscop (*c.* 628–689/690): *see* Benedict Biscop, Saint.

Benet Goita, Juan (b. 1927, Madrid), Spanish writer noted for his intricate novels and experimental prose style.

He lived with his family outside Spain during the Civil War (1936–39). After returning to Spain, he studied civil engineering and earned an advanced degree in 1954. He became a highway engineer in rural areas of Spain, working in León in northwestern Spain, Asturias, and the Basque provinces, among other areas.

In 1961 he published a volume of short stories, *Nunca llegarás a nada* ("You'll Never Amount to Anything"). He settled in Madrid in 1964. In his first novel—*Volverás a Región* (1967; "You Will Return to Región")—Benet Goita recounts the attitudes of different characters living in an area he calls Región, somewhat resembling León. The novel caused considerable interest in Spain because of its tantalizing effects. There are frequent changes in viewpoint, and many of the passages are open to conflicting interpretation. It comprises a triolgy with *Una meditación* (1969; "A Meditation") and *Un viaje de invierno* (1972; "A Winter Journey"). His works, which also include *En el estado* (1977; "In the State"), are complex and demanding of the reader's participation. He also wrote plays and critical essays.

Beneventan script, in calligraphy, southern Italian "national" hand, cultivated in the mother house of the Benedictine order at Montecassino. It has a peculiar jerky rhythm and retains individual cursive forms, which together with many abbreviations and ligatures make for difficult reading. Nevertheless, from humble vernacular beginnings, it rose to be an admired literary script and held that position for more than 500 years, well into the 13th century.



Beneventan script from "Register of Pope John VIII," 11th century (Vatican Library, Reg. Vat. 1)

By courtesy of the Archivio Segreto Vaticano

Benevento, Latin BENEVENTUM, city, capital and archiepiscopal see of Benevento province, Campania region, southern Italy, on a ridge between the Calore and Sabato rivers, northeast of Naples. It originated as Malies, a town of the Oscans, or Samnites; later known as Maleventum or Malventum, it was renamed Beneventum by the Romans. It became an important town on the Appian Way and was a base for Roman expansion in southern Italy. In 275 BC, Pyrrhus, king of Epirus, was defeated at Beneventum in his last battle with the Romans. After partial destruction by Totila, king of the Ostrogoths, in AD 452, Benevento in 571 became the capital of an important Lombard duchy controlling much of southern Italy. It passed in the 11th century to the Byzantines and then to the papacy, which ruled it—except for a brief period (1806–15) when it was governed as a principality by Napoleon's minister Talleyrand—until it became part of Italy in 1860. In 1266 Charles I of Anjou defeated and killed the Hohenstaufen Manfred, king of Naples and Sicily, at Benevento. Although damaged by earthquakes and devastated by Allied air raids in World War II, the city preserves many historic buildings. Monuments from classical times include Trajan's Arch (Porta Aurea; AD 114–117), the ruins of a Roman theatre, and the Ponte Lebbroso, a bridge over the Sabato River. The frequently rebuilt cathedral (founded 7th century), with magnificent bronze doors; the 12th-century cloister of the church of Sta. Sofia (8th century, rebuilt 1688); and the castle (1321) are notable medieval buildings.

Benevento is an agricultural centre for wheat, grapes, olives, and vegetables; its products include almond cakes, a liqueur called Strega, chocolate, biscuits, and agricultural machinery. Wine, bricks, and matches are also manufactured. Pop. (1981 prelim.) mun., 61,443.

benevolence, in English history, any sum of money, disguised as a gift, extorted by various English kings, from Edward IV to James I, from their subjects without Parliament's consent. Forced loans had been taken earlier, but Edward IV discarded even the pretense of repayment, and the word benevolence was first used in 1473 to describe an extorted gift. Richard III's attempts to raise benevolences were opposed by Parliament, which in 1484 abolished them as "new and unlawful inventions." In spite of the law, Henry VII made widespread use of the practice, in 1495 persuading Parliament to make those who had promised gifts legally liable for unpaid arrears. Henry VIII demanded benevolences in 1528 and 1545, but the practice was not followed by his successors. It was revived by James I, who received large sums in 1614. Further attempts to exact gifts in 1615, 1620, and 1622 aroused considerable protest, and the practice was finally discontinued.

Bénézet, SAINT, Latin BENEDICTUS (b. *c.* 1165—d. *c.* 1184; feast day April 14), builder who instigated and directed building of the Pont d'Avignon over the Rhône.

An uneducated shepherd, Bénézet claimed that he was divinely commanded to build the bridge at a point where the force of the Rhône was so great that it had discouraged even Roman engineers in antiquity. The Bishop of Avignon, at first skeptical, finally approved the project, and work began in 1177. Bénézet reputedly overcame many obstacles miraculously. He died four years before the bridge was completed and was buried in a chapel built on one of the piers.

After almost 500 years, his body was removed and his relics are at Saint-Didier in Avignon.

Benezet, Anthony (b. Jan. 31, 1713, St. Quentin, Fr.—d. May 3, 1784, Philadelphia), eminent teacher, Abolitionist, and social reformer in 18th-century America.

Escaping Huguenot persecution in France, the Benezet family fled first to Holland and then to London. Anthony was there apprenticed in a mercantile house, and he joined the Quaker sect. In 1731 he and his family immigrated to Philadelphia.

Disliking the merchant's life, Benezet tried several other vocations before finally deciding to become a teacher. He taught at the Germantown Academy and then at the Friends' English Public School in Philadelphia. In 1755, distressed at the unequal educational opportunities afforded women, he established a school for girls. He devoted the remainder of his life to teaching, holding his last class only a few days before his death. Convinced that personal kindness was the key to harmonious social relationships, Benezet made that principle the basis of his teaching methodology.

By the 1760s Benezet was an ardent Abolitionist, writing and distributing pamphlets at his own expense to encourage opposition to slavery and the slave trade. Late in his life he established and taught a school for blacks, and in his will he left his modest estate to endow the school. At various times during his long philanthropic career, Benezet came to the assistance of refugee French Acadians, Amer-

ican Indians, and other persecuted minorities. Pacifism, vegetarianism, and temperance were other causes he championed.

Among Benezet's many publications were *A Caution to Great Britain and Her Colonies, in a Short Representation of the Calamitous State of the Enslaved Negroes in the British Dominion* (1767), *Some Historical Account of Guinea, with an Inquiry into the Rise and Progress of the Slave-Trade* (1772), and *Observations on the Indian Natives on this Continent* (1784).

Benfey, Theodor (b. Jan. 28, 1809, Nörten, near Göttingen, Hanover—d. June 26, 1881, Göttingen, Ger.), scholar of Sanskrit and comparative linguistics whose works, particularly his edition of the ancient collection of Indian

Benfey

By courtesy of Dr. Wilhelm Rau, Marburg, W. Ger./EB Inc.

animal fables known as the *Pañca-tantra*, contributed in a major way to Sanskrit studies.

Concerned initially with research in classical languages, Benfey worked, while settled as a teacher at Frankfurt am Main (1830–32), on translating the comedies of Terence. In 1834 he became a *Privatdozent* at the University of Göttingen and began teaching classical-language studies. While increasingly occupied with Sanskrit, he published a lexicon of Greek roots (1839–42) and a study of the relation of Semitic and Egyptian languages (1844). In 1848 he became an assistant professor and published an edition and translation with glossary of the Sāmaveda, or ancient Vedic religious chants. Two works on Sanskrit grammar (1852–54 and 1858) were followed by his edition and translation of the *Pañcatantra* (1859), with a commentary that proved to be a valuable contribution to comparative literature. Appointed professor in 1862, he next published a Sanskrit grammar in English (1863–66) and a Sanskrit–English dictionary (1866). His final important work was a history of linguistic research in Germany during the 19th century (1869).

Bengal, Bengali BAṄGĀLĀ, original name VAṄGA, historic region in the northeastern part of the Indian subcontinent, generally corresponding to the area inhabited by speakers of the Bengali language, and now divided between the Indian state of West Bengal and the People's Republic of Bangladesh. Bengal formed part of most of the early empires that controlled northern India.

From the 8th to the 12th centuries it was under the Buddhist Pāla dynasty, based in neighbouring Bihār. After *c.* 1200 it was governed by semi-independent Muslim rulers, and from 1576 it belonged to the Mughal Empire. When Mughal power declined in the 18th century, a separate dynasty emerged in Bengal, Bihār, and Orissa. Its rulers, known as the nawabs of Bengal, soon came into conflict with the British, who had established themselves at Calcutta in western Bengal (1690) and who took possession of the nawabs' realm in 1757–64. Bengal was thenceforth the base for British expansion in India. From 1773 its governor general was the chief executive of British India; from 1834 he bore the title "governor general of India." Assam was joined to Bengal from 1838 to 1874. In 1854 the government of India was separated from that of Bengal, though Calcutta remained India's capital until 1912. With the end of British rule in 1947, West Bengal, Bihār, and Orissa became part of the Republic of India. East Bengal went to Pakistan, but it 1971 it became the independent state of Bangladesh.

Bengal, Bay of, large but relatively shallow embayment of the northeastern Indian Ocean, occupying an area of 839,000 sq mi (2,172,000 sq km).

The following article summarizes information about the Bay of Bengal; for full details, *see* MACROPAEDIA: Asia.

The Bay of Bengal is bordered by India and Sri Lanka to the west, Bangladesh to the north, and Burma and the northern part of the Malay Peninsula to the east. Its southern boundary extends as an imaginary line from Dondra Head at the southern end of Sri Lanka (west) to the northern tip of Sumatra (east).

The Andaman and Nicobar islands, a union territory of India, are the only major island groups in the bay. A number of South Asia's largest rivers, including the Ganges and Brahmaputra on the north, the Irrawaddy on the east, and the Godāvari, Mahānadi, Krishna, and Cauvery on the west, flow into the Bay of Bengal. Among its principal seaports are Calcutta, Cuddalore, Kākināda, Machilīpatnam, Madras, Paradip, and Vishākhapatnam. The continental shelf in the northern bay is about 100 mi (160 km) wide, but becomes narrower along the eastern and western coastlines. The bay has an average depth of more than 2,600 ft (800 m); a maximum depth of 14,764 ft (4,500 m) is reached in the extreme south near the Nicobar-Sumatra mainlands. A unique feature of the Bay of Bengal is the extreme variability of its physical properties, among these its seasonal reverses in the direction of surface water movement with the changing monsoon winds.

Bengal, Partition of (1905), division of Bengal carried out by the British viceroy in India, Lord Curzon, despite strong Indian nationalist opposition and Hindu Bengali indignation; it began a shift of the Indian Nationalist Congress from a middle-class pressure group to a nationwide mass movement. Bengal, Bihār, and Orissa had formed a single province of British India since 1765. By 1900 the province had grown too large to handle under a single administration; east Bengal, because of isolation and poor communications, had been neglected in favour of west Bengal and Bihār. Curzon chose one of several schemes for partition: to unite Assam, which had been a part of the province until 1874, with 15 districts of east Bengal and thus form a new province with a population of 31,000,000. The capital was Dacca, and the people were mainly Muslim.

The Hindus of west Bengal, who controlled most of Bengal's commerce and professional and rural life, complained that the Bengali nation would be split in two, making them a minority in a province including the whole of Bihār and Orissa. They regarded it as an attempt to strangle nationalism in Bengal, where it was more developed than elsewhere. Agitation against the partition included mass meetings, rural unrest, a swadeshi (own products) movement, and a boycott of foreign cloth. The partition was carried through despite the agitation, and the extreme opposition went underground to form a terrorist movement. In 1911 east and west Bengal were reunited; Assam again became a chief commissionership, while Bihār and Orissa were separated to form a new province. The aim was to combine appeasement of Bengali sentiment with administrative convenience. This end was achieved for a time, but the Muslims were dissatisfied.

Bengal quince: *see* bel fruit.

Bengali language, eastern Indo-Aryan language spoken in Bangladesh and the Indian state of West Bengal. Two Bengali dialects are significant: Sadhu-Bhasa, the literary language, which has a vocabulary with many Sanskrit words and is unintelligible to the uneducated; and Calit-Bhasa, the colloquial speech, which has many contracted forms. Calit-Bhasa is spoken by the educated Bengalis as well as by the common people; it is based on the dialect of Calcutta and surrounding districts.

Bengali has preserved case inflection for nouns and pronouns, although western Indo-Aryan languages such as Hindi have tended to lose them. Bengali distinguishes four to six cases, depending on whether the word inflected represents a rational or a nonrational being or thing. Associated with this usage, the singular verb form is used only when familiarity or contempt is intended by the speaker or, in the third-person form, when a nonrational being or object is spoken of.

Bengali, the language of the world-renowned writer Rabindranath Tagore, was the first of the Indian languages to develop Western secular literary styles, such as fiction, drama, and odes.

Bengali literature, the body of writings in the Bengali language of the Indian subcontinent. Its earliest extant work is a pre-12th-century collection of lyrics that reflect the beliefs and practices of the Sahajiyā religious sect. The dispersal of the poets of the Muslim invasion of 1199 broke off all poetic activity until the mid-14th century. Thereafter, the literature is divided into medieval (1360–1800) and modern (after 1800).

Bengasi (Libya): *see* Banghāzī.

Bengel, J(ohann) A(lbrecht) (b. June 24, 1687, Winnenden, near Stuttgart, Württemberg—d. Nov. 2, 1752, Stuttgart), German Lutheran theologian and biblical scholar who was the founder of Swabian Pietism and a pioneer in the critical exegesis of the New Testament.

Bengel studied at Tübingen and in 1713 was appointed professor in a seminary at Denkendorf, where he published his early works on the New Testament. As a student he had been concerned regarding the various readings of the text and sought to develop a critically consistent one. He originated the principle, "The more difficult reading is to be preferred." In 1741 he was made prelate of Herbrechtingen and in 1749 of Alpirspach. Influential in New Testament criticism and theology down to the present day, he held that the scholar should read nothing into the sacred writings that is not there but should draw everything from them and permit nothing to remain hidden that is really in them.

Benghazi (Libya): *see* Banghāzī.

Bengkalis Island, Bahasa Indonesia PULAU BENGKALIS, island in the Strait of Malacca, off the eastern coast of Sumatra, Riau *propinsi* (province), Indonesia. The island, situated about 120 mi (193 km) west of Singapore, stretches northwest–southeast for about 42 mi, its width east–west is about 12 mi, and its elevation ranges between 330 ft (100 m) and 650 ft. Low-lying, swampy, and of coral formation, the island has heavy precipitation, is sparsely populated, and is mostly unfit for cultivation. The only towns of importance are Bengkalis, a port on the western end of the island that ships timber, rubber, resin, and tobacco, and Meskum on the northwestern tip of the island. Travel between the island and Riau province is by steamer.

Bengkulu, *propinsi* (province), southwestern Sumatra, Indonesia, bounded by the Indian

Ocean on the west and by the provinces of Sumatera Barat (West Sumatra) on the north, Jambi and Sumatera Selatan (South Sumatra) on the east, and Lampung on the southeast. It covers an area of 8,173 square miles (21,168 square km) and includes Mega and Enggano islands in the Indian Ocean. The region formed part of the Buddhist Śrivijaya Empire in the 8th century. It became part of the Hindu Majapahit Empire of eastern Java in the 16th century. The first European visitors were the Portuguese, followed by the Dutch in 1596. The region gradually came under Dutch possession, except for British occupation briefly in the late 18th and early 19th centuries. Bengkulu town, now the provincial capital, and the surrounding area remained British until 1824, when the Dutch acquired it by treaty. The province was included in South Sumatra state by the Dutch in 1946 and became part of the Republic of Indonesia in 1950.

The north–south-trending Bengkulu Mountains, which are surmounted by both active and extinct volcanoes, run parallel to the coast and traverse the length of the province. Mount Seblat rises to an elevation of 7,818 feet (2,383 m), and Mount Kaba reaches 6,358 feet (1,938 m). The mountains are flanked by a strip of fertile coastal plain that is enriched from time to time by fresh deposits of ash and lava. Rivers and streams, including the Selagan and Seblat rivers, flow southwestward into the Indian Ocean. The province's agriculture is based on shifting cultivation; rice, tea, coffee, copra, palm oil, ebony, ironwood, and rubber are the major products. Industries and crafts include food processing, textiles, wood carving, metalware, leather, paper plaiting, and the manufacture of transport equipment. Roads run parallel to the coast and connect the settlements of Muaraaman, Curup, Bengkulu, Manna, and Bintuhan. The Minangkabau and Redjang Lampong are the major ethnic groups, and they are predominantly Muslim; Arabs and Chinese are settled in the coastal areas. Pop. (1986 est.) 985,600.

Bengkulu, also spelled BENCOOLEN, or BENKOELEN, city and capital of Bengkulu *propinsi* (province), southwestern Sumatra, Indonesia. It is a port on the Indian Ocean, 180 miles (289 km) southwest of Palembang. The British had a trading post there in the 17th century, and in 1710 the Fort of Marlborough was built. In 1824 Bengkulu was handed over to the Dutch under the terms of the Treaty of London. In 1938 Sukarno, the Indonesian nationalist leader who later became the first president of the Republic of Indonesia, was exiled to Bengkulu during the nationalist movement's struggles against Dutch colonial rule.

Now a major trade centre for mining and agriculture, the city exports gold, silver, coffee, pepper, corn (maize), and cinchona bark. Industries include wood carving, metalworking, basketry, textiles, pottery and tile making, and batik printing. Roads connect it with the coastal towns of Manna, Mukomuko, and Padang, and it has an airport. There is an old Christian cemetery and a botanical garden located in the city. Pop. (1980) 64,783.

Bengtsson, Frans Gunnar (b. Oct. 4, 1894, Tossjö, Swed.—d. Dec. 19, 1954, Stockholm), poet, biographer, novelist, and writer of numerous informal essays, a genre that he virtually introduced to Swedish literature and that brought him his greatest success.

Despite the dilatory pursuit of his studies at the University of Lund, Bengtsson eventually managed to acquire considerable erudition, which he used to good effect in his poetry and prose. His two extended prose works are a biography of Charles XII, 2 vol. (1935–36), and the novel *Röde Orm,* 2 vol. (1941, 1945; *The Long Ships*), both of which are written in an ornate and colourfully Romantic style. Bengtsson's broad knowledge of history and mastery of a rich but informal prose style were used most effectively in his essays, collections of which were published in five volumes during the period 1929–55. These whimsical investigations of literary and historical curiosities are well-represented in the essay collection *Sällskap för en eremit* (1938; *A Walk to the Ant Hill and Other Essays*).

Benguela, also spelled BENGUELLA, formerly SÃO FILIPE DE BENGUELA, city, western Angola. The city was founded in 1617 around São Filipe fortress and was one of the bases for Portuguese expansion in Africa. Benguela is the political and economic coordinating centre for the activities of the hinterland to the east and is linked by rail with Zaire and Zimbabwe. It exports agricultural products, although most foreign trade is handled by Lobito, 18 miles (29 km) north. Benguela's local industries include sugar milling, fish processing, and the manufacture of soap, tools, and pottery. Government Hall and the Mombaka Hotel are the dominant buildings.

Coffee, corn (maize), tobacco, sugarcane, and sisal are grown in the agricultural hinterland, and deposits of manganese are situated to the south of the city. Pop. (1970 prelim.) city, 40,996.

Benguela Current, oceanic current that is a branch of the West Wind Drift of the Southern Hemisphere. It flows northward in the South Atlantic Ocean along the west coast of southern Africa as far north as latitude 15° S before merging with the east-flowing Atlantic South Equatorial Current. The prevailing southerly and southwesterly winds produce upwelling of water with a cool temperature, a relatively low salinity, and a high concentration of plankton, creating excellent fishing grounds. Very cold Antarctic bottom water is prevented from flowing far north by the Walvis Ridge, a submarine feature that extends southwestward from off Cape Fria, South West Africa/Namibia, toward Gough Island. Coastal areas adjacent to the current experience a desert-like aridity that is not broken by the common sea breezes because of their cool temperature and low moisture content.

Benha (Egypt): *see* Banhā.

Beni Abbès, oasis town, west-central Algeria. It lies on the western edge of the Grand Erg (sand dunes) Occidental. The Wadi Saoura divides the stony desert and the sand dunes to the east and south. Beni Abbès is a small town of roofed streets which are so dark that torches are often needed during the day. A small fort dominates the date-palm groves that extend along the valley of the Saoura for 200 miles (320 km). A Saharan museum and a centre for Saharan research are in the town. Pop. (1977 prelim.) mun., 4,978.

beni-e, Japanese wood-block prints hand-coloured with a saffron-derived pinkish rose red and a few subsidiary colours. This technique was first used by Ukiyo-e (*q.v.*) artists in 1710 and continued until the development of two-colour printing (*benizuri-e*) in about 1742.

Beni Hasan, also spelled BANĪ ḤASAN, Egyptian Middle Kingdom archaeological site, on the eastern bank of the Nile, roughly 155 miles (245 km) south of Cairo. The site is noted for its rock-cut tombs of the 11th- and 12th-dynasty officials of the 16th Upper Egyptian (Oryx) nome, or province. Some of the 39 tombs are painted with scenes of daily life and important biographical texts. The governors of the nome, whose capital was Menat Khufu ("Nurse of Khufu"), ancestral home of the 4th-dynasty pharaohs, administered the eastern desert. The tomb of one, Khnumhotep II, contains a scene showing Semitic Bedouin merchants in richly coloured garments entering Egypt. A rock-cut shrine of Pakhet, known as Speos Artemidos, built by Queen Hatshepsut and Thutmose III of the 18th dynasty, lies one mile north, in an ancient quarry, with a smaller shrine of Alexander II nearby.

Beni Isguene, also spelled BENI ISGUEN, town, one of five in the oasis of Mzab, central Algeria, in the Sahara. The name is derived from Berber words meaning "the sons of those who keep the faith." Beni Isguene was founded in the middle of the 11th century by the Ibādīyah, a Berber Muslim heretical sect originally from Tiaret. Beni Isguene's town walls were restored in 1860, and according to tradition it is a sacred town. Strangers are not allowed in Beni Isguene during the midday prayers that last about four hours; nor are they permitted there after sunset or to spend the night within its walls. Strangers may not even visit the place without a guide, and even guided nonresidents are forbidden in some quarters. Surveillance from Beni Isguene's watchtower, called Tour du Tafilet, facilitates enforcement of these prohibitions. At the west end of Beni Isguene stands the white, 12th-century mosque of the oasis at the edge of a palm grove. The inhabitants, in order to preserve their own purity, generally do not venture outside their oasis. Modern technology, however, has filtered inside in the form of motor-driven pumps for irrigation and natural gas for cooking. The main handicrafts are pottery, brassware, jewelry, and carpets.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Beni Mellal, town, central Morocco. It is situated among the foothills of the Moyen (Middle) Atlas mountains. The Kasba bel-Kush, at the town entrance, was built in the 17th century and restored in the 19th. Beni Mellal overlooks the Beni Amir plain and is the chief market for the products, including oranges, olives, figs, other fruit, and livestock, of the irrigated Tadla region. The Bin el-Ouidane dam and reservoir are located 36 miles (58 km) southwest of the town. Beni Mellal is connected by road with Fès, Marrakech, and Casablanca. Pop. (1971) town, 28,933.

Beni River, Spanish RÍO BENI, river in Bolivia, formed by many confluents arising in the north sector of the Cordillera Real north of La Paz, the national capital. It flows northeast through the densely forested Yungas, or northeastern Andean slopes, and plains. It is joined by the Madre de Dios River at Riberalta and flows on to its junction with the Mamoré River at Villa Bella, on the Brazilian border, after a course of 1,000 miles (1,600 km). The Beni and the Mamoré form the Madeira River, which constitutes the extreme northeastern border of Bolivia. Steam navigation is possible on the Beni during high water (December to May), between Rurrenabaque, at the base of the Andes, and the Esperanza rapids near its junction with the Mamoré.

Beni Saf, port, town, northwestern Algeria. It lies midway between Cape Falcon and Cape l'Eau. With the discovery of iron deposits in the surrounding hills, an artificial harbour enclosing 45 acres (18 hectares) of water was built (1876–81) by the Companie de Mines de Soumah et Toufna (later absorbed by the Companie de Mokta el-Hadid). The settlement on the eastern side of Wadi Sidi Ahmed is almost wholly a mining company town. The nearest mine, Rhâr el-Baroud, is 2 miles (3 km) south, and Beni Saf is connected to the other ore deposits by overhead cables and long tunnels. Zinc, marble, and onyx are also mined, and there are fishing and fish-based industries. Pop. (1977 prelim.) mun., 30,736.

Beni Suef (Egypt): *see* Banī Suwayf.

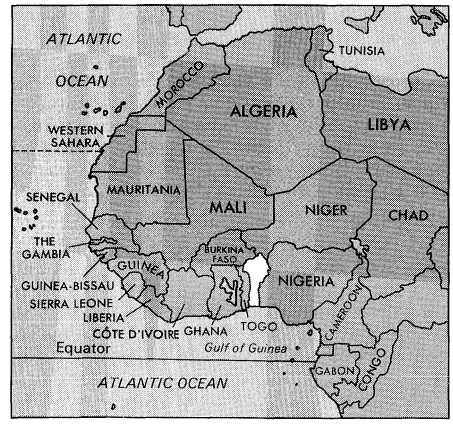
benign pemphigus (medicine): *see* bullous pemphigoid.

Benin, one of the principal historic kingdoms of the West African forest region (fl. 13th–19th century).

Tradition asserts that the Edo people became dissatisfied with the rule of a dynasty of semimythical kings, the *ogisos,* and in the 13th century they invited Prince Oranmiyan of Ife to rule them. His son Eweka is regarded as the first oba, or king, of Benin, though authority would remain for many years with a hereditary order of local chiefs. Late in the 13th century royal power began to assert itself under the oba Ewedo and was firmly established under the most famous oba, Ewuare the Great (reigned *c.* 1440–80), who was described as a great warrior and magician. He established a hereditary succession to the throne and vastly expanded the territory of the Benin kingdom, which by the mid-16th century extended from the Niger Delta in the east to what is now Lagos in the west. (Lagos was in fact founded by a Benin army and continued to pay tribute to the oba of Benin until the end of the 19th century.) Ewuare also rebuilt the capital (present-day Benin City), endowing it with great walls and moats. The oba became the supreme political, judicial, economic, and spiritual leader of his people, and he and his ancestors eventually became the object of state cults that utilized human sacrifice in their religious observances.

Ewuare was succeeded by a line of strong obas, chief of whom were Ozolua "the Conqueror" (*c.* 1481–*c.* 1504; the son of Ewuare) and Esigie (early to mid-16th century; the son of Ozolua), who enjoyed good relations with the Portuguese and sent ambassadors to their king. Under these obas Benin became a highly organized state. Its numerous craftsmen were organized into guilds, and the kingdom became famous for its ivory and wood carvers. Its brassmiths and bronze casters excelled at making naturalistic heads, basreliefs, and other sculptures. From the 15th through the 18th centuries Benin carried on an active trade in ivory, palm oil, and pepper with Portuguese and Dutch traders, for whom it served as link with tribes in the interior of West Africa. It also profited greatly from the slave trade. But during the 18th and early 19th centuries the kingdom was weakened by violent succession struggles between members of the royal dynasty, some of which erupted into civil wars. The weaker obas sequestered themselves in their palaces and took refuge in the rituals of divine kingship while indiscriminately granting aristocratic titles to an expanding class of nonproductive nobles. The kingdom's prosperity declined with the suppression of the slave trade, and as its territorial extent shrank, Benin's leaders increasingly relied on supernatural rituals and large-scale human sacrifices to protect the state from further territorial encroachment. The practice of human sacrifice was stamped out only after the burning of Benin City in 1897 by the British, after which the depopulated and debilitated kingdom was incorporated into British Nigeria. The descendants of Benin's ruling dynasty still occupy the throne in Benin City (although the present-day oba has only an advisory role in government).

Benin, officially PEOPLE'S REPUBLIC OF BENIN, French RÉPUBLIQUE POPULAIRE DU BÉNIN, formerly (until 1975) DAHOMEY, country of western Africa, stretching northward and inland for some 430 miles (700 km) from the Bight of Benin and occupying an area of 43,450 square miles (112,600 square km) between the Niger River in the north and the Atlantic Ocean in the south. The official capital is Porto Novo, but the de facto capital is Cotonou. Benin is bordered by Togo to the west, Burkina Faso (formerly Upper Volta) to the northwest, Niger to the northeast, and Nigeria to the east. Benin extends 420 miles (680 km) from north to south but is only 200 miles (320 km) from east to west at its widest, and its southern coastline extends for only 75 miles (120 km). The population in 1987 was estimated to be 4,307,000.



Benin

A brief treatment of Benin follows. For full treatment, *see* MACROPAEDIA: Western Africa.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Benin consists of five natural regions roughly from south to north: a coastal region, the *barre* (clay) country, the Benin plateaus, the Atacora Massif, and the Niger plains. The coastal region is low-lying, flat, and sandy and is backed by a network of lagoons. North of it lies the *barre* region, a fertile plateau of lateritic clay that contains a vast marshy depression known as Lama Marsh. The Benin plateaus, occupying south-central Benin, consist of clays on a crystalline base and are 300 to 750 feet (90 to 230 m) in elevation. The Atacora Massif in the northwest of the country forms a continuation of the Togo mountain chain, reaching an elevation of 2,103 feet (641 m) at its highest peak. The Niger plains in the northeast slope down to the Niger River Valley and consist of clayey sandstones. Benin's longest river, the Ouémé, flows southward into the Porto-Novo Lagoon and is navigable for 125 of its 285 miles (460 km).

The coastal region has an equatorial climate with a steady temperature between 72° and 93° F (22° and 34° C). The south has two rainy seasons, one from March to July and the other from late September to November, separated by two dry seasons. In the north the rainy season lasts from May to September, and the remainder of the year is dry. Average rainfall of 30 to 50 inches (760 to 1,270 mm) per year in the south gradually diminishes toward the north. The southern part of the country has been largely cleared of its original rain forest and now supports the cultivation of oil palms, rônier palms, coconut palms, kapok, mahogany, and ebony trees. North of Abomey the vegetation is a mixture of forest and savanna, giving way farther north to savanna. The country's varied animal life includes elephant, panther, lion, several species of antelope, monkey, wild pig, crocodile, and buffalo. About one-sixth of the land is arable, and about a fourth as much is available as pasture.

The people. Approximately one-half of Benin's population is younger than 15 years of age. The population distribution is uneven, with the southern third of the country containing about two-thirds of the populace. Some areas in the north are inhabited only by Fulani nomads. The urban population comprises less than one-sixth of the country's total. Cotonou, the focus of the commercial and political life of the country, is a modern, European-built city, whereas Porto-Novo, the national capital, was founded by Africans and combines both African and European features.

The annual rate of growth of the population is fairly high and exceeds that of Africa as a whole. Government policy is directed toward lowering this high rate and toward balancing the spatial distribution of the population.

The Fon people and related groups comprise about three-fifths of the total population and are predominant in the south. The Yoruba, living in the east, make up one-tenth of the population. A Voltaic-speaking group, comprising the Somba, Bargu (Bariba), and other related tribes, accounts for about one-fifth and is found in northern Benin. Nomadic and seminomadic Fulani inhabit semidesert areas.

While French is the official language, the most widely spoken language is Fon, which tends to be a national language. Nearly two-thirds of the populace remain adherents of African traditional religions. Islām has adherents in the north and southeast who, together with Christians, account for the other one-third of the population.

Economy. Benin has a developing, centrally planned economy based largely on agriculture and transit trade. Modest economic growth was interrupted in the late 1970s by drought and increased world oil prices. Recovery was hampered in the 1980s by a serious lack of skilled labour, as well as an extremely costly public sector. The gross national product (GNP) per capita, which is not growing as rapidly as the population, is among the lowest in the world.

Agriculture accounts for nearly half of the GNP and employs about two-thirds of the work force. Production of palm oil, the main export, is only beginning to recover from drought damage. Production of other important export crops such as cotton, peanuts (groundnuts), coffee, and cocoa beans is uneven. Production of the main food crops of cassava, yams, and corn (maize) is growing steadily, and Benin is largely self-sufficient in staple foods. Benin's traditional fishing industry is in decline as a result of the salinization of the coastal lagoons by development projects, but investment in the more modern sectors of the industry, such as deep-sea fishing, is growing. Limestone deposits are exploited for cement. The Sèmè offshore oil field, developed in the 1980s by Saga Petroleum of Norway, has the capacity to produce several times over Benin's domestic demand for petroleum.

Industry accounts for approximately one-eighth of the GNP and employs about one-sixth of the work force. Manufacturing is mainly small-scale, with most major enterprises controlled by the government. The textile complex at Parakou is the country's most important industrial plant; other industry takes the form of the processing of primary products for export or import substitution of simple consumer goods. Most of the country's electricity requirements are imported from Ghana's Volta River Project. Benin and Togo have undertaken a joint venture to construct major hydroelectric dams on the Mono River.

Services account for nearly half of the GNP and employ more than one-third of the work force. The tourist industry is being developed, with several hotel complexes under construction or refurbishment.

Government spending has risen sharply in recent years, with most of the funds going toward the salaries of public employees. The development budget is largely financed from foreign aid. Imports amount to more than five times the value of exports, but the deficit is at least partly made up by unofficial transit trade (particularly of food) to Nigeria and remittances from Beninians overseas. Major

trade partners are France, Spain, and West Germany.

Administrative and social conditions. Benin is a one-party people's republic dedicated to Marxism-Leninism and the attainment of a revolutionary Socialist state. The constitution promulgated in 1977 establishes a unicameral legislature known as the National Revolutionary Assembly. Its 196 members, known as People's Commissioners, are elected by direct universal suffrage and serve five-year terms. The commissioners represent socio-professional classes rather than geographic districts. The Assembly elects the president of the country, who is the head of state and shares the nation's executive authority with the 15-member Executive Council. The only legal political party is the Parti de la Révolution Populaire du Benin. Its Central Committee elects the party's Politburo from its own members. The judiciary, made up of a Central People's Court and lesser courts, is responsible to the National Assembly.

Education has been restructured to stress practical training for employable skills, as well as the traditional subjects. Though education is compulsory for children age 5 to 11, only about 60 percent of primary-school-age children and about one-third of secondary-school-age youths attend school, and most of these are male.

Health conditions are not good, and health care is still at a rudimentary level. Like most of western Africa, Benin has a severe shortage of physicians and other health personnel. Serious diseases include meningitis, leprosy, malaria, and sleeping sickness.

Cultural life. Examples of Benin's rich culture—carved wooden masks, appliqué tapestry, pottery, and bronze statuettes—are sold in marketplaces and exhibited in museums located in Porto-Novo, Abomey, and Parakou. Traditional dance and music are heard in frequent village and neighbourhood ceremonies. News media are strictly controlled by the ruling party; all radio and television service is owned and operated by the state, as is the major daily newspaper, *Ehuzu.*

History. The history of the peoples of the northern part of Benin has not yet been compiled. The Dahomey, or Fon, of the south established the Abomey kingdom in 1625. Ouegbadja (*c.* 1645–85), the first strong ruler of the kingdom, attacked and defeated Dã (or Dan), the king of a small neighbouring state, whose corpse was thrown into the foundations of the palace Ouegbadja was building; hence the name Dahomey (*Dã-ho-mé,* "on the belly of Dã"). King Agadja (1708–32), the son of Ouegbadja, eventually conquered Allada and Ouidah, where French forts had been established by the Compagnie des Indes in the 17th century. The Dahomey kingdom extended its frontiers northward under the reign of King Gezo (1818–58), who conducted many campaigns against the Yoruba in Nigeria to obtain slaves. In 1857 the French established themselves at Grand-Popo. After capturing the kingdom of Dahomey and deposing the ruler, Behanzin, the French established a protectorate in 1892. Two years later Dahomey was a French colony, and a year later it became part of French West Africa. On the outbreak of World War I, French forces from Dahomey participated in the conquest of German-ruled Togoland (1914). During World War II Dahomey followed French West Africa in adhering to the Allied cause. In 1959 it became an autonomous state of the French Community. Dahomey proclaimed independence in 1960, and a new constitution was adopted the same year. After 11 government changes, including 5 military interventions and 2 new constitutions, Major Mathieu Kérékou took over the government in 1972. In 1975 Dahomey became the People's Republic of Benin, and in 1980 the National Assembly elected Kérékou president.

Benin, Bight of, also called BIGHT OF BONNY, bay of the Atlantic Ocean on the West African coast that extends eastward for about 400 miles (640 km) from Cape St. Paul (Ghana) to the Nun outlet of the Niger River (Nigeria). Within the Gulf of Guinea, it is bordered by southeastern Ghana, Togo, Benin (formerly Dahomey), and southwestern Nigeria. The bay receives a portion of the Niger River Delta and also the Sio, Haho, Mono, Couffo, Ouémé, Benin, Forcados, and other rivers. Major ports on the bay are Lomé, Togo; Cotonou, Benin; and Lagos, Nigeria. The bight was the scene of extensive slave trading between the 16th and the 19th centuries, and the region of coastal lagoons west of the Niger Delta became known as the Slave Coast (*q.v.*). By the 1830s, trade in palm oil became the main economic activity, and it has maintained its importance to the present. Petroleum, discovered in the late 1950s in the Niger Delta area, is now a major economic asset to Nigeria. Palm kernels, cocoa, coffee, hardwood, and rubber are other major coastal exports. There is some commercial fishing, especially in the lagoon areas.

Benin City, also called EDO, capital and largest city of Bendel State, southern Nigeria. Benin City is situated on a branch of the Benin River and lies along the main highways from Lagos to the Niger bridge at Asaba and the eastern states; it is also linked by roads to Sapele, Siluko, Okene, and Ubiaja and is served by air and the Niger Delta ports of Koko and Sapele. Formerly the principal city of the Edo (Bini) kingdom of Benin, it was accidentally burned down (and was ransacked for nearly 2,500 of its famous bronzes) in 1897 when the British occupied the city after the Edo had massacred an unarmed British diplomatic mission. Traces of the old wall and moat remain, but the new town is a close-packed pattern of houses and streets converging on the palace and compound of the oba (Edo: "king") and the government offices. In the main square is a statue of Emotan, a lady honoured for offering herself as a sacrifice to restore the prestige of her husband, the oba. The present oba retains traditional and advisory roles in government.

Mud relief sculpture, oba's (king's) palace, Benin City, Nigeria

Joe B. Blossom—Photo Researchers/EB Inc.

Benin City has long been famous for its brass work, some of which is said to date from the 13th century, and for its ivory and wood carvings; its museum (1960) has a notable collection of some of the kingdom's early pieces. The city's present artisans still practice the ancient method of cire perdue ("lost-wax") casting, and its wood-carvers are organized into a cooperative craft society.

The centre of Nigeria's rubber production, modern Benin City has several processing plants and a creping factory; the Rubber Research Institute of Nigeria (1964) is at nearby Iyanomo. Benin City has been known for sawmilling since the 1930s, and the products now made in the city include furniture, beer, and soft drinks. The traditional export of palm oil and kernels remains important. The Nigerian Institute for Oil Palm Research is just outside the city on the old road to Lagos.

Benin City has Anglican, Roman Catholic, Muslim, government, and private secondary schools; it is the site of the University of Benin (1970) and government-sponsored teacher-training colleges. The seat of both Anglican and Catholic bishops, it also has several hospitals and a television station. Pop. (1983 est.) 165,900.

Benivieni, Girolamo (b. 1453, Florence—d. 1542, Florence), poet who was an intimate of several great men of Renaissance Florence. He is important for his versification of the philosopher Marsilio Ficino's translation of Plato's *Symposium,* which influenced other writers during the Renaissance and after.

As a member of the Florentine Medici circle, Benivieni was well-acquainted with the Renaissance humanists Ficino, Pico della Mirandola, and Politian (Angelo Poliziano). Ficino translated the *Symposium* in *c.* 1474 with his own commentary, which Benivieni summarized in the canzone "De lo amore celeste" ("Of Heavenly Love"), and this in turn became the subject of an extensive commentary by Pico della Mirandola. Thus, Platonism reached many other writers, including the Italians Pietro Bembo and Baldassare Castiglione and the English poet Edmund Spenser. Benivieni eventually fell under the spell of the fiery Renaissance religious reformer Girolamo Savonarola. After his conversion, Benivieni rewrote some of his sensual poetry, translated a treatise of Savonarola's into Italian (*Della semplicità della vita cristiana;* "On the Simplicity of the Christian Life"), and wrote some religious poetry. He also produced many occasional poems and a study of Dante's *Inferno.* Benivieni was buried in the church of San Marco, Florence, next to his closest friend, Pico della Mirandola.

Benjamin, one of the 12 tribes that in biblical times constituted the people of Israel, and one of the two tribes (along with Judah) that later became the Jewish people. The tribe was named after the younger of two children born to Jacob (also called Israel) and his second wife, Rachel.

After the death of Moses, Joshua led the Israelites into the Promised Land and, dividing the territory among the 12 tribes, assigned south-central Palestine to the tribe of Benjamin. Members of the tribe were separated when two distinct kingdoms were established after the death of King Solomon (922 BC), and the territory of Benjamin was divided between them. Jews belonging to the 10 tribes of the northern Kingdom of Israel disappeared from history after the Assyrian conquest of 721 BC and are known in legend as the Ten Lost Tribes of Israel. Benjaminites in the southern Kingdom of Judah were assimilated by the more powerful tribe of Judah and gradually lost their identity. Modern Jews thus consider themselves to be descendants of the tribes of Judah and Benjamin or are classed as Levites to indicate an affinity with the religious functionaries who at one time exercised the priesthood in ancient Israel. Saul, the first of Israel's kings, and St. Paul the Apostle were both of the tribe of Benjamin.

Benjamin OF TUDELA (b. Navarre; fl. 12th century), rabbi who apparently was the first European traveler to approach the frontiers of China and whose account of his journey, *Mas'a'ot* (*The Itinerary of Benjamin of Tudela,* 1907), illuminates the situation of Jews in Europe and Asia in the 12th century. Motivated by commercial interests as well as by a desire to learn of the conditions of Jews, he spent about 13 years journeying through Italy, Greece, Palestine, Persia, and the western bor-

ders of China, returning by way of Egypt and Sicily (1159–73). Though the *Itinerary* contains errors and treats places he may not have visited, it remains valuable.

Benjamin, Asher (b. June 15, 1773, Greenfield, Mass.—d. July 26, 1845, Springfield, Mass., U.S.), American architect who was an early follower of Charles Bulfinch. His greatest influence on American architecture, lasting until *c.* 1860, was through the publication of several handbooks, from which many other 18th-century architects and builders, including Ammi Young and Ithiel Town, copied plans. These books included the various editions of *American Builder's Companion, The Architect, or Practical House Carpenter, Practice of Architecture,* and *Builder's Guide.* These and other works were reprinted in the second half of the 20th century.

Benjamin was trained as a carpenter. Early in his career, he designed many residences in and near Greenfield, Mass. In 1803 he moved to Boston and came under the influence of Bulfinch. He designed houses throughout the state, including Linden Hall (Springfield, 1811), West Church (Boston, 1806), and Headquarter's House (Boston, 1807–08).

Benjamin, Judah P(hilip) (b. Aug. 6, 1811, St. Thomas, Virgin Islands—d. May 6, 1884, Paris), prominent lawyer in the United States before the Civil War (1861–65) and in England after that conflict; he also held high offices in the government of the Confederate States of America. The first professing Jew elected to the U.S. Senate (1852; reelected 1858), he is said to have been the most prominent American Jew during the 19th century.

Born a British subject, Benjamin was taken to the United States in his early youth. He was admitted to the Louisiana bar in 1832, and his practice became extremely successful in the fields of commercial and insurance law. He also prospered for a time as a sugar planter, helped to organize the Illinois Central Railroad, and was elected to the Louisiana legislature in 1842. In the U.S. Senate he was noted for his pro-slavery speeches. After his state had seceded from the Union, he was appointed attorney general in the Confederate government (Feb. 21, 1861). Later that year he was named secretary of war by his friend Pres. Jefferson Davis. It was charged that his mismanagement of the war office led to several major military defeats, and he resigned, but Davis promptly named him secretary of

Judah Benjamin

By courtesy of the Library of Congress, Washington, D.C.

state (Feb. 7, 1862). Late in the war he enraged many white Southerners by urging that slaves be recruited into the Confederate Army and emancipated after their term of service.

At the end of the Civil War Benjamin escaped to England, where he was called to the bar (June 1866) after only five months' residence and where he achieved his greatest professional success. In 1872 he became a queen's counsel. His *Treatise on the Law of Sale of Personal Property* (1868) was the principal textbook on its subject for many years in England and the United States.

Judah P. Benjamin, Confederate Statesman, a biography by Robert Douthat Meade, was published in 1943.

Benjamin, Walter (b. July 15, 1892, Berlin—d. Sept. 26, 1940, near Port-Bou, Fr.), man of letters and aesthetician, now considered to have been the most important German literary critic in the first half of the 20th century.

Born into a prosperous Jewish family, Benjamin studied philosophy in Berlin, Freiburg im Breisgau, Munich, and Bern. He settled in Berlin in 1920 and worked thereafter as a literary critic and translator. His halfhearted pursuit of an academic career was cut short when the University of Frankfurt rejected his brilliant but unconventional doctoral thesis, *Ursprung des deutschen Trauerspiels* (1928; *The Origin of German Tragic Drama*). Benjamin eventually settled in Paris after leaving Germany in 1933 upon the Nazis' rise to power. He continued to write essays and reviews for literary journals, but upon the fall of France to the Germans in 1940 he fled southward with the hope of escaping to the United States via Spain. Informed by the chief of police at the town of Port-Bou on the Franco-Spanish border that he would be turned over to the Gestapo, Benjamin committed suicide.

The posthumous publication of Benjamin's prolific output won him a growing reputation in the later 20th century. The essays containing his philosophical reflections on literature are written in a dense and concentrated style that contains a strong poetic strain. He mixes social criticism and linguistic analysis with historical nostalgia while communicating an underlying sense of pathos and pessimism. The metaphysical quality of his early critical thought gave way to a Marxist inclination in the 1930s. Benjamin's pronounced intellectual independence and originality are evident in the extended essay *Goethes Wahlverwandtschaften* (1924–25; "Goethe's Elective Affinities") and the essays collected in *Illuminationen* (1961; *Illuminations*).

Benkei (d. 1189, Japan), warrior-monk whose legendary superhuman exploits in the service of his master, the famous warrior Minamoto Yoshitsune, made him one of the most popular figures in Japanese history and a favourite in many traditional stories and plays and even in motion pictures.

Although his name appears twice in documents from the period, thus affirming his actual existence, Benkei is better known as a legendary figure. He is said to have met his master while attempting to collect 1,000 swords from passersby whom he nightly challenged to duels on the Gojō Bridge in the capital city of Kyōto. Having collected 999 swords, he was foiled in his attempt for the 1,000th by Yoshitsune, whose follower he then became.

After ingeniously aiding his master in many battles, Benkei is said to have died defending Yoshitsune, who was surrounded and forced to commit suicide at the Battle of Koromogawa. According to legend, Benkei's body, which was pierced with arrows, remained erect, even after death.

Benlowes, Edward (b. July 12, 1602, Finchingfield, Essex, Eng.—d. Dec. 18, 1676, Oxford), English poet of the metaphysical school and a patron of the arts.

Though his family was Catholic, Benlowes early become a vehement Protestant. He used the wealth from his large inherited estates to support his various artistic endeavours; he commissioned engravings to illustrate his own and his friends' poems, and he owned his own printing press. During the 1640s he composed *Theophila, or Loves Sacrifice* (printed 1652), a long poem describing, in some fine

Benlowes, engraving

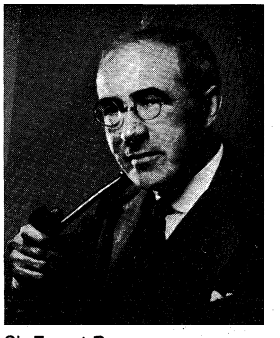
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

rhapsodic passages but with extravagant conceits, the progress of the soul toward mystic communion with God. Financially crippled by the English Civil War and litigation, he spent his declining years at Oxford, reading in the Bodleian Library and occasionally writing poetry.

Benn, Sir Ernest John Pickstone, 2ND BARONET (b. June 25, 1875, Hackney, Middlesex, Eng.—d. Jan. 17, 1954, Oxted, Surrey), British publisher whose Sixpenny Library and Sixpenny Poets were among the first popular series of paperback educational books.

He was the eldest son of Sir John Williams Benn, who was a trade-journal publisher and a Liberal member of Parliament. While his father pursued political interests, the son assumed management of the family publishing business before he was 21. He enlarged it to include hardcover and paperback books as well as additional periodicals. The firm (Ernest Benn Ltd.) became publisher of the well-known series of travel books (*Blue Guides*) edited by L. Russell Muirhead.

During World War I he served in the ministries of munitions and reconstruction. He succeeded to his father's baronetcy in 1922.



Sir Ernest Benn

Popperfoto

His strong individualist views are expressed in some of his works: *The Confessions of a Capitalist* (1925), "Governed to Death" (pamphlet, 1948), and *The State the Enemy* (1953).

Benn, Gottfried (b. May 2, 1886, Mansfeld, Ger.—d. July 7, 1956, Berlin), German poet and essayist whose Expressionistic pessimism and conjurations of decay after World War I gradually mellowed into a philosophy of pragmatism. Perhaps the most influential writer in post-Hitlerian Germany, he is often considered that nation's counterpart of T.S. Eliot, who wrote about him.

The son of a Lutheran clergyman, Benn studied theology at the University of Marburg, then transferred to the academy there for military-medical instruction and became a specialist in venereal and skin diseases. He took medical jobs on cruise ships, got to know the Mediterranean (a frequent setting in his poems), and as a German officer in World War I was made medical supervisor of jail inmates and prostitutes in occupied Brussels.

Degeneracy and medical aspects of decay are important allusions in his early poems, which also were shadowed by the death of his first wife (1914) and the suicide of an actress friend. His first and third collections of verse were fittingly titled *Morgue* (1912) and *Fleisch* (1917; "Flesh").

Because of his Expressionism and despite his right-wing political views, the Nazi regime penalized him both as a writer and as a physician; in 1937, publication was forbidden to him. To escape harassment, he rejoined the army, which he described as "the aristocratic form of emigration."

Benn regained literary attention with *Statische Gedichte* (1948; "Static Poems") and the simultaneous reappearance of his old poems. While busily writing, he remained a practicing physician until he was 68.

His gradual loss of cynicism is richly reflected in the autobiography *Doppelleben* (1950; "Double Life"). His poem "Epilog" ends, "Life is the building of bridges / over rivers that seep away." A broad selection of his poetry and prose in English translation was published under the title *Primal Vision* (1961).

Benn, Tony, original name ANTHONY NEIL WEDGWOOD BENN, also called (1960–63) 2ND VISCOUNT STANSGATE OF STANSGATE (b. April 3, 1925, London), British politician, member of the Labour Party, and, from the 1970s, unofficial leader of the party's radical populist left.

Though a fierce critic of the British class system, Benn came from a moneyed and privileged middle-class family himself. Both of his grandfathers had been members of Parliament, and his father, William Wedgwood Benn (1877–1960), had been a Liberal and then a Labour MP who in 1941 entered the House of Lords as 1st Viscount Stansgate. The younger Benn was first elected to Parliament in 1950. Anticipating that inheritance of his father's title would immediately disqualify him from continuing to serve in the House of Commons, he introduced a personal bill to permit him to renounce the title. The bill was defeated; but, after his father's death in 1960, he continued the struggle, and in 1963 the Peerage Act enabled peers to renounce their titles for their lifetimes. Benn not only renounced his viscountcy immediately but later shed the names with which he had been christened, Anthony Neil Wedgwood, to become simply Tony Benn. He also withdrew his entry from *Who's Who* (which disclosed an education at a private school and at New College, Oxford [M.A., 1949]).

When Labour formed a government under Harold Wilson in 1964, Benn became postmaster general in 1964 and was minister of technology from 1966 to 1970. With Labour out of power from 1970 to 1974 he was the party spokesman on trade and industry. When Labour was in power from 1974 to 1979 under first Wilson and then James Callahan, Benn was secretary of state for industry and minister for posts and telecommunications (1974–75) and secretary of state for energy (1975–77). Benn lost his parliamentary seat in the elections of 1983 but returned to Commons in a by-election in 1984.

During the 1970s and 1980s he became the most influential of left-wing thinkers in the Labour Party and often found himself at odds with the leaders of the party and the other more moderate members. He set out his ideas in a book called *Arguments for Socialism,* published in 1979. In his view, Britain's consensus-based, Keynesian, managed welfare-state economy had collapsed. The "democratic socialism" that he offered would involve a large measure of public investment, public expenditure, and public ownership combined with self-management in the workplace and open (as opposed to secretive) government. He regarded this as "a home-grown British product," distinct from both capitalism and Communism. In other writings and speeches Benn also argued for Britain's withdrawal from Northern Ireland, from the North Atlantic Treaty Organization, and from the European Economic Community.

benne: *see* sesame.

Bennet, Henry: *see* Arlington, Henry Bennet, 1st earl of.

Bennet, John (fl. 1599–1614), English composer known chiefly for his madrigals, which ranged from light and festive in character to serious and even solemn. Bennet occasionally borrowed madrigal texts from existing collections and reset them to original tunes; he is not known to have borrowed tunes.

One of Bennet's sources of such texts was Thomas Morley, to whose *Triumphs of Oriana* Bennet contributed the well-known madrigal "All creatures now are merry-minded." In addition to two volumes of madrigals, he composed a serious piece, for viol accompaniment, to celebrate Queen Elizabeth and a verse anthem "for the King's inauguration," *O God of Gods.*

Bennett, (Enoch) Arnold (b. May 27, 1867, Hanley, Staffordshire, Eng.—d. March 27, 1931, London), British novelist, playwright, critic, and essayist whose major works form an important link between the English novel and the mainstream of European Realism. He is best known for his highly detailed novels of the "Five Towns"—the Potteries, since amalgamated to form the city of Stoke-upon-Trent, in his native Staffordshire. As a young writer he learned his craft from intensive study of the French Realistic novelists, especially Gustave Flaubert and Honoré de Balzac, who emphasized detailed description of people, scenes, and events. He also owes an immediate debt to George Moore, who was influenced by the same writers. Bennett's criticism was of such high calibre that, if he had never written fiction, he would rank as an important writer. He was less successful in his plays, although *Milestones* (1912), written with Edward Knoblock, and *The Great Adventure* (1913), adapted from his novel of five years earlier, *Buried Alive* (1908), both had long runs and have been revived.

Bennett's father was a self-made man who had managed to qualify as a solicitor: the family atmosphere was one of sturdy respectability and self-improvement. Arnold, the eldest of nine children, was educated at the Middle School, Newcastle-under-Lyme; he then entered his father's office as a clerk. In 1889 he moved to London, still as a solicitor's clerk, but soon gained a footing in literature by writing popular serial fiction and editing a women's magazine. After the publication of his first novel, *A Man from the North* (1898), he became a professional writer, living first in the Bedfordshire countryside, then, following his father's death, moving to Paris in 1903. In 1907 he married a French actress, Marguerite Soulié; they separated in 1921.

Arnold Bennett, drawing by Walter Ernest Tittle, 1923; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

As early as 1893 he had used the "Five Towns" as background for a story, and his major novels—*Anna of the Five Towns* (1902), *The Old Wives' Tale* (1908), and *Clayhanger* (1910; included with its successors, *Hilda Lessways,* 1911, and *These Twain,* 1916, in *The Clayhanger Family,* 1925)—have their setting there, the only exception being *Riceyman Steps* (1923), set in a lower middle-class district of London.

Paris during Bennett's eight years there was the capital of the arts, and he made full use of his opportunities to study music, art, and literature as well as life. He retained an understanding of provincial life, but he shed the provincial outlook, becoming one of the least insular of Englishmen. At a time when the popular culture and the arcane complacencies of the elite were equally inbred, Bennett was a cosmopolitan who appreciated Impressionist painting, the ballet of Sergey Diaghilev, and the music of Igor Stravinsky before they reached London. Later, reviewing a constant stream of new books, he unerringly picked out the important writers of the next generation—James Joyce, D.H. Lawrence, William Faulkner, Ernest Hemingway—and praised them discerningly. When Bennett returned to England, he divided his time between London and a country home in Essex. He never returned to the Potteries except on brief visits, but he continued to live there imaginatively, much as Joyce did in Dublin.

Bennett wrote 30 novels, and even many of the lesser ones display the essential Bennettian values, ironic yet kindly, critical yet with a large tolerance. His reputation declined in the 1920s and '30s but soon rose, partly as the result of a reevaluation of his work by a group of young writers who felt themselves to be artistically in his debt. *The Journals of Arnold Bennett, 1896–1928* were published in three volumes (1932–33). Margaret Drabble's biography of Bennett was published in 1974.

Bennett, Floyd (b. Oct. 25, 1890, Warrensburg, N.Y., U.S.—d. April 25, 1928, Quebec), U.S. pioneer aviator who piloted the explorer Richard E. Byrd on the first successful flight over the North Pole on May 9, 1926. For this feat both Bennett and Byrd received the U.S. Congressional Medal of Honor. Floyd Bennett Airport in Brooklyn, N.Y., was named for him in 1931.

Bennett attended a mechanics school in his early years, and subsequently managed garages in New York state. Enlisting in the United States Navy in 1917, he underwent pilot and mechanic training. After his historic polar flight in 1926, Bennett made an 8,000-mile (12,000-kilometre) flight around the United States to prove that long-distance airline operations were feasible.

Bennett, James Gordon (b. Sept. 1, 1795, Newmill, Banffshire, Scot.—d. June 1, 1872, New York City), Scots-born U.S. editor who shaped many of the methods of modern journalism. He emigrated to America in the spring of 1819 and eventually settled in New York City, where he founded a school, gave lectures on political economy, and did subordinate work for the journals. During the next 10 years he was employed on various papers. He was the Washington, D.C., correspondent of the *New York Enquirer* and associate editor of the *Morning Courier and New York Enquirer,* his articles attracting much attention. He founded the short-lived *Globe* in New York City in 1832, and in 1833–34 he was the chief editor and one of the proprietors of *The Pennsylvanian* at Philadelphia.

With a capital of $500 he published on May 6, 1835, the first number of a four-page penny

paper bearing the title of *The New York Herald* and issuing from a cellar. By his industry and sagacity he made the paper a great commercial success. He devoted attention particularly to the gathering of news and was the first to introduce many of the methods of modern news reporting. He published on June 13, 1835, the first Wall Street financial article to appear in any American newspaper; printed a vivid and detailed account of the great fire of December 1835 in New York; was the first, in 1838, to establish correspondents in Europe; was the first, in 1846, to obtain the report in full by telegraph of a long political speech; maintained during the Civil War a staff of 63 war correspondents; was a leader in the use of illustrations; introduced a society department; and, with the Helen Jewett case (1836), was

James Bennett, engraving from the *Democratic Review, c.* 1852, after a daguerreotype by M. Brady

By courtesy of the New-York Historical Society

the first in American journalism to publish an account of a love-nest murder.

Bennett, Michael, original name MICHAEL BENNETT DIFIGLIA (b. April 8, 1943, Buffalo, N.Y., U.S.—d. July 2, 1987, Tucson, Ariz.), American dancer, choreographer, and stage musical director.

Bennett studied many styles of dance and began his career as a dancer in productions of *West Side Story* and *Subways Are for Sleeping.* His major contribution to the dance scene was as a choreographer-director of Broadway musicals, notably in *Promises, Promises* (1968), *Coco* (1969), *Company* (1970), *Follies* (1971), *A Chorus Line* (1975), and *Dreamgirls* (1981). His beginnings as a dancer were most strongly reflected in *A Chorus Line,* which was made for and about dancers. This musical was conceived, directed, choreographed, and coproduced by Bennett; it won nine Tony awards and the 1976 Pulitzer Prize for drama and became the longest-running musical in the history of the Broadway theatre. Bennett received eight Tony awards and several New York Drama Critic awards during his career.

Bennett (of Mickleham and of Calgary and Hopewell), Richard Bedford Bennett, Viscount (b. July 3, 1870, Hopewell, N.B., Can.—d. June 27, 1947, Mickleham, Surrey, Eng.), statesman and prime minister of Canada (1930–35) during the Great Depression.

Bennett was admitted to the bar in 1893 and practiced in his native province of New Brunswick. In 1897 he moved westward and entered politics, serving in the legislative assemblies of the Northwest Territories and Alberta. In 1911 he entered the Canadian House of Commons, representing Calgary, Alta., and later became director general of national service (1916) and minister of justice (1921).

Bennett became the leader of the Conservative Party in 1927 and prime minister after the 1930 election, having promised the voters to vigorously combat the effects of the Great Depression. But Bennett underestimated the severity and longevity of the Depression, and his measures to combat the country's widespread unemployment amounted merely to slightly strengthened tariffs and some measures for unemployment relief. After the Canadian economy had languished for four years,

Viscount Bennett

National Film Board of Canada Phototheque

he proposed a bold legislative program in January 1935 that in some respects resembled the New Deal put forth in the United States by President Franklin D. Roosevelt. But Bennett's reform measures aroused distrust in his own party and failed either to revive the public's enthusiasm or to counter its resentment over his previous laissez-faire policies, and in the October 1935 election he was overwhelmingly defeated by W.L. Mackenzie King and the Liberals. He remained as leader of the opposition until 1938, and in 1939 he retired to England, where he was made a viscount in 1941 (the peerage became extinct when he died, unmarried).

Bennett, Willard Harrison (b. June 13, 1903, Findlay, Ohio, U.S.), American physicist who discovered (1934) the pinch effect, an electromagnetic process that may offer a way to magnetically confine a plasma at temperatures high enough for controlled nuclear fusion reactions to occur.

A faculty member of Ohio State University, Columbus, from 1930, Bennett became director of research of the Electronic Research Corporation in 1938. As a U.S. Army officer (1941–45) he worked on aircraft equipment development, and he served as chief (1946–50) of the physical electronics section of the National Bureau of Standards, Washington, D.C. He was a consultant (1951–61) for the U.S. Naval Research Laboratory and held the Burlington professorship (1961–76) of physics at North Carolina State University, Raleigh.

In addition to his discovery of the pinch effect, Bennett proposed (1936) the tandem Van de Graaff accelerator, which later became widely used in nuclear research, and he invented a nonmagnetic mass spectrometer used in space research.

Bennett, Sir William Sterndale (b. April 13, 1816, Sheffield, Yorkshire, Eng.—d. Feb. 1, 1875, London), British pianist, conductor,

William Bennett, engraving by E. Stodart after a photograph

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

and composer, a notable figure in the musical life of his time.

He became a chorister at King's College, Cambridge, and in 1826 entered the Royal Academy of Music. In 1833 his first piano concerto greatly impressed Felix Mendelssohn, who became a close friend. In 1842 he was appointed one of the directors of the Philharmonic Society in London, and in 1849 he founded the London Bach Society, at which, in 1854, he conducted the first performance in England of Bach's *St. Matthew Passion.* Bennett was appointed conductor of the Philharmonic Society in 1856 and in the same year became professor of music at Cambridge. In 1866 he became principal of the Royal Academy of Music. He was knighted in 1871.

Bennett's work, consisting chiefly of concerti and solo pieces for the piano, enjoyed a wide popularity in England and Germany. His cantata *The May Queen,* written, as were so many of his works, for a festival, and the quartet "God Is a Spirit," from the oratorio *The Woman of Samaria* (1867), are still sung by village and church choirs.

Bennettitales (plant fossil): *see* Cycadeoidales.

Bennigsen, Leonty Leontyevich, Graf von (Count of), original name LEVIN AUGUST GOTTLIEB (THEOPHIL) VON BENNIGSEN (b. Feb. 10, 1745, Brunswick, Duchy of Brunswick [now in W.Ger.]—d. Oct. 3, 1826, Banteln, near Hildesheim, Hanover [now in W.Ger.]), general who played a prominent role in the Russian Army during the Napoleonic Wars.

Having gained military experience while serving in the Hanoverian army (until 1764), Bennigsen joined the Russian Army in 1773 as a field officer and fought against the Turks in 1774 and 1778. He became a colonel in 1787 and participated in the Russian suppression of a Polish uprising (1793), as well as in the brief Russian invasion of Persia in 1796.

Opposed to the policies of the emperor Paul I (reigned 1796–1801), Bennigsen was active in the conspiracy that led to Paul's assassination (March 23 [March 11, Old Style], 1801). He subsequently was appointed governor-general of Lithuania (1801) and general of the cavalry (1802) by the new emperor Alexander I (reigned 1801–25). After Russia joined the third coalition against Napoleon (1805), Bennigsen was placed in command of an army that successfully defended Pułtusk (near Warsaw) from a French attack (Dec. 26, 1806), and he inflicted severe losses upon Napoleon before retreating from the battlefield at Eylau (Feb. 8, 1807). On June 14, 1807, however, he was decisively defeated at the Battle of Friedland; Russia made peace with France (Treaty of Tilsit; July 1807), and Bennigsen retired.

When the war with France resumed (1812) he again played a leading role, commanding the Russian centre at the Battle of Borodino (Sept. 7, 1812) and defeating the French marshal Joachim Murat at Tarutino (Oct. 18, 1812). A dispute with the supreme Russian commander, General Mikhail Kutuzov, forced him into retirement again; but after Kutuzov died (1813) and Russia pursued the French into Prussia and the Duchy of Warsaw, Bennigsen was recalled to duty. On the final day of the Battle of Leipzig (Oct. 16–19, 1813) he led one of the columns that made the decisive attack, and that evening he was made a count. Afterward he fought the forces of the French marshal Louis Davout in northern Germany. In 1818 Bennigsen retired for the last time, settling on his Hanoverian estate of Banteln near Hildesheim.

Bennigsen, (Karl Wilhelm) Rudolf von (b. July 10, 1824, Lüneburg, Hanover [now in W.Ger.]—d. Aug. 7, 1902, Bennigsen, Hanover), Hanoverian politician who combined liberalism with support for Prussian hegemony in a united Germany.

Rudolf von Bennigsen, detail from an oil painting by Franz von Lenbach, 1896; in the Landesmuseum, Hanover

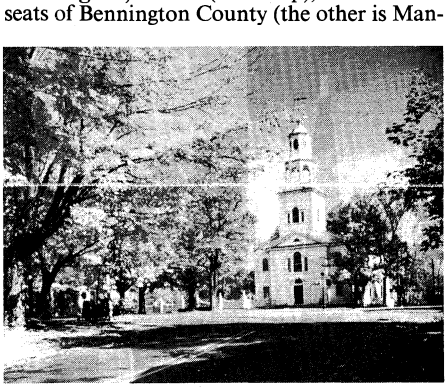
By courtesy of the Niedersachsisches Landesmuseum, Hanover

After studying law at the University of Göttingen, Bennigsen, the son of a Hanoverian major general, entered the civil service of Hanover but had to resign in 1856 in order to accept his election to the lower chamber of that kingdom. A vigorous defender of freedom of religion, he became leader of the liberal opposition and, in 1859, president of the Nationalverein (German National Union), which he founded with Johannes von Miquel. The organization's aims were a united Germany led by Prussia, an all-German parliament, and the exclusion of Austria's non-Germans. After the Nationalverein was dissolved (1867), he was instrumental in founding the National Liberal Party, which was the dominant group in the Reichstag for most of the 1870s.

Bennigsen had unsuccessfully attempted to prevent Hanover from entering the Seven Weeks' War (1866) on the side of Austria and, after the defeat of the Austrian alliance, wanted his sovereign's territories to remain a separate state. Upon the transformation of Hanover into a province of Prussia, however, he entered the Prussian chamber of deputies and the diet of the North German Confederation, turning down Chancellor Otto von Bismarck's offer to head the provisional government of the new province. From 1871 to 1897, with the exception of a four-year retirement (1883–87), he was a member of the all-German Reichstag and served as its president from 1873 to 1879. In 1877 Bismarck's attempt to bring him into the cabinet collapsed because of Emperor William I's opposition and Bennigsen's insistence on the appointment of two other party colleagues to ministerial posts. Relations with the German chancellor cooled when the National Liberals rejected Bismarck's protectionist policies in 1879, an action that also destroyed the power of the party. The same year a right-wing protectionist group split away, the next year a radical group.

In 1888 Emperor William II appointed Bennigsen president of the province of Hanover. Bennigsen retired from public life in 1897.

Bennington, town (township), one of the seats of Bennington County (the other is Manchester), in the southwest corner of Vermont, U.S., on the Walloomsac River, between the Taconic and Green ranges. It includes the villages of Old Bennington, Bennington, and North Bennington. The site, chartered as a town in 1749, was settled in 1761 and named for Benning Wentworth, governor of New Hampshire, who issued the grant. The settlers were led by Samuel Robinson, who camped in the river valley on his return from the French and Indian War and established the First Congregational Church. Within the year the group had organized a town-meeting government that has survived to this day with only slight modifications. These pioneers, among them Ethan Allen's "Green Mountain Boys," successfully resisted the claims to Bennington lands by absentee landlords of New York, and the independence of Vermonters was soon established.



Old First (Congregational) Church, Bennington, Vt.

W.D. Murphy—Shostal/EB Inc.

During the 19th century, the town grew into a textile, pottery, wood-products, and paper centre. Its present economy is based on manufacturing (furniture, textiles, batteries, lithography, and transistors), agriculture (dairy products, apples, maple sugar, and poultry), and tourism. Nearby ski areas attract many visitors.

Extant colonial buildings include the Walloomsac Inn (in continuous service since *c.* 1763), and the houses of Parson Jedediah Dewey, Gov. Isaac Tichenor, and Gen. David Robinson. The Old First Church (1806) was restored in 1937 as a state monument; the grave of Robert Frost, the poet, is in Old Burying Ground. The Bennington Museum, founded in 1876, has a historical collection centred on regional materials, particularly those associated with the Battle of Bennington in 1777; it includes genealogical records, the oldest stars and stripes flag in existence, an art collection containing stoneware and porcelain objects from local potteries, and paintings, including a number of works by Grandma Moses. The city is the seat of Southern Vermont College (1926) and Bennington College (1932). Pop. (1980) 15,815.

Bennington, Battle of (Aug. 16, 1777), in U.S. War of Independence, victory by American militiamen defending colonial military stores in Bennington, Vt., against a British raiding party.

In early August the British commander, Gen. John Burgoyne, hoped to capture needed supplies and overawe New Englanders by dispatching a well-equipped regiment to Bennington under the German colonel Friedrich Baum. On the 16th, Baum's force of 800 British, Germans, Loyalists, and Indians was decisively defeated by about 1,600 colonial troops gathered from neighbouring militia by Ethan Allen and Seth Warner and led by Gen. John Stark. Reinforcements on both sides arrived too late to influence the outcome, and about 700 of the British forces were taken prisoner. The outcome of this engagement went far in enhancing American morale.

The battle, which took place at the site of the present village of Walloomsac, N.Y. (several miles west of Bennington), contributed to the eventual defeat of Burgoyne (*see* Saratoga, Battles of). It is commemorated by a historical park near Walloomsac and by a 306-ft (93-m) obelisk at the village of Old Bennington.

Benno, SAINT (b. *c.* 1010, Hildesheim?, Saxony—d. probably June 16, *c.* 1106, Meissen, March of Thuringia; canonized 1523; feast day June 16), bishop of Meissen.

While a canon with the imperial collegiate church of Goslar, he was made bishop of Meissen in 1066. In the troubles between empire and papacy that followed, Benno took part against the emperor Henry IV, for which he was imprisoned. In 1085 he was deposed by the Synod of Mainz, but after the death of Pope Gregory VII, whose cause Benno championed, he submitted. On the recommendation of the antipope Clement III, Benno was restored to his see, which he held until his death. Other than legendary or traditional lore, little else is known of Benno's life. His canonization by Pope Adrian VI drew from Martin Luther a pamphlet entitled *Wider den neuen Abgott und alten Teufel, der zu Meissen soll erhoben werden* ("Against the New Idol and the Old Devil About to Be Set up at Meissen"). He is the patron saint of Munich, where his relics were enshrined in 1580.

Benny, Jack, original name BENJAMIN KUBELSKY (b. Feb. 14, 1894, Chicago—d. Dec. 27, 1974, Beverly Hills, Calif., U.S.), entertainer whose unusual comedic method and expert timing made him a legendary success in U.S. radio and television for more than 30 years.

Benny Kubelsky was reared in Waukegan, a small city north of Chicago, where his father operated a saloon and later a dry goods store. As a boy he helped out in the store and took up the violin, and by his high school years had become proficient with the instrument. He played it in vaudeville from 1912, and in 1918 when he was taken into the U.S. Navy he was assigned to entertainment duties. It was there that his comic talent came to light and, while he remained a competent violinist in private, on stage his violin soon became little more than a prop which he played ineptly for comic effect.

After World War I Benny returned to vaudeville as a comedian. He appeared in his first motion picture in 1927, completing 18 more between 1930 and 1945. The turning point in his career, however, came in 1932 when he entered radio and quickly gained a large following.

Audiences responded to Benny's type of humour. In an era of comedy characterized by broad jokes and rapid delivery, his style was subtle and languid. Over the years, he and his cast—including Eddie Anderson as Rochester, his chauffeur and valet; and Benny's wife, Sadie Marks, as Mary Livingstone, his nemesis—carefully developed his stage image as a vain, stingy man and would-be violinist. He was notable for his verbal inflection and his acute sense of timing.

"The Jack Benny Program" remained on network radio for 23 years, at which time Benny moved to television, where he appeared regularly until 1965.

Benois, Alexandre, Russian in full ALEKSANDR NIKOLAYEVICH BENOIS (b. May 4 [April 21, old style], 1870, St. Petersburg, Russia—d. Feb. 9, 1960, Paris), Russian theatre art director, painter, and ballet librettist who with Léon Bakst and Sergey Diaghilev cofounded the influential magazine *Mir iskusstva* ("World of Art"), from which sprang the Diaghilev Ballets Russes.

Benois aspired to achieve a synthesis of new western European trends and certain elements of traditional Russian folk art; *Mir iskusstva,* established in 1899 in St. Petersburg, attacked the low artistic standards of the realist Peredvezhniki Society and the deadening influence of the Russian Academy and stressed individualism and artistic personality. The magazine, which he coedited until 1904, soon exerted great influence on stage design.

Benois began his career (*c.* 1901) at the Mariinsky Theatre, St. Petersburg, as scenic designer for the ballets *Sylvia* and *Cupid's Revenge.* When the Diaghilev Ballets Russes opened in 1909, Benois designed decor and costumes for, among others, *Les Sylphides* (1909), *Giselle* (1910), and *Petrushka* (1911), on which he collaborated with Igor Stravinsky. His later works include grand designs for *La Valse* (1929, Ida Rubinstein Company), *The Nutcracker* (1940, Ballet Russe de Monte

Carlo), and *Graduation Ball,* for which he also wrote the libretto (1957, London Festival Ballet). Among his writings are *Reminiscences of the Ballet Russe* (1941) and *Memoirs* (1960).

In retrospect, Benois's collaboration with Stravinsky and Michel Fokine presented some of the greatest dance drama in history and helped found modern ballet. His niece, Nadia Benois, a contemporary painter, also designed decor for ballets, including *Dark Elegies* (1937, Ballet Rambert) and *The Sleeping Beauty* (1939, Sadler's Wells Ballet). She is the mother of the English actor, dramatist, and producer Peter Ustinov.

Benoît DE SAINTE-MAURE, Sainte-Maure also spelled SAINTE-MORE (fl. 12th century, probably from Sainte-Maure, near Poitiers, Fr.), author of an Old French poem in about 30,000 octosyllabic couplets, the *Roman de Troie* (*see* Troy, medieval legends of). Benoît's poem, a travesty of the story told in Homer's *Iliad,* is an immense Baroque tapestry of Greek lore and fable. His is the first version of the Troilus and Cressida story (R.K. Gordon, trans., *The Story of Troilus* [1934]). Benoît's poem, which analyzes various forms of love, was widely popular in its day.

Benoit, Peter (Léonard Léopold) (b. Aug. 17, 1834, Harelbeke, Belg.—d. March 8, 1901, Antwerp), Belgian composer and teacher responsible for the modern renascence of Flemish music.

He studied at the Brussels Conservatory and in 1857 won the Prix de Rome. He travelled in Germany and in 1861 went to France, where he conducted at the Bouffes-Parisiens. Back in Belgium (after 1863) he came under the influence of the novelist Hendrik Conscience, becoming an ardent proponent of a Flemish national movement in music. Benoit published numerous articles and pamphlets propagandizing Flemish music. In 1867 in Antwerp he founded the Flemish School of Music (later the Royal Flemish Conservatory), which he directed until his death.

His compositions include his *Rubens-cantata* (1877), which evoked historical events in Antwerp; the operas *Het dorp in't gebergte* (1857; "The Mountain Village") and *Pompeja* (1895); the oratorio *Lucifer* (1866), considered his masterpiece; the children's oratorio *De waereld in* (1878; "In the World"); and the *Quadrilogie religieuse* (1864). He turned from his early innovative, harmonic style to one of more simplicity. Most of his compositions were choral, many intended to be sung by the common people.

Benoni, town, Transvaal, South Africa, east of Johannesburg. It is situated at 5,419 ft (1,652 m) above sea level and covers two sides of a valley that borders four lakes. Benoni was established as a mining camp after the local discovery of gold in 1887. The local mining chairman, Sir George Farrar, landscaped the valley in the early 1900s and Benoni was officially declared a town in 1907. It is now part of the industrial complex of the Witwatersrand, particularly noted for its iron and steel works and brass foundry. Johannesburg (Jan Smuts) Airport is immediately northwest. Pop. (1978 est.) mun., 192,865.

Bénoué River (West Africa): *see* Benue River.

Benozzo DI LESE: *see* Gozzoli, Benozzo.

Benserade, Isaac de (b. either 1612, Normandy, Fr., or 1613, Paris—d. Oct. 20, 1691, Paris), minor but brilliant French literary light of the courts of Louis XIII and Louis XIV.

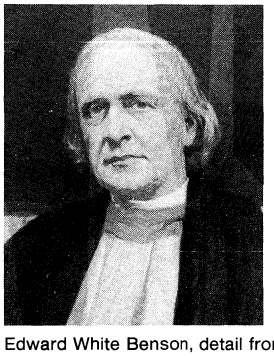
Benserade began visiting the salon of the Marquise de Rambouillet, the literary centre of Paris, in 1634, and wrote a succession of romantic verses that won him a reputation culminating in the "sonnets controversy" of 1649, in which his sonnet "Job" was pitted against Vincent Voiture's "Uranie" in a lively court debate over poetic style. Though Benserade was adjudged the loser, he became

Benserade, detail of an engraving by G. Edelinck
H. Roger-Viollet

a favourite and was repeatedly called on to write libretti for royal ballets, a function he discharged with a wit often regarded by his court audience as daring and even impertinent. Elected to the Académie Française in 1674, he was criticized in 1676 for his *Metamorphoses d'Ovide en rondeaux.* He distinguished himself, however, by his support of the candidacy of La Fontaine for the Académie and by his defense of the rationalism of Pierre Bayle, which the censorship threatened.

Benson, Edward White (b. July 14, 1829, Birmingham, Warwickshire, Eng.—d. Oct. 11, 1896, Hawarden, Cheshire), archbishop of Canterbury (1883–96), whose Lincoln Judgment (1890), a code of liturgical ritual, helped resolve the Church of England's century-old dispute over proper forms of worship.

After serving as assistant master at Rugby School, Warwickshire, from 1852 to 1858, he was made headmaster at Wellington College, Berkshire, in 1859. His study of Cyprian, the martyred bishop of Carthage (*c.* 200–258), contributed to a renewal in patristic scholarship and led to his posthumous *Cyprian* (1897). In 1873 Benson became chancellor of the diocese of Lincoln, where he founded a seminary and established night schools and university extension lectures. He was consecrated in 1877 as bishop of the new diocese of Truro, Cornwall, for which he superintended the building of a cathedral. Enthroned as archbishop of Canterbury in 1883, he regularly attended sessions of the House of Lords and sought reforms of church patronage and discipline, secured by acts of Parliament in 1892 and 1898. Through his organization in 1893 of the Central Church Committee for Church Defence and Instruction, he successfully resisted efforts to disestablish the Anglican Church in Wales.



Edward White Benson, detail from a portrait by Sir Hubert von Herkomer, 1883; in Lambeth Palace, London
By courtesy of the Archbishop of Canterbury; photograph, Courtauld Institute of Art

The most significant episode of Benson's archbishopric occurred during 1888–90, when he heard arguments in the case of Edward King, bishop of Lincoln, who had been charged with improper ritualism in the celebration of the Eucharist. For the first time since 1699, over the protests of King, the Archbishop of Canterbury convened the court and acted as sole judge of his bishops. Although the privy council of the church supported him in this decision, Benson ignored previous rulings of the council when he concluded the case with the Lincoln Judgment, a definition of liturgical practices sanctioned by a tradition of usage. Based on historical analysis of ritualistic practices, the Judgment held that certain forms of observance, such as altar lights and the singing of the Agnus Dei, were legitimate but that manual acts by the clergy not visible to the congregation and the sign of the cross in the blessing were illegal.

Benson facilitated a reconciliation among the various factions within the English Church and virtually brought to an end the prosecutions relating to ritualism that had plagued Anglicanism during the 19th century.

Among Benson's other activities were conversations begun with the church in Russia, reestablishment of the Anglican bishopric in Jerusalem, settlement of an ecclesiastical schism in Natal, and a mission to the unorthodox Assyrian Church. In addition to numerous volumes of sermons, his writings include a collection of prayers (1899) and *The Apocalypse* (1900).

Benson, Sir Frank (Robert) (b. Nov. 4, 1858, Alresford, Hampshire, Eng.—d. Dec. 31, 1939, London), British actor-manager whose

Sir Frank Benson, 1882
By courtesy of the Victoria and Albert Museum, London

touring company and acting school were important influences on contemporary theatre. While at New College, Oxford University, he produced *Agamemnon,* the first play to be done there in the original Greek. In 1882 he made his first professional appearance at the Lyceum Theatre, London, under Sir Henry Irving, playing the role of Paris in *Romeo and Juliet.* The next year he formed a company of his own. In 1886 he married Gertrude Constance Featherstonhaugh (1860–1946), who acted in his company and played leading parts with him. Besides appearing in London he toured the English provinces regularly in Shakespeare and went to Canada (1913) and South Africa (1921). His finest parts were Hamlet, Coriolanus, Richard II, Lear, and Petruchio. From the first he devoted himself largely to the production of Shakespeare's plays. After 1888 he organized 26 of the annual Stratford-upon-Avon Shakespearean festivals. His acting school was founded in 1901. He was knighted in 1916 in Drury Lane Theatre. *My Memoirs* was published in 1930.

Bent, Charles (b. Nov. 11, 1799, Charleston, Va., U.S.—d. Jan. 19, 1847, Taos [New Mexico]), fur-trading pioneer who became civil governor for the United States of the newly captured province of New Mexico.

After moving from Charleston, Va., to Marietta, Ohio, in 1805, the Bent family settled in

St. Louis the following year. Charles and his brother William developed an interest in the fur trade, and they probably worked for John Jacob Astor's American Fur Company during the early 1820s.

In 1824 the two brothers joined with Ceran St. Vrain on a fur-trapping expedition on the upper Arkansas River. In 1828 the three organized the company of Bent & St. Vrain and built Bent's Fort near La Junta, in the Louisiana Territory (now Colorado). It became the most famous of the mountain trading posts.

Leaving William behind to manage the post, Charles Bent and St. Vrain moved on to the Mexican province of New Mexico, where they directed the field operations of their company. In 1835 Charles settled at San Fernando de Taos. Eleven years later, during the Mexican War, U.S. forces took over the province, and Bent was appointed civil governor. After four months, the U.S. troops withdrew, and Charles Bent was one of several U.S. civilians killed in a revolt by Mexican and Pueblo Indians in the territory.

Bent, James Theodore (b. March 30, 1852, Leeds, Yorkshire, Eng.—d. May 5, 1897, London), British explorer and archaeologist who excavated the ruined Zimbabwe (*dzimbahwe; i.e.*, stone houses, or chiefs' graves) in the land of the Shona people of eastern Rhodesia (now Zimbabwe Rhodesia).

Bent first travelled to islands of the Aegean and, in 1890, to southern Turkey before he began in 1891 to examine the great Zimbabwe remains that he described in *The Ruined Cities of Mashonaland* (1892). Later archaeological searches took him to Ethiopia, the Nilotic Sudan, and the southern Arabian peninsula.

bent grass, any of the annual and perennial grasses of the genus *Agrostis* (family Poaceae), with about 125 species distributed in temperate and cool parts of the world and at high altitudes in subtropical and tropical areas. At least 40 species are found in the United States; some are weeds, others are forage and turf plants. Bent grasses have slender stems, flat blades, and open or dense clusters of small spikelets. Many have creeping stolons (horizontal, subsurface stems).

Redtop (*A. gigantea*), 1 to 1.5 metres (about 3 to 5 feet) tall, was introduced into North America during colonial times as a hay and pasture grass. It spreads by rhizomes and has reddish flowers. The smaller, creeping bent (*A. stolonifera* variety *palustris*), known as fiorin in England, whose stolons grow up to 1.2 m per season, and colonial bent (*A. tenuis*) are popular lawn grasses. The many strains of both species are planted in golf courses and bowling greens around the world; they are closely cut to develop a finely textured, spongy firm turf.

Creeping bent (*Agrostis stolonifera* variety *palustris*)
R.G. Doord from the Natural History Photographic Agency—EB Inc.

Benten, also called BENZAITEN (Japanese: Divinity of the Reasoning Faculty), in Japanese mythology, one of the Shichi-fuku-jin (Seven Gods of Luck); the Buddhist patron goddess of literature and music, of wealth, and of femininity. She is generally associated with the sea; many of her shrines are located near it, and she is frequently depicted riding on, or accompanied by, a sea dragon. According to one legend, she married a sea dragon, thus putting an end to his ravages of the island Enoshima. She is often shown playing the *biwa,* a kind of lute. A white serpent serves as her messenger.

Benten playing a *biwa,* copy of a painting by Yoshinobu, 17th century; in the Museum für Völkerkunde, Vienna
By courtesy of the Museum fur Volkerkunde, Vienna

Benten is identified with the Indian goddess Sarasvatī, also a patron of literature and the arts, who probably travelled to Japan along with Buddhism. *See also* Shichi-fuku-jin.

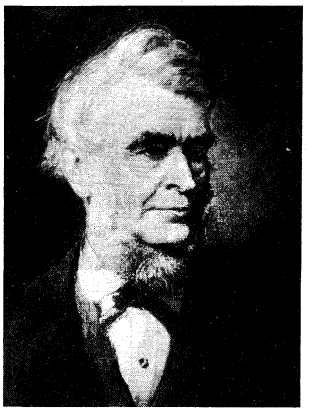
Bentham, George (b. Sept. 22, 1800, Stoke, Devon, Eng.—d. Sept. 10, 1884, London), British botanist whose classification of seed plants (Spermatophyta), based on an exhaustive study of all known species, served as a foundation for modern systems of vascular plant taxonomy.

Impressed by the French naturalist Pyrame de Candolle's analytic tables of French flora, Bentham began to study botany while managing his father's estate near Montpellier, Fr., and serving as secretary (1826–32) to his uncle, the British philosopher and jurist Jeremy Bentham. In 1833, upon his inheritance of wealth following the deaths of his father and uncle, Bentham turned his full attention to botany.

After he donated his herbarium of more than 100,000 specimens to the Royal Botanical Gardens at Kew, Surrey, in 1854, the director of the Gardens, Sir William Hooker, invited him to establish permanent quarters there. At Kew, Bentham participated in the Gardens' definitive survey of floras of the British colonies and possessions, for which he prepared the *Flora Hongkongensis* (1861) and the *Flora Australiensis* (7 vol., 1863–78), cataloging and describing more than 7,000 species.

Realizing the inadequacy of current criteria for assigning species to their appropriate genera, he undertook the ambitious task of compiling an unambiguous descriptive classification of all seed plants. Collaborating with Hooker's son Sir Joseph, Bentham spent 27 years in research and examination of specimens for the work *Genera Plantarum* (3 vol., 1862–83). It was published in Latin and covered 200 "orders" (analogous to what are now known as families) of 7,569 genera, which included more than 97,200 species.

Although their general system of classification represented little more than a refinement of Candolle's taxonomy and failed to recognize the dynamic nature of plant speciation postulated by Charles Darwin's principles of organic evolution, it established an authoritative taxonomy of genera and species that has been largely adopted by modern systems of classification based upon evolutionary theory.



George Bentham, oil painting by Lewis Dickensen, 1870; in the collection of the Linnean Society of London
BBC Hulton Picture Library

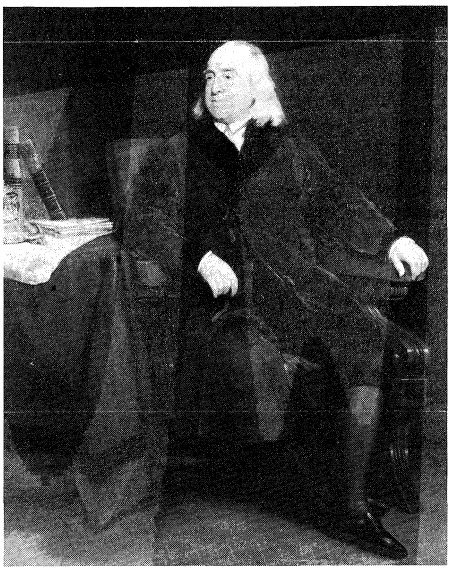
Bentham and Hooker's taxonomy, with modifications, persists throughout the British Commonwealth. Bentham's *Handbook of British Flora* (1858; 7th ed., 1924) remains a standard work.

Bentham, Jeremy (b. Feb. 15, 1748, London—d. June 6, 1832, London), English philosopher, economist, and theoretical jurist, the earliest and chief expounder of Utilitarianism.

Early life and works. At the age of four, Bentham, the son of an attorney, is said to have read eagerly and to have begun the study of Latin. Much of his childhood was spent happily at his two grandmothers' country houses. At Westminster School he won a reputation for Greek and Latin verse writing. In 1760 he went to Queen's College, Oxford, and took his degree in 1763. In November he entered Lincoln's Inn to study law and took his seat as a student in the King's Bench division of the High Court, where he listened with rapture to the judgments of Chief Justice Lord Mansfield. In December 1763 he managed to hear Sir William Blackstone lecture at Oxford but said that he immediately detected fallacies that underlay the grandiloquent language of the future judge. He spent his time performing chemical experiments and speculating upon the more theoretical aspects of legal abuses rather than in reading law books. On being called to the bar, he "found a cause or two at nurse for him, which he did his best to put

to death," to the bitter disappointment of his father, who had confidently looked forward to seeing him become lord chancellor.

Bentham's first book, *A Fragment on Government,* appeared in 1776. The subtitle, "being an examination of what is delivered, on the subject of government in general, in the introduction to Sir William Blackstone's *Commentaries,*" indicates the nature of the work. Bentham found the "grand and fundamental" fault of the *Commentaries* to be Blackstone's



Jeremy Bentham, detail of an oil painting by H.W. Pickersgill, 1829; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

"antipathy to reform." Bentham's book, written in a clear and concise style different from that of his later works, may be said to mark the beginning of philosophic radicalism. It is also a very good essay on sovereignty. Lord Shelburne (afterward 1st Marquess of Lansdowne), the statesman, read the book and called upon its author in 1781. Bentham became a frequent guest at Shelburne's home. At this period Bentham's mind was much-occupied with writing the work that was later published in French in 1811 by his admirer Étienne Dumont and entitled *Théorie des peines et des récompenses.* This work eventually appeared in English as *The Rationale of Reward* (1825) and *The Rationale of Punishment* (1830). In 1785 Bentham started, by way of Italy and Constantinople, on a visit to his brother, Samuel Bentham, an engineer in the Russian armed forces; and it was in Russia that he wrote his *Defence of Usury* (published 1787). This, his first essay in economics, presented in the form of a series of letters from Russia, shows him as a disciple of the economist Adam Smith but one who argued that Smith did not follow the logic of his own principles. Bentham held that every man was the best judge of his own advantage, that it was desirable from the public point of view that he should seek it without hindrance, and that there was no reason to limit the application of this doctrine in the matter of lending money at interest. His later works on political economy followed the laissez-faire principle, though with modifications. In the "Manual of Political Economy" he gives a list of what the state should and should not do, the second list being much longer than the first.

Mature works. Disappointed, after his return to England in 1788, in the hope of making a political career, he settled down to discovering the principles of legislation. The great work on which he had been engaged for many years, *An Introduction to the Principles of Morals and Legislation,* was published in 1789. In this book he defined the principle of utility as "that property in any object whereby it tends to produce pleasure, good or happiness, or to prevent the happening of mischief, pain, evil or unhappiness to the party whose interest is considered." Mankind, he said, was governed by two sovereign motives, pain and pleasure; and the principle of utility recognized this state of affairs. The object of all legislation must be the "greatest happiness of the greatest number." He deduced from the principle of utility that, since all punishment involves pain and is therefore evil, it ought only to be used "so far as it promises to exclude some greater evil."

The fame of his writings spread widely and rapidly. Bentham was made a French citizen in 1792, and in later life his advice was respectfully received in several of the states of Europe and America. With many of the leading men of these countries Bentham maintained an active correspondence. The codification of law was one of Bentham's chief preoccupations, and it was his ambition to be allowed to prepare a code of laws for his own or some foreign country. He was accused of having underestimated both the intrinsic difficulties of the task and the need for diversity of institutions adapted to the tradition and civilization of different countries. Even so, Bentham must be reckoned among the pioneers of prison reform. It is true that the particular scheme that he worked out was bizarre and spoiled by the elaborate detail that he loved. "Morals reformed, health preserved, industry invigorated, instruction diffused" and other similar desiderata would, he thought, be the result if his scheme for a model prison, the "Panopticon," were to be adopted; and for many years he tried to induce the government to adopt it. His endeavours, however, came to nothing; and though he received £23,000 in compensation in 1813, he lost all faith in the reforming zeal of politicians and officials.

In 1823 he helped to found the *Westminster Review* to spread the principles of philosophic radicalism. Bentham had been brought up a Tory, but the influence of the political theory of the Enlightenment served to make a democrat of him. As far back as 1809 he had written a tract, *A Catechism of Parliamentary Reform,* advocating annual elections, equal electoral districts, a wide suffrage, and the secret ballot, which was, however, not published until 1817. He drafted a series of resolutions based on this tract that were introduced in the House of Commons in 1818. A volume of his *Constitutional Code,* which he did not live to complete, was published in 1830.

After Bentham's death, in accordance with his directions, his body was dissected in the presence of his friends. The skeleton was then reconstructed, supplied with a wax head to replace the original (which had been mummified), dressed in Bentham's own clothes and set upright in a glass-fronted case. Both this effigy and the head are preserved in University College, London.

Bentham's life was a happy one. He gathered around him a group of congenial friends and pupils, such as the philosopher James Mill, father of John Stuart Mill, with whom he could discuss the problems upon which he was engaged. His friends, too, practically rewrote several of his books from the mass of rough though orderly memoranda that Bentham himself prepared. Thus the *Rationale of Judicial Evidence,* 5 vol. (1827), was put in its finished state by J.S. Mill and the *Book of Fallacies* (1824) by Peregrine Bingham. The services of Étienne Dumont in recasting as well as translating the works of Bentham were still more important.

Assessment. Bentham was less a philosopher than a critic of law and of judicial and political institutions. Unfortunately, he was not aware of his limitations. He tried to define what he thought were the basic concepts of ethics, but the majority of his definitions are oversimple or ambiguous or both, and his "felicific calculus," a method for calculating amounts of happiness, as even his warmest admirers have admitted, cannot be used. As a moralist and psychologist, Bentham has similarly appeared to be inadequate; his arguments, though sometimes elaborate, rest too often on insufficient and ambiguous premises. His analyses of the concepts that men use to describe and explain human behaviour are too simple. He seems to have believed both that man is completely selfish and that everyone ought to promote the greatest happiness, no matter whose. Not even the formula of which he made so much, "the greatest happiness of the greatest number," possesses a definite meaning.

Given all this, it should be noted that the publication since World War II of Bentham's previously unknown manuscripts has done much to enhance his reputation as a philosopher of law. His Victorian editor, Sir John Bowring, cut out from Bentham's work much that was both original and well-argued. The more up-to-date scholarship of such Bentham specialists as Herbert L.A. Hart, J.H. Burns, Frederick Rosen, and Lea Campos-Boralevi has revealed a more rigorous and systematic thinker than the legendary muddled Utilitarian that Bentham appeared to be to earlier generations.

As a critic of institutions Bentham was admirable. In his *Rationale of Judicial Evidence* he describes the methods that a court should use to get at the truth as quickly as possible; and in the *Essay on Political Tactics* he describes what he considers the most effective forms of debate for a legislative assembly—an account largely based on the procedure of the House of Commons. In these works and in others Bentham is concerned to discover what makes for efficiency. Though he defines efficiency in terms of happiness, his reader need not do so; or, if he does, he need not think of happiness as Bentham did. Bentham's assumptions about what makes for happiness are often quite ordinary and sensible; the reader can accept them and still insist that happiness is not to be defined in terms of pleasure and is not to be measured. Whatever is excellent, ingenious, and original in Bentham—and there is a great deal of it—need not depend on the "felicific calculus" and "the greatest happiness of the greatest number." (J.P.Pl./Ed.)

BIBLIOGRAPHY. J.H. Burns (gen. ed.), *The Collected Works of Jeremy Bentham* (1968–); Leslie Stephen, *The English Utilitarians,* vol. 1 (1900, reprinted 1968), still one of the best general accounts of Bentham's life and thought; Elie Halevy, *La Formation du radicalisme philosophique,* 3 vol. (1901–04; *The Growth of Philosophical Radicalism,* 1928), a study of Bentham's philosophy seen in the context of the history of English thought in his time. Later works on Bentham's thought and philosophy include Herbert L.A. Hart, *Essays on Bentham* (1982); Frederick Rosen, *Jeremy Bentham and Representative Democracy* (1983); Lea Campos-Boralevi, *Bentham and the Oppressed* (1984); and Ross Harrison, *Bentham* (1983).

Bentham, Sir Samuel (b. Jan. 11, 1757, England—d. May 31, 1831, London), British engineer, naval architect, and navy official in Russia (1780–91) and England (from 1795) who was an early advocate of explosive-shell weapons for warships.

Bentham led Russian vessels fitted with shell guns to victory over a larger Turkish force (June 7, 1788). As inspector of naval works in England, he developed the Arrow class of sloops used against France. He was the brother of the philosopher Jeremy Bentham and father of the botanist George Bentham.

benthos, the assemblage of organisms inhabiting the seafloor. Benthic epifauna live upon

the seafloor or upon bottom objects; the so-called infauna live within the sediments of the seafloor. By far the best-studied benthos are the macrobenthos, those forms larger than 1 mm (0.04 inch), which are dominated by polychaete worms, pelecypods, anthozoans, echinoderms, sponges, ascidians, and crustaceans. Meiobenthos, those organisms between 0.1 and 1 mm in size, include polychaetes, pelecypods, copepods, ostracodes, cumaceans, nematodes, turbellarians, and foraminiferans. The microbenthos, smaller than 0.1 mm, include bacteria, diatoms, ciliates, amoeba, and flagellates.

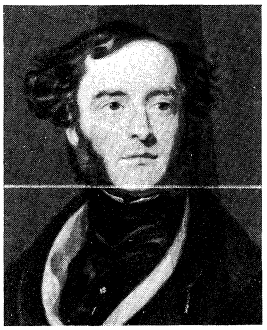
The variety and abundance of the benthos vary with latitude, depth, water temperature and salinity, locally determined conditions such as the nature of the substrate, and ecological circumstances such as predation and competition. In shallow water the rapidly changing physical environment outweighs biotic factors. Infaunal environmental conditions are less subject to change than epifaunal.

The principal food sources for the benthos are plankton and organic debris from land. In shallow water, larger algae and flowering plants are important, and, where light reaches the bottom, benthic photosynthesizing diatoms are also a significant food source. Hard and sandy substrates are populated by suspension feeders such as sponges and pelecypods. Softer bottoms are dominated by deposit eaters, of which the polychaetes are the most important. Fishes, starfish, snails, cephalopods, and the larger crustaceans are important predators and scavengers.

Benti, also spelled BENTY, town and seaport, western Guinea, western Africa. It lies at the head of the estuary of the Mélikhouré (Melacorée) River, 10 miles (16 km) upstream from the Atlantic coast. Important for the export of bananas (second only to Conakry), its port can accommodate oceangoing vessels of 21-foot (6-metre) draft. Benti is also a collecting and trading centre for pineapples, swamp rice, fish, salt, coconuts, and palm oil and kernels that are grown in the hinterland by the Mandenyi (Mmani) people. Formerly the site of a French military post (founded in the 1860s), the town has an agricultural training school.

Bentinck, Lord George, in full WILLIAM GEORGE FREDERICK CAVENDISH-SCOTT-BENTINCK, LORD BENTINCK (b. Feb. 27, 1802, Welbeck, Nottinghamshire, Eng.—d. Sept. 21, 1848, Welbeck), British politician who in 1846–47 articulately led the protective-tariff advocates who opposed the free-trade policy of Prime Minister Sir Robert Peel.

The second son of the 4th Duke of Portland, Bentinck served in the army before entering (1828) the House of Commons. Initially a moderate Whig, he voted for the emancipation (parliamentary enfranchisement) of Roman Catholics in 1829 and for the Reform Bill of 1832, but subsequently he became more conservative. In 1846, when Peel declared in favour of free trade and against the Corn Laws, Bentinck devoted himself completely and effectively to the leadership of the protectionists. With his purely political antagonism he combined personal vindictiveness toward Peel, who he believed had "hounded to the death" the former prime minister George Canning, a relative of Bentinck.



Lord George Bentinck, detail of an oil painting by S. Lane, 1836; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Apart from the tariff question, Bentinck's views proved too independent for the comfort of most of his colleagues. In opposition to the rest of his party, for instance, and to please his chief adviser, Benjamin Disraeli, he supported a bill for removing Jewish political disabilities. The result was that in December 1847 he resigned his leadership of the protectionist opposition.

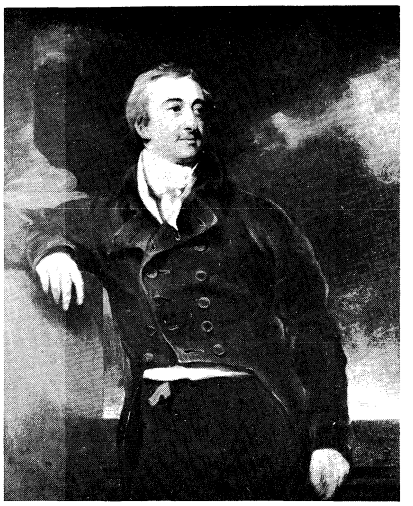
A celebrated sportsman, Bentinck was the last member of the House of Commons to wear a pink hunting coat there; and he exercised great authority at race meetings. Until within three years of his death he was little-known out of the sporting world. He then abandoned his connection with the turf, disposed of his magnificent string of race horses (including the next Derby winner), and devoted his whole energies to the laborious duties of a parliamentary leader.

Bentinck, Lord William, in full WILLIAM HENRY CAVENDISH-BENTINCK, LORD BENTINCK (b. Sept. 14, 1774, Bulstrode, Buckinghamshire, Eng.—d. June 17, 1839, Paris), British governor-general of Madras (in effect, of India) from 1828 to 1835. He reformed the finances, opened up administrative and judicial posts to Indians, and suppressed such practices as thuggee, or ritual murder by robber gangs. The innovations effected in his years of office were decisive milestones on the road that was ultimately to lead to independence more than a century later.

Early career. The second son of the 3rd Duke of Portland, Bentinck, at the age of 17, received a commission as ensign in the Coldstream Guards; by 1794 he was a lieutenant colonel. Born to wealth and rank, he was a promising, if not outstanding, young officer. Nevertheless, his appointment as governor of Madras in 1803, at the early age of 29, caused surprise.

Although he performed his duties satisfactorily enough, his administration was clouded by his disagreements with his council and was abruptly terminated by the mutiny at Vellore. An unwise order by the commander in chief of the Madras Army had forbidden the native troops to wear their traditional beards and turbans; Bentinck, even more unwisely, would not allow the order to be rescinded. The consequence was a serious mutiny in July 1806, accompanied by attacks on officers and British troops. The outbreak was suppressed with heavy loss of life, and the ill-considered order was finally withdrawn. Bentinck, nevertheless, was held responsible and recalled. Believing he had been treated unjustly, he pressed for the next 20 years for a chance to vindicate his name by service in India.

Tour in Sicily. The Napoleonic Wars were on, and he was next assigned to Spain, where he commanded a brigade at Corunna, after which he was appointed commander of the British troops in Sicily. Italy was then in the hands of Napoleon, but in Sicily the Bourbon monarchs of Naples still reigned under the protection of the British fleet. Bentinck's orders were to raise a Sicilian Army of 10,000 men to supplement his 5,000 British soldiers and land on the east coast of Spain with his combined forces to assist in the campaign against Napoleon. Had Bentinck been no more than a soldier, his course would have been clear. But he was a man of imagination, a Whig (a liberal) by family tradition, and a radical in the eyes of his contemporaries. Therefore, besides merely raising a Sicilian Army, he engineered the deposition of the Bourbon king—in favour of the heir apparent—as well as the adoption of a liberal Sicilian constitution with a legislative body modeled on the English Parliament. Further, he planned to invade Italy and rally the people not only to expel Napoleon but to set up a constitutional monarch. The British government would never have supported such a plan; in fact, it intended eventually to restore Austrian rule in Italy. The Italian landing did not take place at that time, however, and Bentinck delayed his landing in Spain beyond the date when he was most needed. When he finally did land in Italy, at Genoa in 1814, his liberal proclamations again embarrassed his government, and he was recalled to England in 1815. On his return, he was elected to the House of Commons.



Lord William Bentinck, oil painting by Sir Thomas Lawrence; in the collection of the Duke of Portland

By courtesy of His Grace the Duke of Portland; photograph, Gordon Hull

Governor-general of India. He refused reappointment to the governorship of Madras in 1819, waiting to attain his real ambition—the appointment as governor-general of India and governor of Bengal, which came in 1827. Bentinck's immediate instructions were to rescue India from its financial difficulties; at this time the government in India operated on an annual deficit of about £1,500,000. Bentinck soon succeeded in turning the deficit into a surplus of about the same amount. He next turned to judicial and administrative reforms, which included making more administrative and judicial positions available to Indians and improving the salaries and status of Indian judges. Bentinck also made English, instead of Persian, the language of the higher courts and of higher education and arranged for financial aid to colleges, which were to be adapted to the Western models.

Bentinck showed great courage and humanity by his decision to abolish suttee (*satī*), the custom of burning widows alive with the corpse of their husbands. Previous governors-general had shrunk from prohibiting the custom as an interference in religion and one particularly likely to upset the Indian Army; but Bentinck cut through these hesitations without facing much open opposition. He was also responsible for the measures taken to suppress the murder of unwanted children, human sacrifice, and the *thags* (thugs)—bands of robbers, bound together by oaths and ritual, who murdered unsuspecting travelers in the name of the goddess Kālī. Flogging in the Indian Army was also abolished, long before it ended in the British Army.

Assessment. Bentinck left India in March 1835 and died in Paris a few years later. It has been argued that the reforms he initi-

ated and those that followed in the next 20 years—which accelerated the westernization of India—were partly responsible for the Indian Army's Mutiny of 1857. That argument may have little force; his reforms were liberal, not radical, and would eventually have become inevitable. Bentinck was not an original thinker; his philosophical masters were the Utilitarians Jeremy Bentham and James Mill; his practical instructor, especially in the field of education, was the historian Thomas Babington Macaulay, among others. He borrowed useful elements from the creed of his liberal Whig ancestors and of Bentham and combined them in policies that were sensible, practical, and humanitarian. Toward the end of his career he had lost the impetuosity that had characterized his earlier years in Sicily and the tactlessness that had appeared when he first held office in Madras. Though certainly not the most brilliant of the governors general, in solid achievements and in utilizing the resources available to him, he must rank among the most successful. (P.Ma.)

BIBLIOGRAPHY. There is no good biography. D.C. Boulger, *Lord William Bentinck,* vol. 17 in *Rulers of India* (1892), is below the usual standard of that series. See also John Rosselli, *Lord William Bentinck and the British Occupation of Sicily, 1811–1814* (1956), and *Lord William Bentinck: The Making of a Liberal Imperialist, 1774–1839* (1974). C.H. Philips (ed.), *The Correspondence of Lord William Cavendish Bentinck, Governor-General of India, 1828–1835,* 2 vol. (1977), to some extent fills the gap.

Bentinck, William Henry Cavendish: *see* Portland, William Henry Cavendish Bentinck, 3rd duke of.

Bentivoglio FAMILY, Italian family that controlled Bologna during the second half of the 15th century.

Long prominent in Bolognese affairs, the Bentivogli are first recorded there in 1323. Emboldened by the power that they had gained as pro-papist Guelf chiefs in the 14th century, they made two unsuccessful attempts to seize power. First, Giovanni I Bentivoglio declared *signore* (lord) in 1401, was defeated in 1402 by the Visconti of Milan, who were expanding their territory. Second, Anton Galeazzo, who seized power in 1420, was forced to yield to Pope Martin V, who had reestablished papal authority.

The family was unable to dominate Bologna until Annibale (died 1445), son of Anton Galeazzo, returned from exile (1438) to become virtual *signore* from 1443 to 1445. Upon Annibale's assassination, the Bentivogli chose as his successor Sante (1424–63), a little-known member of the family who had been reared in Florence. Although nominally only a member of the Sixteen, the city's ruling body, Sante, in fact, ruled Bologna. He reached an extremely important agreement with the papacy (*Capitula,* 1447) defining the extent of Bologna's independence from papal control. Sante Bentivoglio established his family's close relationship with the Sforza family of Milan, which often was an important ally during wars.

Sante's successor, Giovanni II (1443–1508), improved the town and its waterways, made the army more efficient, and maintained a family tradition of patronage of the arts and letters. He successfully evaded the designs of Pope Paul II, who wished to increase papal control of Bologna.

Having been the target of many conspiracies, Giovanni became suspicious and so tyrannical that, when the Bentivogli were challenged by Pope Julius II, they received little popular support and were driven from Bologna in 1506. The family finally moved to Ferrara. To the Ferranese branch belonged many gifted persons, including the writers and diplomats Cardinals Guido (1579–1644) and Cornelio (1668–1732).

Bentivoglio, Guido (b. Oct. 4, 1579, Ferrara, Ferrara—d. Sept. 7, 1644, Rome), Italian churchman, diplomat, and historian, whose writings give precise accounts of his diplomatic activities and of affairs in the countries he visited. Pope Paul V sent him as nuncio to Flanders (1607–15) and to France (1616–21) and created him cardinal (January 1621).

Among Bentivoglio's important works are his *Relazioni in tempo delle sue nunziature* (1629; partial Eng. trans., *Historical Relations of the United Provinces and Flanders,* 1652); his *Della guerra di Fiandra* (1632–39; *The Compleat History of the Warrs of Flanders,* 1654), and his diplomatic letters to the papal secretariat of state (ed. by L. De Steffani, *La Nunziatura di Francia del cardinale Guido Bentivoglio,* 4 vol., 1863–70, and by R. Belvederi, *Guido Bentivoglio diplomatico,* 1947). Bentivoglio's *Opere storiche* were edited with a life by L. Barotti and his *Memorie e lettere* were edited (1934) by C. Panigada.

Where the same name may denote a person, place, or thing, the articles will be found in that order

Bentley, Arthur F(isher) (b. Oct. 16, 1870, Freeport, Ill., U.S.—d. May 21, 1957, Paoli, Ind.), U.S. political scientist and philosopher known for his work in epistemology, logic, and linguistics and for his contributions to the development of a behavioral methodology of political science.

Bentley received his B.A. in 1892 and his Ph.D. in 1895 from Johns Hopkins University and taught a seminar in sociology the following year at the University of Chicago. He then engaged in reporting and editorial work for the *Times-Herald* and *Record-Herald* of Chicago until 1910, when he retired to Paoli, Ind., to manage his orchard and write. He was active in the Red Cross during World War I and was Indiana leader of the presidential campaign of Sen. Robert M. La Follette of the Progressive Party in 1924. In *The Process of Government: A Study of Social Pressures* (1908), his most noted work, Bentley attempted to develop a methodology of behavioral social science research and urged concentration of study on overt human activity, the raw material of the political process. He arranged political data in terms of groups, interests, and pressures (a given activity might be viewed as the activity of a group, the expression of an interest, or the exertion of pressure). He did not attempt to formulate a general group theory and in his later work was prepared to consider the individual as the focal point of inquiry into the political process. Concerned more with methodology than with theory, he saw the study of manifest behaviour as the way to more profound understanding of human affairs. Together with John Dewey, Bentley developed a "transactional" view of social explanation that went beyond the existing prescientific "self-action" and mechanistic "interaction" approaches and postulated knowledge as a social phenomenon.

In *The Process of Government* Bentley dealt with the social nature of language, in which all description and thought are to be found. Other works by Bentley include *Relativity in Man and Society* (1926), *Linguistic Analysis of Mathematics* (1932), *Behavior, Knowledge, Fact* (1935), *Knowing and the Known* (1949, with John Dewey), and *Inquiry into Inquiries: Essays in Social Theory* (1954).

Bentley, E(dmund) C(lerihew) (b. July 10, 1875, London—d. March 30, 1956, London), Britishjournalist and man of letters who is remembered as the inventor of the clerihew (*q.v.*) and for his other light verse and as the author of *Trent's Last Case* (1913), a classic detective story that remains a best-seller.

After attending St. Paul's School in London (where he met G.K. Chesterton, who became his closest friend) and the University of Oxford, Bentley lived in London and studied law. He soon abandoned the law, however, for journalism, which he practiced for most of his life.

The clerihew, a "baseless biography," consisting of a four-line stanza of two rhyming couplets, the first rhyme being provided by the name of the subject, was introduced in *Biography for Beginners,* by "E. Clerihew" (1905), and was immediately popular and soon widely imitated. *More Biography* (1929) was followed by *Baseless Biography* (1939), illustrated by Bentley's son, Nicolas. In *Clerihews Complete* (1951) all Bentley's clerihews are collected.

Bentley wrote *Trent's Last Case* in exasperation at the infallibility of Sherlock Holmes, and the book has been said to mark the end of the Holmes era in detective fiction. Two decades later, Bentley revived this character in *Trent's Own Case* (1936; with Warner Allen) and in *Trent Intervenes* (1938), a collection of short stories.

Bentley, Eric (Russell) (b. Sept. 14, 1916, Bolton, Lancashire, Eng.), critic, translator, and stage director responsible for introducing the works of many European playwrights to the United States and known for his original, literate reviews of theatre and critical works on drama.

Bentley's Ph.D. dissertation from Yale was expanded into the book *A Century of Hero Worship* (1944; reissued as *The Cult of the Superman,* 1969). From 1948 to 1951 Bentley directed in numerous European cities, including Dublin, Zurich, and Padua. In 1950 in Munich he worked with Bertolt Brecht on a production of Brecht's play *Mother Courage.* Concurrent with his directing, Bentley contributed reports on European theatre to *Theatre Arts* and the *Kenyon Review* in the U.S. Bentley's translations of Brecht and reviews of European theatre won him recognition and various grants in the U.S. Since 1974 he has been professor of theatre at the State University of New York (Buffalo).

Bentley's criticism is noteworthy for covering practical, aesthetic, and philosophical aspects of theatre, and it stems from a belief that art must rescue humanity from meaninglessness. Rejecting simple theories, Bentley's books are exhilarating for the enthusiasm with which he embraces a blend of reason and creativity. Criticized by some for his negative opinion of the Broadway stage and popular theatre in general, Bentley is defended by others who maintain that his beliefs are based on a solid critical approach. His *The Life of the Drama* (1964) has been hailed as one of the best general books on the theatre ever written. Other books include *The Playwright as Thinker* (1946; Eng. ed. *The Modern Theatre,* 1948), *In Search of Theater* (1953), *The Theory of the Modern Theatre* (1968, rev. ed. 1976), and the *Brecht Commentaries* (1981).

Bentley, Richard (b. Jan. 27, 1662, Oulton, Yorkshire, Eng.—d. July 14, 1742, Cambridge, Cambridgeshire), British clergyman, one of the great figures in the history of classical scholarship who combined wide learning with critical acuteness. Gifted with a powerful and logical mind, he was able to do much to restore ancient texts and to point the way to new developments in textual criticism and scholarship.

He was educated at Wakefield Grammar School and St. John's College, Cambridge. In 1689 he made the acquaintance of John Mill at Oxford, who asked him to look through the proof sheets of the Oxford edition of the chronicler John Malalas. The request gave rise to Bentley's *Epistola ad Joannem Millium* (1691), a short treatise in which his skill

Richard Bentley, detail of an oil painting by James Thornhill, 1710; in Trinity College, Cambridge.

By courtesy of the Master and Fellows of Trinity College, Cambridge, Eng.

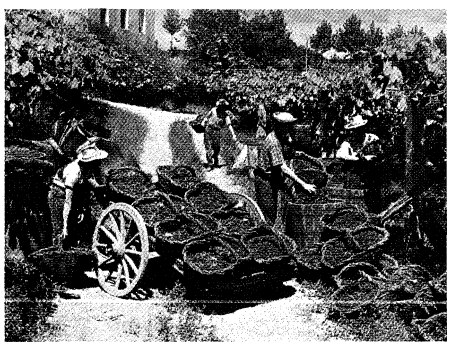
in textual emendation and his knowledge of ancient metre were strikingly displayed.

Bentley was appointed Boyle lecturer at Oxford in 1692, and in 1694 he became keeper of the Royal Library and fellow of the Royal Society. In 1699 he published his *Dissertation upon the Epistles of Phalaris,* in which he attacked the genuineness of the epistles, bringing all his learning and critical powers to bear in proof of their spuriousness.

In 1700 Bentley was chosen master of Trinity College, Cambridge, and in 1717 he became regius professor of divinity. His tenure as master was marked by friction and litigation. His domineering temper and his contemptuous treatment of the fellows led to various attempts to secure his ejection and embroiled him in controversy and feuding for the next 30 years.

Through it all, however, Bentley continued his classical studies. He published a critical appendix to John Davies' edition of Cicero's *Tusculan Disputations* in 1709, and two years later he published an edition of Horace. His later works include an edition of Terence, published in 1726, together with the fables of Aesop and the *Sententiae* of Publilius Syrus, and in 1739 an edition of Manilius. On other classical authors, such as Nicander, Plautus, Lucretius, and Lucan, he left notes, which were published after his death. In his later years he concerned himself mainly with Latin authors; he nonetheless had planned an edition of Homer which, though never brought to fruition, had an important result in that he discovered the significance for the text of the lost letter *digamma.*

Bento Gonçalves, city, northeastern Rio Grande do Sul state, southern Brazil. Situated in the hills overlooking the Rio Jaguari Valley, Bento Gonçalves is a commercial centre in a fertile agricultural region settled by Italians in the late 19th century. Viticulture is the primary economic activity. The city is the terminus of a railroad spur leading northward 70 miles (110 km) from the Pôrto Alegre–Uruguaiana line. It is also accessible by highway. Pop. (1980 prelim.) 40,323.



Grape harvest in Bento Gonçalves, Braz.

Plessner International

Bentol, city, northwestern Liberia, West Africa. Bentol is a marketing and commercial centre with such rural characteristics as irregular arrangement of family compounds, rotation farmlands, woodland and palm forest, and interconnecting paths. The mud walls and stockades of a former time have disappeared. Industrial activity includes the production of milled rice, sawn wood, soap, plastics, paints, furniture and fixtures, cement blocks, oils, processed fish, and confections. Bentol's proximity to the Monrovia–Gbarnga road has spurred internal development. Pop. (1974) 1,802.

Benton, city, seat (1835) of Saline County, central Arkansas, U.S., on the Saline River, 25 miles (40 km) southwest of Little Rock. The site on the Military Road, a main Missouri–Texas route, was settled about 1815. Incorporated as a city in 1848, it was named in honour of Thomas Hart Benton, the Missouri political leader. Salt mining and pottery making were early occupations, and by 1900 lumbermen were logging pine, oak, and gum trees. During World War II, aluminum processing, based on local deposits of high-grade bauxite, developed; there has since been light industrial growth. The Benton Colony of the Arkansas State Hospital is nearby, and Hot Springs and sections of the Ouachita National Forest are to the west. Pop. (1982 est.) 17,776.

Benton, Thomas Hart (b. March 14, 1782, near Hillsborough, N.C., U.S.—d. April 10, 1858, Washington, D.C.), writer and Democratic Party leader who championed agrarian interests and westward expansion during his 30-year tenure as U.S. senator from Missouri.

Thomas Hart Benton, *c.* 1845–50

By courtesy of the Library of Congress, Washington, D.C.

After military service in the War of 1812 Benton settled in St. Louis, Mo., in 1815 and soon became editor of the *St. Louis Enquirer* (1818–20). Vigorously asserting that the West must "share in the destinies of this Republic," he appealed to a mixture of agrarian, commercial, and slaveholding interests and was elected a U.S. senator in 1820, an office he held until 1851.

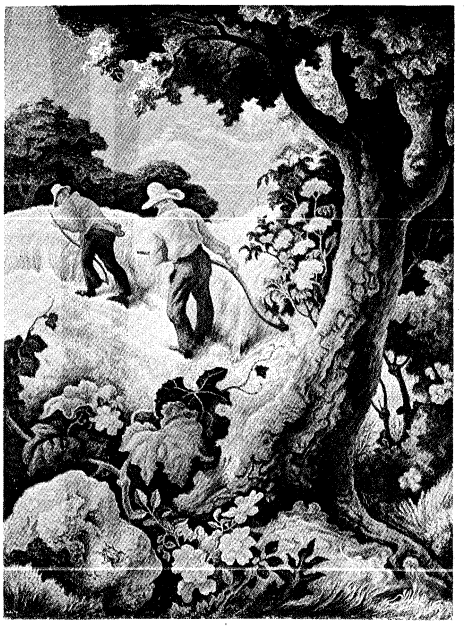
Building an electoral base among small farmers and traders in the mid-1820s, Benton became a crusader for distribution of public lands to settlers. His views on many issues grew to coincide with those of President Andrew Jackson, and he was soon acknowledged as chief spokesman for the Democratic Party in the Senate. In the 1830s he led in Congress Jackson's successful fight to dissolve the Bank of the United States. Benton also eschewed wildcat state banks as economically unsound; rather, he advocated a federal independent treasury and a hard-money policy.

Although he was generally considered proslavery and pro-Southern and was an early supporter of statehood for Missouri without restriction on bondage, in the 1840s he came to oppose the extension of slavery into the territories on the grounds that it inhibited the national growth and was a menace both to the Union and to his vision of the freeholder's Arcadia. This steadfast antislavery position, applied repeatedly to emotionally charged sectional issues, finally cost him his Senate seat in 1851. He continued his opposition in the House of Representatives, however, from 1853 to 1855. Unlike many other antislavery Democrats, he rejected the newly formed Republican Party, and he went so far as to oppose his own son-in-law, John C. Frémont, as Republican presidential nominee (1856).

Benton's imposing memoir-history of his years in the Senate, *Thirty Years' View*, 2 vol. (1854–56), was eloquent with agrarian and Jacksonian Democratic faith, opposition to slavery extension, and concern for the imperiled Union. He produced a learned *Examination* of the Supreme Court's Dred Scott decision in 1858 (reaffirming that the status of slaves, as property, could not be affected by federal legislation), and his 16-volume *Abridgement of the Debates of Congress* through 1850 is still useful.

Benton, Thomas Hart (b. April 15, 1889, Neosho, Mo., U.S.—d. Jan. 19, 1975, Kansas City, Mo.), one of the foremost painters and muralists associated with the American Regionalists of the 1930s. Like Grant Wood and John Steuart Curry, he was impatient with domination by French art and believed that the rural areas of the South and of the Middle West and the people and traditions of his own country were the source and strength of American art.

Educated at the Art Institute of Chicago and the Académie Julian in Paris, Benton began his career as a cartoonist for the *Joplin* (Missouri) *American* in 1906. This early experience is evident in the plasticity of movement, stylization of features, and brilliant colour of his cartoon-like figures. In his mural "Arts of the West" (1932; New Britain Museum of American Art, New Britain, Conn.), Benton utilized an innovative design technique—one scene is divided from another with completely arbitrary borders, and the changes in scale and overlapping give somewhat the effect of a photomontage. Other major murals include those done for the New School for Social Research (1931) and the Whitney Museum of American Art (1932) in New York City.



"July Hay," oil and egg tempera painting by Thomas Hart Benton, 1943; in the Metropolitan Museum of Art, New York City

By courtesy of the Metropolitan Museum of Art, New York City, George A. Hearn Fund, 1943

Benton taught at the Art Students League in New York, where Jackson Pollock was one of his pupils, and from 1935 to 1941 at the Kansas City Art Institute and School of Design, Kansas City, Mo.

Benton, William (Burnett) (b. April 1, 1900, Minneapolis, Minn., U.S.—d. March 18, 1973, New York City), publisher of *Encyclopædia Britannica* (1943–73), U.S. advertising executive, and government official who made significant contributions to those fields.

The descendant of missionaries and educators, Benton was greatly influenced by his indomitable mother, a professor's widow, pioneer woman school superintendent, boarding school headmistress, and Montana homesteader who instilled in Benton the drive to excel. As a schoolboy he spent summers helping his mother "prove up" her homestead claim. After a year at Carleton College (Northfield, Minn.), he transferred to Yale University where he demonstrated an ability to write, became chairman of the *Yale Record,* and graduated in 1921. He also made one of the most influential friendships of his life with his classmate Robert M. Hutchins.

William Benton
Blackstone-Shelburne, New York

Benton was attracted to the advertising business, and after eight years of increasing success in New York City and Chicago, he took on as partner Chester Bowles and founded the New York agency of Benton and Bowles in 1929. The agency flourished through the Great Depression, due in part to its innovations in radio entertainment programs sponsored by advertisers. By 1935 it was the sixth-largest in the world, but Benton had grown restive in advertising and sold out to his partners for approximately $1,000,000.

Hutchins, who had become president of the University of Chicago, urged Benton to come to the university as a vice president; in 1937 he agreed. His restless energy was well-suited to the educational ferment Hutchins was developing there, and his advertising and radio background enabled him to develop the distinguished "University of Chicago Round Table" of the air into an extremely popular national radio forum. While at the university, he played a significant role in helping one of its trustees, Paul G. Hoffman, organize the Committee for Economic Development. He was also, prior to U.S. involvement in World War II, active with Hutchins in the America First movement. There he came to know Robert E. Wood, chairman of Sears, Roebuck, and Company.

Surprised to learn that the mail order house reluctantly owned *Encyclopædia Britannica,* Benton suggested that Sears give the encyclopaedia to the university, and Wood shortly agreed. But the trustees were reluctant to take on responsibility for operating capital and general management, and Benton offered to put up his own money. The university accepted the gift, committing management and common stock to Benton, and retaining preferred stock and a royalty contract. Later, Benton acquired all the stock and the royalty arrangements were modified; by the year after his death the accumulated royalties to the university amounted to $47,800,000.

In 1945 Benton resigned from the university to become U.S. assistant secretary of state. He converted for peacetime use the U.S. Information Service, the cultural exchange programs, and the Voice of America and organized U.S. participation in the establishment of UNESCO, in which he later (1963–69) served as U.S. representative. He also lobbied the Fulbright Scholarship Act and the Foreign Service Act of 1946 through Congress.

Appointed to a vacant U.S. Senate seat from Connecticut in 1949, Benton won reelection in 1950 to the remaining two years of that term. In the Senate he was among the very first to decry the tactics for which Sen. Joseph R. McCarthy of Wisconsin was eventually censured. He was defeated for a full term in the Republican electoral landslide of 1952.

Thereafter, for the first time since 1945, he devoted sustained attention to Encyclopædia Britannica, Inc., which he led on an unprecedented course of acquisition and expansion. He acquired an educational film maker, ERPI, from Western Electric and renamed it Encyclopædia Britannica Films (1943; later given to his four children), published the 54-volume *Great Books of the Western World* (1957), and *Enciclopedia Barsa* (Spanish, 1957; Portuguese, 1964), and set in motion joint ventures leading to the publication of major foreign encyclopaedias (*Encyclopaedia Universalis,* French, 1968–75; *Britannica International Encyclopaedia,* Japanese, 1972–75). He acquired *Compton's Pictured Encyclopedia* (1961), G. & C. Merriam Company (Webster's dictionaries, 1964), and Frederick A. Praeger, Inc. (publishers, 1964; sold 1976). Shortly thereafter he authorized a massive effort to create the 15th edition of the *Britannica,* the costs of which ultimately exceeded $30,000,000. He died a year before publication. In accordance with his wishes the ownership of the *Britannica* went to the William Benton Foundation, a support foundation for the University of Chicago. His own writings include two books: *This Is the Challenge* (1958) and *The Voice of Latin America* (1961). There is an authorized biography, *The Lives of William Benton* (1969) by Sidney Hyman.

In 1968 Benton was honoured by the University of Chicago with the first William Benton Distinguished Service Medal.

Benton Harbor, city, Berrien County, southwestern Michigan, U.S., on Lake Michigan near the mouth of the St. Joseph River, opposite its twin city of St. Joseph. Originally called Brunson Harbor and a part of St. Joseph, it was renamed for Thomas Hart Benton (a Missouri senator who had supported statehood for Michigan) and was separately incorporated as a village in 1869, following a disagreement over bridging the river. The House of David, a religious sect, established a colony there in 1903. The city is also the site of Lake Michigan (junior) College (1946).

Shiloh, office building of the House of David religious sect, Benton Harbor, Mich.
Milt and Joan Mann from CameraMann

Benton Harbor was once a marketing and trucking centre for Michigan's fruit belt, a centre of diversified manufacturing, and the hub of a popular tourist region. In the 1960s and 1970s the city's total population declined and became about 90 percent black. By the mid-1980s most businesses in the downtown area had closed, and the city was facing insolvency. Inc. city, 1891. Pop. (1980) city, 14,707; metropolitan area (SMSA) 171,276.

Bentong, town, Pahang state, West Malaysia (Malaya), on the Sungai (River) Bentong, northeast of Kuala Lumpur, across the Main Range. It is a regional administrative headquarters and a commercial centre for local rubber estates and alluvial tin mines. Genting Highlands is a nearby hill resort, and Genting Pass, a lookout along the road to Kuala Lumpur, provides a spectacular panorama of hills and valleys dotted with vegetable gardens. The Bilut river valley, close by, is the site of a rural development project. Bukit Raka (Raka Hill, 3,000 ft [914 m]) and Chamang Falls are nearby recreation areas. Pop. (1980) 22,921.

bentonite, clay formed by the alteration of minute glass particles derived from volcanic ash. It was named for Fort Benton, Mont., near which it was discovered.

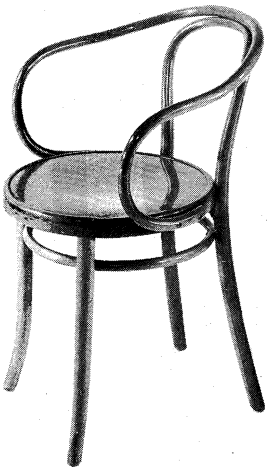
The formation of bentonite involves the alteration of volcanic glass to clay minerals; this requires hydration (taking up or combination with water) and a loss of alkalies, bases, and possibly silica, with the preservation of the textures of the original volcanic glass. Bentonite consists chiefly of crystalline clay minerals belonging to the smectite group, which are hydrous aluminum silicates containing iron and magnesium as well as either sodium or calcium. Two types of bentonite are recognized, and the uses of each depend on specific physical properties.

Sodium bentonites absorb large quantities of water, swelling to many times their original volume, and give rise to permanent suspensions of gel-like masses. These have been used to seal dams; in bonding foundry sands, asbestos, and mineral wool; as drilling muds; in portland cements and concrete, ceramics, emulsions, insecticides, soaps, pharmaceuticals, and paints; in the manufacture of paper; for clarifying water, juices, and liquors; and as a water softener to remove calcium from hard water. Calcium bentonites are nonswelling and break down to a finely granular aggregate that is widely used as an absorbent clay sometimes called fuller's earth.

Bentonite deposits occur in rocks that range in age from Ordovician to Tertiary (about 2,500,000 to 500,000,000 years old). In the United States the principal production has been from Wyoming, Montana, California, Arizona, and Colorado. Important world producers are Greece, Japan, Italy, Argentina, Brazil, Spain, Hungary, Romania, Poland, South Africa, Peru, and Mexico.

bentwood furniture, type of furniture made by bending wooden rods into the required shape after they have been heated with steam. Although this method of bending wood was used by makers of the Windsor chair (*q.v.*) in the 18th century, it was not until the 1840s that its possibilities were exploited fully.

Michael Thonet, an Austrian cabinetmaker working in Vienna, experimented with designs based on birch rods bent into curvilinear shapes. His bentwood chairs are among the most successful examples of early mass-produced furniture. They were exhibited at the Great Exhibition of 1851 in London and were sold in vast quantities throughout Europe and



Bent beechwood armchair by the Thonet brothers, Austria, *c.* 1870; in the Museum of Modern Art, New York City

By courtesy of the Museum of Modern Art, New York, gift of Thonet Industries

the United States for the rest of the century. Because bentwood furniture was light, comfortable, and inexpensive, as well as strong and graceful, it was widely used in clubs, hotels, shops, and restaurants. Many of the early bentwood pieces were stained black or dark brown. Seats were commonly made of cane or plywood and were the only portions not made by the bentwood method. One of the most aesthetically pleasing examples of bentwood furniture is the Thonet rocking chair.

The bentwood technique was revived by Le Corbusier and other leading designers and architects of the 20th century. The early tubular steel furniture of the 1920s was also based on designs by Thonet and his sons.

Benty (Guinea): *see* Benti.

Benue, state, east central Nigeria. A wooded savanna region occupying 17,442 sq mi (45,174 sq km), it is bounded on the south by Cross River and Anambra states, on the west by Bendel and Kwara states, and on the north and east by Plateau and Gongola states. The Niger River defines its western boundary and the Benue River the western half of its northern boundary; it has a common border of less than 25 mi (40 km) with Cameroon where the Mokamoun rises in the mountains of that country. The area is inhabited by the Tiv (the largest ethnic group in the state), the Idoma, the Igala, and a number of smaller groups; all are mainly agricultural peoples, cultivating sesame seed, soybeans, shea nuts, cotton, yams, corn (maize), and rice as cash crops. Yams, sorghum, millet, peanuts (groundnuts), and cassava are raised as staple foods.

Mining is important in several scattered areas: south of the Benue River there are salt deposits southwest of Ibi, lead near Akwana, and gold deposits near Takum; north of the river there are saline springs in the Benue valley and major deposits of tin, niobium, and marble; petroleum has been discovered in Keffi, Lafia, and Nasarawa. Limestone has been found at Yandev near Gboko and coal at a number of sites in the state.

Makurdi (the state capital) and Lafia, on the railway from Port Harcourt, are Benue's largest urban centres. Makurdi is the chief port of the Benue River, and Idah on the west bank of the Niger River is a major trading and ferrying port. Gboko, which has a cement factory, Takum, and Katsina Ala are also sizable market towns. There are new post-secondary institutions at Idah and Makurdi. Pop. (1983 est.) 3,968,200.

Benue-Congo languages, largest language branch of the Niger-Congo language family, both in terms of numbers of speakers and of geographical extent. Languages of the Benue-Congo group are spoken from Nigeria southward to the Cape of Good Hope in South Africa. The Benue-Congo group includes a number of minor languages and language subgroups of Nigeria and Cameroon and the extensive Bantu subgroup spoken throughout southern Africa. *See also* Bantu languages.

Benue River, also spelled BÉNOUÉ, river in West Africa, longest tributary of the Niger, about 673 mi (1,083 km) in length. It rises in northern Cameroon as the Bénoué at about 4,400 ft (1,340 m) and, in its first 150 mi, descends more than 2,000 ft over many falls and rapids, the rest of its course being largely uninterrupted. During flood periods its waters are linked via the Mayo-Kebbi tributary with the Logone, which flows into Lake Chad. Below the Mayo-Kebbi the river is navigable all year by boats drawing less than 2½ ft and by larger boats for more restricted periods. A considerable volume of imports (particularly petroleum) is transported by river, and cotton and peanuts (groundnuts) are exported in the same way from the Chad region. Between Yola and Makurdi the Benue is joined by the Gongola, and it then flows east and south for about 300 mi.

A sandbar crosses the Benue at its confluence with the Niger, allowing only about 2 ft of water when the flow is minimal. River traffic moving upstream from the delta is frequently delayed at Lokoja, Nigeria, waiting for a sufficient depth of water, and is obliged to return before the level falls too low.

Benxi (China): *see* Pen-hsi.

Benz, Carl (Friedrich) (b. Nov. 25, 1844, Karlsruhe, Baden—d. April 4, 1929, Ladenburg, near Mannheim, Ger.), German mechanical engineer who designed and built the world's first practical automobile powered by an internal-combustion engine.

Although the original Benz car (a three-wheeled vehicle, now preserved in Munich) first ran early in 1885, its design was not patented until Jan. 26, 1886. Benz & Cie. was founded in Mannheim in 1883 to build stationary internal-combustion engines; the company completed its first four-wheeled automobile in 1893 and produced the first of a series of racing cars in 1899. In 1926 the Benz company merged with Daimler-Motoren-Gesellschaft to form Daimler-Benz, maker of Mercedes-Benz automobiles. Benz had left the firm in about 1906 to organize C. Benz Söhne, Ladenburg, with his sons, Eugen and Richard.

Benzaiten (Japanese goddess): *see* Benten.

benzaldehyde (C_6H_5CHO), the simplest representative of the aromatic aldehydes, occurring naturally as the glycoside amygdalin. Prepared synthetically, it is used chiefly in the synthesis of other organic compounds and to some extent in perfumes and flavouring agents.

Benzaldehyde was first isolated in 1803, and in the 1830s Justus von Liebig and Friedrich Wöhler investigated the compound in studies that laid the foundation for the structural theory of organic chemistry. Industrially, benzaldehyde is made by processes in which toluene is first chlorinated to benzyl chloride or to benzal chloride. Direct oxidation of toluene with manganese dioxide also produces benzaldehyde.

Benzaldehyde is readily oxidized to benzoic acid and is converted to addition products by hydrocyanic acid or sodium bisulfite. It undergoes simultaneous oxidation and reduction with alcoholic potassium hydroxide, giving potassium benzoate and benzyl alcohol; with alcoholic potassium cyanide, it is converted to benzoin; with anhydrous sodium acetate and acetic anhydride it gives cinnamic acid.

benzaldehyde green (dye): *see* malachite green.

benzene, the simplest aromatic hydrocarbon, widely used in industry; chemical formula, C_6H_6. Discovered by Michael Faraday in 1825 in illuminating gas made from whale oil, it was named benzene in 1845 by A.W. von Hofmann, the German chemist, who detected it in coal tar.

Benzene is obtained chiefly from coke-oven gas, which yields various grades of benzol sufficiently pure for most markets. Since 1950 benzene has also been prepared from petroleum. It is highly toxic, and long exposure to it may cause leukemia.

The structure of benzene has been of interest since its discovery. In 1865 the German chemist August Kekule proposed the hexagonal formula with alternate single and double bonds; it is still used despite two objections: benzene does not show the properties normally associated with double bonds, and the number of isomeric disubstituted benzenes is smaller than would be predicted. Kekule, therefore, postulated an oscillation of the double bonds, giving the ring the symmetry demanded by the number of known isomers. In 1931 the U.S. chemist Linus Pauling, applying quantum mechanics, described a hybrid state resulting from resonance of the two structures that Kekule had assumed to be in equilibrium. This hybrid state explains the low reactivity of benzene by giving the carbon–carbon bond in the ring properties intermediate between those of normal double and single bonds. X-ray data support this view: the distance between the carbon atoms of a normal double bond is 1.34 angstroms (Å), that of a single bond 1.54, and that of a benzene bond 1.39. A similar symmetrical structure is indicated by molecular-orbital considerations.

The parent substance of a large class of chemical compounds, benzene is used for the commercial synthesis of ethyl benzene, phenol, and maleic anhydride (used to make plastics); aniline (for dyestuffs); dodecylbenzene (for detergents); and chlorobenzenes (for insecticides). With sulfuric acid and with nitric acid, benzene gives monosubstituted, disubstituted, and trisubstituted products. With chlorine and bromine, substitution or addition takes place.

Benzene is remarkably resistant to oxidation, but, with vanadium oxide at 450° C (842° F), benzoquinone and maleic anhydride are formed. Reduction to cyclohexane takes place in the presence of hydrogen and nickel at 180° C (356° F). Passed through a red-hot tube, benzene yields diphenyl, diphenylbenzenes, acetylene, and hydrogen.

A colourless, limpid liquid with a characteristic odour, benzene boils at 80.1° C (176.2° F) and solidifies at 5.5° C (41.9° F). It is only slightly soluble in water. It is an excellent solvent for rubber, gums, fats, and many resins.

benzene hexachloride (BHC), also called 1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE, any of several isomeric compounds (*i.e.,* of the same composition but different structures) formed by the reaction of chlorine with benzene in the presence of light; one of these isomers is an insecticide called Lindane or Gammexane.

Benzene hexachloride was first prepared in 1825; the insecticidal properties were identified in 1944 with the γ-isomer, which is about 1,000 times more toxic than any of the other isomers formed in the reaction. The structural differences among these individuals are in the orientations of the chlorine atoms with respect to the ring of carbon atoms.

The chemical addition of chlorine to benzene produces a mixture containing at least six of the eight possible isomers of BHC; the γ-isomer, which makes up 20–25 percent of this mixture, is more soluble than the other isomers in certain solvents and can therefore be extracted in concentrated form. More volatile

than DDT, BHC has a faster but less protracted action upon insects. Its use had declined by the 1960s because of competition from other insecticides and its effects on fishes, which are killed by concentrations as low as one part per million in water.

Benzer, Seymour (b. Oct. 15, 1921, New York City), U.S. molecular biologist who developed (1955) a method for determining the detailed structure of viral genes and coined the term cistron to denote functional subunits of genes. He also did much to elucidate the nature of genetic anomalies, called nonsense mutations, in terms of the nucleotide sequence of deoxyribonucleic acid (DNA), the "gene substance," and discovered a reversal, or suppression, of these mutations in certain bacteria.

Benzer received his Ph.D. from Purdue University, West Lafayette, Ind., in 1947. After holding various positions elsewhere, he returned to Purdue in 1953 and in 1967 joined the faculty of the California Institute of Technology. In 1975 he became the Boswell professor of neuroscience at that institution.

benzidine, an organic chemical belonging to the class of amines and used in making numerous dyestuffs. The azo dyes derived from benzidine are important because, unlike simpler classes of azo dyes, they become strongly fixed to cotton without a mordant.

Benzidine is prepared from nitrobenzene by reduction in alkaline medium to hydrazobenzene ($C_6H_5NHNHC_6H_5$), which is converted to benzidine by treatment with strong acid. This process is the simplest case of a general reaction, the benzidine rearrangement.

The chemical reactions of benzidine are typical of aromatic primary amines; with nitrous acid it yields the bisdiazonium salt, which may be coupled with aromatic amino or hydroxyl compounds to produce azo dyes.

Benzidine, a colourless, crystalline solid, practically insoluble in water, is toxic, causing dermatitis and bladder tumours. It is used in forensics for the identification of bloodstains.

benzoic acid, a white, crystalline organic compound belonging to the family of carboxylic acids, widely used as a food preservative and in the manufacture of various cosmetics, dyes, plastics, and insect repellents.

First described in the 16th century, benzoic acid exists in many plants; it makes up about 20 percent of gum benzoin, a vegetable resin. It was first prepared synthetically about 1860 from compounds derived from coal tar. It is commercially manufactured by the chemical reaction of toluene (a hydrocarbon obtained from petroleum) with oxygen at temperatures around 200° C (about 400° F) in the presence of cobalt and manganese salts as catalysts. Pure benzoic acid melts at 122° C (242° F) and is very slightly soluble in water.

Among the derivatives of benzoic acid are sodium benzoate, a salt used as a food preservative; benzyl benzoate, an ester used as a miticide; and benzoyl peroxide, used in bleaching flour and in initiating chemical reactions for preparing certain plastics.

benzoquinone, simplest member of the quinone family of organic compounds; *see* quinone.

benzyl alcohol, an organic compound, of molecular formula $C_6H_5CH_2OH$, that occurs combined with carboxylic acids (as esters) in balsams and oils of jasmine and other flowers. Several of its natural and synthetic esters have long been used in perfumery; the alcohol itself has become important in the second half of the 20th century as a developer booster in the processing of colour motion-picture film and as a dyeing assistant for filament nylons. Benzyl alcohol is manufactured by the hydrolysis of benzyl chloride in the presence of soda ash.

Beograd (Yugoslavia): *see* Belgrade.

Beorhtric (d. 802), king of the West Saxons, or Wessex (from 786), succeeding Cynewulf.

Beorhtric was a descendant of Cerdic, founder of Wessex, but his parentage is unknown. In his time the Danes first began invading England, landing in Dorset. Beorhtric was troubled by a rival to his crown, Egbert (his eventual successor) and, failing to have him killed, succeeded in driving him into exile on the Continent, with the aid of his father-in-law Offa, king of Mercia. According to legend, Beorhtric died by poison, accidentally tasting a preparation made by his wife Eadburg, an ambitious woman who was wont to destroy her enemies by stratagem, or failing that, by poison.

Beothuk, extinct American Indian tribe of hunters and gatherers that resided on the island of Newfoundland; their language, Beothukan, may be related to Algonkian, but some authorities believe it to have been an independent language. When discovered by John Cabot in 1497 the tribe probably numbered no more than 500 persons; in the succeeding centuries the Beothuk were decimated by Europeans and by Micmac hunters crossing from Nova Scotia. A few survivors may have escaped to Labrador to intermarry with the Montagnais, but the last known Beothuk, Nancy Shawanahdit, died in 1829.

Little is known of Beothuk culture. The people were apparently divided into small bands of a few related families, each band having its own leader. Their skill as canoeists was noted by many early writers; they speared seals with primitive harpoons and fished for salmon and shellfish. Equally at home in the woods, they tracked deer with bow and arrow. Birch bark was used to make cooking vessels and wigwams. They smeared red ochre on their skin, apparently for both religious reasons and protection against insects; this habit is thought to be the source of the European reference to "Red" Indians.

Beowulf, heroic poem, the highest achievement of Old English literature and the earliest European vernacular epic. Preserved in a single manuscript (Cotton Vitellius A XV) from *c.* 1000, it deals with events of the early 6th century and is believed to have been composed between 700 and 750. It did not appear in print until 1815. Although originally untitled, it was later named after the Scandinavian hero Beowulf, whose exploits and character provide its connecting theme. There is no evidence of a historical Beowulf, but some characters, sites, and events in the poem can be historically verified.

The poem falls into two parts. It opens in Denmark, where King Hrothgar's splendid mead hall, Heorot, has been ravaged for 12 years by nightly visits from an evil monster, Grendel, who carries off Hrothgar's warriors and devours them. Unexpectedly, young Beowulf, a prince of the Geats of southern Sweden, arrives with a small band of retainers and offers to cleanse Heorot of its monster. The King is astonished at the little-known hero's daring but welcomes him, and after an evening of feasting, much courtesy, and some discourtesy, the King retires, leaving Beowulf in charge. During the night Grendel comes from the moors, tears open the heavy doors, and devours one of the sleeping Geats. He then grapples with Beowulf, whose powerful grip he cannot escape. He wrenches himself free, tearing off his arm, and leaves, mortally wounded.

The next day is one of rejoicing in Heorot. But at night as the warriors sleep, Grendel's mother comes to avenge her son, killing one of Hrothgar's men. In the morning Beowulf seeks her out in her cave at the bottom of a mere and kills her. He cuts the head from Grendel's corpse and returns to Heorot. The Danes rejoice once more. Hrothgar makes a farewell speech about the character of the true hero, as Beowulf, enriched with honours and princely gifts, returns home to King Hygelac of the Geats.

The second part passes rapidly over King Hygelac's subsequent death in a battle (of historical record), the death of his son, and Beowulf's succession to the kingship and his peaceful rule of 50 years. But now a fire-breathing dragon ravages his land and the doughty but aging Beowulf engages it. The fight is long and terrible and a painful contrast to the battles of his youth. Painful, too, is the desertion of his retainers except for his young kinsman Wiglaf. Beowulf kills the dragon but is mortally wounded. The poem ends with his funeral rites and a lament.

Beowulf belongs metrically, stylistically, and thematically to the inherited Germanic heroic tradition. Many incidents, such as Beowulf's tearing off the monster's arm and his descent into the mere, are familiar motifs from folklore. The ethical values are manifestly the Germanic code of loyalty to chief and tribe and vengeance to enemies. Yet the poem is so infused with a Christian spirit that it lacks the grim fatality of many of the Eddic lays or the Icelandic sagas. Beowulf himself seems more altruistic than other Germanic heroes or the heroes of the *Iliad.* It is significant that his three battles are not against men, which would entail the retaliation of the blood feud, but against evil monsters, enemies of the whole community and of civilization itself. Many critics have seen the poem as a Christian allegory, with Beowulf the champion of goodness and light against the forces of evil and darkness. His sacrificial death is not seen as tragic but as the fitting end of a good (some would say "too good") hero's life.

That is not to say that *Beowulf* is an optimistic poem. The English critic J.R.R. Tolkien suggests that its total effect is more like a long, lyrical elegy than an epic. Even the earlier, happier section in Denmark is filled with ominous allusions that were well understood by contemporary audiences. Thus, after Grendel's death, King Hrothgar speaks sanguinely of the future, which the audience knows will end with the destruction of his line and the burning of Heorot. In the second part the movement is slow and funereal; scenes from Beowulf's youth are replayed in a minor key as a counterpoint to his last battle, and the mood becomes increasingly sombre as the *wyrd* (fate) that comes to all men closes in on him. John Gardner's *Grendel* (1971) is a retelling of the story from the point of view of the monster.

Beppu, city, Ōita Prefecture (*ken*), Kyushu, Japan, facing Beppu-wan (Beppu Bay). Lo-

Hot springs at Beppu, Japan
George Holton—Photo Researchers

cated at the base of a steep symmetrical fan of coarse volcanic detritus, it has been a major hot-springs resort since the late 19th century. After World War II the city's accommodations were increased when former villas were converted into hotels and convalescent homes. Beppu also houses national medical facilities and volcanic-research institutes.

The Beppu district, including eight spas, is also noted for its boiling ponds, called *jigoku* ("hell"), which eject mud high into the air. Other tourist attractions are Tsurumi-dake (Mt. Tsurumi), Shidaka-ko (Lake Shidaka), and the Kijima plateau. Pop. (1983 est.) 135,441.

Beqaa (Lebanon): *see* Biqāʿ, al-.

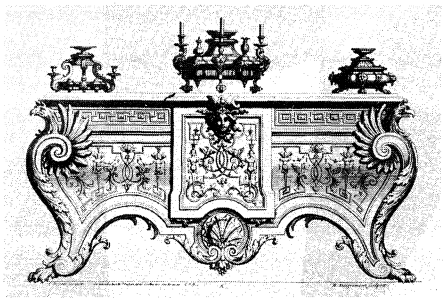
bequest (law): *see* legacy.

berādarī (Hindu council): *see* bhāīband.

Berain, Jean, THE ELDER (b. Oct. 28, 1637, Saint-Mihiel, Fr.—d. Jan. 24, 1711, Paris), French draftsman, engraver, painter, and designer who was called by his contemporaries the oracle of taste in all matters of decoration.

Trained under the great French decorator Charles Le Brun, he was working at the Louvre when appointed, in 1674, royal designer to King Louis XIV of France. After the death of Le Brun in 1690, he was commissioned to compose and supervise the entire exterior decoration of Louis's ships. Skillful in adapting the work of his predecessors, he designed tapestries, accessories, furniture, costumes, and decorations for opera, court festivals, and public solemnities. His work inspired the ornamentation of rooms and furniture by other cabinetmakers, such as André-Charles Boulle, whose elaborate work in etched brass and tortoiseshell marquetry owes much of its inspiration to Berain's designs. Other craftsmen followed Boulle in using Berain for their chief source, and soon he exercised enormous influence all over Europe.

Berain satisfied Louis's passionate appetite for splendour and grand entertainment. He designed chimneypieces, drapery, ornamental mounts, andirons, faience, chandeliers, sconces, and wall panels—all filled with such fantastic iconography as flaming hearts being hammered on anvils by cupids, assorted animals integrated into florid arabesques, and similar grotesqueries. As a result of Louis's fondness for Oriental art, Berain delved into Chinese motifs, which became the height of fashion in the mid-18th century. His decorative experiments during the last part of Louis's reign influenced subsequent Rococo artists in fields ranging from furniture to porcelain.



Etching of a design for a table from his book, *Ornamens Inventory,* by Jean Berain the Elder, *c.* 1670–1700

By courtesy of the Victoria and Albert Museum, London

Berain designed the stage decor for extravagant theatrical productions devised by Molière. His son Jean Berain the Younger (1678–1726), best known as an engraver, was his pupil and succeeded to his official functions. His brother Claude Berain (d. 1726?) was an engraver to the King.

berakah, also spelled BERAKHA, OR BERACHAH (Hebrew: "blessing"), plural BERAKOTH, BERAKOT, BERACHOTH, OR BERACHOT, in Judaism, a benediction (expression of praise or thanks directed to God) that is recited at specific points of the synagogue liturgy, during private prayer, or on other occasions (*e.g.,* before performing a commandment or for being spared from harm in the face of danger). Most *berakoth* begin with the words *Barukh Attah Adonai Eloheinu Melekh ha-Olam* ("Blessed art Thou, O Lord our God, King of the Universe").

Berakoth for food and wine are customarily recited in many Jewish homes as a grace before meals; *e.g.,* "Blessed art Thou, O Lord our God, King of the Universe, who hast created the fruit of the vine." Many of the *berakoth* also thank God for choosing the Jewish people to observe the holidays and remember him in this way.

Béranger, Pierre-Jean de (b. Aug. 19, 1780, Paris—d. July 16, 1857, Paris), French poet and writer of popular songs, celebrated for his liberal and humanitarian views during a period when French society as a whole was undergoing rapid and sometimes violent change.

Béranger was active in his father's business enterprises until they failed. He then found work as a clerk at the University of Paris (1809). He led a marginal existence, sleeping in a garret and doing literary hackwork in his spare time. After the downfall of Napoleon, he composed songs and poems highly critical of the government set up under the restored Bourbon monarchy. They brought him immediate fame through their expression of popular feeling, but they led to dismissal from his post (1821) and three months' imprisonment (an experience he compared favourably to life in his garret).

Béranger, detail of a lithograph by Metzmacher, 1835

By courtesy of the Bibliotheque Nationale, Paris

Béranger's lyrical, tender songs echoed the just-passed Napoleonic era, and his satires ridiculing the monarchy and reactionary clergy were written in a clear, simple, attractive style. Both song and satire soon made him as well known among ordinary country people as in the liberal literary circles of Paris. He thus became an influential and respected figure in his own lifetime. He was able to live on the proceeds of his works and refused all official honours, even membership of the Académie Française. After the 1848 revolution he was elected a member of the new democratic parliament.

In his private character he was noted for his amiability and generosity, as ready to receive help from his many friends in Paris literary society as he was to give it when able. His best known poems are "Le Roi d'Yvetot" (written *c.* 1813; "The King of Yvetot"), "Le Dieu des pauvres gens" ("The God of the Poor People"), "Le Sacre de Charles le Simple" ("The Coronation of Charles the Simple"), "La Grand-Mère" ("The Grandmother"), and "Le Vieux Sergent" ("The Old Sergeant").

Berār, the eastern districts of Mahārāshtra state, western India, specifically Amrāvati, Akola, Buldāna, and Yeotmāl. These districts, together with parts of Parbhani and Nānded, comprised the British administrative unit of Berār in the Central Provinces, which had been derived from the Muslim political territory of Berār or Birār. The term Berār no longer has administrative meaning, having been superseded by the term Vidarbha, which includes Bhandāra, Chandrapur, Wardha, and Nāgpur districts, together with the four districts that were part of the former British-administered unit of Berār.

The Melghāts (northern highland of Berār) form the natural boundary of Berār, draining northward into the Tāpti River and southward into the Pūrna. The Vidarbha region also includes the Penganga (or Wardha) and Wainganga rivers. The southern region of Berār on the Buldāna-Yeotmāl plateau is generally less developed than the rich cotton area of the Pūrna Basin. Nāgpur is the largest city of the Vidarbha region, which contains deposits of coal, iron ore, and manganese. The region is predominantly agricultural, with one-half of the land under cash crops (cotton and oilseeds). Almost all industry is based on the processing of these crops.

Berat, city, capital of Rrethi i Beratit (Berat district), southern Albania, on the Osum River, just west of Maj' e Tomorrit (Tomorr Peak; 7,930 ft [2,417 m]). The town is situated among steep hills cut through by the Osum. The terraced houses and several mosques and churches are surmounted by the ruins of a citadel. The oil field at Stalin is 7 mi (11 km) north.

Located strategically between the ancient regions of Illyria and Epirus, Berat was the scene of many battles. Probably the site of ancient Greek Antipatreia (Byzantine Pulcheriopolis), the city was rebuilt in the 13th century and renamed Beligrad (from which the name Berat derives) in the 14th century by the Serbs. It was refortified by Ali Paşa, the Turkish grand vizier, in the 19th century. A Turkish bridge (1780) connects the west-bank Christian quarter of Goritsa (Old Slavonic: Little Village) with the east-bank Muslim quarter of Moré-Tchélépi.

In the late 19th century, as the capital of southern Albania, Berat served as the centre of the Albanian nationalist movement and a major base of support for the Albanian League. It was in Berat, in 1944, that the Communist-controlled Anti-Fascist National Liberation Council proclaimed itself as the provisional government of the country. Pop. (1980 est.) city, 33,300; (1978 est.) district, 140,600.

Berazategui, *partido* (political subdivision) at the southeastern limits of Gran (Greater) Buenos Aires, Argentina, in Buenos Aires province, on the Río de la Plata estuary. The subdivision was created in October 1960 out of the existing *partido* of Quilmes. Berazategui was originally the property of the Barragán family when it was sold in 1860 to José Clemente Berazategui and Juan Etcheverry. They established a colony of cattle ranchers on the land; the first meat-packing plant was built there in 1890, and beef has been an important product since that time. In 1906 Gaston Fourvel Rigolleau established a glass factory in Berazategui, and further industrial and commercial development followed. The area is also a textile centre; its first yarn-making industry being established in 1936. Pop. (1980) 201,862.

Consult the INDEX *first*

Berber, the indigenous peoples of North Africa, largely scattered in tribes across Morocco, Algeria, Tunisia, Libya, and Egypt.

Despite Roman colonization of the area and an invasion by the Arabs in the 7th century AD, rural Berber tribes remained relatively

autonomous until the 12th century, when invading Bedouin Arabs wrecked the Berbers' peasant economy and converted many of the settled tribes to nomads.

A great number of modern-day Berbers are migrant labourers, working in Spain, France, and elsewhere; but many Berbers are still sedentary farmers, cultivating the lowlands in winter and grazing flocks in the mountains

Berber girl
Harrison Forman

during the summer. Others are year-round pastoral nomads dependent for vegetable foods on serfs and servants dwelling in desert plateaus and oases. Principal Berber crops are wheat, barley, fruits, vegetables, nuts, and olives raised for oil. Cattle, sheep, and goats are maintained in herds, along with oxen, mules, camels, and horses for draft and transportation. Sedentary farmers occupy single-story stone houses, while seasonally nomadic tribes erect strongholds of pounded earth for defense and storage and live in goat-hair tents when at pasture. Most home industries, such as pottery making and weaving, are women's work.

The simplest Berber political structure, found in the independent villages in Algeria and the Haut Atlas mountains, is the *jamā'ah,* a meeting of all reputable adult men in the village square. Fully nomadic tribes elect a permanent chieftain and council, while seasonal nomads annually elect a summer chief to direct the migration.

All Berber groups harbour one or more ritual castes, said to be descendants of the Prophet or of saints, who go about immune to harm because of their holiness. Most Berbers consider themselves Muslims.

Berber languages, also called BERBERO-LIBYAN, group of languages spoken in scattered areas throughout northern Africa from Egypt to the Atlantic Ocean and from the Niger River to the Mediterranean Sea. The Berber languages belong to the Hamito-Semitic language family, along with the Semitic, Cushitic, and Chadic languages.

The group includes Tamashek, or Tuareg, spoken by the Tuaregs in the central Sahara and north of the Niger River; Shawia, or Chaouïa, spoken by the Shawias, and Kabyle, or Zouaouah, in Algeria; Rif and Tamazight in Morocco; Shluh (Tashelhayt, or Chleuch), spoken by the Shluhs in Morocco and Mauritania; Zenaga in Senegal; and the ancient extinct Libyan, or Numidian, language. Some scholars also place the extinct Guanche language of the Canary Islands in this group, but the relationship has not been proved. The Berber languages differ greatly from one another in their sound systems but only slightly in grammar and vocabulary.

The Arabic script is used for writing all the present-day languages of this group except for Tamashek, which uses a modified form of the writing system used by speakers of the ancient Libyan language. The languages borrowed many words from Arabic, and some also contain words borrowed in ancient times from Latin and Punic. Except for the numerous short inscriptions in ancient Libyan and a few modern religious texts, the Berber languages have practically no written literature.

Berbera, port, Wogooyi Galbeed *gobolka* (administrative region), northwestern Somalia, East Africa, on the Gulf of Aden. It lies at the terminus of roads from the towns of Hargeysa and Burco and has an airport. Known during classical times and to Ibn Sa'īd (died 1286) and other early Arab geographers, Berbera was one of the Muslim settlements of the medieval state of Adal. It was sacked by the Portuguese in 1518 and occupied by the *sharīfs* of Mocha in the 17th century, by the Egyptians in 1875, and by the British in 1884. It served as the capital of British Somaliland until 1941. Water is supplied by pipeline from Dubar to the south. Its trade, mainly with Aden, 150 mi (240 km) north, has increased since World War II because of improved port facilities (further modernized with aid from the Soviet Union in the late 1960s and early 1970s). Exports include sheep, hides and skins, ghee, frankincense, myrrh, and gum arabic. Berbera is also the site of a Soviet-built naval and missile base. A portion of the population migrates to the Ogo Highlands during the hot season. Pop. (1980 est.) 65,000.

Berberidaceae, the barberry family of the buttercup order (Ranunculales), comprising 12 genera of perennial herbs and shrubs; it occurs in most temperate regions of the world. In the shrubs the leaves are spiny margined. The form of the flower is highly variable.

The most important and largest genus is *Berberis,* with about 500 species, among which are many ornamentals including the barberry (*q.v.*). Other members of interest include heavenly bamboo (*Nandina domestica*), an indoor pot plant; mayapple (*Podophyllum peltatum*), a woodland wild flower; *Epimedium,* a ground cover; and Oregon grape (*q.v.; Mahonia*), broad-leaved evergreen shrubs.

Berbice River, river in eastern Guyana, rising in the highlands of Rupununi district and flowing northward for 370 mi (595 km) through dense forests to the coastal plain. It enters the Atlantic Ocean at New Amsterdam, where its flow is obstructed by shallows. The basin of the Berbice is restricted by the proximity of its larger neighbours, the Essequibo and Courantyne, and its only tributary of consequence is the Canje. The river is navigable for 100 mi by small vessels; many rapids lie farther upstream. Its name is that of the Dutch colony of Berbice, which in 1831 became part of British Guiana, now Guyana.

Berceo, Gonzalo de (b. *c.* 1198, Berceo, Spain—d. *c.* 1265), the first author of verse in Castilian Spanish whose name is known. He was a secular priest associated with the monasteries of Santo Domingo de Silos and San Millán de Cogolla in the Rioja, and served as the communities' travelling agent or negotiator. In inns and lodging places he entertained other guests by singing songs that he had composed.

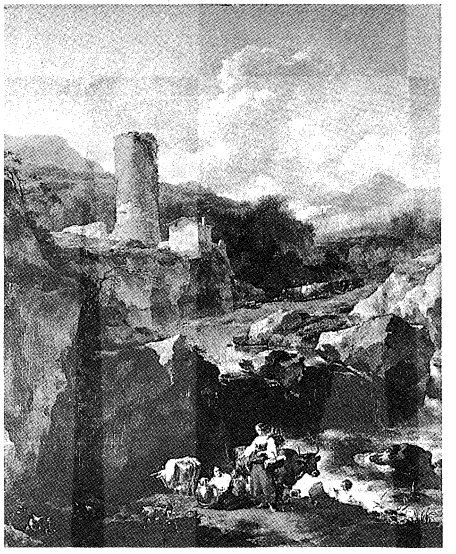
Berceo sang about religion—the lives of the saints, the Mass, and the miracles of the saints and the Virgin. He sang in Castilian, a dialect which was then considered inferior to Galacian-Portuguese, in order to bring religious learning to the common people. He used both Latin and folk sources and adhered consistently to the *cuaderna vía,* a verse form of four-line stanzas, 14 syllables to the line with each line broken by a caesura. In *Vida de San Millán* (*c.* 1234), Gonzalo supported the monastery's claim to certain dues. Among his other works were *Vida de Santo Domingo de Silos, Vida de Santa Oria* (*c.* 1265), *Milagros de Nuestra Señora* (*c.* 1245–60; "Miracles of Our Lady"), and *Sacrificio de la misa* (*c.* 1237). His verse rarely reaches poetic heights but has simplicity and homely charm. Its clear and amusing rustic images contrast with the chivalric epics of the period and reflect the author's joy in his subject matter. It also sheds light on medieval thought and its development.

berceuse (French: "lullaby"), musical composition, typically of the 19th century, having the character of a lullaby. While the word appears to imply no particular formal pattern, rocking rhythms in $\frac{6}{8}$ time are common not only in the vocal prototype but also in its stylized instrumental counterparts, usually for piano. A well-known example of the latter is Chopin's *Berceuse,* Opus 57, with its abundant figurations above a sequence of chords in the left hand.

Prominent among subsequent composers of berceuses were Liszt, Saint-Saëns, and Ravel. An unusual yet particularly attractive instance is the *Berceuse* for voice, piano, and cello by the early 20th-century Dutch composer Alphons Diepenbrock.

Berchem, Claes Pietersz(oon), also spelled NICOLAES PIETERSZOON BERGHEM, or BERRIGHEN (b. Oct. 1, 1620, Haarlem, Neth.— d. Feb. 18, 1683, Amsterdam), Dutch landscape painter and etcher who achieved wide popularity among his contemporaries.

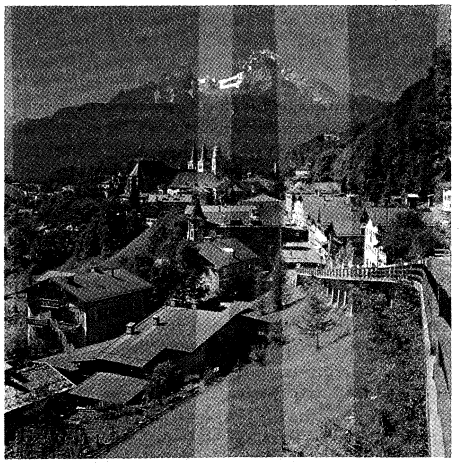
Berchem received instruction from his father, Pieter Claesz., a prominent still-life painter, and from several other Dutch masters. After



"Italian Landscape," painting by Claes Pietersz. Berchem, 1656; in the Rijksmuseum, Amsterdam
By courtesy of the Rijksmuseum, Amsterdam

study in Italy, he produced many landscapes in warm colours and an Italian style. He also painted cityscapes and winter and pastoral scenes, all in the tradition of Dutch naturalism enlivened by vivid colours and glowing light. His finest pictures are at the Rijksmuseum in Amsterdam and the Hermitage, Leningrad.

Berchtesgaden, town, Bayern *Land* (Bavaria state), southeastern West Germany, on a small stream, the Berchtesgadener Ache, in a deep valley surrounded on three sides by Austrian territory. The opening of its salt mines in the 12th century began many centuries of bitter rivalry with Salzburg and Hallein. From 1300 the town was ruled by the provosts of its Augustinian abbey (founded *c.* 1102), who became princes of the Holy Roman Empire in 1491. The town was occupied by Austrian



Berchtesgaden, W.Ger., with Mt. Watzmann, a peak of the Salzburg Alps, in the background
Schuster—De Wys Inc.

troops in 1704 and was annexed to Austria in 1805. Following a brief period of French rule (1809–10), it passed to the Bavarian kingdom. It was a major resort and recreational centre during the Allied occupation after World War II.

Medieval landmarks include the abbey church, on the site of the 12th-century basilica, and the castle, originally the residence of the provosts, later the summer residence of the Bavarian kings (it now houses a museum). On the Obersalzberg, 1,640 ft (500 m) above the town (linked by a cable railway), were the chalets of Adolf Hitler (the Berghof), Hermann Göring, Martin Bormann, and other Nazi leaders, with air-raid shelters, barracks, and various installations. Destroyed in an Allied air attack in April 1945, the ruins were levelled in 1952, and trees were planted on the site. An elevator cut in solid rock connects with Hitler's private retreat on top of the mountain, the "Eagle's Nest," now a teahouse. Berchtesgaden's economic mainstay is the tourist trade, based on the scenic locale, including the Königssee, a picturesque Alpine lake to the south, mountain climbing and skiing facilities, and saline baths. The ancient salt mines are still in operation. Other activities include agriculture, wood carving, brewing, the manufacture of stockings and buttons, and china painting. Pop. (1983 est.) 8,186.

Berchtold, Leopold (Anton Johann Sigismund Joseph Korsinus Ferdinand), Graf von (count of) (b. April 18, 1863, Vienna—d. Nov. 21, 1942, near Csepreg, Hung.), Austro-Hungarian foreign minister whose ultimatum to Serbia (July 23, 1914) was followed (Aug. 1) by the outbreak of World War I.

A wealthy landowner in Hungary and Moravia, Berchtold, through marriage, became one of the richest men in Austria-Hungary. Entering the diplomatic service in 1893, he held posts in Paris and London and, in 1906, was appointed ambassador to Russia.

Berchtold
By courtesy of Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

On Feb. 19, 1912, after the death of Aloys, Graf Lexa von Aehrenthal, Berchtold reluctantly succeeded him as foreign minister. He soon fell under the influence of Franz, Graf Conrad von Hötzendorf, chief of the general staff, but was restrained by the heir presumptive, Archduke Francis Ferdinand. At the beginning of the First Balkan War (October–December 1912), he unrealistically attempted to maintain the territorial status quo, and after the war he prevented Serbia from gaining a corridor to the Adriatic Sea. Subsequently he was confronted with the Serbian ambition to form a state comprising all the South Slav peoples, including those subject at that time to Austria-Hungary. His vacillation aggravated the tension between Austria and Serbia, leading to the assassination of Archduke Francis Ferdinand by a Bosnian Serb at Sarajevo, Bosnia (now in Yugoslavia), June 28, 1914.

Encouraged by Conrad von Hötzendorf, who for years had urged a preventive war against Serbia, Berchtold, with the consent of the council of joint ministers, decided on an ultimatum, the onerous terms of which would assure its rejection by the Serbian government. He informed Germany, which granted Austria-Hungary a "blank check" for unconditional support, but not Italy, for fear that Rome would report immediately to St. Petersburg and thereby hasten the mobilization of Russia on Serbia's side—a prospect that Berchtold earlier had failed to take seriously. After the outbreak of the war, when Italy demanded territory from Austria-Hungary in return for no more than "benevolent neutrality," Berchtold was forced to resign Jan. 13, 1915. He then accepted high office at court.

Berdiaev, Nikolay Aleksandrovich: *see* Berdyayev, Nikolay Aleksandrovich.

Berdiansk (Ukrainian S.S.R.): *see* Berdyansk.

Berdichev, also spelled BERDIČEV, city, Zhitomir *oblast* (administrative region), Ukrainian Soviet Socialist Republic. Founded in 1482 as a Lithuanian fortress, Berdichev was Polish from 1569 until 1793. The 16th-century fortress walls survive, as does the Roman Catholic church in which the French novelist Honoré de Balzac married Eveline Hanska, a wealthy Russian widow, in 1850 after an 18-year courtship. Before 1917 an important trading centre, Berdichev is now significant for its engineering works, sugar refinery, tannery, and clothing factories and is a railway junction on the Zhitomir–Vinnitsa and Rovno–Kazatin lines. Pop. (1983 est.) 83,000.

Berdichevsky, Micah Joseph, pseudonym MICAH JOSEPH BIN GORION (b. Aug. 19, 1865, Medzhibozh, Podolia, Russia—d. Nov. 18, 1921, Berlin), author of works in Hebrew, German, and Yiddish; his impassioned writings, perhaps more than those of any other Jewish author, bear poignant witness to the "rent in the heart" of 19th-century Jews torn between tradition and assimilation. He was also the author of enduring reconstructions of Jewish legends and folklore.

Berdichevsky was the son of a rabbi of a mystical Jewish sect, Ḥasidism, that stressed devoutness and joy in the service of God rather than adherence to the formal works of Jewish tradition. His teenage marriage was broken off when his enraged father-in-law discovered that he was secretly studying works of the Haskala (Enlightenment), a movement advocating that Jews integrate themselves into society and favouring a modern, secular education. Berdichevsky studied for a time at Volozhin seminary and then entered the University of Breslau (now Wrocław, Pol.) at the age of 25.

In these years the inner struggle between his upbringing and his desire for spiritual liberation was further intensified. Over the next several decades, he expressed this conflict in an outpouring of stories, essays, and novels. He spent the last 10 years of his life in Berlin, working as a dentist and recreating with insight and poetic appreciation portions of the Aggada, Jewish writings dealing with legends and folklore. He published part of them in Hebrew as *me-Otzar ha-Aggada* (1913–14; "Out of the Treasures of the Aggada").

Berdichevsky's stories, collected in volumes such as *me-Ḥutz le-taḥum* (1922–23; "Out of the Pale") and *Ben ha-ḥomot* ("Between the Walls"), all deal with the travails of Jewish life. His fiction varies in style and deals either with protagonists striving futilely to escape the weight of Jewish tradition through assimilation or with Jews attempting to survive within the pale of the ghetto.

Berdichevsky's essays, collected posthumously in nine volumes in 1922, include *Be-sede sefer* ("In the Field of Literature"), *Ba-derekh* ("On the Way"), and *Maḥshavot we-torot* ("Reflections and Teachings"). They variously contain literary criticism, polemics against the dead hand of Jewish tradition, and idealizations of Ḥasidism. Also among his essays are those attacking the "spiritual Zionism" of the eminent author Aḥad Ha'am (1856–1927). Berdichevsky promulgated an idiosyncratic theory of Jewish history, maintaining that there had been no unified spiritual philosophy in Judaism's past (thus justifying his own departure from tradition) and that during an early period in their history, the ancient Hebrews had even worshipped idols. His essays entitled *Horeb* (a biblical name for Mt. Sinai) interpret sympathetically some of the beautiful and humane ideas to be found in Aggada writings. In the opinion of some authorities, including the noted Jewish literary historian Meyer Waxman, Berdichevsky's most enduring contribution to literature is his retelling of the Aggada stories.

Berdsk, city, Novosibirsk *oblast* (administrative region), central Russian Soviet Federated Socialist Republic, on the Novosibirsk Reservoir just south of Novosibirsk city. Founded at the beginning of the 18th century as a fortress, it became a city in 1944. Industrial activities include flour milling and radio production. It is on the Turksib Railway. A recreation centre, it has sanatoriums on the outskirts. Pop. (1983 est.) 72,000.

Berdyansk, also spelled BERDIANSK, or BERD'ANSK, formerly (1939–58) OSIPENKO, city and port, Zaporozhye *oblast* (administrative region), Ukrainian Soviet Socialist Republic, on the Berdyansk Gulf of the Sea of Azov. Founded in 1827, the city is a holiday and health resort. Its industries include engineering, oil-processing, flour-milling, and fishing. Pop. (1983 est.) 128,000.

Berdyayev, Nikolay Aleksandrovich, Berdyayev also spelled BERDIAEV (b. March 6, 1874, Kiev—d. March 23, 1948, Clamart, Fr.), religious thinker, philosopher, and Marxist who became a critic of Russian implementation of Karl Marx's views and a leading representative of Christian Existentialism, a school of philosophy that stresses examination of the human condition within a Christian framework.

During Berdyayev's student days at Kiev University (from 1894), he engaged in Marxist activities that led in 1899 to a sentence of three years' exile in Vologda, in northern Russia. After his release he travelled through Germany, returning in 1904 to Russia; and in St. Petersburg (now Leningrad) he took part in a widespread religious and cultural revival. After another visit abroad in 1907 he moved to Moscow, where he joined the Russian Orthodox Church. Somewhat of a nonconformist, he attacked the church's Holy Synod in an article and was tried for it in 1914. Escaping

sentence after his case was dropped at the outbreak of the Russian Revolution (1917), he was in favour with the new regime and was appointed professor of philosophy at Moscow University in 1920.

Two years later Berdyayev was expelled from the Soviet Union when it became clear that he would not embrace orthodox Marxism. Other exiles joined him in founding the Academy of Philosophy and Religion in Berlin in 1922. In 1924 he transferred the academy to Paris and founded there a journal, *Put* (1925–40; "The Way"), in which he criticized Russian Communism. He became known as the foremost Russian émigré in France.

In further developing his Existentialist philosophy, Berdyayev was inclined to prefer unsystematic and mystical modes of expression over logic and rationality. He asserted that truth was not the product of a rational quest but the result of "a light which breaks through from the transcendent world of the spirit." He believed that man's greatness was his share in this world of the spirit and in the divine capacity to create. A human act of creation enables man to arrive at truth by penetrating the confusion of the surrounding environment.

Highly sensitive to the moods of his time, Berdyayev believed that the "contradictions of modern history" portend a new era of "divine–human creation" through which man could revitalize the world. In that belief were remnants of his early Marxism by which man could improve his lot. Though he condemned "the crimes and violence of the Soviet order," he claimed to see signs of the "divine–human creation" in the progress made in Russia after the Revolution.

Among Berdyayev's significant works are *Dukh i realnost* (1927; *Freedom and the Spirit*, 1935); *O naznacheni cheloveka* (1931; *The Destiny of Man*, 1937); *Istoki i smysl russkogo kommunizma* (1955; *The Origin of Russian Communism*, 1937); *Samopoznaniye: Opyt filosofskoy avtobiografi* (1949; *Dream and Reality: An Essay in Autobiography*, 1950); and *Essai de métaphysique eschatologique* (1946; *The Beginning and the End*, 1952).

BIBLIOGRAPHY. E. Lampert, *Nicolas Berdyaev and the New Middle Ages* (1945); Oliver Fielding Clarke, *Introduction to Berdyaev* (1950); M. Spinka, *Nicholas Berdyaev: Captive of Freedom* (1950).

Berea, town, Madison County, central Kentucky, U.S., near the Cumberland Mountains, 40 mi (64 km) south of Lexington. The history of the town is centred around Berea College, founded in 1855 and one of the largest and oldest of the Kentucky mountain schools. The school, which charges no tuition, has student work programs in the college-owned bakery, candy kitchen, numerous craft shops, Boone Tavern (hotel and restaurant), and the 1,375-ac (556-ha) farm and 7,000-ac forest. Churchill Weavers, one of the nation's largest handweaving companies, is also in Berea. Pop. (1980) 8,226.

Berea, city, southwestern suburb of Cleveland, Cuyahoga County, northeastern Ohio, U.S., on the Rocky River. In 1807 Gideon Granger, then U.S. postmaster general, purchased the site from the Connecticut Land Company, and Jared Hickcox was the first settler. A township, first called Watertown and then Middleburgh, was organized. In 1828 John Baldwin founded the sandstone industry, and quarrying and farming formed the basis for development. In 1836 the post office was named Berea (probably for the biblical Berea [Aleppo]). The construction of the Cleveland–Columbus Railroad (now Penn Central) through the site and the founding of Baldwin Institute (1845) and German Wallace College (1863)—combined in 1913 as Baldwin-Wallace College—gave added impetus to growth. The township was incorporated as a village in 1850. Berea Grit (sandstone) continued to play an important economic role until the veins became depleted and quarrying ceased in 1936. Since World War II Berea has taken on many traits of a commuter suburb, although a number of industries (light engineering and the manufacture of alloy castings, tools and dies, and plastics) are located there. Inc. city, 1930. Pop. (1980) 19,567.

Berengar, name of rulers grouped below by country and indicated by the symbol •.

Foreign-language equivalents:
German ..... Berengar
Italian ..... Berengario

Germany/Holy Roman Empire

• **Berengar,** also called BERENGARIO, DUCA (duke) E MARCHESE (marquess) DEL FRIULI (d. April 7, 924), king of Italy from 888 (as Berengar I) and emperor from 915, founder of a line of princes of the 9th–11th centuries who in popular Italian histories are ranked incorrectly as national kings. Through his mother he was a grandson of the Carolingian emperor Louis I the Pious.

After the fall of the emperor Charles III the Fat, Berengar was elected king of Italy in 888 at Pavia. He acknowledged the overlordship of the East Frankish king Arnulf, and from early 889 he was confined to northeastern Italy by Guy of Spoleto (died 894), who then ruled the rest of Italy. After the death of Guy's son and successor, Lambert (898), Berengar finally was recognized throughout the kingdom.

In 899 Berengar was defeated on the Brenta River by the invading Magyars. The next year King Louis of Provence (the future Emperor Louis III the Blind) was invited to Italy by a group of nobles antagonistic to Berengar. Louis was crowned king of the Lombards and then, in 901, was made emperor by Pope Benedict IV. Within a year Berengar had expelled Louis from Italy. The young emperor returned, however, and was captured at Verona on July 21, 905, blinded, and sent back to Provence.

Berengar himself was crowned emperor by Pope John X in 915. But once again he was challenged by some Italian noblemen, who in 922 called in King Rudolf II of Burgundy. Rudolf defeated Berengar the next year at Fiorenzuola, near Piacenza. The next spring Berengar was murdered by one of his own men.

Italy

• **Berengar I:** *see* Berengar (Germany/Holy Roman Empire).

• **Berengar II,** also called BERENGARIO, MARCHESE (marquess) D'IVREA E DI GISLA (b. *c.* 900—d. 966), grandson of Berengar I and king of Italy from 950 to 952. Berengar played an important part in the career of the German king and Holy Roman emperor Otto I the Great. For several months in 951 he held captive Adelaide, daughter and widow of kings of Italy; she escaped from him and married Otto, who assumed the title of king of the Lombards and made Berengar his vassal. Later (from 960) Berengar and his son Adalbert attacked Pope John XII, on whose appeal Otto marched into Rome and was crowned emperor (962). John's subsequent negotiations with Berengar caused Otto to depose the Pope and to imprison Berengar in Germany (963).

Berengar OF TOURS, Latin BERENGARIUS, French BÉRENGER DE TOURS (b. *c.* 999, probably Tours, Touraine—d. Jan. 10, 1088, priory of Saint-Cosme, near Tours), theologian principally remembered for his leadership of the losing side in the crucial eucharistic controversy of the 11th century.

Having studied under the celebrated Fulbert at Chartres, Berengar returned to Tours after 1029 and became canon of its cathedral and head of the School of Saint-Martin, which rivalled Bec under Lanfranc, later to be his opponent. He befriended Geoffrey, count of Anjou, and Eusebius Bruno, later bishop of Angers. About 1040 he was appointed archdeacon of Angers.

Shortly thereafter, Berengar, who was not easily influenced and always exhibited great independence of thought, began to teach ideas contrary to prevailing beliefs; most notably, he rejected the then current view of transubstantiation credited to the 9th-century abbot of Corbie, St. Paschasius Radbertus, who professed that the bread and wine, after consecration in the mass, became the real body and blood of Christ. Instead, Berengar favoured a different interpretation formulated in *De corpore et sanguine Domini* ("Concerning the Body and Blood of the Lord") by Ratramnus, a monk of Corbie, to whom the elements became the body and blood of Christ in a symbolic sense. Berengar's restatement of Ratramnus' views caused severe opposition. He boldly wrote (*c.* 1050) to Lanfranc against his condemning Ratramnus. The letter unfortunately arrived in Lanfranc's absence and, after being read by several persons, finally reached him at Rome. Pope Leo II excommunicated Berengar at the Easter Synod of 1050 and ordered him to the Council of Vercelli (1050). Berengar reluctantly obeyed. He arrived in Paris to get permission from King Henry I, his nominal abbot, to attend the synod. He was imprisoned by Henry and condemned at Vercelli in absentia.

On his release from prison, Berengar took refuge with his protector, Geoffrey, and Henry ordered a synod at Paris to judge Berengar and his supporter Eusebius. The synod condemned them both (1051). In 1054 the powerful papal legate Cardinal Hildebrand came to France to preside at the Synod of Tours. In order to preserve peace, a compromise was reached by Berengar's signing a vague eucharistic statement. In 1059 Berengar was summoned to Rome for another council, at which he was refused a hearing and was asked to sign an extreme statement repugnant to his ideas. After this, Geoffrey died, and Eusebius was drawing away from Berengar. Yet Berengar published a treatise (*c.* 1069) against the Roman council of 1059, which was answered by Hugo of Langres and by Lanfranc, with a rejoinder by Berengar.

His position was now steadily worsening, and the rigorous pattern of examination, condemnation, and recantation reoccurred at the nearly violent Council of Poitiers (1076), the Roman synods of 1078 and 1079, and a trial at Bordeaux in 1080. Thenceforth, Berengar was silent. He retired to ascetic solitude in the priory of Saint-Cosme.

Berengar's eucharistic doctrine is expressed in his *De sacra coena*, written in reply to Lanfranc. More than any of his contemporaries, Berengar applied to theological development the method of dialectic. He based his argument on belief that Paschasius' view was contrary to the Scriptures, the Fathers, and reason. Thus in some respects, he was an important forerunner of Protestantism. His thought is dealt with in A.J.S. MacDonald, *Berengar and the Reform of Sacramental Doctrine* (1930).

Berengario (Italian personal name): *see under* Berengar, except as below.

Berengario da Carpi, Jacopo (b. *c.* 1460, Carpi, Italy—d. *c.* 1530, Ferrara), Italian physician and anatomist who was the first to describe the heart valves. He also was one of the first to illustrate medical works with drawings from nature.

He was a professor at Bologna from 1502 to 1527. While there he became known for his use of mercurial ointment in the treatment of syphilis.

Bérenger, Alphonse-Marie-Marcellin-Thomas (b. May 31, 1785, Valence, Fr.—d. March 9, 1866, Paris), French magistrate and parliamentarian, distinguished for his role in the reform of law and legal procedure based on humanitarian principles.

Appointed judge in Grenoble in 1808, Bérenger had a successful career in the magistracy during the First Empire and served as a representative for the Drôme *département* during the Hundred Days. In 1818 he published *De la justice criminelle en France,* in which he attacked the special courts of the Restoration and demanded the institution of trial by jury.

Bérenger was elected deputy for Valence in 1827 and kept this mandate for 12 years. As a member of the court of cassation from 1831, he took part in all juridical discussions, notably in the revision of the criminal code and in securing for juries the right to find extenuating circumstances in crimes. Although he withdrew from political activities, Bérenger remained active as counsellor and then as president of one of the chambers of cassation until 1860. He served as president of the high court of Bourges, judging political trials during the Second Republic. In his most important work, *De la répression pénale, comparaison du système pénitentiaire en France et en Angleterre* (1853), he defended humanitarian principles in the administration of justice.

Berenguer (y Fusté), Dámaso, CONDE (count) DE XAUEN (b. Aug. 4, 1873, Cuba—d. May 19, 1953, Madrid), Spanish general who served briefly as prime minister (January 1930–February 1931) before the establishment of the Second Republic.

Berenguer entered the army in 1889, served in Cuba and Morocco, and was promoted to general in 1909. He was minister of war in 1918, when, after a long interval, the army began to express its political views. He then served as high commissioner in Morocco and was appointed head of King Alfonso XIII's military household. When the dictatorship of Miguel Primo de Rivera came to an end, Alfonso made Berenguer prime minister, hoping that he would be able to prepare for a return to constitutional rule. But the political parties blamed the King for permitting the dictatorship; and the republicans, Socialists, and Catalan left demanded that he abdicate. Berenguer negotiated from January to December 1930 without success. Then there occurred a small military revolt at Jaca. Berenguer resigned on Feb. 14, 1931, but served as minister of war under his successor, Admiral Juan Bautista Aznar-Cabañas. The municipal elections of April 1931 showed the republicans to be in the majority in the main cities, and Alfonso XIII left the country. The republicans took over, and Berenguer was in prison during most of the Second Republic. In 1946 he published a defense of his administration.

Berenice, also spelled BERNICE, Greek BERENICHE, or BERENIKHE, name of princesses and queens of the Ptolemaic rulers of Egypt, grouped below chronologically and indicated by the symbol •.

• **Berenice** (d. *c.* 246 BC), daughter of Ptolemy II Philadelphus and Arsinoe I of Egypt; she was married to the Seleucid ruler Antiochus II Theos, supplanting his first wife, Laodice, whose children she persuaded him to bar from the succession in favour of her own. Laodice, however, persuaded Antiochus to come to Ephesus (in Asia Minor), where he died in 246, perhaps a victim of her intrigues. The former queen then ordered her partisans to kill Berenice and her children, who had taken refuge at Daphne, near Antioch, in Syria. Aroused by the murder, Ptolemy III Euergetes, Berenice's brother, launched a successful war (the Third Syrian War) against Laodice and her son, Seleucus II.

• **Berenice I** (fl. *c.* 317–*c.* 275 BC), queen of Egypt, third wife of Ptolemy I Soter, and mother of Arsinoe II and Ptolemy II Philadelphus.

Berenice arrived in Egypt in the retinue of Eurydice, Ptolemy's second queen, whom he married as part of a political agreement with her father, Antipater of Macedonia. In about 317 Ptolemy married Berenice; probably because she was not of royal blood, a genealogy was fabricated to make her a half sister of the King. In 308 Berenice gave birth to Ptolemy II Philadelphus, and in 290 Ptolemy made her queen of Egypt. In 285 Ptolemy II was made co-regent and successor to his father, bypassing Eurydice's children. Ptolemy II's second wife was his sister Arsinoe II, also the child of Berenice.

• **Berenice II** (b. *c.* 269—d. 221 BC), daughter of Magas, king of Cyrene (in modern Libya), whose marriage to Ptolemy III Euergetes reunited her country with Egypt.

Magas' queen, who favoured an alliance with the Seleucid dynasty of Syria, attempted to thwart the marriage by summoning Demetrius the Fair, a Macedonian prince, as a husband for Berenice. The Princess, however, arranged Demetrius' murder and married Ptolemy about 245.

Berenice II, coin, 3rd century BC; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

When Ptolemy set forth to avenge the murder of his sister (the widow of Antiochus II) in Syria, Berenice dedicated a lock of her hair for his safe return. According to the court astronomer, it was transferred to heaven, where it formed a new constellation that was consequently named Coma Berenices, "Hair of Berenice." Berenice and Ptolemy had four children: the future Ptolemy IV Philopator, Arsinoe III, Magas, and Berenice, who died as a child. The Queen survived her husband, but her son Ptolemy IV linked her to a plot with her father, Magas, and had her poisoned.

• **Berenice III** (d. 80 BC), queen of Egypt, daughter of Ptolemy IX, the most strong-willed member of the royal family. She ruled during a period of violent civil strife.

Daughter of either Cleopatra Selene or Cleopatra IV, Berenice first married her uncle, Ptolemy X, sometime before 101. After the death in 101 of the dowager queen, Cleopatra III, the widow of Ptolemy VIII, Berenice became full queen. In 87 Ptolemy X was expelled from Egypt by an insurrection of the people of Alexandria, who believed that he had assassinated the dowager queen. He recruited a mercenary army in Syria and, after returning to Egypt, plundered the tomb of Alexander the Great in Alexandria in order to pay his troops. Outraged, the Alexandrian populace again expelled him, and he fled with Berenice to Lycia in Asia Minor. After her husband was killed, Berenice returned to Egypt. She married Ptolemy XI, upon whose death, in 80, Berenice became the sole ruler of Egypt. Young Ptolemy Alexander, son of Ptolemy X, had, meanwhile, been befriended by Lucius Cornelius Sulla, the Roman dictator, with whose aid he was sent to Egypt to be married to Queen Berenice. Neither the Queen nor the people of Alexandria were consulted about the matter. When Ptolemy learned that Berenice was loath to surrender her authority, he arranged for her murder, for which the enraged Alexandrians killed him; he was the last legitimate Ptolemaic ruler of Egypt.

• **Berenice IV** (d. 55 BC), eldest daughter of Ptolemy XII Auletes of Egypt, sister of the great Cleopatra, and ruler of Egypt during her father's absence in 58–55; she was executed by him after his return.

Ptolemy, driven from Egypt by the threat of popular insurrection in 58, went to Rome. When his queen died shortly after his departure, Berenice was proclaimed queen. In 57 Ptolemy, employing bribery and intrigue, succeeded in inducing the Romans to restore him to his kingdom. The Alexandrians, however, resolved to oppose him and dispatched a delegation to Rome to refute Ptolemy's accusations against them and to present charges of his misrule. After arranging the murder of these delegates and even of some Romans who suspected him, Ptolemy departed for Ephesus, in Asia Minor, late in 57. While other issues obscured his cause in Rome, Ptolemy was able to buy the support of Aulus Gabinius, Roman proconsul of Syria.

The Alexandrians, meanwhile, sought a prince for Berenice. Archelaus, reputedly a Pontic prince, appeared in 56 and was married to her. Gabinius, however, marched against Alexandria and the following year restored Ptolemy, who promptly executed Berenice and her supporters.

Berenice (b. *c.* AD 28), mistress of the Roman emperor Titus and a participant in the events leading up to the fall of Jerusalem.

The eldest daughter of Herod Agrippa I by his wife Cypros, Berenice was married at a young age to Marcus, the son of Alexander the Alabarch. Before consummating the marriage, Marcus died, and Berenice then married Herod, King of Chalcis, with whom she had two sons. Following his death in AD 48, she lived with her brother, Agrippa II. Suspicion that they enjoyed an incestuous relationship caused her to marry Polemon, priest-king of Cilicia, but she soon left him and returned to her brother.

During a massacre of Jews at Jerusalem in 65, Berenice risked her life to intercede for them with Gessius Florus. She and Agrippa II worked at that time to dissuade the Jews from their planned rebellion.

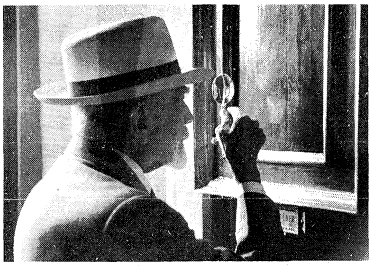
Titus had fallen in love with Berenice during the period that he was in Judaea (67–70). After the Roman recapture of Jerusalem, Berenice and her brother went to Rome (*c.* 75). Titus took her as his mistress and lived openly with her for a time. He dared not marry her because of her foreign origins, and finally he sent her away. She returned to Rome in 79, but the love affair was not resumed. Berenice's unfulfilled relationship with Titus was the subject of plays by both Pierre Corneille (*Tite et Bérénice,* 1670) and Jean Racine (*Bérénice,* 1670).

Berenson, Bernard, Bernard originally spelled BERNHARD (b. June 26, 1865, Vilnius, Lithuania, Russia—d. Oct. 6, 1959, Settignano, Italy), U.S. art critic, especially of Italian Renaissance art.

Reared in Boston, he was educated at Harvard University, from which he was graduated in 1887. His first book, *The Venetian Painters of the Renaissance* (1894), displayed a concise writing style. He was also endowed with a discriminating eye, exceptional memory, perceptive intelligence, and humanistic learning. For a time he was an adviser to the international art dealer Lord Duveen, and his opinion was often sought in the purchase of paintings.

Many masterpieces now in U.S. museums were bought upon his recommendation.

Although Berenson retained his U.S. citizenship, he lived in Italy most of his life. He was



Berenson, photograph by David Seymour
Seymour—Magnum

sequestered during World War II in Tuscany, and his diary *Rumour and Reflection, 1941–1944,* was published in 1952. He bequeathed to Harvard University his villa, I Tatti, with its art collection and magnificent library to be administered as a Center for Italian Renaissance Culture. Among his major works are *Aesthetics and History in the Visual Arts* (1948), *The Drawings of the Florentine Painters* (1938), and the monumental *Italian Painters of the Renaissance* (1952). Two biographies, *Bernard Berenson: The Making of a Connoisseur* by Ernest Samuels and *Being Bernard Berenson* by Meryle Secrest, were published in 1979.

Berent, Wacław (b. Sept. 28, 1873, Warsaw—d. Nov. 22, 1940, Warsaw), novelist, a member of the Young Poland movement, which was dominated by a desire to emphasize the expression of feeling and imagination in literature. His first novel, *Fachowiec* (1895; "The Expert"), composed while he was a student of biology at the University of Zürich and written in a realistic style, describes a student who leaves school to become a common labourer.

Berent later studied biology in Munich and while there wrote his best known and most characteristic work, *Próchno* (1903; "Rotten Wood"), a caustic portrait of late 19th-century artistic and intellectual life in Berlin. As with his later novels, the style of *Próchno* is elaborate and difficult; Berent was never a popular author. *Ozimina* (1911; "Winter Corn") centres on a group of wealthy aristocrats, gentry, and bourgeois at a ball in Warsaw. *Żywe kamienie* (1918; "Live Stones"), intended to be a poetic vision of the Middle Ages, demonstrating the power of poetry and art and their influence on life, is long and elaborate and was not well received. His last novel, *Nurt* (1934; "The Current"), is an impressionistic and anecdotal biography of Polish personalities of the late 18th and early 19th centuries.

Beresford, John (b. March 14, 1738, Dublin—d. Nov. 5, 1805, near Londonderry, County Londonderry, Ire.), political leader in the struggle to preserve the political monopoly of the Protestant landowning aristocracy in Ireland; he was once called "king of Ireland" because of his great wealth and control of a vast political patronage.

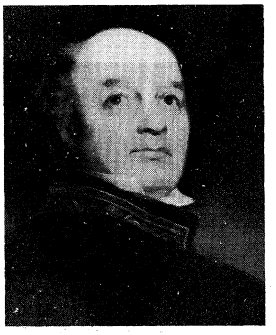
Beresford, detail of a mezzotint by C.H. Hodges after C.G. Stuart, 1792
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Beresford served as a member of the privy councils of Ireland (from 1768) and Great Britain (from 1786). As a subordinate commissioner (1770–80) and first commissioner (1780–1802) of Irish revenue, he capably administered and reformed the taxation system, but he gave government jobs to numerous relatives and political allies. He helped to frame Pitt's abortive Anglo-Irish Trade Treaty (proposed 1784–85), which was attacked by Henry Grattan and other Irish nationalists who wanted greater commercial independence from Great Britain.

In 1795 Beresford was dismissed from office by the new British viceroy of Ireland, the 2nd Earl Fitzwilliam, who advocated conciliating other Irishmen besides the Protestant landowners. Fitzwilliam, however, was quickly superseded by the 2nd Earl (afterward 1st Marquess) Camden, who began a program of Irish repression that had Beresford's full approval. Beresford was involved in planning the fiscal relations between Great Britain and Ireland under the Act of Union (Aug. 1, 1800).

The architect James Gandon owed to Beresford's influence the commissions for the custom house (1781–91) and several other distinguished government buildings in Dublin.

Beresford, William Carr Beresford, Viscount, DUQUE (duke) DE ELVAS (b. Oct. 2, 1768—d. Jan. 8, 1854, Bedgebury, Kent, Eng.), British general and Portuguese marshal prominent in the (Iberian) Peninsular War of 1808–14. For his costly victory over the French at La Albuera, Spain, on May 16, 1811, he was subjected to harsh criticism in Great Britain.



Viscount Beresford, detail of a portrait by Richard Rothwell; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

An illegitimate son of the 2nd earl of Tyrone (afterward 1st marquess of Waterford), Beresford entered the British Army in 1785. As a brigadier general he led a raid, unauthorized but informally encouraged by his superiors, on the Spanish colonial city of Buenos Aires—Spain at the time (1806) being an ally of Napoleonic France. Beresford captured the town easily, but local forces compelled him to surrender on Aug. 12, 1806. Escaping after six months' imprisonment, he was appointed governor of Madeira, which was then held by the British on behalf of Portugal. Recalled to combat service, he fought well under Gen. Sir John Moore at Corunna, Spain (La Coruña; Jan. 16, 1809). Gen. Sir Arthur Wellesley, the future duke of Wellington, chose him to reorganize the Portuguese Army, in which Beresford was given the rank of marshal (March 7, 1809).

In command of a British corps at La Albuera, near Badajoz, Beresford lost one-fourth of his men while defeating the French marshal Nicolas-Jean de Dieu Soult, duc de Dalmatie. Resuming command of Portuguese troops, he was wounded at Salamanca (July 22, 1812). He served Portugal until 1819, being successively created conde, marquês, and duque (count, marquess, and duke) in that country's peerage. During Wellington's first prime ministry he was master general of the ordnance (1828–30).

Beresteczko, Battle of (June 28–30, 1651), military engagement in which the king of Poland, John Casimir (ruled 1648–68), inflicted a severe defeat upon the rebel Cossack leader Bohdan Khmelnytsky.

In 1648 Khmelnytsky organized an insurrection among the Zaporozhian Cossacks, who lived along the Dnepr River, against their Polish rulers, who had been trying to limit the Cossacks' autonomy by reducing their numbers, restraining them from conducting lucrative raids upon their Turkish and Crimean Tatar neighbours, and forcing them into a condition of serfdom. After a series of military victories, the Cossacks exacted the Compact of Zborów (1649) from the Polish king.

Although that settlement granted a large degree of autonomy to the "registered" Cossacks (*i.e.,* those comprising a privileged class), it failed to satisfy either the Poles or the "unregistered" Cossacks. Within 18 months hostilities were resumed. The Cossacks were formally taken under the protection of the Turkish sultan (April 1651) and were reinforced by the Sultan's vassal, the Khan of the Crimean Tatars. In June the Cossack–Tatar force advanced against the Poles and engaged them in battle at Beresteczko, on the Styr River in Volhynia south of Lutsk. The Cossacks' army was approximately three times larger than the Poles'. But in the midst of the fighting the Tatar khan and his force left the field of battle. This action, which has been described by some historians as treasonous desertion and by others as a manoeuvre to establish another line of defense closer to the Dnepr to protect Kiev from an advancing Lithuanian Army, enabled the numerically inferior Polish Army to gain a victory over the Cossacks.

Subsequently, the defeated rebels accepted a new peace settlement, concluded at Biała Cerkiew (Sept. 28, 1651), which reduced the number of "registered" Cossacks from 40,000 to 20,000 and deprived them of the right to settle in and control various provinces that had been designated in the Compact of Zborów. Neither the Cossacks nor the Polish Sejm (Diet) accepted the new treaty, and in January 1654 the Cossacks chose to recognize the suzerainty of the Russian tsar and to incorporate their community into the Muscovite state (Union of Pereyaslav).

Berezina River, river in the Belorussian Soviet Socialist Republic, a tributary of the Dnepr, which it joins near Rechitsa. Its 381-mi (613-km) length drains 9,450 sq mi (24,500 sq km). Rising north of the Minsk Elevation, it flows to the south-southeast in a meandering course through a swampy, forested basin; it is

Berezina River bend, Belorussian S.S.R.
Novosti Press Agency

navigable only by small craft. During Napoleon's retreat from Moscow in 1812, a bitter engagement was fought on the Berezina.

Berezniki, city, Perm *oblast* (administrative region), western Russian Soviet Federated Socialist Republic, on the left bank of the Kama River at the head of the Kama Reservoir. Huge local deposits of salt and potassium resulted in the city's development as one of the largest chemical centres of the U.S.S.R., producing nitrogenous fertilizers, potash, nitric and sulfuric acids, soda, chlorine, titanium sponge, and pesticides. It was incorporated as a city in 1932. Pop. (1983 est.) 190,000.

Berg, former duchy of the Holy Roman Empire, on the right bank of the Rhine, now in the administrative districts of Düsseldorf and Cologne in the Federal Republic of Germany.

In the 11th century the counts of Berg came into possession of Westphalian lands east of Cologne. From 1161 these were divided between the senior branch of Berg and the junior branch of Altena (later Mark), which acquired the countship of Cleves in 1368. The Berg line became extinct with the assassination in 1225 of Engelbert I the Holy, the third member of the family to hold the archbishopric of Cologne, and the title passed to the House of Limburg. In 1288 Count Adolf V began to develop Düsseldorf (later Berg's capital) as a port. A member of the House of Jülich, Gerhard VI (died 1360) married the heiress of Berg in 1348; in 1380 his son William was created duke; and in 1423 Duke Adolf also inherited Jülich, thus uniting the two duchies and associated lands. When the male line became extinct in 1511, the territories passed to John III, duke of Cleves. Berg became a leading iron and textile manufacturing centre in the 17th and 18th centuries. In 1806 Napoleon made it a grand duchy in his Confederation of the Rhine, with his brother-in-law Joachim Murat as grand duke. Berg, along with Jülich, which had been annexed by the French, became part of Prussia's Rhine province by award of the Congress of Vienna in 1814–15.

Berg, Alban (b. Feb. 9, 1885, Vienna—d. Dec. 24, 1935, Vienna), Austrian composer in the atonal style. He composed orchestral music (including *Five Orchestral Songs,* 1912), chamber music, songs, and two sensational operas, *Wozzeck* (1925) and *Lulu* (1937).

Apart from a few short musical trips abroad and annual summer sojourns in the Austrian Alps, Berg's life was spent in the city of his birth. At first, the romantically inclined youth leaned toward a literary career. But, as in most Viennese middle-class homes, music was regularly played in his parents' house, in keeping with the general musical atmosphere of the city. Encouraged by his father and older brother, Alban Berg began to compose music without benefit of formal instruction. His output consisted of more than 100 songs and piano duets, most of which remain unpublished.

In September 1904 he met Arnold Schoenberg, an event that decisively influenced his life. The death of Berg's father had left little money for composition lessons, but Schoenberg was quick to recognize Berg's talent and accepted the young man as a free pupil. The musical precepts and the human example provided by Schoenberg shaped Berg's artistic personality for the next six years.

In the circle of Schoenberg's students, Berg presented his first public performance in the fall of 1907: *Piano Sonata,* Opus 1 (1908). This was followed by *Four Songs,* Opus 2 (1909), and *String Quartet,* Opus 3 (1910), each strongly influenced by the young composer's musical gods, Gustav Mahler and Richard Wagner.

Having come into a small inheritance, Berg married Helene Nahowski, daughter of a high-ranking Austrian officer, in 1911. The Bergs took an apartment in Vienna, where he settled down to devote the remainder of his life to music, although they participated freely in the intellectual life of the city. Among their closest friends were Adolph Loos (1870–1933), one of the pioneers of modern architecture, and the painter Oskar Kokoschka.

Alban Berg, oil painting by Arnold Schoenberg, *c.* 1900; in the Historisches Museum der Stadt Wien

By courtesy of the Historisches Museum der Stadt Wien

A characteristic of Berg's creative activity was the slow, often hesitant, manner in which he gave final form to the musical ideas that, for the most part, were the result of sudden inspiration. This fastidious, perfectionist manner of composing explains his relatively small number of works. In 1912 Berg finished his first work since his student days with Schoenberg, *Five Orchestral Songs,* Opus 4. The inspiration for this composition came from postcard messages addressed to both his friends and foes by the eccentric Viennese poet Peter Altenberg. These sometimes erotic postcard texts were sufficiently nonconformist to prompt Berg to use them as background for even less traditional music than he had composed in the past. But when two of these songs were presented at a concert of the Academic Society for Literature and Music in March 1913, they provoked a near riot, in which performers and audience freely participated.

The genesis of Berg's first work for the stage was a memorable theatrical experience: the performance of Georg Büchner's (1813–37) *Woyzeck,* a drama built around a poor working man who murders his faithless sweetheart and then commits suicide while their child, unable to comprehend the tragedy, plays nearby. The theme fascinated Berg. But his work on the opera—which, varying the spelling, he would call *Wozzeck*—was delayed by World War I. During the course of the war, Berg (always in frail health) worked in the War Ministry. When he did begin composition, he was confronted by the gigantic task of compressing 25 scenes into three acts. Although he managed to write the libretto in 1917, he did not begin composing the score until the war was over. He completed the opera in 1921, dedicating it to Alma Mahler, the widow of Gustav Mahler, the composer and conductor who had dominated Vienna's musical life during Berg's youth.

Wozzeck—perhaps the most frequently performed theatrical work in the atonal idiom—represents Berg's first attempt to deal with social problems within the framework of opera. From numerous statements he made, it is evident that he intended the opera to portray far more than the tragic fate of the protagonist. He wanted, in fact, to make it symbolical of human existence. Musically, its unity stems from large overall symmetries within which are set traditional forms (such as the passacaglia and sonata), excerpts in popular music style, dense chromaticism (use of notes not belonging to the composition's key), extreme atonality, and passing approaches to traditional tonality, all of which function to create a work of notable psychological and dramatic impact. Although it antedates Schoenberg's early 12-tone compositions, the opera also includes a theme using the 12 notes of the chromatic scale.

After 137 rehearsals, *Wozzeck* was presented in its entirety for the first time on Dec. 14, 1925, at the Berlin State Opera, with Erich Kleiber conducting. Critical response was unrestrained. Typical of the prevailing attitude was the reaction of a reviewer in the *Deutsche Zeitung:*

> As I was leaving the State Opera I had the sensation of having been not in a public theatre but in an insane asylum. . . . I regard Alban Berg as a musical swindler and a musician dangerous to the community.

But another critic described the music as "drawn from Wozzeck's poor, worried, inarticulate, chaotic soul. It is a vision in sound."

Upon completion of *Wozzeck,* Berg, who had also become an outstanding teacher of composition, turned his attention to chamber music. His *Chamber Concerto,* Opus 8, for violin, piano, and 13 wind instruments was written in 1925, in honour of Schoenberg's 50th birthday.

Berg searched for a new opera text. He found it in two plays by the German dramatist Frank Wedekind (1864–1918). From *Erdgeist* ("Earth Spirit") and *Büchse der Pandora* ("Pandora's Box"), he extracted the central figure for his opera *Lulu.* This work engaged him, with minor interruptions, for the next seven years, and the orchestration of its third act remained incomplete at his death (it was completed by the Austrian composer Friedrich Cerha and given its premiere in Paris in 1979). Symbolically and musically complex and highly expressionistic in idiom, *Lulu* was composed entirely in the 12-tone system.

With the seizure of power by the Nazis in Germany in 1933, Berg lost most of his income. Although, unlike their teacher Schoenberg, Berg and his friend and colleague Anton von Webern were of non-Jewish descent, they, with Schoenberg, were regarded as representatives of "degenerate art" and were increasingly excluded from performances in Germany. The meagre response that Berg's works evoked in Austria caused him particular anguish; abroad, he was considered more and more as the representative Austrian composer, and his works were performed at leading musical festivals.

Berg's last complete work, the *Violin Concerto,* originated under unusual circumstances. In 1935 the U.S. violinist Louis Krasner commissioned Berg to compose a violin concerto for him. As usual, Berg procrastinated at first. But after the death of Manon, the beautiful 18-year-old daughter of Alma Mahler (by then the wife of the architect Walter Gropius), Berg was moved to compose the work as a kind of requiem and to dedicate it to the "memory of an angel"—Manon. Having found his inspiration, Berg worked at fever pitch, in the

seclusion of his villa in the Austrian province of Carinthia, and completed the concerto in six weeks. By the time the work was finally presented by Krasner in Barcelona in April 1936, it had become a requiem not only for Manon Gropius but for Alban Berg as well. One of the major violin concerti of the 20th century, it is a work of highly personal, emotional content achieved through the use of 12-tone and other resources—symbolic as well as musical.

In mid-November 1935 he returned, a sick man, to Vienna. Although his mind was completely absorbed in his desire to finish the opera *Lulu,* he had to be hospitalized in December with septicemia and, after a deceptive initial improvement, he died suddenly.

A man of strikingly attractive appearance and reserved, aristocratic bearing, Berg had also a generous personality that found expression in his correspondence and among his friends. He was an outstanding teacher of composition who encouraged his pupils to undertake significant work of their own. Few honours were accorded Berg in his lifetime, but, within a few years after his death, he became widely recognized as a composer who broke with tradition, mastered a radical technique, and blended the two to create, with Schoenberg and Webern, a 20th-century Viennese school of music.

Berg's powerful and complex works draw from a broad range of musical resources but are chiefly shaped by a few central techniques: the use of a complex chromatic expressionism, which nearly obscures, yet actually remains within, the framework of traditional tonality; the recasting of classical musical forms with atonal content—*i.e.,* abandoning traditional tonal structure dependent upon a centrally important tone; and a deft handling of the 12-tone approach developed by his teacher, the composer Arnold Schoenberg, as a method of structuring atonal music. Berg dealt with the new medium so skillfully that the classical heritage of his compositions is not obliterated, thus justifying the term frequently applied to him—the "classicist of modern music."

(W.R.)

MAJOR WORKS. *Orchestral music. Three Pieces for Orchestra,* op. 6 (composed 1914); *Chamber Concerto* for piano, violin and 13 wind instruments, op. 8 (1924); *Violin Concerto* (1935).

Chamber music. Piano Sonata, op. 1 (1908); *String Quartet,* op. 3 (1910); *Four Pieces for Clarinet and Piano,* op. 5 (1913); *Lyric Suite,* op. 10 (1925–26).

Vocal music. Operas: *Wozzeck,* libretto by Berg, based on a play by Georg Büchner, op. 7 (first performed 1925); *Lulu,* libretto by Berg, based on two tragedies by Frank Wedekind (1937), orchestration of third act incomplete until 1979, when it was finished by Friedrich Cerha. Voice and orchestra: *Five Orchestral Songs,* on picture- postcard texts, by Peter Altenberg, op. 4 (composed 1912); *Der Wein,* concert aria with orchestra with text translated from Charles Baudelaire, op. 11 (1929). Voice and piano: *Seven Early Songs* (1905–08); *Four Songs,* op. 2 (1909).

BIBLIOGRAPHY. H.F. Redlich, *Alban Berg: The Man and His Music* (1957), especially noteworthy for its prodigious use of examples in presenting a basic analysis of the music; Willi Reich, *The Life and Work of Alban Berg* (1965), an authoritative text by a pupil and intimate friend of Berg; Alban Berg, *Briefe an seine Frau* (1965; *Alban Berg: Letters to His Wife,* 1971), provides important source material; Mosco Carner, *Alban Berg: The Man and the Work* (London, 1975; New York City, 1977).

Berg, Lev Simonovich (b. Feb. 14, 1876, Bendery, Bessarabia, Russia—d. Dec. 24, 1950, Leningrad), geographer and zoologist who established the foundations of limnology in Russia with his systematic studies on the physical, chemical, and biological conditions of fresh waters, particularly of lakes. Important, too, was his work in ichthyology, which yielded much useful data on the paleontology, anatomy, and embryology of fishes in Russia. Of broader significance were Berg's findings on the periodicity of reproduction among fishes and the influence of climatic variations on migratory species. He is also credited with having discovered the symbiotic relationship between lampreys and salmon (*see* symbiosis).

Berg extended his ichthyological research to zoogeography, a field of study concerned with the distribution of animals. Data from his zoogeographical analyses enabled him to reconstruct with considerable accuracy the chronology of the major glaciations. In turn, he used these paleoclimatological reconstructions to investigate the origin of various sedimentary rocks and the formation of soils, the results of which demonstrated the efficacy of integrating the procedures of modern geography and historical geology.

Berg, Patty, byname of PATRICIA JANE BERG (b. Feb. 13, 1918, Minneapolis, Minn., U.S.), U.S. winner of more than 80 golf tournaments by the 1980s and first president of the Ladies' Professional Golfers' Association (LPGA) in 1950.

From a golf-playing family, Berg first took up speed skating but turned to golf after an injury at 15. She placed second in the U.S. girls' speed-skating championship in 1933. She finished second in the U.S. Women's Amateur tournament in 1935 and then won it in 1938. After winning more than 40 amateur tournaments, Berg turned professional in 1940. She won every major LPGA event, including the U.S. Women's Open (1946) and the World Championship (1953–55 and 1957). She led the LPGA in money winnings three times (1954–55, 1957). Berg was a major force in popularizing women's golf. She was named by the Associated Press among the 15 greatest female athletes of 1900–77. She wrote with Mark Cox *Golf Illustrated* (1950; English title, *Golf for Women,* 1951).

Berg, Paul (b. June 30, 1926, New York City), U.S. biochemist whose development of recombinant DNA techniques won him a share (with Walter Gilbert and Frederick Sanger) of the 1980 Nobel Prize for Chemistry.

After graduating from Pennsylvania State College in 1948 and taking a Ph.D. from Western Reserve University in 1952, Berg pursued further studies at the Institute of Cytophysiology in Copenhagen and at Washington University in St. Louis, where he remained as assistant professor of microbiology until 1959. From 1959 he was associated with the medical school of Stanford University, serving as chairman of the biochemistry department in 1969–74 and becoming Willson professor in 1970.

In the course of studying the actions of isolated genes, Berg evolved methods for splitting DNA molecules at selected sites and attaching segments of the molecule to the DNA of a virus or plasmid, which could then enter bacterial or animal cells. The foreign DNA was incorporated into the host and caused the synthesis of proteins not ordinarily found there. One of the earliest practical results of recombinant technology was the development of a strain of bacteria containing the gene for producing the mammalian hormone insulin.

Bergama carpet, any of several types of village floor coverings handwoven in the vicinity of Bergama, western Turkey, or brought there for market from the interior of the country. Although most Bergama carpets date from the 19th and 20th centuries, rare examples survive from the 17th century.

The bold patterns, usually in red, blue, and white, are highly varied. Several designs, showing rows of panels or centralized medallion

Bergama carpet from western Anatolia, 19th century; in the collection of Joseph V. McMullan

Collection of Joseph V. McMullan; photograph, Otto E. Nelson—EB Inc.

designs, preserve the fashions of much earlier centuries. Large central diamond designs, for example, are derived from a wreath motif seen in Ottoman court prayer rugs of the 17th century. The format of Bergama carpets is usually more nearly square than in other Turkish types, and the few known prayer rugs tend to be unusually small. An erosive red-dye process sometimes causes the pile to look as if it had been cut in relief.

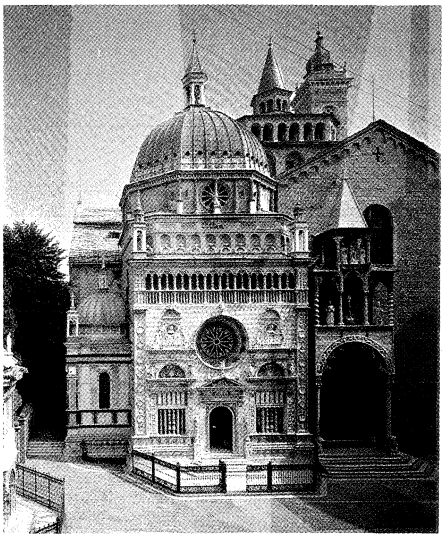
bergamasca, also spelled BERGOMASK, lusty 16th-century dance depicting the reputedly awkward manners of the inhabitants of Bergamo, in northern Italy, where the dance supposedly originated. It was performed as a circle courtship dance for couples: men circled forward and women backward until the melody changed; partners then embraced, turned a few steps, and began again. The rustics in Shakespeare's *Midsummer Night's Dream* perform a *bergomask.*

The *bergamasca* never became a court dance, although it gained some popularity as an instrumental composition built on a ground bass. Claude Debussy's *Suite bergamasque* (1890) and Gabriel Fauré's *Masques et bergamasques* (1919) did not use the *bergamasca* as a specific musical form; both works were inspired by Verlaine's poem "Clair de lune," in which the name of the bygone dance *bergamasque* evokes a dreamy image.

Bergamo, Latin BERGOMUM, city, capital of Bergamo province, Lombardia (Lombardy) region, northern Italy, in the southern foothills of the Alps between the Brembo and Serio rivers, northeast of Milan. Originally the centre of the Orobi tribe, it became a Roman town (Bergomum) in 196 BC. Rebuilt after destruction by Attila the Hun, it was later the seat of a Lombard duchy and became an independent commune in the 12th century. Ruled by the Milanese Visconti family after 1329, it passed in 1428 to Venice until 1797, when the French took control and then included it in the Cisalpine Republic (established by Napoleon). In 1815 it became Austrian and, in 1859, part of the Italian kingdom.

The city is divided into the upper (*alta*) and lower (*bassa* or *piana*) towns, linked by a cable railway. Notable landmarks of the older upper town include the Romanesque cathedral, rebuilt 1483 and 1639; the Cappella (chapel) Colleoni (1470–76), by Giovanni Antonio Amadeo, with ceiling frescoes by Giovanni Battista Tiepolo; the basilica of Sta. Maria Maggiore (begun 1137, rebuilt 14th and 15th centuries); the baptistery (1340); and the

Palazzo della Ragione (rebuilt 1538–54). The Rocca, a 14th-century castle, houses the Roman and Risorgimento museums, and the old citadel has a museum of geology and natural history. The birthplace of the composer Gaetano Donizetti is preserved as a museum. The



Cappella Colleoni, Bergamo, Italy
Marzari—SCALA from Art Resource/EB Inc.

modern lower town, the community centre since the 19th century, has a fine collection of paintings in the Accademia Carrara.

Bergamo is an industrial centre with textile mills, engineering works, and cement, mechanical, and electrical manufactures. Pop. (1981 est.) mun., 124,150.

bergamot, any of several North American perennial plants of the mint family, Lamiaceae (or Labiatae); their leaves are used as an herb. *Monarda didyma,* a variety native to the United States, is made into Oswego tea, a beverage used by the Oswego tribe of American Indians and said to be the drink adopted by American colonists during their boycott of British tea. The leaves are also used to flavour punches, lemonade, and other cold drinks. Other names for the aromatic herb include bee balm, fragrant balm, and Indian's plume.

The bergamot orange, *Citrus bergamia,* is found chiefly in the south Italian province of Calabria and yields a pear-shaped fruit valued by the flavouring and perfume industries for the essential oil extracted from its peel. The bergamot pear, a popular winter pear cultivated in Britain since the time of the Romans, is a large, round fruit with a yellowish-green skin that has russet markings.

Berganza, Teresa (b. March 16, 1935, Madrid), Spanish mezzo-soprano, known for coloratura roles in Gioacchino Rossini and Wolfgang Amadeus Mozart operas and for concert singing.

Berganza studied with Lola Rodríguez Aragón at the Madrid Conservatory, where she won the Premio Grande de Lucrezia Arana in 1954. A year later she made her debut in Madrid as a concert singer and toured Spain, Portugal, France, Italy, Austria, and Germany. In 1957 she made her stage debut at the Aix-en-Provence Festival in France as Dorabella in Mozart's *Cosi fan tutte,* and in the following year she appeared in Milan at La Scala in Rossini's *Le Comte Ory,* at the Glyndebourne Festival in Scotland as Cherubino in Mozart's *Le nozze di Figaro,* and in Dallas, Texas, as Isabella in Rossini's *L'italiana in Algeri.* In 1960 she sang her first Rosina in Rossini's *Il barbiere di Siviglia* at Covent Garden, London, and in 1967 she made her debut at the Metropolitan Opera in New York City in *Le nozze di Figaro.*

Berganza has appeared in many of the world's opera houses and made many concert tours accompanied by her husband, the pianist-composer Félix Lavilla. She was made Dame of the Most Noble Order of Isabella La Catolica—the youngest artist to be so honoured—in Spain and also won the Grand Prix Academy Charles Cross Award three times.

Bergbom, Kaarlo (b. Oct. 2, 1843, Vyborg, Russia—d. Jan. 17, 1906, Helsinki), activist in the struggle to enhance Finnish-language institutions, and founder-director of the first stable Finnish-language theatre, the Finnish National Theatre. Bergbom, himself the author of a romantic tragedy, directed the first performance of Aleksis Kivi's one-act biblical drama *Lea* (1869), the event cited as the beginning of professional theatre in the Finnish language.

In 1872 Bergbom founded the Finnish National Theatre as a touring troupe; with the lifelong assistance of his sister, Emilie, he managed the theatre until his death. The first year of its existence, the National Theatre performed 36 plays, of which only 13, all single-act, were native works; by its 20th season the ratio was reversed, two-thirds of the plays being Finnish and including the premieres of six full-length Finnish plays. Bergbom also produced notable Finnish versions of classics and works by foreign authors, among them the first Finnish-language productions of Shakespeare (*Romeo and Juliet,* 1881) and Goethe (*Faust,* 1885). In 1902 a permanent building was constructed in Helsinki as home for the theatre. Bergbom was assisted in his endeavours by such company members as the actress Ida Aalberg and by the important Finnish playwright Minna Canth, whose works concerning the emancipation of women were premiered by the company.

Bergdama, also called DAMARA, a nomadic Negroid people of mountainous central South West Africa/Namibia. They speak a click Khoikhoin (Hottentot) language, but racially they are more like the peoples of Central and West Africa, though their origin is obscure. When first encountered by Europeans, in the 17th and 18th centuries, many of the Bergdama were serfs of the Khoikhoin and Herero. Knowing the arts of iron-forging and pottery making, they provided iron implements and ornaments for their masters. They also served them as cattle herdsmen.

Bergdama in the aboriginal state subsisted on wild plant foods, and some groups also kept goats. They were scattered in small bands of migratory families composed of several closely related kin—each band, when temporarily settled, inhabiting a circle of grass-covered huts enclosed by a thornbush fence. A sacred fire burned in the centre of each village. The band chief, advised by his elder male kinsmen, controlled the group, and he was also its ritual leader and fire keeper. There was no larger scale political or social organization.

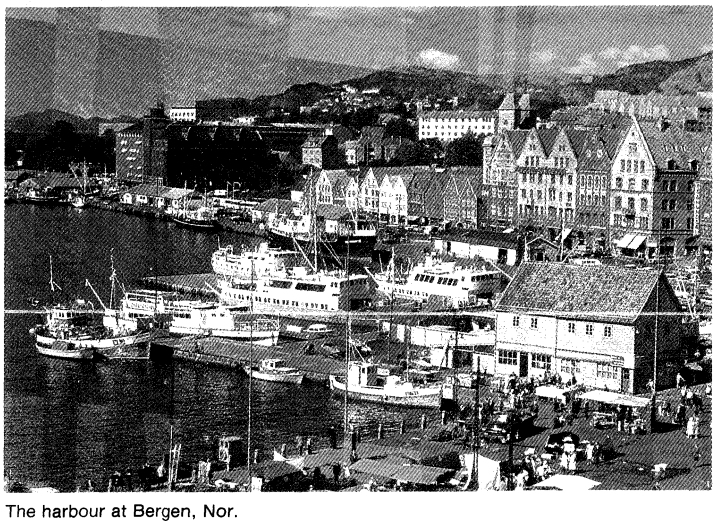
Bergdama religion included the concept of a supreme being responsible for rain and the annual renewal of plant life. There was also belief in life after death and that sickness and death were caused by the deity or by the souls of departed men who required food. Many Bergdama have adopted Christianity.

Bergen (Belgium): *see* Mons.

Bergen, city, port, and seat of Hordaland *fylke* (county), southwestern Norway. The principal port and business section is on a peninsula projecting into Byfjorden, bounded on the north by the inlet and harbour of Vågen (for small ships) and on the south by Puddefjorden (for larger vessels) and the lake of Store Lungegårdsvann.

Originally called Bjørgvin, the city was founded in 1070 by King Olaf III. About 1100 a castle was built on the northern edge of the Vågen harbour, and Bergen became commercially and politically important; it was Norway's capital in the 12th and 13th centuries. An episcopal see was established there in the 12th century. A trade centre for centuries, Bergen exported fish and furs and imported grain and manufactured goods. In the 14th century, German Hanseatic merchants acquired control over the city's trade; their influence in a weakened Norway lasted into the 18th century. Bergen has remained the most important port on the west coast of Norway, despite its almost complete destruction by fire four times, the last in 1855. Since then, wooden construction has been prohibited.

In modern times, Bergen has developed a diversified economy, based largely on fishing, shipbuilding and associated industries (repairing and equipment), machinery and metal products, and food processing. It is now the second largest city of Norway. Notable buildings are the 12th-century Mariakirken (Church of St. Mary), the city's oldest structure; Bergenhus fortress, including Håkonshallen (Haakon's Hall, built in the 13th century); and the Rosenkrantz Tower. The latter two buildings were severely damaged during the German occupation (1940–45). Bergen is the seat of a university (1948) as well as of the Norwegian School of Economics and Business Administration (1936). Its Western Norway Museum of Applied Art (1887) has a fine collection. Bergen was the birthplace of Edvard Grieg, the composer; Ole Bull, the violinist; Johan Christian Dahl, the landscape painter; and Ludvig Holberg, the dramatist. Pop. (1983) mun., 207,232.



The harbour at Bergen, Nor.
Mittet Foto A/S

Bergen, Edgar, byname of EDGAR JOHN BERGREN (b. Feb. 16, 1903, Chicago—d. Sept. 30, 1978, Las Vegas, Nev., U.S.), noted U.S. ventriloquist and radio comedian whose career in vaudeville, radio, and motion pictures spanned almost 60 years. Bergen was best known as the foil of his ventriloquist's dummy Charlie McCarthy. The "Edgar Bergen-Charlie McCarthy Show" was a permanent fixture on U.S. network radio from 1937 until 1957. Other characters created by Bergen, such as Mortimer Snerd and Effie Klinker, were woven into the perennially popular program, which was rated as radio's most popular in 1937–40 and 1942–43, and among the top seven from 1937 to 1952.

Bergen's parents took him on a visit to their native Sweden when he was four years old; there he learned the language that various of his later characters would occasionally articulate. He attended public schools in Chicago where, when he was 11, he discovered a facility for vocal tricks that gave him an interest in ventriloquism. He had the head of the dummy Charlie McCarthy carved (although he made the body himself) while he was still in high school. By the time he attended Northwestern University he was proficient enough to earn his expenses with ventriloquism and magic tricks.

He went into vaudeville and performed in nightclubs in the United States and Europe. During World War II Bergen took Charlie with him to entertain American service personnel, touring the Aleutian Islands, Alaska, and Greenland and appearing on many special radio shows. After their radio show terminated, Bergen and McCarthy appeared often as guests on variety television shows.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bergen-Belsen, also called BELSEN, German Nazi concentration camp near the villages of Bergen and Belsen, about 10 miles (16 kilometres) northwest of Celle, then in Prussian Hanover, Ger. Originally established in July 1943 partly as a prisoner-of-war camp and partly as a Jewish transit camp, it was designed for 10,000 prisoners but, by war's end, held 41,000. Although Bergen-Belsen contained no gas chambers, some 37,000 prisoners died from starvation, overwork, disease, and some of the most squalid, fetid living conditions of any of Germany's camps; corpses were bulldozed into mass graves. Anne Frank, whose wartime diary would later become world famous, died at Bergen-Belsen in March 1945.

Taken by the British on April 15, 1945, it was the first such camp to be liberated by the Western Allies and received instant notoriety. The SS commandant, Josef Kramer (*q.v.*), the "Beast of Belsen," was tried by a British military court and hanged.

Bergen op Zoom, *gemeente* (municipality), Noordbrabant *provincie* (province), southwestern Netherlands, on the small Zoom River, near its canal junction with the East Scheldt (Oosterschelde) Channel. It was taken by the Normans in 880. Bergen op Zoom (meaning "hills on the border [of the marshes]") became a lordship in 1287 by separation from Breda and was a hereditary fief of the duchy of Brabant. It prospered in the 15th century as a trade centre, its fairs being visited by English merchants who enjoyed special privileges. In 1533 it was raised to a margravate by Charles V. It resisted Spanish rule, was fortified, and successfully resisted several Spanish assaults between 1581 and 1622. Taken by the French (1747) during the War of the Austrian Succession and again in 1795, it was held against the English until the fall of Napoleon in 1814. The fortifications were dismantled in 1867, and the town was occupied by the Germans during World War II.

The Gevangenpoort (gate; *c.* 1300) is a remnant of the medieval fortifications; the Ravelin fortress remains of the ramparts that were completed in 1740. Historic buildings include the medieval town hall; the Grote Kerk (St. Gertrude's Church), dating originally from the 14th century but much restored; and the Markiezenhof (Court of the Marquis, 1485–1520).

Economic activities include fishing (anchovies), oyster culture, and asparagus growing; industries include metallurgical and engineering works, confectioneries, biscuit factories, and one of Europe's largest distilleries. Pop. (1983 est.) 45,178.

Berger, Victor (Louis) (b. Feb. 28, 1860, Nieder-Rehbach, Austria-Hungary—d. Aug. 7, 1929, Milwaukee, Wis., U.S.), a founder of the U.S. Socialist Party, the first Socialist elected to Congress.

Berger immigrated to the U.S. in 1878. He taught public school in Milwaukee for a time and from 1892 was editor successively of *Vorwarts*, a German-language newspaper that he founded, and the *Social Democratic Herald*, later known as the *Milwaukee Leader*. With Eugene V. Debs, he founded the Social Democratic Party, which in 1901 became the Socialist Party. Elected from Milwaukee to the U.S. House of Representatives in 1910, Berger served one term.

During World War I, he joined other Socialists in actively opposing U.S. participation; as a result, he was prosecuted under the Espionage Act, found guilty, and sentenced to 20 years in prison. Meanwhile, in 1918, he had again been elected to Congress. This time, however, members voted to deny him his seat. A special election was held in 1919, and Berger was again sent to Congress and again refused admittance. On an appeal to the Supreme Court, Berger had his espionage conviction overturned in 1921 and the following year was elected yet again to the House. Thus vindicated, he was permitted to take his seat; he served until 1929. In 1927 he succeeded Debs as chairman of the Socialist Party executive committee, a post he held until his death.

Bergerac, town, Dordogne *département*, Aquitaine region, southwestern France, on the Dordogne River, east of Bordeaux. It was intermittently held by the English from 1152 until 1450, and in the 16th and 17th centuries it became a centre of French Protestantism. The Treaty of Bergerac (1577), between Henry III and the Huguenot princes, was a futile attempt to end the Wars of Religion. In 1621 Bergerac was subdued by a royal army, and its fortifications were destroyed. Features include the church of Saint-Jacques (16th century), Maison Peyraréde (Kings' House), the Tobacco Museum (in the town hall), and the Récollets' Cloister cellar. The marketing of wines, chestnuts, and truffles is augmented by light manufacturing (tobacco, confectionary, shoes, fruit preserves). The national powder works, dating from World War I, has been converted to chemical production. Pop. (1982) 24,604.

Church of Saint-Jacques in Bergerac, Fr.
Editions Modernes "Theojac"

Bergerac, Savinien Cyrano de: *see* Cyrano de Bergerac, Savinien.

Bergeron, Tor Harold Percival (b. Aug. 15, 1891, Godstone, near London—d. June 13, 1977, Stockholm), Swedish meteorologist best known for his work on cloud physics.

He was educated at the universities of Stockholm and Oslo, from the latter of which he received his Ph.D. in 1928. He taught at the University of Stockholm (1935–45) and the University of Uppsala, Swed. (1946–60). From 1918 to 1921 he was a student and co-worker of the pioneering meteorologist Vilhelm Bjerknes and was actively engaged in the development of new methods of weather forecasting.

Bergeron was noted for his studies in the analysis of air masses and the formation of warm and cold fronts. He was also the first meteorologist to take into account upper atmospheric phenomena and their effect on climate. His theory on the origin of precipitation was instrumental in the further exploration of cloud physics. He wrote a number of works on such subjects as weather fronts, ice nuclei in clouds, methods and problems of weather forecasting, build-up of ice sheets, and the Earth's future supply of fresh water.

Bergey, David Hendricks (b. Dec. 27, 1860, Skippack, Pa., U.S.—d. Sept. 5, 1937, Philadelphia), U.S. bacteriologist, primary author of *Bergey's Manual of Determinative Bacteriology,* an invaluable taxonomic reference work.

Bergey taught in the schools of Montgomery County, Pa., until he began studies at the University of Pennsylvania. In 1884 he received the B.S. and M.D. degrees and practiced medicine until 1893. He then joined the staff at the University of Pennsylvania and was appointed Thomas A. Scott fellow in the Laboratory of Hygiene in 1894. He received a doctor of public health degree in 1916, served as professor of hygiene and bacteriology in both undergraduate and graduate schools of the university, became director of the laboratory in 1929, and served in other university posts until his retirement in 1932. He was the director of biological research of the National Drug Company in Philadelphia until his death in 1937.

Bergey's publications include the *Handbook of Practical Hygiene* (1899) and *The Principles of Hygiene* (1901). His research included such varied topics as tuberculosis, food preservatives, phagocytosis (engulfment of particles by cells), and anaphylaxis (reaction of an organism to a foreign substance), and a systematic arrangement of the class of microorganisms called Schizomycetes.

Berghem, Claes Pietersz(oon) (Dutch painter): *see* Berchem, Claes Pietersz(oon).

Bergisch Gladbach, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, just east-northeast of Cologne. Chartered in 1856, it has a 12th-century Romanesque church (in the Paffrath district), the moated castles of Zwiefelsstrunden and Blegge, and the 16th-century headquarters of the Order of St. John (in Herrenstrunden). Paper is the city's chief product, but machinery, electrical equipment, wool, glass fibre, and pharmaceutical products are also manufactured, and iron is smelted. Nearby Bensberg, which was annexed by Bergisch Gladbach in 1975, is the site of a nuclear reactor building company. The city serves as a tourist base for the Bergisches Land, a hilly

wooded district in the lower Rhine Valley. Pop. (1983 est.) 101,081.

Bergisches Land, region, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, along the east bank of the Rhine River, between the Sieg River south of Cologne and the Ruhr River near Duisburg, merging into the Sauerland, a hilly region to the east. The Bergisches Land extends over the area that was the medieval county and duchy of Berg (*q.v.*). It comprises a gentle plateau with little agriculture but has numerous industries, largely dependent on the Ruhr coalfields to the north.

Bergius, Friedrich (b. Oct. 11, 1884, Goldschmieden, near Breslau, Ger.—d. March 30, 1949, Buenos Aires), German chemist who succeeded in converting coal dust and hydrogen directly into gasoline and lubricating oils without isolating intermediate products. For his work in developing the hydrogenation method necessary for this process he shared the 1931 Nobel Prize for Chemistry with Carl Bosch of Germany.

Bergius was educated at the universities of Breslau, Leipzig, and Berlin and at technical schools in Karlsruhe and Hannover. He described his research in *The Use of High Pressure in Chemical Actions* (1913). These studies led to his work on converting coal into liquid hydrocarbons.

Bergius also researched the conversion of wood into sugar and of sugar into other food products. This work helped to provide Germany with food during World War II.

Bergman, Bo Hjalmar (b. Oct. 6, 1869, Stockholm—d. Nov. 17, 1967, Stockholm), Swedish lyrical poet whose early pessimistic and deterministic view of life gave way to a militant humanism under the pressures of the political and social dangers of his time; his simplicity and clarity of style greatly influenced 20th-century Swedish poetry.

Bergman began writing while an official of the Swedish post office, from which he retired in 1933. *Marionetterna* (1903; "Marionettes"), his first volume of poetry, was an expression of melancholy passivity, but each of the ensuing volumes increasingly attacked the political developments in Europe, particularly his last three volumes of verse: *Trots allt* (1931; "In Spite of Everything"), *Gamla gudar* (1939; "Old Gods"), and *Riket* (1944; "The Kingdom"). Bergman's prose works include five volumes of short stories, five novels, five monographs, and autobiographical fragments.

Bergman, Hjalmar Fredrik Elgérus (b. Nov. 19, 1883, Örebro, Swed.—d. Jan. 1, 1931, Berlin), Swedish dramatist, novelist, and short-story writer, who was notable for his intense interest in psychological complexities.

The son of a wealthy banker, Bergman was brought up in conventional middle-class ease with no notice taken of his extreme sensibility and imaginative powers. In his early teens his father, who had hitherto despised him,

Hjalmar Bergman
By courtesy of the Swedish Institute for Cultural Relations, Stockholm

became aware of his precocious talents, and the shy, awkward, but observant boy became the object of an overpowering and domineering affection. At this period he accompanied his father on business trips to Bergslagen, the mining district outside Örebro, which was to form the background of many of his books.

During 1900–01 Bergman studied at Uppsala University. From 1901 to 1908 he travelled in Europe, especially in Italy: Florence became his favourite city. Delicate nerves and the threat of blindness made his life difficult. In 1908 he married Stina, the daughter of the actor-producer August Lindberg, and she became his defense against the world. They settled first in Lindesberg, then for a time in Rome. For the rest of his life, except during World War I, Bergman led a restless and curiously isolated existence between Sweden and other parts of Europe.

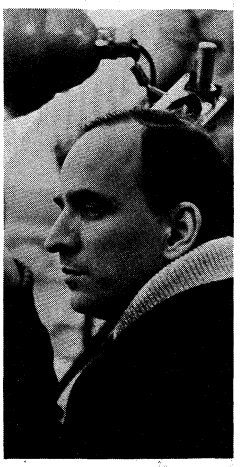
His first play, *Maria, Jesu moder* (1905), owes much to the literary ideas of the 1890s, but shows an original approach to the psychology of Christ and the Virgin Mary. His other early plays reveal the influence of Ibsen. His most original contribution to drama was *Marionettspel* (1917; "Plays of Marionettes"), reflecting the same pessimism as his later novels. His first popular novel *Hans Nåds testamente* (1910; "His Grace's Will") was set in Bergslagen, and portrayed the eccentric Baron Roger and his valet Vickberg in richly comic scenes. Beneath the humour, however, there are undertones of tragedy, as is characteristic, too, of his later works. A collection of short stories *Amourer* (1910), mostly set in Italy, displays his subtle understanding of the irrational as a decisive factor in human behaviour. Bergman produced a series of novels and long short stories, starting with *Vi Bookar, Krokar och Rothar* (1912) and ending with *En döds memoarer* (1918; "Memoirs of One Dead"). These were mainly concerned with Bergslagen, from early times, and with the fortunes and complicated feuds of certain families and characters.

His amazing memory and powers of observation enabled Bergman to create out of his own experiences and out of oral traditions, a grotesque, fantastic, sombre, and yet moving world that was peculiarly his own, despite its real-life setting. His work was appreciated by a discriminating few, until with *Markurells i Wadköping* (1919; *God's Orchid*, 1924) he at last captured the wider public. The action of this vigorous comic novel takes place, with numerous recapitulations, within a 24-hour period. It tells the story of the grotesque innkeeper Markurell, who, although he has succeeded in getting most of the inhabitants of the town of Wadköping in his power, shows mercy, out of love for his only son Johan, whose real father proves to be the innkeeper's chief enemy. The novel is written ironically, but a sense of tragedy permeates it.

Bergman followed this with other successes, including *Farmor och vår Herre* (1921; *Thy Rod and Thy Staff*, 1937) and *Chefen Fru Ingeborg* (1924; *The Head of the Firm*, 1936), and *Clownen Jac* (1930; "The Clown Jac").

His play *Swedenhielms* (1925) is among the few living Swedish comedies and his dramatization of *Markurells* also has remained popular. Four of his plays (*Markurells of Wadkoping, The Baron's Will, Swedenhielms,* and *Mr. Sleeman Is Coming*) were published in English translation in 1968. He also wrote radio and film scripts. Fundamentally a pessimist, Bergman felt for all the weaknesses of man with an understanding pity irradiated by humour.

Bergman, (Ernst) Ingmar (b. July 14, 1918, Uppsala, Swed.), Swedish film writer-director who achieved world fame with such films as *Det sjunde inseglet* (1956; *The Seventh Seal*); *Smultronstället* (1957; *Wild Strawberries*); the trilogy *Såsom i en spegel* (1961; *Through a Glass Darkly*), *Nattsvardsgästerna* (1961; *The Communicants*, or *Winter Light*), *Tystnaden* (1963; *The Silence*); and *Viskingar och rop* (1972; *Cries and Whispers*). He is noted for his versatile camera work and for his fragmented



Ingmar Bergman
Camera Press

narrative style, which contribute to his bleak depiction of human loneliness, vulnerability, and torment.

Life. Bergman was the son of a Lutheran pastor and frequently remarked on the importance of his childhood background in the development of his ideas and moral preoccupations. Even when the context of his film characters' sufferings is not overtly religious, they are always implicitly engaged in a search for moral standards of judgment, a rigorous examination of action and motive, in terms of good and bad, right and wrong, which seems particularly appropriate to someone brought up in a strictly religious home. Another important influence in his childhood was the religious art Bergman encountered, particularly the primitive yet graphic representations of Bible stories and parables found in rustic Swedish churches, which fascinated him and gave him a vital interest in the visual presentation of ideas, especially the idea of evil as embodied in the devil.

Bergman attended Stockholm University, where he studied art, history, and literature. There for the first time he became passionately involved in the theatre and began writing and acting in plays and directing student productions. From these he went on to become a trainee director at the Mäster Olofsgärden Theatre and the Sagas Theatre, where he produced a spectacularly unconventional and disastrous production of the Swedish playwright August Strindberg's *Ghost Sonata.* In 1944 he was given his first full-time job as a director, at Hälsingborg municipal theatre. Also, and more importantly, he met Carl-Anders Dymling, the head of the Svensk Filmindustri. Dymling was sufficiently impressed by him to commission an original screenplay, *Hets* (1944; *Frenzy*, or *Torment*). This was directed by Alf Sjöberg, then Sweden's leading film director, and had an enormous success, both at home and abroad. Largely as a result of this success, Bergman was, in 1945, given a chance to write and direct a film of his own, *Kris* (*Crisis*), and from this point on, his career was under way.

The films that Bergman wrote or directed, or both, in the next five years were, if not directly autobiographical, at least very much concerned with the sort of problems that he himself was encountering at that time: the role of the young in a changing society, ill-fated young love, and military service. At the end of 1948 he directed his first film based on an original screenplay of his own, *Fängelse*

(1949; *Prison*, or *The Devil's Wanton*). It recapitulated all the themes of his previous films in a complex, perhaps overambitious story, built around the romantic and professional problems of a young film director who considers making a film based on the idea that the devil rules the world. While this is not to be taken without qualification as Bergman's message in his early work, it may at least be said that his imaginative world is divided very sharply between the worlds of good and evil, the latter always overshadowing the former, the devil lying in wait at the end of each idyll.

In 1951 Bergman's career in films, like nearly the whole of Swedish filmmaking, came to an abrupt halt as the result of a major economic crisis in Sweden. But in 1952 he returned with two films, *Kvinnors väntan* (*Waiting Women*, or *Secrets of Women*) and *Sommaren med Monika* (*Summer with Monika*, or *Monika*), that marked the beginning of his mature work. He was also appointed director of the Malmö municipal theatre, where he remained until 1959. This new phase introduced two markedly new characteristics in his work. In subject matter, Bergman, now himself married, returned again and again to the question of marriage. Viewing it from many angles, he examined the ways by which two people adjust to living together, their motives for being faithful or unfaithful to each other, and their reactions to bringing children into the world. At this time Bergman began to gather around him, in his film and stage productions, a faithful "stock company" of actors with whom he worked regularly to give his work and their interpretation of it a manifest consistency and style.

In 1955 Bergman had his first great international success with *Sommernattens leende* (*Smiles of a Summer Night*), a bittersweet romantic comedy-drama in a period setting. In the next few years, a kind of Bergman fever swept over the international film scene: concurrently with the succession of his new films, which included two masterpieces, *The Seventh Seal* (1956), a medieval morality play, and *Wild Strawberries* (1957), a meditation on old age, all of his early work was shown, and Bergman was universally recognized as one of the most important figures in cinema. Indeed, a far wider section of the cultured public became aware of his work than of that of any previous filmmaker; for the first time a filmmaker was as widely and as highly regarded as artists in any of the more traditional media.

Inevitably, a reaction set in, though Bergman continued to make films and direct plays with undiminished activity; and his trilogy of films, *Through a Glass Darkly, Winter Light,* and *The Silence,* dealing with the border line between sanity and madness and that between human contact and total withdrawal, was regarded by many as his crowning achievement.

About this time, he acquired a country home on the bleak island of Fårö; and the island provided a characteristic stage for the dramas of a whole series of films that included *Persona* (1966), *Vargtimmen* (1968; *Hour of the Wolf*), *Skammen* (1968; *Shame*), and *En passion* (1969; *The Passion*, or *The Passion of Anna*), all dramas of inner conflicts involving a small, closely knit group of characters. With *Beröringen* (1971; *The Touch*), his first English-language film, Bergman returned to an urban setting and more romantic subject matter, though fundamentally the characters in the film's marital triangle are no less mixed up than any in the Fårö cycle of films; and then *Viskingar och rop* (1972; *Cries and Whispers*), *Scener ur ett aktenskap* (1974; *Scenes from a Marriage*), and *Herbstsonate* (1978; *Autumn Sonata*), all dealing compassionately with intimate family relationships, won popular as well as critical fame. Throughout the years he continued to direct for the stage, most notably at Stockholm's Royal Dramatic Theatre. In 1977 he received the Swedish Academy of Letters Great Gold Medal, and in the following year the Swedish Film Institute established a prize for excellence in filmmaking in his name. Later films include *Fanny och Alexander* (1983; *Fanny and Alexander*), in which the fortunes and misfortunes of a wealthy theatrical family in turn-of-the-century Sweden are portrayed through the eyes of a young boy.

Assessment. Bergman established a worldwide reputation for writing and directing films that, in an unmistakably individual style, examine the issues of morality by exploring man's relationship to himself, to others, and to God. His work and the worldwide vogue it enjoyed in the late 1950s and early 1960s introduced many people for the first time to the idea of the total filmmaker, the writer-director who throughout a sizable body of work uses the medium of film to express his own ideas and perceptions, with as much ease and conviction as artists in earlier generations used the novel or the symphony or the fresco. In addition, the immense international popularity of his films has tended to ensure that Bergman's picture of Sweden and the Swedish temperament is the first and often the only impression received by the outside world; and when other Swedish films seem to present much the same image, it is usually because the influence of Bergman on his Swedish colleagues is so pervasive rather than because his highly personal vision should be taken as an objectively true portrait of his country.

Bergman's anguished appraisal of the human situation has lost nothing of its intensity through the years; rather, he has progressively stripped away the distracting decorations in his films to create an abstract drama of man's relation with man and perhaps with God (if he exists). He deals with man's attempt to define his own personality by removing his masks to see if there is a face underneath. The images of the creator as actor and the creator as magician recur throughout Bergman's work. He himself embodies elements of both the thinker and the actor, the preacher and the charlatan; in Bergman they all fuse to create an artist of great force and individuality whose work is always unmistakably his own. (J.R.T.)

MAJOR WORKS. *Kris* (1945; *Crisis*); *Skepp till Indialand* (1947; *A Ship to India*, or *The Land of Desire*); *Hamnstad* (1948; *Port of Call*); *Fängelse* (1949; *Prison*, or *The Devil's Wanton*); *Törst* (1949; *Thirst*, or *Three Strange Loves*); *Till glädje* (1949; *To Joy*); *Sommarlek* (1951; *Illicit Interlude*, or *Summer Interlude*); *Kvinnors väntan* (1952; *Secrets of Women*, or *Waiting Women*); *Gycklarnas afton* (1953; *The Naked Night*, or *Sawdust and Tinsel*); *En lektion i kärlek* (1954; *A Lesson in Love*); *Kvinnodröm* (1955; *Dreams*, or *Journey into Autumn*); *Sommarnattens leende* (1955; *Smiles of a Summer Night*); *Det sjunde inseglet* (1956; *The Seventh Seal*); *Smultronstället* (1957; *Wild Strawberries*); *Nära livet* (1958; *Brink of Life*, or *So Close to Life*); *Ansiktet* (1958; *The Magician*, or *The Face*); *Jungfrukällan* (1960; *The Virgin Spring*); *Djävulens öga* (1960; *The Devil's Eye*); *Såsom i en spegel* (1961; *Through a Glass Darkly*); *Nattsvardsgästerna* (1961; *Winter Light*); *Tystnaden* (1963; *The Silence*); *För att inte tala om alla dessa kvinnor* (1964; *All These Women*, or *Now About These Women*); *Persona* (1966); *Vargtimmen* (1968; *Hour of the Wolf*); *Skammen* (1968; *Shame*); *En passion* (1969; *The Passion of Anna*); *Beröringen* (1971; *The Touch*); *Viskingar och rop* (1972; *Cries and Whispers*); *Scener ur ett aktenskap* (1974; *Scenes from a Marriage*); *Trollflojten* (1974; *The Magic Flute*); *The Serpent's Egg* (1977); *Herbstsonate* (1978; *Autumn Sonata*); *From the Life of the Marionettes* (1980); *Fanny och Alexander* (1983; *Fanny and Alexander*).

BIBLIOGRAPHY. Jorn Donner, *Djävulens ansikte: Ingmar Bergmans filmer* (1962; Eng. trans., *The Personal Vision of Ingmar Bergman*, 1964), a perceptive study of Bergman's themes and images by a fellow filmmaker; John Russell Taylor, *Cinema Eye, Cinema Ear* (1964), contains a critical study of Bergman, filmography, and bibliography; Henrik Sjogren, *Ingmar Bergman på teatern* (1968), a complete account of Bergman's theatrical work, with pictures and credits; *Four Screenplays of Ingmar Bergman: Smiles of a Summer Night, The Seventh Seal, Wild Strawberries, The Magician (The Face)* (1960), and *A Trilogy: Through a Glass Darkly, Winter Light, The Silence* (1965), two collections of English translations of Bergman's principal screenplays.

Bergman, Ingrid (b. Aug. 29, 1915, Stockholm—d. Aug. 29, 1982, London), one of the most popular motion-picture actresses in the United States from the 1940s until her death and an international star in Swedish, French, German, Italian, and British films. The natural charm, freshness, intelligence, and vitality

Ingrid Bergman
EB Inc.

with which she approached her varied roles made her the image of sincerity and ideal womanhood.

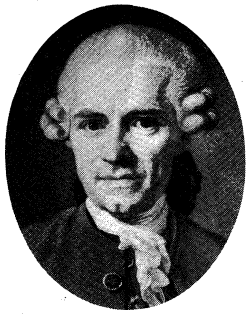
Bergman studied at the Royal Dramatic Theatre, in Stockholm. Her screen debut in *Munkbrogreven* (*The Count of the Monk's Bridge,* 1935), was followed by challenging roles in such Swedish films as *En kvinnas ansikte* (*A Woman's Face,* 1938) and the original *Intermezzo* (1939). Brought to the United States to star in the Hollywood version of *Intermezzo* (1939, released in Great Britain as *Escape to Happiness*), Bergman achieved tremendous popularity through a series of critical and commercial successes that included *Casablanca* (1942); *For Whom the Bell Tolls* (1943); *Gaslight* (1944), for which she won the Academy Award for best actress; *Saratoga Trunk* (1945); *Spellbound* (1945), a thriller directed by Alfred Hitchcock; *The Bells of St. Mary's* (1945); and another Hitchcock thriller, *Notorious* (1946). Her love affair with the Italian director Roberto Rossellini, during the filming of *Stromboli* (1950), led her first husband to divorce her. The scandal forced her to return to Europe, where she appeared in Italian and French films, such as *Europa '51* (1952; *The Greatest Love,* 1954) and *Un viaggio in Italia* (1954; *Journey to Italy,* 1955). After her marriage to Rossellini in 1950 ended in divorce, she made a triumphant Hollywood comeback in *Anastasia* (1956), for which she won her second Academy Award. She won her third Oscar, for best supporting actress, for her role in the highly successful film *Murder on the Orient Express* (1974). She was nominated for an Academy Award for her role as a concert pianist in the Swedish film *Autumn Sonata* (1978), directed by Ingmar Bergman. Her last role was that of Golda Meir, the Israeli prime minister, in the television play *A Woman Called Golda* (1981).

On the stage from 1940, when she starred in *Liliom,* Bergman appeared in critically acclaimed plays such as *Hedda Gabler* (Paris, 1962), *A Month in the Country* (Great Britain, 1965), *Captain Brassbound's Conver-*

sion (London, 1971), and *The Constant Wife* (New York, 1975). She also starred in the television plays *The Turn of the Screw* (1959) and *Hedda Gabler* (1963).

My Story (1980) is her autobiography with alternating sections by Alan Burgess.

Bergman, Torbern Olof (b. March 20, 1735, Katrineberg, Swed.—d. July 8, 1784, Medevi), Swedish chemist and naturalist who introduced many improvements in chemical analysis and made important advances in the theory of crystal structure.



Torbern Bergman, detail of an oil painting by Per Krafft; in the Royal Swedish Academy of Sciences, Stockholm

By courtesy of Svenska Portrattarkivet, Stockholm

Bergman was appointed associate professor of mathematics at the University of Uppsala in 1761, and six years later he became professor of chemistry there. His early studies were on rainbows and on the Aurora Borealis, which he estimated to have a height of 740 kilometres (460 miles). Bergman also investigated the pyroelectric properties of the mineral tourmaline and discovered that when a tourmaline crystal is heated, the ends become oppositely charged.

Bergman's most important paper is probably his *Disquisitio de Attractionibus Electivis* (1775; *A Dissertation on Elective Attractions*), in which he included tables listing the elements in the order of their affinity (their ability to react and displace other elements in a compound). These tables were widely acclaimed and were included in chemical literature as late as 1808.

Bergman introduced many new reagents and devised analytical methods for chemical analysis. His *De Analysi Aquarum* (1778; "On Water Analysis") is the first comprehensive account of the analysis of mineral waters.

Bergmann, Ernst (Gustav Benjamin) von (b. Dec. 16, 1836, Riga, Latvia—d. March 25, 1907, Wiesbaden, Ger.), German surgeon and author of a classic work on cranial surgery, *Die Chirurgische Behandlung der Hirnkrankheiten* (1888; "The Surgical Treatment of Brain Disorders").

Bergmann was educated at Dorpat, where he was professor of surgery from 1871 to 1878. He then taught at Würzburg until 1882, when he settled at the University of Berlin.

Ernst von Bergmann

The Bettmann Archive

In addition to his contributions to cranial surgery, Bergmann is noted for introducing steam sterilization of instruments and dressings (1886), and in 1891 he introduced aseptic methods to the practice of surgery.

Bergmann's Rule, in zoology, principle correlating external temperature and the ratio of body surface to weight in warm-blooded animals. Birds and mammals in cold regions have been observed to be bulkier than individuals of the same species in warm regions. The principle was proposed by Carl Bergmann, a 19th-century German biologist, to account for an adaptive mechanism to conserve or to radiate body heat, depending on climate.

Bergner, Elisabeth (b. Aug. 22, 1900, Vienna—d. May 12, 1986, London), Austrian actress who was noted for her stage and motion-picture performances as well as for her fragile beauty.

Bergner began her career in Zurich in 1919 but reached international fame in Berlin under Max Reinhardt's direction in 1924 of *Saint Joan* by George Bernard Shaw. Although she was highly regarded as a stage actress—and she continued to perform through the 1960s—it was her motion-picture roles in sentimental romances that gained her the most enthusiastic audience.

Bergner made her first motion picture in 1923; *Nju* (1924), directed by her husband-to-be, Paul Czinner, was an instant success, as were the films that followed. Denounced by the Nazis, Bergner and Czinner moved to England. Her stage debut there as Gemma Jones in *Escape Me Never* (1933) was met with great enthusiasm, and she repeated the role in New York City (1935) and again for the film version that was directed by Czinner (1935); the latter performance garnered her an Academy Award nomination. Other English-language films of Bergner's included *Catherine the Great* (1934), *As You Like It* (1936), *Paris Calling* (1942; her only U.S. film), and *Cry of the Banshee* (1970). Her last motion-picture performance was in 1979.

J.M. Barrie wrote his last play (*The Boy David;* 1936) especially for Bergner, and she enjoyed a two-season run as Sally in Martin Vale's *The Two Mrs. Carrolls* (1943). After the war she returned on tour to her homeland on numerous occasions, and there she became the first actress to win the Schiller Prize (1963) for contributions to German cultural life. She also won awards at the Berlin Film festivals of 1963 and 1965.

bergomask (dance): *see* bergamasca.

bergschrund (German: "mountain crevice"), a crevasse or series of crevasses often found near the head of a mountain glacier. The erosion of the rock beneath a bergschrund often results in a cirque (*q.v.*), or natural amphitheatre.

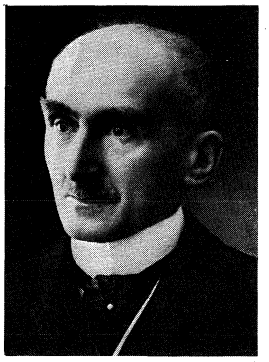
Bergslagen, major ore-producing region in central Sweden, lying northwest of Stockholm and extending from Vänern (Sweden's largest lake) to the Gulf of Bothnia. It falls predominantly within the *län* (counties) of Kopparberg, Örebro, Värmland, and Västmanland.

In the Middle Ages iron was mined there on a large scale and was smelted with charcoal. Metal products were shipped to the south in exchange for cattle. New iron mines opened in the early 18th century. In 1877 an ore export port was constructed on the Baltic coast, at Oxelösund, and was connected by rail to the mines of Grängesberg and Stråssa. The development of Sweden's world-famous steel industry was based on raw materials from Bergslagen.

While iron is the principal ore, Bergslagen has also served as a source of copper (especially at Falun), silver, lead, and zinc. Today the region has many factories producing heavy engineering and metal products. Avesta has important steel works. There are also a number of pulp and paper mills in the area.

Bergson, Henri(-Louis) (b. Oct. 18, 1859, Paris—d. Jan. 4, 1941, Paris), French philosopher, the first to elaborate what came to be called a process philosophy, which rejected static values in favour of values of motion, change, and evolution. He was also a master literary stylist, of both academic and popular appeal.

Early years. Through his father, a talented musician, Bergson was descended from a rich Polish Jewish family—the sons of Berek, or Berek-son, from which the name Bergson is derived. His mother came from an English Jewish family. Bergson's upbringing, training,



Bergson, 1928

Archiv fur Kunst und Geschichte, West Berlin

and interests were typically French, and his professional career, as indeed all of his life, was spent in France, most of it in Paris.

He received his early education at the Lycée Condorcet in Paris, where he showed equally great gifts in the sciences and the humanities. From 1878 to 1881 he studied at the École Normale Supérieure in Paris, the institution responsible for training university teachers. The general culture that he received there made him equally at home in reading the Greek and Latin classics, in obtaining what he wanted and needed from the science of his day, and in acquiring a beginning in the career of philosophy, to which he turned upon graduation.

His teaching career began in various lycées outside of Paris, first at Angers (1881–83) and then for the next five years at Clermont-Ferrand. While at the latter place, he had the intuition that provided both the basis and inspiration for his first philosophical books. As he later wrote to the eminent American Pragmatist William James:

> I had remained up to that time wholly imbued with mechanistic theories, to which I had been led at an early date by the reading of Herbert Spencer. . . . It was the analysis of the notion of time, as that enters into mechanics and physics, which overturned all my ideas. I saw, to my great astonishment, that scientific time does not *endure* . . . that positive science consists essentially in the elimination of duration. This was the point of departure of a series of reflections which brought me, by gradual steps, to reject almost all of what I had hitherto accepted and to change my point of view completely.

The first result of this change was his *Essai sur les données immédiates de la conscience* (1889; *Time and Free Will: An Essay on the Immediate Data of Consciousness*), for which he received the doctorate the same year. This work was primarily an attempt to establish the notion of duration, or lived time, as opposed to what he viewed as the spatialized conception of time, measured by a clock, that is employed by science. He proceeded by analyzing the awareness that man has of his inner self to show that psychological facts are qual-

itatively different from any other, charging psychologists in particular with falsifying the facts by trying to quantify and number them. Fechner's Law, claiming to establish a calculable relation between the intensity of the stimulus and that of the corresponding sensation, was especially criticized. Once the confusions were cleared away that confounded duration with extension, succession with simultaneity, and quality with quantity, he maintained that the objections to human liberty made in the name of scientific determinism could be seen to be baseless.

Philosophical triumphs. The publication of the *Essai* found Bergson returned to Paris, teaching at the Lycée Henri IV. In 1891 he married Louise Neuburger, a cousin of the French novelist Marcel Proust. Meanwhile, he had undertaken the study of the relation between mind and body. The prevailing doctrine was that of the so-called psychophysiological parallelism, which held that for every psychological fact there is a corresponding physiological fact that strictly determines it. Though he was convinced that he had refuted the argument for determinism, his own work, in the doctoral dissertation, had not attempted to explain how mind and body are related. The findings of his research into this problem were published in 1896 under the title *Matière et mémoire: Essai sur la relation du corps à l'esprit* (*Matter and Memory*).

This is the most difficult and perhaps also the most perfect of his books. The approach that he took in it is typical of his method of doing philosophy. He did not proceed by general speculation and was not concerned with elaborating a great speculative system. He began in this, as in each of his books, with a particular problem, which he analyzed by first determining the empirical (observed) facts that are known about it according to the best and most up-to-date scientific opinion. Thus, for *Matière et mémoire* he devoted five years to studying all of the literature available on memory and especially the psychological phenomenon of aphasia, or loss of the ability to use language. According to the theory of psychophysiological parallelism, a lesion in the brain should also affect the very basis of a psychological power. The occurrence of aphasia, Bergson argued, showed that this is not the case. The person so affected understands what others have to say, knows what he himself wants to say, suffers no paralysis of the speech organs, and yet is unable to speak. This fact shows, he argued, that it is not memory that is lost but, rather, the bodily mechanism that is needed to express it. From this observation Bergson concluded that memory, and so mind, or soul, is independent of body and makes use of it to carry out its own purposes.

The *Essai* had been widely reviewed in the professional journals, but *Matière et mémoire* attracted the attention of a wider audience and marked the first step along the way that led to Bergson's becoming one of the most popular and influential lecturers and writers of the day. In 1897 he returned as professor of philosophy to the École Normale Supérieure, which he had first entered as a student at the age of 19. Then, in 1900, he was called to the Collège de France, the academic institution of highest prestige in all of France, where he enjoyed immense success as a lecturer. From then until the outbreak of World War I, there was a veritable vogue of Bergsonism. William James was an enthusiastic reader of his works, and the two men became warm friends. Expositions and commentaries on the Bergsonian philosophy were to be found everywhere. It was held by many that a new day in philosophy had dawned that brought with it light to many other activities such as literature, music, painting, politics, and religion.

L'Évolution créatrice (1907; *Creative Evolution*), the greatest work of these years and Bergson's most famous book, reveals him most clearly as a philosopher of process at the same time that it shows the influence of biology upon his thought. In examining the idea of life, Bergson accepted evolution as a scientifically established fact. He criticized, however, the philosophical interpretations that had been given of it for failing to see the importance of duration and hence missing the very uniqueness of life. He proposed that the whole evolutionary process should be seen as the endurance of an *élan vital* ("vital impulse") that is continually developing and generating new forms. Evolution, in short, is creative, not mechanistic. (*See* creative evolution.)

In this developing process, he traced two main lines: one through instinct, leading to the life of insects; the other through the evolution of intelligence, resulting in man; both of which, however, are seen as the work of one vital impulse that is at work everywhere in the world. The final chapter of the book, entitled "The Cinematographical Mechanism of Thought and the Mechanistic Illusion," presents a review of the whole history of philosophical thought with the aim of showing that it everywhere failed to appreciate the nature and importance of becoming, falsifying thereby the nature of reality by the imposition of static and discrete concepts.

Among Bergson's minor works are *Le Rire: Essai sur la significance du comique* (1900; *Laughter: An Essay on the Meaning of the Comic*) and, *Introduction à la metaphysique* (1903; *An Introduction to Metaphysics*). The latter provides perhaps the best introduction to his philosophy by offering the clearest account of his method. There are two profoundly different ways of knowing, he claimed. The one, which reaches its furthest development in science, is analytic, spatializing, and conceptualizing, tending to see things as solid and discontinuous. The other is an intuition that is global, immediate, reaching into the heart of a thing by sympathy. The first is useful for getting things done, for acting on the world, but it fails to reach the essential reality of things precisely because it leaves out duration and its perpetual flux, which is inexpressible and to be grasped only by intuition. Bergson's entire work may be considered as an extended exploration of the meaning and implications of his intuition of duration as constituting the innermost reality of everything.

Later years. In 1914 Bergson retired from all active duties at the Collège de France, although he did not formally retire from the chair until 1921. Having received the highest honours that France could offer him, including membership, since 1915, among the "40 immortals" of the Académie Française, he was awarded the Nobel Prize for Literature in 1927.

After *L'Évolution créatrice,* 25 years elapsed before he published another major work. In 1932 he published *Les Deux Sources de la morale et de la religion* (*The Two Sources of Morality and Religion*). As in the earlier works, he claimed that the polar opposition of the static and the dynamic provides the basic insight. Thus, in the moral, social, and religious life of men he saw, on the one side, the work of the closed society, expressed in conformity to codified laws and customs, and, on the other side, the open society, best represented by the dynamic aspirations of heroes and mystical saints reaching out beyond and even breaking the strictures of the groups in which they live. There are, thus, two moralities, or, rather, two sources: the one having its roots in intelligence, which leads also to science and its static, mechanistic ideal; the other based on intuition, and finding its expression not only in the free creativity of art and philosophy but also in the mystical experience of the saints.

Bergson in *Les Deux Sources* had come much closer to the orthodox religious notion of God than he had in the vital impulse of *L'Évolution créatrice.* He acknowledged in his will of 1937, "My reflections have led me closer and closer to Catholicism, in which I see the complete fulfillment of Judaism." Yet, although declaring his "moral adherence to Catholicism," he never went beyond that. In explanation, he wrote: "I would have become a convert, had I not foreseen for years a formidable wave of anti-Semitism about to break upon the world. I wanted to remain among those who tomorrow were to be persecuted." To confirm this conviction, only a few weeks before his death, he arose from his sickbed and stood in line in order to register as a Jew, in accord with the law just imposed by the Vichy government and from which he refused the exemption that had been offered him.

Influence. Although it did not give rise to a Bergsonian school of philosophy, Bergson's influence has been considerable. His influence among philosophers has been greatest in France, but it has also been felt in the United States and Great Britain, especially in the work of William James; George Santayana; and Alfred North Whitehead, the other great process metaphysician of the 20th century.

BIBLIOGRAPHY. A good introduction to the study of Bergson is provided by Harold A. Larrabee (ed.), *Selections from Bergson* (1949), with an introduction by the editor. The best edition of works is the *Oeuvres,* with notes by Andre Robinet and an introduction by Henri Gouhier (1959). Perhaps the best sympathetic account (in French) of the man and his work is that of Vladimir Jankélévitch, *Henri Bergson* (1959), a complete revision of his earlier work (*Bergson,* 1931). Critical, yet also sympathetic, are Jacques Maritain, *La Philosophic bergsonienne,* 2nd ed. (1930); and Jacques Chevalier, *Bergson* (1926; Eng. trans. 1928). A highly critical account is Bertrand Russell, *The Philosophy of Bergson* (1914). A good account of Bergson the man may be found in Jean Guitton, *La Vocation de Bergson* (1960). On Bergson's influence on literature and the arts, see Romeo Arbour, *Henri Bergson et les lettres françaises* (1955).

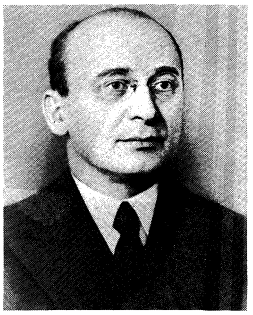
Bergström, Sune K. (b. Jan. 10, 1916, Stockholm), Swedish biochemist, corecipient with fellow Swede Bengt Ingemar Samuelsson and Englishman John Robert Vane (*qq.v.*) of the 1982 Nobel Prize for Physiology or Medicine. All three were honoured for their isolation, identification, and analysis of numerous prostaglandins, which are biochemical compounds that influence blood pressure, body temperature, allergic reactions, and other physiological phenomena in mammals. Bergström was the first to demonstrate the existence of more than one such compound and to determine the elemental compositions of two of them.

Bergström was educated at the Karolïnska Institute, Stockholm, where he was awarded doctoral degrees in medicine and biochemistry in 1944. He held research fellowships at Columbia University and the University of Basel, then returned to Sweden to accept a professorship of chemistry at the University of Lund. In 1958 he moved to the Karolïnska Institute, where he became dean of the medical faculty in 1963 and rector in 1969. After his retirement as rector in 1977 he continued to conduct research.

Berhampur (India): *see* Baharampur.

Beria, Lavrenty Pavlovich, Beria also spelled BERIYA (b. March 29 [March 17, old style], 1899, Merkheuli, Russia—d. Dec. 23, 1953, Moscow), director of the Soviet secret police who played a major role in the purges of Stalin's opponents.

Having joined the Communist Party in 1917, Beria participated in revolutionary activity in Azerbaijan and Georgia before he was drawn into intelligence and counterintelligence activ-



Beria
Keystone

ities (1921) and appointed head of the Cheka (secret police) in Georgia. He became party boss of the Transcaucasian republics in 1932, and personally oversaw the political purges in those republics during Stalin's Great Purge (1936–38). Beria was brought to Moscow in 1938 as the deputy to Nikolay Yezhov, the head of the People's Commissariat for Internal Affairs (NKVD; the Soviet secret police). Yezhov was apparently arrested and shot on Stalin's orders, and Beria then became head of the secret police, retaining this position longer (1938–53) than any of his predecessors. Although Beria was officially instructed to curtail the "excesses" of Yezhov's purges of the mid-1930s, he supervised a purge of the police bureaucracy itself and administered the vast network of labour camps established throughout the country. In February 1941 he became a deputy prime minister of the U.S.S.R. and during World War II, as a member of the State Defense Committee, he not only controlled the Soviet Union's internal security system but also played a major role in raw materials production by means of the slave labour at his disposal in the camps. He was made a marshal of the U.S.S.R. in 1945. He was also a member of the Central Committee of the Communist Party from 1934 and of the executive policy-making committee, the Politburo, from 1946. When the Politburo was reorganized as the Presidium in 1952, Beria retained his seat.

Soon after Stalin's death in March 1953, Beria became one of four deputy prime ministers as well as head of the Ministry of Internal Affairs, an organization which at that time combined both the secret political and regular police functions. During the ensuing struggle for power, Beria apparently attempted to use his position as chief of the secret police to succeed Stalin as sole dictator. By July 1953, however, he had been defeated by an anti-Beria coalition (led by Malenkov, Molotov, and Khrushchev). He was arrested, deprived of his government and party posts, and publicly accused of being an "imperialist agent" and of conducting "criminal anti-party and anti-state activities." Convicted of these charges at his trial in December 1953, Beria was immediately executed.

beriberi, also called VITAMIN B_1 DEFICIENCY, nutritional disorder caused by a deficiency of vitamin B_1 (thiamine) and characterized by impairment of the nerves and heart. General symptoms include loss of appetite and overall lassitude, digestive irregularities, and a feeling of numbness and weakness in the limbs and extremities. (The term *beriberi* is derived from the Sinhalese word meaning "extreme weakness.") In the form known as dry beriberi, there is a gradual degeneration of the long nerves, first of the legs and then of the arms, with associated atrophy of muscle and loss of reflexes. In wet beriberi, a more acute form, there is edema (overabundance of fluid in the tissues) resulting largely from cardiac failure and poor circulation. In infants breast-fed by mothers who are deficient in thiamine, beriberi may lead to rapidly progressing heart failure.

The cardiac symptoms, in both infants and adults, generally respond promptly and dramatically to the administration of thiamine. When neurological involvement is present, response to thiamine therapy is much more gradual; in more severe cases, the structural lesions of the nerve cells may be irreversible.

Thiamine normally plays an essential role as a coenzyme in the metabolism of carbohydrates; in its absence, pyruvic acid and lactic acid (products of carbohydrate digestion) accumulate in the tissues, where they are believed to be responsible for most of the neurological and cardiac manifestations.

Vitamin B_1 occurs widely in food but may be lost in the course of processing, particularly in the milling of grains. In Far Eastern countries, where polished white rice is a dietary staple, beriberi has been known for over 1,000 years. The history of the recognition, the cause, and the cure of beriberi is dramatic and is well-documented in medical literature. In the 1870s the Japanese Navy reported that beriberi had been eradicated among its sailors as a result of adding extra meat, fish, and vegetables to their regular diet. Before that time, almost half of the sailors were likely to develop beriberi, and many died of it. In 1897 Christiaan Eijkman (*q.v.*), working in the Dutch East Indies (now Indonesia), showed that a beriberi-like disease could be produced in chickens by a diet of polished rice. That beriberi in humans was also related to the ingestion of white rice was confirmed by British researchers in Malaysia. There W. Fletcher in 1907 and Henry Fraser and A.T. Stanton in 1909 showed that in selected groups under close observation, beriberi occurred in persons who were eating a polished rice diet whereas those eating parboiled or brown rice did not develop the disease. In 1912 Casimir Funk demonstrated that beriberi could be cured in pigeons by feeding them a concentrate made from rice polishings. Following this discovery he proposed that this, as well as several other conditions, were due to the ingestion of diets which were deficient in specific factors which he termed "vitamines."

The incidence of beriberi in Asia has markedly decreased, partly because an improved standard of living has allowed a more varied diet and partly because of the gradual popular acceptance of partially dehusked, parboiled, and enriched rice—forms that contain higher concentrations of thiamine. The prevention of beriberi is accomplished by eating a well-balanced diet, since thiamine is present in most raw and untreated foods. In Western countries, thiamine deficiency is encountered almost solely in cases of chronic alcoholism.

Bering, Vitus (Jonassen) (b. 1681, Horsens, Den.—d. Dec. 19, 1741, Bering Island, near the Kamchatka Peninsula), navigator whose exploration of the Bering Strait and Alaska prepared the way for a Russian foothold on the North American continent.

After a voyage to the East Indies, Bering joined the fleet of Tsar Peter the Great as a sublieutenant. In 1724 the Tsar appointed him leader of an expedition to determine whether Asia and North America were connected by land, because Russia was interested both in colonial expansion in North America and in finding a northeast passage—*i.e.*, sea route to China around Siberia. (In 1648 a Russian, Semyon Dezhnyov, had sailed through the Bering Strait, but his report went unnoticed until 1736.) On July 13, 1728, Bering set sail from the Siberian peninsula of Kamchatka and in August passed through the Bering Strait into the Arctic Ocean. Bad weather prevented thorough observation, and, though he did not sight the North American coast, he concluded that Siberia and America were not joined.

During the reign of Empress Anna, Bering sought to undertake a second expedition. His simple plan, however, was expanded into Russia's Great Northern Expedition (1733–43), which mapped much of the Arctic coast of Siberia. On June 4, 1741, Bering sailed from Kamchatka in the *St. Peter,* joined by Aleksey Chirikov commanding the *St. Paul.* A storm later separated the ships, and Chirikov went on to discover several Aleutian Islands independently. Bering sailed into the Gulf of Alaska on August 20. Anxious to get his ship back to safety, he was able to reconnoitre only the southwestern coast, the Alaskan peninsula, and the Aleutian Islands. Suffering from scurvy, he was unable to maintain effective command, and the ship was wrecked early in November on the shore of Bering Island, near Kamchatka. After his death there, a few survivors were able to reach Siberia and brought news of excellent fur-trading possibilities in the Aleutians and Alaska.

Bering's explorations are described in F.A. Golder's *Bering's Voyages* (1922, 1925) and in *The Haunted Journey* (1961) by Robert Murphy.

Bering Canyon, submarine canyon in the Bering Sea, 250 mi (400 km) long, and possibly the longest such feature in the world. The canyon head is situated at the edge of the continental shelf north of Umnak Island in the Aleutians. Its upper half is fed by a number of tributary valleys and trends southwestward. With depth, the canyon turns gradually northwestward, then turns abruptly to trend north along its lower 45 mi to its mouth on the continental rise at a depth of 10,500 ft (3,200 m). The canyon is asymmetric in cross section; along its northerly trend its western wall is as steep as 13°, and its eastern wall has slopes of only 2° to 3°. Maximum relief is at least 2,600 ft, and the canyon's volume has been estimated at 1,030 cu mi (4,300 cu km), compared with volumes of less than 75 cu mi for most other canyons. Bering Canyon is believed to have formed during Late Tertiary and Pleistocene times (from perhaps 2,000,000 to 10,000,000 years ago), when large masses of sediment supplied by Alaskan and Siberian rivers slumped down the continental slope.

Bering Sea, Russian BERINGOVO MORE, body of water in the northernmost Pacific Ocean that separates the continents of Asia (northeastern Siberia) and North America (Alaska). The Bering Sea covers 890,000 sq mi (2,304,000 sq km) and connects with the Arctic Ocean by way of the Bering Strait. The U.S.–Soviet boundary passes through the sea and strait.

The following article summarizes information about the Bering Sea. For full treatment, *see* MACROPAEDIA: North America.

The Bering Sea is roughly triangular in shape, with its apex to the north and its base formed by the 1,100-mi- (1,600-km-) long arc of the Alaska Peninsula and the Aleutian Islands, which constitute part of the U.S. state of Alaska. Its maximum east–west width is about 1,488 mi, and from north to south it is about 992 mi. The numerous islands in the sea include the Aleutians (14,610 sq mi), Nunivak (1,940 sq mi), St. Lawrence (about 1,000 sq mi), Karaginsky (983 sq mi), and Nelson (885 sq mi). The Bering Sea may be divided into two nearly equal parts. A relatively shallow plain, usually less than 500 ft (150 m) deep, extends along the continental and insular shelves in the north and east. The southwest portion of the sea is a much deeper plain, lying at depths of 12,000 to 13,000 ft.

Climate in the northern and eastern parts of the sea is subarctic with winter temperatures of −31° to −49° F (−35° to −45° C), high winds, and frequent storms. Almost all of the Bering Sea water comes from the Pacific Ocean. The sea is rich in plant and marine life; salmon, herring, cod, flounder, and hal-

ibut are commercially fished. The islands are breeding grounds for the fur seal and the sea otter; walrus, seal, and sea lion inhabit the northern areas. First explored by Russian ships under Semyon I. Dezhnyov in 1648, the sea is named after Vitus Bering, a Danish captain who visited the area in 1728.

Bering Sea Dispute, dispute between the United States, on the one hand, and Great Britain and Canada, on the other, over the international status of the Bering Sea. In an attempt to control seal hunting off the Alaskan coast, the United States in 1881 claimed authority over all the Bering Sea waters. Britain refused to recognize this claim. In 1886 the U.S. government ordered the seizure of all vessels found sealing in the Bering Sea. Thus, in 1886, 1887, and 1889, a number of vessels were seized, most of them Canadian ships sailing from British Columbia and manned by British subjects. In answer to protests by Canada and Great Britain, the U.S. insisted that the Bering Sea had been a *mare clausum* (*i.e.,* a closed sea under the dominion of the state) under the Russians and that the U.S. had succeeded to the Russian rights.

Because of the rapid shrinking of the seal herd, an agreement was made in 1891 for both British and U.S. vessels to police the area, and a treaty of arbitration was signed the next year. This resulted in an international tribunal, which met in Paris in 1893 and condemned the U.S. seizures. It held that the Bering Sea was part of the high seas and that no single nation had jurisdiction over it. It assessed damages against the United States for the seizures at $473,151. Restrictions were placed on sealing during the summer breeding months and in the waters surrounding the Pribilof Islands.

In 1911 the United States, Canada, and Japan signed the North Pacific Sealing Convention, which further restricted the area of pelagic sealing but awarded Canada a percentage of all the revenue derived from the annual hunt. In 1941 Japan withdrew from the agreement, claiming that the seals were damaging its fisheries, and the United States and Canada made other temporary arrangements. In 1956 representatives of Canada, the United States, Japan, and the Soviet Union worked out an interim convention, which came into force the following year.

Bering Strait, Russian PROLIV BERINGA, strait linking the Arctic Ocean with the Bering Sea and separating the continents of Asia and North America at their closest point. The strait averages 98 to 164 ft (30 to 50 m) in depth and at its narrowest is about 53 mi (85 km) wide. There are numerous islands in the strait, including the two Diomede Islands (about 6 sq mi [16 sq km]), and to the south of the strait lies St. Lawrence Island (about 1,000 sq mi). The U.S.–Soviet boundary extends through the strait.

Some of the Bering Sea water passes through the strait into the Arctic Ocean, but most of it returns to the Pacific. In winter the region is subject to severe storms and the sea is covered by ice fields averaging 4 to 5 ft thick. In mid-summer drift ice remains in the Bering Strait. The strait is named after Vitus Bering, a Danish captain, who sailed into the strait in 1728. During the Ice Age the sea level fell by several hundred feet, making the strait into a land bridge between Asia and North America, over which a considerable migration of plants and animals, as well as man (about 20,000 to 35,000 years ago), occurred.

Berio, Luciano (b. Oct. 24, 1925, Oneglia, Italy), Italian musician whose success as theorist, conductor, composer, and teacher placed him among the leading representatives of the musical avant-garde. His style is notable for combining lyric and expressive musical qualities with the most advanced techniques of electronic and aleatoric music.

Luciano Berio, 1970
By courtesy of RCA Records

Berio studied composing and conducting at the Conservatorio Giuseppe Verdi in Milan, and in 1952 he received a Koussevitzky Foundation scholarship at Tanglewood, Mass., where he studied under the influential composer Luigi Dallapiccola. With another leading Italian composer, Bruno Maderna, he founded (1954) the Studio di Fonologia Musicale at Milan Radio. Under Berio's direction until 1959, it became one of the leading electronic music studios in Europe. There he attacked the problem of reconciling electronic music with *musique concrète* (*i.e.,* composition using as raw material recorded sounds such as storms or street noises rather than laboratory-created sounds). Berio and Maderna also founded the journal *Incontri Musicali* ("Musical Encounters"), a review of avant-garde music.

In all his work Berio's logical and clear constructions are considered highly imaginative and poetic, drawing elements of style from such composers as Igor Stravinsky and Anton Webern. *Serenata I* (1957), his last major serial piece, was dedicated to Pierre Boulez. *Différences* (1958–59, rev. 1967) contrasts live and prerecorded instruments. His *Sequenza* series (1958–75) includes solo pieces for flute, harp, female voice, piano, and violin that incorporate aleatoric elements. Other compositions include *Laborintus II* (1965) and *Sinfonia* (1968), which incorporate a wide range of literary and musical references. *Sinfonia* also gathers a large performance force using an orchestra, organ, harpsichord, piano, chorus, and reciters. Berio's *Coro* (1976) is written for 40 voices and 40 instruments.

Beriosova, Svetlana (b. Sept. 24, 1932, Kaunas, Lithuania), prima ballerina.

Daughter of Nicolas Beriosoff (a Russian who became a British subject), she was brought in 1940 to the United States, where she studied ballet. In 1952, after appearing with several major companies, including the Grand Ballet de Monte Carlo and the Metropolitan Ballet, she joined the Sadler's Wells (now Royal) Ballet, in which she became prima ballerina in 1955. As well as dancing the entire classical repertoire, Beriosova she created the leading part in several modern ballets, including Kenneth MacMillan's *Fairy Kiss* (*Le Baiser de la fée,* 1960), and the title roles of *Antigone* (1959) and the speaking-dancing *Persephone* (1961). Her interpretation of *Giselle* is said to rank among the greatest of all times. She retired in 1975.

Bériot, Charles-Auguste de (b. Feb. 20, 1802, Louvain, Belg.—d. April 8, 1870, Brussels), Belgian violinist and founder of the Franco-Belgian school of violin playing.

The student and legal ward of Jean-François Tiby, Bériot was performing publicly by age nine. His Paris and London debuts came in 1826, after a mutually unsatisfying period of instruction with Pierre Baillot. Returning to Brussels, he was named solo violinist to King William I of The Netherlands. The Revolution of 1830 brought an end to the appointment and he then toured widely with the singer Maria Malibran, marrying her in 1836. She died only months into the marriage, and he did not resume his career for two years. In 1842 he declined the chair left vacant by Baillot at the Paris Conservatory to serve as head of the violin faculty at the Brussels Conservatory. Impending blindness forced his retirement in 1852. Bériot's compositional and performance style made a synthesis of Paganini's virtuosic fireworks with the elegance and emotional sensitivity of the classic French tradition.

Berkeley, city, Alameda County, west central California, U.S., on the northeast shore of San Francisco Bay, directly east of the Golden Gate and adjacent to Oakland (south). Originally part of the Rancho San Antonio, granted to the Peralta family in 1820, it was settled as Ocean View in 1853 and selected as a campus site by the College of California (founded 1853 in Oakland). With the creation of the University of California in 1868, the two schools merged and the campus (named for the philosopher George Berkeley) was opened in 1873. Population increased through an influx of refugees after the San Francisco earthquake (1906). Bridging the bay in the 1930s facilitated commuting and contributed to the city's growth. Various divinity schools, notably the Pacific School of Religion (1866), the California School for the Blind and Deaf, and Armstrong College (1918) are also located there. Berkeley Aquatic Park faces the bay. Inc. 1878. Pop. (1982 est.) 103,479.

Berkeley, Busby, original name WILLIAM BERKELEY ENOS (b. Nov. 29, 1895, Los Angeles—d. March 14, 1976, Palm Springs, Calif., U.S.), American motion-picture director and choreographer who was noted for the elaborate dancing girl extravaganzas he created on film. Using innovative camera techniques, he revolutionized the genre of the musical in the Depression era.

Berkeley's parents were itinerant actors. He was on the stage at the age of five and eventually moved from comedy acting and dancing to directing plays and musicals. As a Broadway choreographer he directed the dancing in more than 20 musicals. In 1930 Samuel Goldwyn, the film producer, brought him to Hollywood to do the dance numbers for the musical *Whoopee* (1930).

During the following decade Berkeley directed for Warner Brothers and completed his most creative work. *Gold Diggers of 1933* (1933) and *Footlight Parade* (1933) are representative in their subordination of plot to spectacle. Believing 20 dancers were better than one, Berkeley used huge chorus lines and new technical methods to create a mood of opulent prosperity. Berkeley's production trademarks are props such as mirrors and special lighting, coupled with a camera mounted on a monorail for easy movement. These movies have been called exhilarating, yet they are oddly surreal in the multiplication of images.

In 1939 Berkeley began directing popular but less innovative films for Metro-Goldwyn-Mayer Studios. Rising production costs made further spectacles unfeasible, and with *The Gang's All Here* (1943) such films became far less extravagant.

Critics agree that Berkeley liberated musicals from the traditional genre, giving viewers a sense of freedom and escape during the Great Depression. In the late 20th century Berkeley's films enjoyed a nostalgic revival, and in 1970 the New York Gallery of Modern Art presented a Berkeley retrospective. Berkeley himself returned briefly to Broadway to supervise a production of *No No Nanette* with Ruby Keeler in 1970.

Berkeley, George (b. March 12, 1685, near Dysert Castle, near Thomastown?, County Kilkenny, Ire.—d. Jan. 14, 1753, Oxford), Anglo-Irish Anglican bishop, philosopher, and scientist, best known for his Empiricist philosophy, which holds that everything save the spiritual exists only insofar as it is perceived by the senses.

George Berkeley, detail of an oil painting by John Smibert, *c.* 1732; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Early life and works. Berkeley was the eldest son of William Berkeley, described as a "gentleman" in George's matriculation entry, and as a commissioned officer, a cornet of dragoons, in the entry of a younger brother. Brought up at Dysert Castle, Berkeley entered Kilkenny College in 1696 and Trinity College, Dublin, in 1700, where he was graduated with a B.A. degree in 1704. While awaiting a fellowship vacancy, he made a critical study of time, vision, and the hypothesis that there is no material substance. The principal influences upon his thinking were Empiricism, represented by the English philosopher John Locke, and Continental Skepticism, represented by Nicolas Malebranche and Pierre Bayle. His first publication, *Arithmetica* and *Miscellanea Mathematica* (published together in 1707), was probably a fellowship thesis.

Elected fellow of Trinity College in 1707, Berkeley began to "examine and revise" his "first arguings" in his revision notebooks. The revision was drastic and its results revolutionary. His old principle was largely superseded by his new principle; *i.e.,* his original line of argument for immaterialism, based on the subjectivity of colour, taste, and the other sensible qualities, was replaced by a simple, profound analysis of the meaning of "to be" or "to exist." "To be," said of the object, means to be perceived; "to be," said of the subject, means to perceive.

Berkeley called attention to the whole situation that exists when a person perceives something, or imagines it. He argued that, when a person imagines trees or books "and no body by to perceive them," he is failing to appreciate the whole situation: he is "omitting" the perceiver, for imagined trees or books are necessarily imagined as perceivable. The situation for him is a two-term relation of perceiver and perceived; there is no third term; there is no "idea of" the object, coming between perceiver and perceived.

The revision was a gradual development. At the start Berkeley held that nothing exists but "conscious things." "On second thoughts," he was certain of the existence of bodies and knew intuitively "the existence of other things besides ourselves." His expressions, "in the mind" and "without the mind," must be understood accordingly. As he wrote in his notebook, heat and colour (which philosophers had classed as secondary qualities because of their supposed subjectivity) are "as much without the mind" as figure and motion (classed as primary qualities) or as time; for both primary and secondary qualities are *so* in the mind as to be in the thing, and are *so* in the thing as to be in the mind. The mind does not become red, blue, or extended when those qualities are in it; they are not modes nor attributes of mind. Colour and extension are not mental qualities for Berkeley: colour can be seen, and extension can be touched; they are "sensible ideas," or sense-data, the direct objects of percipient mind.

Berkeley accepted possible perception as well as actual perception; *i.e.,* he accepted the existence of what a person is not actually perceiving but might perceive if he took the appropriate steps. The opposite view was held by some philosophers, including Materialists, who (in Berkeley's words) "are by their own principles forced" to accept it. They are forced to accept that objects actually seen and touched have only an intermittent existence, that they come into existence when perceived and pass into nothingness when no longer perceived. Berkeley treated those views with respect; he denied that they are absurd; but he did not hold them, and he explicitly denied that they follow from his principles. In effect he said to his readers, "You may hold, if you will, that objects of sense have only an 'in-and-out' existence, that they are created and annihilated with every turn of man's attention; but do not father those views on me. I do not hold them." In his notebook he wrote, "Existence is *percipi* or *percipere.* The horse is in the stable, the Books are in the study as before." Horse and books, when not being actually perceived by man, are still there, still perceivable "still with relation to perception." To a nonphilosophical friend Berkeley wrote, "I question not the existence of anything that we perceive by our senses."

Berkeley's immaterialism is open to "gross misinterpretation," as he said in his preface; rightly understood, it is common sense. Like most people, he accepted and built on "two heads," "two kinds entirely distinct and heterogeneous": (1) active mind or spirit, perceiving, thinking, and willing; and (2) passive objects of mind, viz., sensible ideas (sense-data) or imaginable ideas.

Period of his major works. Berkeley's golden period of authorship followed the revision. In *An Essay Towards a New Theory of Vision* (1709), he examined visual distance, magnitude, position, and problems of sight and touch, and concluded that "the proper (or real) objects of sight" are not without the mind, though "the contrary be supposed true of tangible objects." In his *Treatise Concerning the Principles of Human Knowledge,* Part I (1710), he brought all objects of sense, including tangibles, within the mind; he rejected material substance, material causes, and abstract general ideas; he affirmed spiritual substance; and he answered many objections to his theory and drew the consequences, theological and epistemological. His *Three Dialogues between Hylas and Philonous* (1713), by its attractive literary form and its avoidance of technicalities, reinforced the main argument of the *Principles;* the two books speak with one voice about immaterialism.

Berkeley was made a deacon in 1709 and ordained a priest in 1710. He held his fellowship for 17 years, acting as librarian (1709), junior dean (1710–11), and tutor and lecturer in divinity, Greek, and Hebrew.

In politics Berkeley was a Hanoverian Tory, and he defended the ethics of that position in three sermons, published as *Passive Obedience* (1712). Thus, with four major books in five years, the foundations of his fame were laid; and, when he first left Ireland in 1713 on a leave of absence, he was already a man of mark in the learned world; his books were reviewed on the Continent, and Gottfried Wilhelm Leibniz, the wide-ranging author of the *Monadology,* knew of his immaterialism and commented upon it.

Among the London wits he was an immediate success. Jonathan Swift, dean of St. Patrick's Cathedral, Dublin, presented him at court. For Sir Richard Steele, an essayist, he wrote essays in *The Guardian* against the freethinkers. He was in the theatre with Joseph Addison, essayist and poet, on the first night of *Cato* and has left a spirited description of the experience. Alexander Pope credited him with "ev'ry virtue under heav'n." In 1713–14 he went on an embassy to Sicily as chaplain with Charles Mordaunt, 3rd earl of Peterborough, whom Berkeley called an "ambassador extraordinary." In 1715 during the Jacobite rebellion (on behalf of the exiled Stuarts) he proved his loyalty by publishing his *Advice to the Tories Who Have Taken the Oaths.* He was abroad again from 1716 to 1720 in Italy, acting as tutor to George Ashe, son of the Bishop of Clogher (later, of Derry); his four travel diaries give vivid pictures of sightseeing in Rome and of tours in southern Italy. On his return he published his *De motu* (1721), which rejected Sir Isaac Newton's absolute space, time, and motion, gave a veiled hint of his immaterialism, and has recently earned him the title "precursor of Mach and Einstein."

Resuming his work in Dublin, he took a full part in teaching and administration for more than three years. In 1724 he was appointed dean of Derry, and his 24 years' connection with Trinity College ended.

His American venture and ensuing years. The deanery and legacy from Hester van Homrigh (Swift's Vanessa) were seen by Berkeley as providences, furthering his "scheme of Bermuda," in the New World. The frenzied speculation that preceded the bursting of the South Sea Bubble had shaken his faith in the Old World, and he looked in hope to the New. His *Essay Towards preventing the Ruin of Great-Britain* (1721) was soon succeeded by his prophetic verses on "Westward the course of empire takes its way." Already by 1722 he had resolved to build a college in Bermuda for the education of young Americans (Indians), publishing the plan in *A Proposal For the better Supplying of Churches . . .* (1724). The scheme caught the public imagination; the King granted a charter; the Archbishop of Canterbury acted as trustee; subscriptions poured in; and Parliament passed a contingent grant of £20,000. But there was opposition; an alternative charity for Georgia was mooted; and the prime minister, Sir Robert Walpole, hesitated.

In 1728 Berkeley married Anne, daughter of Chief Justice Forster, a talented and well-educated woman, who defended her husband's philosophy after his death. Soon after the wedding, they sailed for America, settling at Newport, R.I., where Berkeley bought land, built a house (Whitehall), and waited. Berkeley preached often in Newport and its neighbourhood, and a philosophical study group met at Whitehall. Eventually, word came that the grant would not be paid, and Berkeley returned to London in October 1731. Several American universities, Yale in particular, benefitted by Berkeley's visit; and his correspondence with Samuel Johnson, later president of King's College (Columbia University), is of philosophical importance.

Alciphron; or, The Minute Philosopher (1732) was written at Newport, and the setting of the dialogues reflects local scenes and scenery. It is a massive defense of theism and Christianity with attacks on deists and freethinkers and discussions of visual language and analogical knowledge and of the functions of words in religious argument.

Upon his return to London in 1731, Berkeley's pen, never idle for long, became active. A writer in the *Daily Post-boy* commended *Alciphron* but attacked the appended *Essay*

on vision. Berkeley replied with *The Theory of Vision, or Visual Language . . . Vindicated and Explained* (1733). This fine work brought the metaphysics (theory of Being) of the *Essay* into line with the *Principles* and added his doctrine of cause, admitting defects in the premises of the original *Essay. Alciphron* provoked replies from the satirist Bernard de Mandeville; John Hervey, Baron Hervey of Ickworth; the statesman Henry St. John, 1st Viscount Bolingbroke; and Peter Browne, Berkeley's former teacher and provost. To Browne, Berkeley sent a long, private letter on analogy—discovered only recently and first published in *Mind* (July 1969)—which constitutes an important supplement to his 4th dialogue.

In 1734 Berkeley published *The Analyst; or, a Discourse Addressed to an Infidel Mathematician,* which Florian Cajori, a historian of mathematics, has called "the most spectacular event of the century in the history of British mathematics." Besides being a contribution to mathematics, it was an argument ad hominem for religion. "He who can digest a second or third fluxion . . .," wrote Berkeley, "need not, methinks, be squeamish about any point in divinity." A long and fruitful controversy followed. James Jurin, a Cambridge physician and scientist, John Walton of Dublin, and Colin Maclaurin, a Scottish mathematician, took part. Berkeley answered Jurin in his lively satire *A Defence of Free-Thinking in Mathematics* (1735) and answered Walton in an appendix to that work and again in his *Reasons For not Replying . . .* (1735).

Years as bishop of Cloyne. Berkeley was consecrated as bishop of Cloyne in Dublin in 1734. He found Trinity College flourishing: its new library was completed and John Stearne's Doric printing house was being built. To the latter, Berkeley contributed a font of Greek type and also founded the Berkeley gold medal for Greek. His episcopate, as such, was uneventful. He took a seat in the Irish House of Lords in 1737 and, while in Dublin, published *A Discourse addressed to Magistrates and Men in Authority* (1738), condemning the Blasters whose Hell-Fire Club, now in ruins, still can be seen near Dublin.

The see-house at Cloyne was a cultured home and a social centre and, during epidemics, a dispensary. On arrival the family consisted of his wife and two sons; and two more sons and two daughters were born at Cloyne. George, the only child to prolong the line, became canon of Canterbury.

In 1745 Berkeley addressed open letters to his clergy and to the Roman Catholics of his diocese about the Stuart uprising. In letters to the press over his own name or through a friend, he expressed himself on several public questions, political, social, and scientific. Two major works stand out, *The Querist* and *Siris,* both occasioned by the poverty, distress, and sickness around him, but rising far above their source.

The Querist, published in three parts from 1735 to 1737, deals with basic economics—credit, demand, industry, and "the true idea of money"—and with special problems, such as banking, currency, luxury, and the wool trade. The final query puts the central question, "Whose fault is it if poor Ireland still continues poor?"

Siris (1744) passed through some six editions in six months. It is at once a treatise on the medicinal virtues of tar-water, its making and dosage, and a philosopher's vision of a chain of being, "a gradual evolution or ascent" from the world of sense to "the mind, her acts and faculties" and, thence, to the supernatural and God, the three in one.

In August 1752, Berkeley commissioned his brother, Dr. Robert Berkeley, as vicar general and arranged with the bishop of Cork as to his episcopal duties and, with his wife and his children George and Julia, went to Oxford and took a house in Holywell Street, where he resided until his death. He was buried in Christ Church Chapel.

BIBLIOGRAPHY. A.A. Luce and T.E. Jessop (eds.), *The Works of George Berkeley, Bishop of Cloyne,* 9 vol. (1948–57), definitive edition with valuable introductions and notes; *Bishop Berkeley's Querist in Historical Perspective,* text with critical comment, and discussion of the basis of credit and of 18th-century monetary, banking, and currency problems, by J. Johnston (1970). A.A. Luce, *The Life of George Berkeley, Bishop of Cloyne* (1949, reprinted 1968), a definitive biography; Edwin S. Gaustad, *George Berkeley in America* (1979). G.A. Johnston, *The Development of Berkeley's Philosophy* (1923, reprinted 1965); J.M. Hone and M.M. Rossi, *Bishop Berkeley,* introduction by W.B. Yeats (1931); A.A. Luce, *Berkeley and Malebranche* (1934, reprinted 1967), *Berkeley's Immaterialism* (1945, reprinted 1968), and *The Dialectic of Immaterialism* (1963); J. Wild, *George Berkeley* (1936, reprinted 1962); H.M. Bracken, *The Early Reception of Berkeley's Immaterialism, 1710–1733,* rev. ed. (1965); D.M. Armstrong, *Berkeley's Theory of Vision* (1960), and (ed.), *Berkeley's Philosophical Writings* (1965); W.E. Steinkraus (ed.), *New Studies in Berkeley's Philosophy,* 13 contributions, with selected bibliography by T.E. Jessop (1966); A.D. Ritchie, *George Berkeley: A Reappraisal,* ed. by G.E. Davie (1967); G.W. Engle and G. Taylor (eds.), *Berkeley's Principles of Human Knowledge: Critical Studies* (1968). See V.I. Lenin, *Materialism and Empirio-Criticism* (Eng. ed. 1950), for an ex parte study of Berkeley in connection with revisionism. For bibliographic works on Berkeley, see *Bibliography of George Berkeley* by T.E. Jessop (1934); the list is continued through 1962 by C.M. Turbayne and R. Ware in the *Journal of Philosophy,* pp. 93–112 (1963). See also *Bibliography of George Berkeley, Bishop of Cloyne; His Works and His Critics in the 18th Century* by Geoffrey Keynes (1976).

Berkeley, Sir Lennox (Randall Francis) (b. May 12, 1903, Boars Hill, near Oxford), British composer whose works are noted for their classical elements.

Berkeley was born into a titled family. He received his B.A. (1926) from Merton College, Oxford, and then studied (1927–32) in Paris under the renowned music teacher Nadia Boulanger. While in Paris he met Igor Stravinsky and François Poulenc, both of whom influenced his style; Poulenc remained a lifelong friend. In 1936 Berkeley attended a music festival in Spain, and there he met Benjamin Britten. The two collaborated on an orchestral work, *Mont Juic* (1937), and maintained a strong professional, as well as personal, association.

Berkeley's works are characterized by their rich melodies and his flair for orchestral texture. Among his more notable compositions are the *Divertimento* (1943), a highly polished orchestral piece; *Piano Sonata,* Opus 20 (1945), which displays his subtle use of harmony; and his vocal music, much of it religious, such as the beautiful *Stabat Mater* (1947). He wrote pieces for specific performers, such as guitarist Julian Bream and oboist Janet Craxton. He composed several operas, including *Nelson* (1954) and *Ruth* (1956). His later works show some influence of atonality in composition, and some notable examples of this style are *Sonatina,* Opus 61 (1962), and his *Symphony No. 4* (1977).

He was professor of composition at the Royal Academy of Music (1946–68), honorary professor of music at Keele University (from 1976), and from 1977 president of the Cheltenham Festival of Music. He received many honours for his works. In 1957 he was made a Commander of the British Empire, and he was knighted in 1974.

Berkeley, Sir William (b. 1606, Somerset, Eng.—d. July 9, 1677, Twickenham, Middlesex), British colonial governor of Virginia during Bacon's Rebellion, an armed uprising (1676) against his moderate Indian policy.

Sir William Berkeley, detail of an oil painting attributed to Sir Peter Lely, *c.* 1644; in a private collection

By courtesy of Maurice duPont Lee

Knighted by Charles I in 1639, he was appointed governor of Virginia in 1641. Berkeley's governorship of Virginia was almost continuous from this date until his death, except during the period of the English Commonwealth (1649–60).

His loyalty to the crown during England's Civil War led him to declare Virginia an asylum for Charles II and his supporters. This loyalty also forced his retirement from the governorship until the Restoration (1660).

His second period as governor was marred by economic depression, Indian attacks, and the ambitions of his cousin by marriage, Nathaniel Bacon. Berkeley wanted to foster trade with the Indians; Bacon was for their removal from the colony and in 1676 led an expedition against them. Berkeley called it rebellion, and the forces of the two men clashed. The rebellion ended with Bacon's death, of natural causes.

Berkeley was recalled by Charles II to explain this turn of events but died before he had an opportunity to report to the King. Berkeley was the author of a play, *The Lost Lady,* written for the London stage in 1638.

Berkeley Springs, formally BATH, town, seat (1820) of Morgan County, in the eastern panhandle of West Virginia, U.S., near the Potomac River, just northwest of Martinsburg. At the foot of Warm Spring Mountain, it was popularized as a health resort by George Washington, who surveyed the area for Lord Fairfax in 1748. Probably the oldest spa in the nation, it was chartered in 1776 and officially named Bath for the famous English watering place, but its post-office name is Berkeley Springs (from Norborne Berkeley, royal governor of Virginia [1768–70]). There, Virginia's Revolutionary War wounded were treated, and after the Revolution its medicinal waters were frequently patronized by the Washington family; the original George Washington bath (a rock-lined hollowed log) is marked by a plaque. The town, already in decline as other spas became more fashionable, suffered severely from Civil War clashes. The historic warm springs (75°F [24° C]), in Berkeley Springs Park, remain popular for whirlpool therapy and other treatments. In the park is a scaled-down replica (1887–88) of Berkeley Castle in England. Aside from resort and sanitarium activities, the town's economy is sustained by agriculture, canneries and bottling works, and the manufacture of sporting goods. Cacapon State Park is nearby. Pop. (1980) 789.

berkelium (Bk), synthetic chemical element of the actinide series in Group IIIb of the periodic table, atomic number 97. Not occurring in nature, berkelium (as the isotope berkelium-243) was discovered in December 1949 by Stanley G. Thompson, Albert Ghiorso, and Glenn T. Seaborg at the University of California at Berkeley as a product re-

sulting from the helium-ion bombardment of americium-241 (atomic number 95) in a 152-centimetre (60-inch) cyclotron. All berkelium isotopes are radioactive; berkelium-247 is the longest lived (1,400-year half-life). Berkelium-249 (314-day half-life) has been widely used in the chemical studies of the element because it can be produced in weighable amounts that are isotopically pure by nuclear reactions beginning with curium-244. Metallic berkelium has not yet been prepared, but it should be electropositive, reactive, and silver-coloured like the other actinide metals, with a specific gravity of about 14. Tracer chemical investigations have shown that berkelium exists in aqueous solutions in the +3 and +4 oxidation states, presumably as Bk^{3+} and Bk^{4+} ions. The solubility properties of berkelium in its two oxidation states are entirely analogous to those of the other actinides and to the lanthanide elements in the corresponding oxidation states. Solid compounds, including the oxides BkO_2, Bk_2O_3, and the chloride $BkCl_3$, have been synthesized on the submicrogram scale.

atomic number	97
stablest isotope	247
valence	3,4
electronic config.	2-8-18-32-26-9-2 (27-8-2) or (Rn)$5f^{8}6d^{1}7s^{2}$ or (Rn)$5f^{9}7s^{2}$

Berkhamsted, parish (town), Dacorum district, county of Hertfordshire, England, 28 mi (45 km) northwest of London, on an old coaching route along the Bulbourne Valley of the Chiltern Hills, which now contains modern road, rail, and canal routes. A moated Norman castle has been thoroughly excavated and is preserved. Diversified light industry includes paper and furniture making. Pop. (1981 prelim.) 15,461.

Berkner, Lloyd Viel (b. Feb. 1, 1905, Milwaukee—d. June 4, 1967, Washington, D.C.), U.S. physicist and engineer who first measured the extent, including height and density, of the ionosphere (ionized layers of the Earth's atmosphere), leading to a complete understanding of radio wave propagation. He later turned his attention to investigating the origin and development of the Earth's atmosphere. Need for data on a worldwide scale led him to propose the International Geophysical Year in 1950, largest cooperative study of the Earth ever undertaken, which was carried out by the International Council of Scientific Unions while he was president in 1957–59.

In 1963 Berkner, with L.C. Marshall, advanced a theory to describe the way in which the atmospheres of the solar system's inner planets had evolved.

As a naval officer beginning in 1926, Berkner was also active in the development of radar and navigation systems, naval aircraft electronics engineering, and studies that led to the construction of the Distant Early Warning system, a chain of radar stations designed to give the United States advance warning in the event of a missile attack across the North Pole. He wrote more than 100 papers and several books, including *Rockets and Satellites* (1958), *Science in Space* (1961), and *The Scientific Age* (1964).

Berkshire, county of southern England, that occupies the valleys of the middle Thames and its tributary, the Kennet, immediately to the west of London. Its area is 485 sq mi (1,256 sq km), and it is divided into six districts: Bracknell, Newbury, Reading, Slough, Windsor and Maidenhead, and Wokingham.

The eastern end of the county is underlain largely by the river gravels and terraces of the Thames, and there are stretches of infertile, often forested, land, including Windsor Forest. The western part of the county is crossed by chalk downs, or uplands, that reach a height of 975 ft (297 m) in Inkpen Beacon, and through these downs the Thames cuts its way by means of the Goring Gap. The Thames and Kennet valleys provide major routeways westward from London and are followed by the railway routes to Oxford, Bristol, and the west of England. The motorway from London to South Wales crosses the county.

The Berkshire Downs supported numerous prehistoric settlements linked by ridgeways that led particularly to the focus of Stonehenge in the adjoining county of Wiltshire. Settlement of the river valleys and eastern Berkshire dates from the Iron Age, and the Belgic site at Silchester, southwest of Reading, later became a Roman route centre. With the Norman Conquest of 1066 the strategic importance of the Thames Valley became recognized, and the first Windsor Castle was built, later to become the main residence of the British royal family outside London. Windsor and Eton, on either bank of the Thames on Berkshire's eastern boundary, contain the county's most noted structures. Eton College, England's best known boys' school, endowed by Henry VI and dating in part from the 15th century, is also located there.

Proximity to London and to major transport routes has encouraged the spread of several waves of industrial and urban development across the county. In the 19th century Reading, the county town (seat), was the focus of growth. Following World War I a new industrial centre grew up at Slough, while later growth occurred at Bracknell, one of Britain's new towns. Meanwhile, residential development spread westward from London, and, with excellent road and rail links, even Hungerford and Newbury at the western end of the county are within regular commuting range of London. Intermediate towns such as Maidenhead, 25 mi (40 km) from London, have attracted office development as firms have shifted their headquarters and warehouses out of the central city. Agriculture is now largely restricted to the western end of the county; the chalk downs support cereal crops, and Newbury and Lambourne are known for their racehorses. Pop. (1982 est.) 699,500.

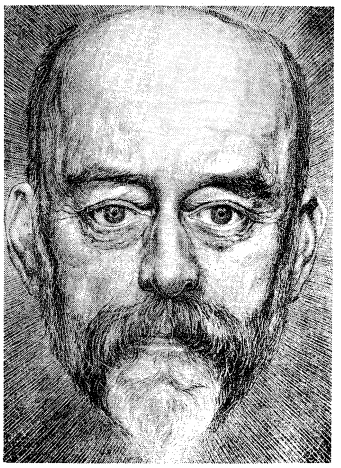
Berkshire, breed of domestic pig originating in England, where in the early 19th century the name "Berkshire" became synonymous with improved pig strains of differing origin and type. Hogs imported from East Asia figured prominently in the improvement of varieties native to the region. The establishment of a herdbook in 1885 fixed current strains.

The Berkshire is medium-sized and predominantly black in colour, with white on its face, legs, and tip of tail. It has a short dished face with erect ears pointing slightly forward. The breed is used for fresh pork production in England, Japan, North and South America, and other areas worldwide. A larger bacon strain has been evolved in Australia and New Zealand.

Berkshire Hills, segment of the Appalachian Mountains, U.S., mainly in Berkshire County, western Massachusetts. Many summits rise to more than 2,000 ft (600 m), including Mt. Greylock (3,491 ft [1,064 m]), the highest point in Massachusetts. The scenic, wooded hills are a continuation of the Green Mountains of Vermont; they include the Hoosac Range and Taconic Range (Massachusetts) and the Litchfield Hills (Connecticut). The chief streams are the Deerfield and Westfield (east) and the Hoosic and Housatonic (west). The scenic Berkshire country comprises rolling highland dominated by long, wooded ridges, remarkably even-topped in general elevation and intersected and broken by deep valleys. Because of its many lakes, the district is often called the Lake Region of America, partly due to the similarity of its scenery with that of the English Lake District. Crossed by the Appalachian Trail (for hikers), the Berkshires, with state parks and forests and home of the summer music festival at Tanglewood (Lenox), have long been a favourite year-round resort area.

Berlage, Hendrik Petrus (b. Feb. 21, 1856, Amsterdam—d. Aug. 12, 1934, The Hague), Dutch architect whose work, characterized by a use of materials based on their fundamental properties and an avoidance of decoration, exerted considerable influence on modern architecture in The Netherlands.

Berlage studied architecture in Zürich. Following a European tour, he began his practice in Amsterdam in 1889. His best known work is the Stock Exchange in Amsterdam (1897–1903). It is notable for its rounded Romanesque arches and the forthright use of



Berlage, lithograph by C. Le Beau

By courtesy of The Netherlands Information Service, The Hague

structural steel and traditional brick, examples of Berlage's concern that materials be used truthfully. Beginning in the early 1900s, he carried out city planning for residential areas in a number of Dutch cities. He also designed furniture and wallpaper and had considerable interest in handicrafts.

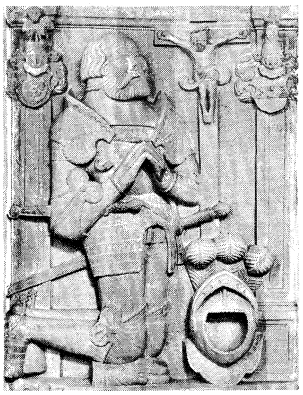
On a visit to the U.S. in 1911, Berlage studied American building methods, later using them in his own work. He was exposed to the ideas of U.S. architects Louis Sullivan and Frank Lloyd Wright and introduced them to Europe. Notable Berlage buildings include the Algemeenen Nederlandschen Diamantbewerkersbond (Diamond Workers' Union building), Amsterdam (1899–1900); Holland House, London (1934); and the Haags Gemeentemuseum, The Hague (1934).

Berle, Milton, original name MILTON BERLINGER (b. July 12, 1908, New York City), comedian who, as a highly popular entertainer in the early days of television in the United States, came to be known as "Mr. Television."

Berle first appeared on the vaudeville stage at the age of 10. With his mother's encouragement, he continued in vaudeville throughout his youth, and also acted in more than 50 silent films. He attended a school for professional children and soon began to perform as a master of ceremonies, and in the "legitimate" theatre as a comedian. He was known for blatantly borrowing jokes and comic routines from other comedians. For a decade after 1939 Berle worked chiefly in nightclubs, at the same time vainly attempting to gain a radio audience. None of his radio programs lasted more than a year. He continued to appear in motion pictures, making 19 between 1937 and 1968. His type of comedy—rapid delivery accompanied by slapstick and facial contortions—and his willingness to elicit laughter at any cost seemed to suit a visual medium. Eventually he achieved national recognition

and great popularity when he entered television. He worked regularly on television from the late 1940s until 1966. His autobiography, *Out of My Trunk,* was published in 1945.

Berlichingen, Götz von, Götz also rendered GOTTFRIED, byname GÖTZ WITH THE IRON HAND, German GÖTZ MIT DER EISERNEN HAND (b. 1480, Jagsthausen Castle, Württemberg—d. July 23, 1562, Hornberg Castle), imperial knight (*Reichsritter*), romanticized in legend as a German Robin Hood and remembered as hero of Goethe's play *Götz von Berlichingen.* His iron hand was a substitute for a hand shot away in the siege of Landshut (1504). He served under various masters in a series of campaigns, ending with the wars against the Turks in Hungary (1542) and the campaign of Charles V against the French (1544). When not engaged as a warrior, he kidnapped nobles for ransom and attacked convoys of merchants for booty, activities that twice put him under ban of the empire. He led a section of rebels in the Peasants' War (1525), but after claiming that he had been compelled by the rebels to do so, he was acquitted by the imperial chamber.



Berlichingen, detail from tomb sculpture, 1562; in Kloster Kirche Schöntal, Baden-Württemberg, W.Ger.
Helga Schmidt-Glassner

Perhaps the most remarkable thing about his life is that he lived to old age in a turbulent and violent era; he told about his life in his *Autobiography* (1731; Eng. trans., 1956), an entertaining account of an eventful period when knights such as Götz were becoming anachronisms.

Berlin, city divided into East and West Berlin, formerly (1871–1945) the capital of Germany; it lies entirely within the territory of the German Democratic Republic (East Germany), 110 mi (180 km) from the borders of the Federal Republic of Germany (West Germany). East Berlin is the capital of East Germany. The political division of the city (from 1948) reflects the partition of Germany after World War II into a Soviet-oriented East Germany and a Western-oriented West Germany. It has been physically divided (from 1961) by the Berlin Wall, erected by East German authorities to prevent unauthorized movements between the two parts of the city, especially the flow of East Germans to the West. West Berlin is a state (*Land*) and a major city of West Germany; however, it is not constitutionally a part of West Germany, because it has continued in the status of an occupied city (by Britain, France, and the United States) from the end of World War II. Berlin is the centre of Germanic culture, technology, medicine, and industrial enterprise, despite its political partition.

A brief treatment of Berlin follows. For full treatment (including a map), *see* MACROPAEDIA: Berlin.

The Berlin Wall dominates the city's character, dividing West Berlin from East Berlin and forming an irregular line through the city's centre and running along most of the city's outer border with East Germany. The Spree River runs through the city, and a chain of lakes formed by the Havel River touches the western outskirts; birch and Scotch pine forests ring the perimeter. The climate is moderate, rarely very hot or cold, with an average precipitation of 23 in. (598 mm), about one-fourth to one-fifth of which reaches the ground as snow.

West Berlin has enjoyed particularly strong economic growth. Traditional industries (textiles, metalwork, machines, porcelain and china, publishing) have been revived throughout Greater Berlin. Electronics, clothing, cigarettes, and bicycles are also important. Berlin continues to be a market for cereals from the region.

The city's durability was demonstrated in the vast reconstruction undertaken after the destruction of World War II. The erection of modern buildings and the restoration of historic ones have helped Berlin maintain its position as the most populous German city. City planners in both Germanys, continuing to consider reunion a possibility, have designed structures and streets that will be congruous in that event. Some of the notable buildings in West Berlin are Charlottenburg Palace, the restored Reichstag building, the Philharmonic Hall, and the New National Gallery of modern art, the latter designed by the architect Ludwig Mies van der Rohe. Dominating central East Berlin is a 1,197-ft (357-m) television tower; famous avenues of East Berlin include Unter den Linden, leading to the Brandenburg Gate, and the Karl-Marx-Allee and Lenin-Allee, which meet at Alexanderplatz. In West Berlin the best known street is probably Kurfürstendamm, with its many shops. Both halves of the city have preserved ruined buildings to serve as war memorials. Among these are the hollow main tower of the Kaiser Wilhelm Memorial Church in West Berlin and the walls of St. Nicholas Church in East Berlin.

Berlin has traditionally played a leading role in education. Humboldt University of Berlin (formerly known as the University of Berlin, or Friedrich Wilhelm University) is located in East Berlin and is today oriented toward Communist ideology; the Free University (1948) in West Berlin was founded partly in reaction to that change. A modern Klinikum, or teaching hospital, is also located in West Berlin. The Charité (1710) retains a similar role in East Berlin.

The city of Berlin lies at the centre of a great system of canals, used traditionally to relieve river-traffic congestion. East Berlin and West Berlin cooperate in the administration of one of Europe's finest subway systems, and the Stadtbahn elevated railway system also runs through both sections of the city. The Reichsautobahn ("National Expressway") is the city's superhighway terminus; West Berlin has built its own extensions. Tegel and Berlin–Schönefeld airports, in West Berlin and East Berlin, respectively, handle international flights. Area West Berlin, 185 sq mi (480 sq km); East Berlin, 156 sq mi (403 sq km). Pop. (1985 est.) West Berlin, 1,851,800; (1985 est.) East Berlin, 1,196,871.

Berlin, town (township), Hartford County, west central Connecticut, U.S., on the Mattabesset River, just southeast of New Britain. The first white settler was Richard Beckley of New Haven, who established Beckley's Quarter in 1660. Formerly called Kensington, the area was incorporated as a town from parts of Farmington, Middletown, and Wethersfield in 1785 and was renamed for Berlin, Prussia. It includes the villages of East Berlin and Kensington and was an early industrial town (pistols, implements, wagons, spectacles, leather, thread). The first American tinware was made there in 1740 by Edward and William Pattison, early itinerant Yankee peddlers. Simeon North, the first man to receive a government contract for making pistols, was born in Berlin, where he established his first factory. A diversified manufacturing economy now prevails.

Emma Willard (1787–1870), a pioneer in women's education, was born in Berlin. Pop. (1982 est.) 15,351.

Berlin, city, Coos County, northern New Hampshire, U.S., at the falls of the Androscoggin River and on the northern rim of the White Mountains. Chartered in 1771 as Maynesborough, it was not settled until 1821 and was renamed for Berlin, Prussia, in 1829. Available waterpower led to the beginning of the lumber and pulp industry in 1825. Pulp and paper mills remain the economic mainstay. The Berlin (Nansen) Ski Jump is one of the highest (181½ ft [55 m]) steel tower jumps in the United States. Berlin is just north of White Mountain National Forest. Milan Hill State Park is nearby. The city is home to the New Hampshire Vocational Technical College. Inc. town, 1829; city, 1897. Pop. (1982 est.) 12,643.

Articles are alphabetized word by word, not letter by letter

Berlin, Congress of (June 13–July 13, 1878), diplomatic meeting of the major European powers at which the Treaty of Berlin replaced the Treaty of San Stefano, which had been signed by Russia and Turkey (March 3, 1878) at the conclusion of the Russo-Turkish War of 1877–78. Officially convoked by the Austrian foreign minister, Count Gyula Andrassy, the congress met in Berlin on June 13.

Dominated by the German chancellor Otto von Bismarck, the congress solved an international crisis caused by the San Stefano treaty by revising the peace settlement to satisfy the interests of Great Britain (by denying Russia the means to extend its naval power and by maintaining the Ottoman Empire as a European power) and those of Austria-Hungary (by allowing it to occupy Bosnia-Hercegovina and thereby increase its influence in the Balkans). In doing so, however, the congress left Russia humiliated by substantially reducing the gains that it had made under the San Stefano treaty. Furthermore, the congress failed to consider adequately the aspirations of the Balkan peoples themselves and, thereby, laid the foundation for future crises in the Balkans.

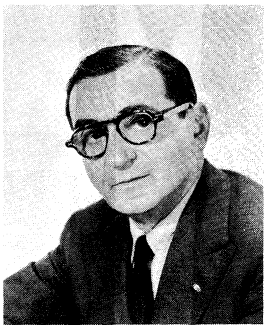
Berlin, Free University of, German FREIE UNIVERSITÄT BERLIN, autonomous, state-financed West German university, the largest in West Berlin. It was founded in 1948, after Berlin was divided, by a group of professors and students who broke away from East Berlin's Humboldt University (founded 1809) to seek academic freedom. Some of the students had been expelled from Humboldt for demonstrating against compulsory Communist doctrine and teaching methods. The Free University was restructured in 1970 and again in 1974. Its governing board includes the mayor of Berlin and faculty and student representatives. Although independent, it receives financial support from the city of West Berlin and the Federal Republic of Germany.

Berlin, Humboldt University of, formerly (1810–1949) FRIEDRICH WILHELM UNIVERSITY, byname UNIVERSITY OF BERLIN, German HUMBOLDT-UNIVERSITÄT ZU BERLIN, or FRIEDRICH-WILHELMS-UNIVERSITÄT, coeducational state-supported institution of higher learning in East Berlin, founded in 1809 by the scholar and educational reformer Wilhelm von Humboldt, Prussian minister of education. Under Humboldt's guidance the univer-

sity, originally named after Frederick William III of Prussia, developed into the largest in Germany. It enrolled more than 1,750 students by 1840 and became a leader in teaching and research, attaining world renown for its modern curriculum. Georg Wilhelm Hegel taught philosophy at the university (1818–30), published his *Philosophy of Right* there (1821), and served as rector in his last years (1830–31). Among his students was Karl Marx.

In 1933 the university witnessed the burning of hundreds of books banned from its library by the Nazis. Coming under control of the German Democratic Republic after World War II, it was renamed Humboldt-Universität after its founder and given a Marxist–Leninist orientation in much of its curriculum.

Berlin, Irving, original name ISRAEL BALINE (b. May 11, 1888, Temum, Russia), American composer who played a leading role in the evolution of the popular song from the early ragtime and jazz eras through the golden age of musical comedies. His easy mastery of a wide range of song styles for both stage and motion pictures made him one of the greatest and most enduring of American songwriters.



Irving Berlin

He was born to the family of a Jewish cantor that immigrated to New York City in 1893. As a boy he was a street singer and a singing waiter in New York's Lower East Side. By 1907, when he was 19, young Baline was writing lyrics; a printer's error on his first published song named him Irving Berlin. He kept the name, continued his writing, and within a few years was a successful "song plugger," demonstrating new tunes. Unable to read notes, he learned music by ear. He began writing his own music as well as lyrics, and in 1911 he wrote what quickly became the preeminent hit of Tin Pan Alley's ragtime vogue, "Alexander's Ragtime Band." His first ballad, "When I Lost You," was written in 1912 after the tragic death of his first wife. Then he began contributing to numerous Broadway revues and musical entertainments, including Florenz Ziegfeld's *Follies*. Through the following decades he wrote the scores for several musical comedies, one of his most popular being *Annie Get Your Gun* (1946; film, 1950). Berlin wrote more than 800 songs, many of which became classics, including "Oh, How I Hate to Get Up in the Morning," "A Pretty Girl Is Like a Melody," "Always" (written in 1925 as a wedding present for his second wife), "Remember," "Blue Skies," "Puttin' on the Ritz," the patriotic standard "God Bless America," "Heat Wave," and "There's No Business Like Show Business." In the era of big motion-picture musicals Berlin was able to transfer his stage success to the screen, writing the scores for many successful films, including *Top Hat* (1935), *Easter Parade* (1948), *Call Me Madam* (1953), and *White Christmas* (1954). His score for *Holiday Inn* (1942) introduced the touching ballad "White Christmas," which became one of the most popular songs ever recorded.

Berlin, Sir Isaiah (b. June 6, 1909, Riga, Latvia), British intellectual historian and writer who was noted for his writings on political philosophy.

Berlin and his family emigrated from the Soviet Union to England in 1920. He went to St. Paul's School and then attended Corpus Christi College, Oxford, on a scholarship. He was a brilliant student and obtained his M.A. in 1935. In the meantime, Berlin had begun his career as a lecturer in philosophy at New College, Oxford (1932–38), where he later became a fellow (1938–50). During the war years he had a brief but distinguished career in the British diplomatic corps, serving chiefly in New York City, Washington, D.C., and Moscow. He returned to Oxford, where he taught at All Souls College (1950–66), was Chichele professor (1957–67), served as president of Wolfson College (1966–75), and from 1975 was professor at All Souls College. He was president of the British Academy from 1974 to 1978.

Berlin's most important works include *Karl Marx; His Life and Environment* (1939; rev. ed. 1959, 1963), an examination of the influences on Marx; *Historical Inevitability* (1955), which stands as a major critique of the doctrines of determinism; *The Age of Enlightenment* (1956), a discussion of 18th-century philosophers; and *Four Essays on Liberty* (1969). His political philosophy in general is concerned with the problem of liberty and free will in increasingly totalitarian and mechanistic societies. In 1951 his essay "The Hedgehog and the Fox" appeared in the *Oxford Slavonic Papers* and was later published in book form (1953). This essay, considered a masterpiece of literary criticism, examines the divergent elements of Leo Tolstoy's character by analyzing his historical theories, an aspect of Tolstoy previously ignored by scholars. Berlin's collected writings have been published in *Russian Thinkers* (1978), *Concepts and Categories* (1978), *Against the Current* (1979), and *Personal Impressions* (1980). He also translated into English several works of Ivan Turgenev.

Berlin was knighted in 1957 and in 1971 was made a member of the Order of Merit.

Berlin, Isaiah ben Judah Loeb, also called ISAIAH PICK (b. October 1725, Eisenstadt, Hungary—d. May 13, 1799, Breslau, Silesia, Prussia), Jewish scholar noted for his textual commentaries on the Talmud and other writings.

The son of a well-known Talmudic scholar, he moved to Berlin as a youth and was educated by his father and at the yeshiva of another eminent rabbi. Berlin became a member of the rabbinate late in life (1787), and in 1793 he was elected rabbi of Breslau, in which post he tried to conciliate the various opposing factions in the local Jewish community.

Berlin's writings are distinguished for their critical and historical insight. Among his works are commentaries, notes, and glosses on many early works of Jewish scholarship. His commentary on the Talmud entitled *Masoret ha-Shas* ("Talmud Tradition") supplements an earlier work by a Frankfort rabbi and is the best known of Berlin's numerous collated texts (noting variant readings and parallel passages).

Berlin blockade and airlift, international crisis that arose from an attempt by the Soviet Union, in 1948–49, to force the Western powers to abandon their post-World War II jurisdictions in West Berlin. In March 1948 the Western powers decided to unite their zones of Germany into a single economic unit. In protest, the Soviet representative withdrew from the Allied Control Council. Coincident with the introduction of a new Deutsche Mark in West Berlin (as throughout West Germany), which the Russians regarded as a threat to the East German currency, the Soviet occupation force began a blockade of all rail, road, and water communications between Berlin and the West. On June 24 the Russians announced that the four-power administration of Berlin had ceased and that the Western Allies no longer had any rights there. On June 26 the United States and Britain began to supply the city with its vital needs from outside by air. They also organized a similar "airlift" in the opposite direction of West Berlin's greatly reduced industrial exports. By mid-July the Soviet army of occupation in East Germany had increased to 40 divisions, against 8 in the Allied sectors. By the end of July three groups of U.S. strategic bombers had been sent as reinforcements to Britain. Tension remained high, but war did not break out.

Despite dire shortages of fuel and electricity, the airlift kept life going in West Berlin for 11 months, until on May 12, 1949, the Soviet Union lifted the blockade. The airlift continued until September 30, at a total cost of $224,000,000 and after delivery of 2,323,738 tons of food, fuel, machinery, and other supplies. The end to the blockade was brought about because of countermeasures imposed by the Allies on East German communications and, above all, because of the Western embargo placed on all strategic exports from the Eastern bloc.

Berlin Botanical Garden and Botanical Museum, German in full BOTANISCHER GARTEN UND BOTANISCHES MUSEUM BERLIN-DAHLEM, oldest botanical garden in West Germany. It was founded in the 17th century as a royal garden for growing flowers, medicinal plants, vegetables, and hops (for the royal brewery), but it eventually became badly neglected. In 1801 the botanist Carl Ludwig Willdenow became director and began to rehabilitate the garden; a decade later he had created what was to become one of the outstanding botanical research centres and public displays of Europe. The botanical garden and museum were nearly totally destroyed during World War II and had to be rebuilt.

The Berlin Botanical Garden has special displays, service greenhouses, and acres of outdoor gardens, with about 18,000 kinds of plants. There is also a botanical museum and a museum library. The centre publishes two periodicals, *Willdenowia* and *Englera.*

Berlin Painter (fl. 500–460 BC), Athenian vase painter who, with Kleophrades, is considered the outstanding vase painter of the Late Archaic period. He is best-known as the decorator of an amphora now in West Berlin.

Stylistically, the Berlin amphora is decorated on a new principle of design. It had been customary to frame the groups of figures on each side with pattern bands. The Berlin Painter eliminated this frame, allowing the figures to dominate. The unusually large figures stand out sharply against the amphora's black background.

Several scholars feel that the Berlin Painter was most productive and his work most original during his early period (*c.* 500–480 BC). Some feel, too, that his later works (*c.* 470–460 BC) may actually be those of a workshop or of a group of artists copying the master. More than 200 vases have been attributed to the Berlin Painter on the basis of their stylistic relationship to the Berlin amphora. Among the vases most frequently attributed to the Berlin Painter are an amphora (now in Munich) depicting a discus thrower, made especially for the Panathenaea, a festival of games held in Athens every four years; a bell krater (vessel with broad body and wide mouth used for mixing wine with water), now in the Louvre, Paris, representing Zeus pursuing Ganymede; a volute krater now in the British Museum, showing Achilles in his last two victories; a hydria (water pot) in the Metropolitan Museum of Art, New York City, showing Achilles and Penthesileia; and a hydria in the Vatican, depicting Apollo traveling over the sea on a

Hermes striding past the satyr Orcimachos, the Berlin amphora by the Berlin Painter, *c.* 490 BC; in the Antikenmuseum, West Berlin

By courtesy of the Antikenmuseum, Staatliche Museen Preussischer Kulturbesitz, West Berlin; photograph, Ingrid Geske

winged tripod. A useful study of the artist is J. Beazley's *Berlin Painter* (1964).

Berlin Wall, German BERLINER MAUER, barrier surrounding West Berlin, first erected on the night of Aug. 12–13, 1961, as the result of a decree passed on August 12 by the East German Volkskammer (Peoples' Chamber). The original barbed-wire barricade was built to stop the increasing drift of population, including professionals, intellectuals, and skilled workers, to the West. The barbed wire was later replaced by a concrete wall (up to 6 feet [2 m] high) topped with barbed wire and guarded at official crossing points and from observation turrets along its length. In 1970, even as relations between the two Germanies improved, East German authorities raised the wall to a height of 10 feet (3 m) to discourage continued defections to the West. By 1980 the barrier included a network of walls, electrified fences, and fortifications extending 28 miles (45 km) through Berlin, dividing the two parts of the city, and extending 75 miles (120 km) around West Berlin, separating it from the rest of East Germany. The wall is supplemented by another form of barrier: strict regulations (clarified and slightly eased in an agreement reached Dec. 20, 1971) governing movement between West Berlin and East Germany.

Berlin ware, faience and porcelain pottery made in Berlin after 1678, when the first faience manufactory there was founded by Pieter van der Lee. Others were opened in 1699 by Cornelius Funcke and in 1756 by Karl Friedrich Lüdicke. A fourth, begun by C.F. Rewend, was flourishing in nearby Potsdam, Prussia, by 1740. All closed, however, by the end of the 18th century. The first porcelain factory was founded in 1761 by Wilhelm Kaspar Wegely, with the aid of an arcanist, Johann Benckengraff, from Höchst, and the patronage of King Frederick II the Great. Wegely gave up in 1757 after King Frederick occupied Saxony, became involved with the Meissen factory, and withdrew his patronage. This early Berlin porcelain, which is rare, is of good quality, but its enamel colours could only be made to adhere to it with difficulty, and they have often partially flaked off.

Berlin porcelain allegorical group modeled by Wilhelm Christian Meyer, *c.* 1775; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph Wilfrid Walter—EB Inc.

Johann Ernst Gotzkowsky acquired the porcelain formula in 1761 and started a factory that he sold to the king in 1763, when it became the Royal factory, which, in 1918, became the State factory. It is impossible to identify 18th-century Berlin porcelain with complete certainty. The best period was from 1781 to 1786, however, and many fine-quality table services were made. Mosäik borders, elaborate diapered patterns of fish scales, appeared in 1763 and took a variety of forms. Vases remained popular, usually with intricately modeled applied flowers, and Berlin ware achieved a reputation for the quality of its painting that it has never lost.

In the early years of the 19th century, Berlin became noted for large vases in the Biedermeier style. It also specialized in finely painted porcelain plaques. The production of lithophanes started in 1830, and a "Majolika" ware was introduced and shown at the Paris Exposition of 1867. The factory was destroyed during World War II, but it was rebuilt and reopened soon thereafter.

Berlin West Africa Conference, a series of negotiations (Nov. 15, 1884–Feb. 26, 1885) at Berlin, in which—under the chairmanship of the German chancellor Otto von Bismarck—the European great powers (Austria-Hungary, France, Germany, Great Britain, Italy, and Russia), together with the United States, Spain, Portugal, Sweden-Norway, Denmark, Belgium, Holland, and Turkey, met to decide all questions connected with the Congo Basin in Central Africa.

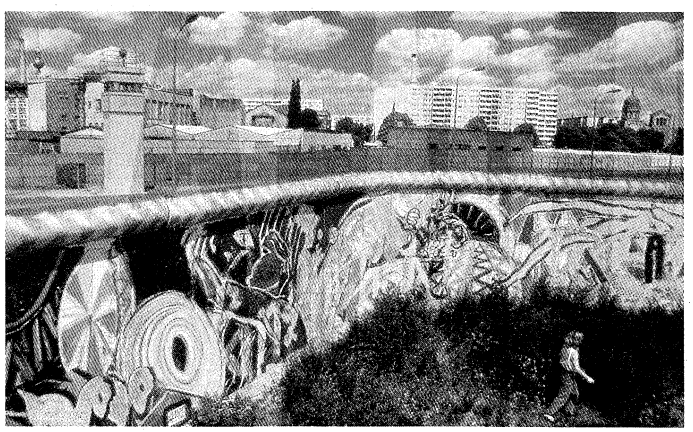
The conference, proposed by Portugal in pursuance of its special claim to control of the Congo estuary, was necessitated by the jealousy and suspicion with which the great European powers viewed one another's attempts at colonial expansion in Africa. Indeed, while Henry Morton Stanley, under the auspices of Leopold II of Belgium, had been pushing on with his work of exploration and acquisition, Pierre Savorgnan de Brazza, a French explorer, had already established his station of Brazzaville at the Kintamo Rapids on the south side of Stanley Pool (1880). Stanley, contenting himself with establishing the neighbouring station of Léopoldville, was gratified by the transference of the French station to the north side of the pool within the year, for thus the whole southern shore of Stanley Pool reverted to Leopold II's control. Portugal, meanwhile, eager to safeguard its claims to the territory north and south of the Congo, asked Great Britain to acknowledge its claim to the line of the Atlantic coast between latitudes 5°12′ and 8° S—with an eastern limit near present-day Matadi, in Congo (Brazzaville). This Great Britain did by a treaty of Feb. 26, 1884. The storm of protest provoked by the terms of the treaty forced the annulment of the treaty and impelled Portugal to propose an international conference.

The general act of the Conference of Berlin declared the Congo Basin, including German East Africa, to be neutral (a fact that in no way deterred the Allies from extending the war into that area in World War I); guaranteed freedom for trade and shipping for all states; forbade slave trading; and rejected Portugal's claims—thereby making possible the founding of the independent Congo Free State, to which Great Britain, France, and Germany had already agreed in principle.

The conference showed England's isolation in regard to German–French collaboration in Africa and so enabled Bismarck to develop an individual German colonial policy.

Berlin woolwork, 19th-century amateur embroidery developed in Germany and based upon hand-painted charts from which cross-stitch patterns could be worked in a very soft embroidery wool, spun at Gotha and dyed in Berlin, where the charts were printed and painted. The first chart was issued in 1804, and between 1810 and 1840 no fewer than 14,000 different designs were published; by the latter year they had superseded practically all other embroidery patterns in England and the United States.

The wool for this work was dyed brilliant colours in the German taste, and these bright colours and versatility of the embroidery led to its widespread popularity. Besides the usual cross-stitch and petit point used in canvas embroidery, a raised or clipped stitch called Surrey was employed that created a thick wool pile and enhanced the colour and shading of



Berlin Wall

Kammerer/Rumpenhorst—*Time* Magazine

"Familien Glück," Berlin woolwork picture made in New England, second half of the 19th century; in the Museum of Fine Arts, Boston

By courtesy of the Museum of Fine Arts, Boston, gift of Mrs. Emily Douglas Furness

floral designs. Coloured glass beads were also introduced to accent the floral and scenic patterns.

Berlin Zoo, German in full ZOOLOGISCHER GARTEN UND AQUARIUM BERLIN, West Berlin, one of the world's largest and most comprehensive animal collections. It is generally considered the oldest zoo in Germany, having been founded in 1841, when the Prussian King Frederick William IV presented his pheasantry and menagerie to the citizens. The zoological garden was officially opened in 1844 with municipal support and it soon developed an excellent collection. Many rare species, including pygmy hippopotamuses, Indian elephants, and orangutans, have been bred there. By the outbreak of World War II in 1939, 4,000 birds and mammals and 8,300 aquarium specimens were housed in the zoo. The grounds were totally destroyed during the war, however, and only 91 animals survived.

Rebuilding was begun in 1952, and by 1977 the Berlin Zoo had more than 5,000 land vertebrates of nearly 1,350 species, plus an aquarium fauna of about 7,000 freshwater and marine fishes and invertebrates. The zoo occupies about 99 ac (40 ha), and the aquarium is housed in a four-story building. The Berlin Zoo has the world's best collection of wild cattle—it was the first zoo to breed the mountain anoa—and excellent collections of birds of prey, cranes, and antelopes. The zoo also maintains the international studbooks for gaur and both black and white rhinoceroses.

Berliner, Emil, Emil also spelled EMILE (b. May 20, 1851, Hannover, Hanover—d. Aug. 3, 1929, Washington, D.C., U.S.), German-born U.S. inventor who made important contributions to telephone technology and developed the phonograph record.

Berliner emigrated to the United States in 1870. In 1877, a year after Alexander Graham Bell invented the telephone, Berliner developed a transmitter employing a loose metal contact and, while experimenting with it, made the important discovery that the device could act as a superior telephone receiver.

Berliner later added other inventions to the development of the telephone, and, in 1887, turning his attention to the problem of the phonograph, he made another contribution of major significance, the flat phonograph disk, or record, across which the stylus moved horizontally, rather than up and down, thus minimizing the distortions caused by gravity on Thomas Edison's recording stylus. He also invented a method for manufacturing records.

Berliner's interest was, further, attracted to aeronautics; in 1908 he designed a lightweight internal-combustion motor that became a widely imitated prototype for aircraft. Under his general supervision, his son, Henry Berliner, designed a helicopter that flew successfully as early as 1919. Returning to problems of sound reproduction, the elder Berliner in 1925 invented an acoustic tile for use in auditoriums and concert halls.

Berliner Ensemble, theatrical company founded in 1949 by the German playwright and poet Bertolt Brecht in East Berlin. The Berliner Ensemble originated as a branch of the Deutsches Theater, where Brecht had directed a production of his *Mother Courage and Her Children* in January 1949. Originally designed as a touring company, the ensemble was composed primarily of younger members of the Deutsches Theater, with Helene Weigel, Brecht's wife, as its leading actress and co-director. The company devoted itself to works written or adapted by Brecht himself, beginning in November 1949 with a production of *Mr. Puntila and His Servant Matti.* In 1954 the Berliner Ensemble moved to its own theatre, the Theater am Schiffbauerdamm, where it was established as an independent state theatre of East Germany.

Several tours through Europe, including two visits to Paris, with *Mother Courage* (1954) and *The Caucasian Chalk Circle* (1955), brought the Berliner Ensemble international fame and high critical esteem. After Brecht's death, in 1956, Helene Weigel carried on as the company's director with some composite direction taking place until her death in 1971, when Ruth Berghaus succeeded her.

Berlinger, Milton (U.S. entertainer): *see* Berle, Milton.

Berlinghieri, Bonaventura (fl. 1235–44), Italian painter from Lucca, Italy, known for his poignant and detailed scenes from the life of St. Francis on the predella (base of the altarpiece) of the church of S. Francesco at Pescia.

Bonaventura was the son of the painter Berlinghiero of the Berlinghieri family of Lombardian painters. The Pescia work is one of the

"St. Francis and Episodes from His Life," altarpiece panel by Bonaventura Berlinghieri, 1235; in the church of S. Francesco, Pescia, Italy

SCALA—Art Resource/EB Inc.

earliest known pictorial narratives of the saint of Assisi. Consisting of a central panel and subsidiary scenes, it shows evidence of Byzantine influence. Another work of rare charm is his "St. Francis Receiving the Stigmata," to be found in the Accademia at Florence. Other works attributed to Bonaventura are not well documented.

Berlingske Tidende (Danish: "Berling's Times"), morning daily newspaper published in Copenhagen, generally regarded as Denmark's leading paper.

Established in 1749 by a German printer, Ernst Heinrich Berling, as a semiweekly called the *Københavnske Danske Post-Tidende,* it became a daily in 1841. It managed to operate with some degree of independence under modified government sponsorship for nearly a century and a half. Rigid government censorship of the press ended completely in 1849 with the new Danish constitution. The paper broke all ties with the government in 1901.

Moderate to conservative throughout its history, *Berlingske Tidende* appeals to a broad readership. It combines serious journalism, emphasizing foreign news, and varied and entertaining features.

Berlinguer, Enrico (b. May 25, 1922, Sassari, Sardinia, Italy—d. June 11, 1984, Padua), secretary general of the Italian Communist Party (Partito Comunista Italiano) from March 1972 until his death. He was a leading spokesman for "national Communism," seeking independence from Moscow and favouring the adaptation of Marxism to local requirements.

Berlinguer was born into a middle-class Sardinian family, his father being a socialist who became a deputy and later senator. The son became a Communist Party member in 1943 and was put in charge of the Young Communists in his hometown of Sassari. In 1944 he took part in demonstrations against Italy's Fascist regime, was arrested, and spent three months in jail. After the war he continued as an organizer of Communist youth in Milan and then Rome, becoming a member of the party's Central Committee in 1945 and of the party executive in 1948.

After holding a series of posts within the party, both in Rome and in Sardinia, Berlinguer became secretary for the Lazio region. In 1968 he was elected deputy to the Italian Parliament. The following year, on the occasion of the party's 12th National Congress, he was elected assistant secretary. During the following three years Berlinguer proved to be a hard worker if not a brilliant speaker, and a realistic rather than a flamboyant man. His election as secretary general at the party's 13th congress in Milan in 1972 was no surprise.

As secretary general of the largest Communist organiztion in Western Europe, Berlinguer frequently declared his readiness to take an active part in government in what he termed a "historic compromise" between Christian Democrats and Communists. Although his proposal for such a coalition government was never fully realized, Berlinguer did wield considerable influence as a popular national figure and as leader of a party that controlled many local governments nationwide. In 1976 he was invited to serve in a formal consultative role to the prime minister—the first time in 15 years that an Italian Communist had held such a position—and in 1979 he became a member of the European Parliament.

In the late 1970s and early 1980s Berlinguer found himself increasingly at odds with the Communist government of the Soviet Union. During this period he repeatedly proclaimed his support for the North Atlantic Treaty Organization and denounced the Soviet intervention in Afghanistan and the institution of martial law in Poland. Berlinguer's 1980 visit to China to reestablish official relations with the Communist Party of that country was also seen as a sign of the widening rift between the Italian Communists and the Soviet Union.

Berlioz, (Louis-)Hector (b. Dec. 11, 1803, La Côte-Saint-André, Fr.—d. March 8, 1869, Paris), French composer, critic, and conductor of the Romantic period, known largely for his

Symphonie fantastique (1830), the choral symphony *Roméo et Juliette* (1839), and the dramatic piece *La Damnation de Faust* (1846). His last years were marked by fame abroad and hostility at home.

Early career. The birthplace of Berlioz was a village about 35 miles (56 kilometres) northwest of Grenoble in the French Alps. France was at war; the schools were disrupted; and Berlioz received his education from his father, an enlightened and cultured physician, who gave him his first lessons in music as well as in Latin. But, like many composers, Berlioz

Berlioz
The Bettmann Archive

received in his early years little formal training in music. He worked out for himself the elements of harmony and by his 12th year was composing for local chamber-music groups. With help from performers, he learned to play the flute and the guitar, becoming a virtuoso on the latter.

In 1821 his father sent him to Paris to study medicine, and for a year he followed his courses faithfully enough to obtain his first degree in science. He took every opportunity to go to the Paris-Opéra, however, where he studied, score in hand, the whole repertory, in which the works of Gluck had for him the most appeal and authority. His musical vocation had become so clear in his mind that he contrived to be accepted as a pupil of Jean-François Lesueur, professor of composition at the Paris Conservatoire. This led to disagreements between Berlioz and his parents that embittered nearly eight years of his life. He persevered, took the obligatory courses at the Conservatoire, and in 1830 won the Prix de Rome, having received second prize in an earlier competition. These successes pacified his family but were, in a sense, incidental to his career, for in the same year he had finished and obtained a performance of his first great score, which is also a seminal work in 19th-century music, the *Symphonie fantastique.*

It was in some respects unfortunate that, instead of being able to follow up this success, Berlioz was required, under the terms of his prize, to spend three years abroad, two of them in Italy. During his long Paris apprenticeship, he had experienced the "revelation" of two modern musicians, Beethoven and Weber, and of two great poets, Shakespeare and Goethe. He had meanwhile fallen in love, at a distance, with Harriet Smithson, a Shakespearean actress who had taken Paris by storm; and, on the rebound from this rather one-sided attachment, he had become engaged to a brilliant and beautiful pianist, Camille Moke (later Mme Pleyel). In leaving Paris, Berlioz was not only leaving a flirtatious fiancée and the artistic environment that had stimulated his powers; he was also leaving the opportunity to demonstrate what his genius saw that modern French music should be. The public was content with the "Paris school," dating back to the 1780s, and there is evidence that all Europe (including the Vienna of Beethoven and Schubert) accepted the productions of André Grétry, Étienne Méhul, Luigi Cherubini, and their followers as leading the musical world.

Berlioz wanted to bring forward the work of Weber and Beethoven (including the last quartets) and add contributions of his own. He also preached, for the sake of dramatic expression in music, a return to the master of the stage, Gluck, whose works he knew by heart. These three musicians were all in some sense dramatists, and to Berlioz music must first and foremost be dramatically expressive. This doctrine he had begun to expound in his first musical reviews, as early as 1823, and, with the sharpness and strength of an early vision, it remained the artistic creed of his mature years. When one understands its intellectual and intuitive basis, one understands also the reasons for his dynamic career. What may look like self-seeking—the unceasing effort to have his music played—was, in fact, the dedication of his tremendous energies to a cause, often at the expense of his own creative work. The result of his many journeys to Germany, Belgium, England, Russia, and Austria-Hungary was that he taught the leading orchestras of Europe a new style and, through them, taught a new idiom to the young composers and critics who flocked wherever he went.

Before these "campaigns" began, however, Berlioz had his time of reflection in Italy. He wrote in his *Mémoires* (1870) how unproductive he was after the rich output of the Paris years, which had brought forth an oratorio, numerous cantatas, two dozen songs, a mass, part of an opera, two overtures, a fantasia on Shakespeare's *Tempest,* and eight scenes from Goethe's *Faust,* as well as the *Symphonie fantastique.* Even in Italy, however, Berlioz filled notebooks, met the Russian composer Mikhail Glinka, made a lifelong friend of Mendelssohn, and tramped the hills with his guitar over his shoulder, playing for the peasants and *banditti* whose meals he shared. The impressions gathered in Italy remained a source of both musical and dramatic inspiration down to the last of his works, *Les Troyens* and *Béatrice et Bénédict* (first performed 1862). Meanwhile, his love affair stagnating and his impatience with life at the Villa Medici in Rome becoming acute, he returned to France after 18 months and forfeited part of his prize.

Mature career. Back in Paris, he set about conquering it anew. He put together a collection of earlier pieces in a form then fashionable, the monodrama, or recitation by one actor interspersed with musical scenes. Since the *Symphonie fantastique* had ended with the death and demonic torments of the protagonist, Berlioz called his new work *Le Retour à la vie* (later *Lélio,* after the hero's name). First performed in 1832, this concoction, which contains three or four delightful pieces, enjoyed great success, and Berlioz had reason to think himself launched again.

A series of accidents brought him in touch with the actress Harriet Smithson, whom he married on Oct. 3, 1833. The marriage did not last, though for some years the couple led a peaceful existence at Montmartre in the house that Maurice Utrillo later never tired of painting. Among the visitors there were the young poets and musicians of the Romantic movement, including Alfred de Vigny and Chopin. It was there that Berlioz' only child, Louis, was born and also where he composed his great *Requiem,* the *Grande Messe des morts* (1837), the symphonies *Harold en Italie* (1834 and *Roméo et Juliette* (1839), and the opera *Benvenuto Cellini* (Paris, 1838).

It was after the premiere of *Harold en Italie* that Berlioz had the astonishing experience of seeing the famous violin virtuoso Paganini fall at his feet and declare that he was a genius destined to carry on the new musical tradition initiated by Beethoven. The next day Berlioz received 20,000 francs with a letter from Paganini repeating this judgment. Using the money to free himself from journalistic drudgery, Berlioz composed the choral symphony *Roméo et Juliette,* dedicated to Paganini.

In Paris it was always expected that a composer, regardless of his bent, should be tested at the Opéra. Berlioz' friends intrigued to procure the assignment of a libretto. An adaptation of Benvenuto Cellini's autobiography was secured, and Berlioz finished his score in a short time. The intrigue now passed to the other side, which saw to it that the production of *Benvenuto Cellini* at the Opéra failed. From this blow the work itself and the composer's reputation in France never recovered during his lifetime. The score is a masterpiece, and the attribution of the failure to the libretto shows ignorance of the qualities of both the libretto and the music.

The *Requiem* of 1837 had been a government commission for a ceremonial occasion designed to encourage the Rome laureate. The request to compose another work for a public ceremony—the *Symphonie funèbre et triomphale* (*Funeral Symphony*) for military band, chorus, and strings, commissioned for the 10th anniversary of the July Revolution (1840)—was intended as a partial solace for the defeat of *Benvenuto Cellini.* A few years before, Berlioz' literary gifts had won him the post of music critic for the leading Paris newspaper, the *Journal des Débats,* and his employers wielded political influence. Once again, there were intrigues, but the score of the *Funeral Symphony* was ready for the inauguration of the Bastille column. Unfortunately, the music was drowned out by the drum corps, a disaster that Berlioz repaired by giving the work the following month at a concert hall. This was the score that Wagner, then seeking fame in Paris, admired so wholeheartedly.

Berlioz was able to put Wagner in the way of some musical journalism and thus began a fitful connection of 30 years between the two men whose influence on modern music still resembles a battle of ideals: Berlioz aiming at the creation of drama in and through music alone; Wagner at marriage of symphony with opera. Although Berlioz and Wagner met again in London in 1855 and found each other congenial, their philosophical differences generally kept them apart.

After 1840 Berlioz' life consisted of a series of tours across Europe. The last of these was an exhausting series of concerts in St. Petersburg and Moscow in 1867, when he was desperately ill. But it had the effect of introducing the Russian Five, notably Mussorgsky, to his style through his manuscript scores and his conducting. For Berlioz was the first of the virtuoso conductors, having made himself such in order to supply the deficiencies of men who were unable to direct the new music according to the new canon: play what is written. Moreover, the rhythmical difficulties of his scores and the unfamiliar curve of his melodies disconcerted many. The orchestras themselves had to be taught a new precision, vigour, and ensemble, and this was Berlioz' handiwork. Wagner's memoirs bear testimony to this "revelation of a new world," which he experienced at Berlioz' hands in 1839.

On orchestration itself (and, even more important, on instrumentation) Berlioz produced the leading treatise, *Traité d'instrumentation et d'orchestration modernes* (1844). Much more

than a technical handbook, it served later generations as an introduction to the aesthetics of expressiveness in music. As Albert Schweitzer has shown, its principle is as applicable to Bach as to Berlioz, and it is in no way governed by considerations of so-called program music. To this last-named genre of dubious repute, Berlioz did not contribute more than the printed "story" of his first symphony, which is intelligible as music, without any program.

Among Berlioz' dramatic works, two became internationally known: *La Damnation de Faust* (1846) and *L'Enfance du Christ* (1854). Two others began to emerge from neglect after World War I: the massive two-part drama *Les Troyens* (1855–58), based on Virgil's story of Dido and Aeneas, and the short, witty comedy *Béatrice et Bénédict,* written between 1860 and 1862 and based on Shakespeare's *Much Ado About Nothing.* For all these Berlioz wrote his own librettos. He also wrote a *Te Deum* (1849; perfomed 1855), which is a fitting counterpart to the *Requiem,* and between 1843 and 1856 he orchestrated his songs, including the song cycle *Les Nuits d'été* (*Summer Nights*). Among his best known overtures are *Le Roi Lear* (1831), *Le Carnaval romain* (1844), based on material from *Benvenuto Cellini,* and *Le Corsaire* (1831–52).

In Berlioz' final years he was incapacitated by illness and saddened by many deaths. His first wife, from whom he was separated but to whom he still felt a deep attachment, died in 1854; his second wife, Maria Recio, who had been his companion for many years and whom he had married when he became a widower, died suddenly in 1862. Finally, his son, Louis, who was a sea captain and on whom he concentrated the affection of his declining years, died of yellow fever in Havana at the age of 33.

Assessment. The outstanding characteristics of Berlioz' music—its dramatic expressiveness and variety—account for the feeling of attraction or repulsion that it produces in the listener. Its variety also means that devotees of one work may dislike others, as one finds lovers of Shakespeare who detest *Othello.* But Berlioz also presents a particular difficulty of musicianship in being closer to the true sources of music than to its German, Italian, or French conventions; his melody is abundant and extended and is often disconcerting to the lover of four-bar phrases; his harmony may be obvious or subtle, but it is always functional and frequently depends on elements of timbre; his modulations can be harsh and may even seem harsher than they would in another composer, because he uses his effects sparingly and achieves much by small means and adroit contrasts. This is also true of his orchestration, generally light and transparent, never pasty. As George Bernard Shaw said: "Call no conductor sensitive in the highest degree to musical impressions until you have heard him in Berlioz and Mozart."

The Belgian composer César Franck once said that Berlioz' whole output is made up of masterpieces. He meant by this that each of the composer's dozen great works was the realization of a conception distinct from all the others, rather than successive efforts to attain perfection in the last or best of a series. Franck's judgment is borne out by the fact that, unlike many composers, Berlioz almost never repeats himself. Rather, he created a fresh style for each of his subjects, with the result that familiarity with one is no guaranty of ready access to another. Nothing could be less alike than the *Symphonie funèbre et triomphale* and *Roméo et Juliette* or than the *Requiem* and *L'Enfance du Christ.* To be sure, Berlioz' harmonic system seems the same throughout, partly because it deviates so noticeably from common expectation and partly because its nuances are only now being appreciated for what they are, instead of being looked upon as clumsy attempts to do something else. Again, his melody and free counterpoint everywhere carry his mark—the sinewy originality and dynamic equilibrium of the former, the ingeniously careless independence of the latter. Yet, out of these characteristic elements Berlioz makes a radically different atmosphere for each of his dramas and within them for each of his dramatis personae. Only a repeated hearing of any given work discloses all the power and art (including what would now be called psychology) that it contains. This does not mean that these works are without flaw; it does mean that they embody unique conceptions, to be taken for what they have to give and which no other composer provides.

In the creation of drama and atmosphere, Berlioz excels in scenes of melancholy, introspection, love—gentle or passionate—the contemplation of nature, and the tumult of crowds. His intention throughout is to combine truth with musical sensations, be they powerful or (to quote Shaw again) "wonderful in their tenuity and delicacy, unearthly, unexpected, unaccountable."

Much might be added or quoted that would show the extent to which Berlioz' music still needs careful and dispassionate study. In 1935 the respected British musicologist Sir Donald Tovey, who had not before heard *Les Troyens* declared that it is "one of the most gigantic and convincing masterpieces of music drama." And, he went on, "You never know where you are with Berlioz." What is certain is that books that date from the 19th century or echo its views, with or without a bias toward Wagner or Debussy, will mislead the student and possibly close the ears of the listener. It is easy to represent Berlioz as merely a craftsman in tone colour who helped develop the resources of the orchestra. But with the repeated performance of the major works all over the Western world, the more comprehensive judgment has come to prevail that Berlioz is a dramatic musician of the first rank. Before 1945 the Berlioz repertoire was limited to the *Symphonie fantastique* and a few brief extracts. The great works, done once and usually with insufficient preparation, produced little effect and confirmed the wisdom of letting them lie. The advent of long-playing records radically altered the situation. Audiences can now judge the interpretations that they are being given, and thus they hear Berlioz performances with a knowledge and critical attention comparable to those with which they hear other composers. (J.Ba.)

MAJOR WORKS. *Operas. Benvenuto Cellini* (first performed 1838); *Les Troyens,* comprising *La Prise de Troie* and *Les Troyens à Carthage* (composed 1855–58); and *Béatrice et Bénédict* (1862).

Choral works. Huits Scènes de Faust (1829); *Lélio ou Le Retour à la vie* (1831, sequel to *Symphonie fantastique*); *Requiem—Grand Messe des Morts* (1837); *Roméo et Juliette* (1839); *Symphonie funèbre et triomphale* (1840); *La Damnation de Faust* (1846); *L'Enfance du Christ* (1854), oratorio; *Te Deum,* p. 22 (1855).

Orchestral works. Waverly (1823), overture; *Les Francs-Juges* (composed *c.* 1827), overture; *Symphonie fantastique* (1830–31); *Le Roi Lear* (1831), overture; *Le Corsaire* (1831–52), overture; *Harold en Italie* (1834), symphony with solo viola; *Le Carnaval romain* (1844), overture.

Voice and orchestra. La Mort de Cléopâtre (1829); *La Captive* (1834); *Les Nuits d'été* (1843 and 1856); *La Mort d'Ophélie* (1850).

Songs with piano. Irlande (1829–30), five songs; *Les Nuits d'été* (original version, 1834–41); *Trente-trois Melodies* (1863).

BIBLIOGRAPHY. An intensive study of the musical aesthetic elements in Berlioz' work as a whole is being facilitated by the publication of a scholarly edition of both his scores and his literary works. The former, gradually replacing the earlier and untrustworthy "German" edition, are being prepared in England and published in West Germany; the latter are being edited in France.

Hector Berlioz, *Memoirs,* trans. by David Cairns (1969), gives the story, atmosphere, and purpose of the artist's life; his *Evenings with the Orchestra,* trans. by Jacques Barzun (1956), is a sampling of Berlioz' music criticism. *The New Letters of Berlioz, 1830–1868,* ed. by Jacques Barzun (1954), provides a selection illustrative of the composer's day-to-day activities. For a judgment typical of the Wagnerian era, see Romain Rolland, "Berlioz," *Musiciens d'aujourd'hui,* 2nd ed. (1908), trans. in Barrett H. Clark (comp.), *Great Short Biographies of the World* (1929). J.G. Prod'Homme, *Hector Berlioz (1803–1869) sa vie et ses oeuvres,* 3rd ed. (1927), marks the beginning of the rehabilitation. Walter J. Turner, *Berlioz, the Man and His Work* (1934); and Tom S. Wotton, *Hector Berlioz* (1935, reprinted 1969), affirm, with much musical detail, the now accepted estimate of the man and his works. Jacques Barzun, *Berlioz and the Romantic Century,* 3rd ed., 2 vol. (1970), gives the fullest account of Berlioz' life. Cecil Hopkinson, *A Bibliography of the Musicial and Literary Works of Hector Berlioz, 1803–1869,* 2nd ed., ed. by Richard MacNutt (1980), is the standard bibliography.

berm, terrace of a beach that has formed in the backshore, above the water level at high tide. Berms are commonly found on beaches that have fairly coarse sand and are the result of the deposition of material by low-energy waves. They have a marked change of slope at their seaward edge and a flat or reverse-sloped platform that lies slightly higher than the mean high-water level. On broad beaches there may be three or more subparallel berms, each formed under different wave conditions. On some beaches a berm several metres wide may be laid down each summer and destroyed each winter by high storm waves.

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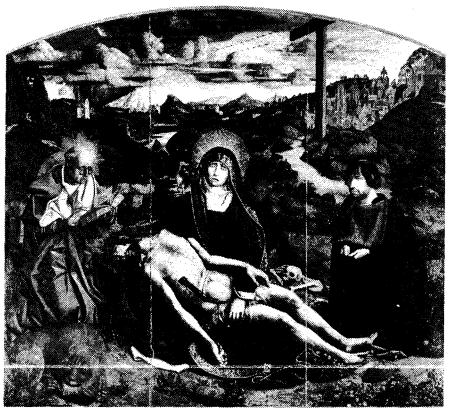
Bermejo, Bartolomé, also called BARTOLOMÉ DE CÁRDENAS (b. Córdoba, fl. 1474–95—d. Barcelona), painter, a cultivator of the Flemish style, who was considered the finest painter in Spain before El Greco. His style became the model for many painters of his era.

Little is known of Bermejo's early activity. Between 1474 and 1477 he worked in Aragon, where he left disciples, and between 1486 and 1495 in Catalonia, where he collaborated with Jaime Huguet, the principal master of that school. His earliest dated work, the panel of



"Pietà," by Bartolomé Bermejo, 1490; in the cathedral, Barcelona
Archivo Mas, Barcelona

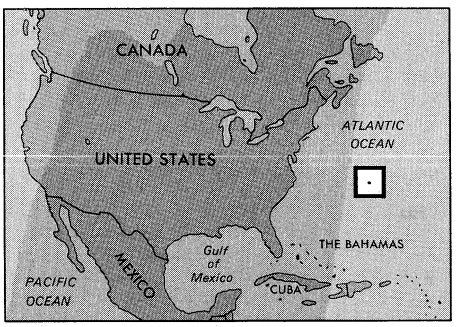
"Santo Domingo de Silos Madrid" (Prado), painted in 1474, has typical Gothic elements. Under the influence of the Flemish masters these elements gradually disappeared as he became more skilled in the use of foreshortening, in detailed depiction of accessories, and

in the resolution of difficult problems in perspective. The work that demonstrates most clearly his mastery of Renaissance techniques is the "Pietà" of 1490 in the cathedral of Barcelona, which lacks gold in the background (present in earlier works); instead, a landscape under a stormy sky is painted very much in the manner of the Flemish master Rogier van der Weyden, rich in detail, colour, and life. The figure of the donor (Canon Luis Desplà) in this picture is considered one of the finest portraits painted in Europe in this period.

Bermejo Pass, Spanish PASO DE BERMEJO, also called PASO DEL BERMEJO, mountain pass at 12,917 feet (3,937 m) in the central Andes Mountains, between Argentina and Chile, directly south of Mount Aconcagua. It is the site of the Cristo Redentor (Christ of the Andes) statue, dedicated in 1904 and erected to commemorate a series of peace and boundary settlements between Argentina and Chile.

Bermejo River, Spanish RÍO BERMEJO, western tributary of the Paraguay River, south-central South America. It rises near Tarija, Bolivia, and, after a rapid plunge to the Chaco lowlands, meanders southeastward in shifting channels into Argentina past Bermejo, Embarcación, El Pintado, and Presidencia Roca to join the Paraguay River opposite Pilar, Paraguay, after a course of 650 miles (1,046 km). Much silt is carried in suspension by the river, thus originating its name (*bermejo,* "reddish colour"). The Bermejo forms the border between Formosa and Chaco provinces, Argentina, and is navigable for small craft along its central course, which is usually referred to as the Teuco River.

Bermuda, self-governing British colony in the western North Atlantic Ocean. It is an archipelago of 7 main and about 150 smaller islands and groups of rocks, situated about 570 miles (900 km) east of Cape Hatteras (North Carolina, U.S.). Its total land area is 21 square miles (54 square km), and the capital is Hamilton. The archipelago is about 24 miles (39 km) long and averages less than 1 mile (1.6 km) in width. Clustered together in the shape of a fishhook and connected by bridges, the



Bermuda

main islands are treated as a single geographic entity and are referred to as the Main Island, or Great Bermuda (14 miles [22.5 km] long and 1 mile wide). The population in 1988 was estimated at 58,400.

A brief treatment of Bermuda follows. For full treatment, *see* MACROPAEDIA: West Indies, The.

The most recent statistics about Bermuda's administration, society, and economy are provided in BRITANNICA WORLD DATA ANNUAL.

The land. The coral islands of Bermuda are composed of a layer 200 feet (60 m) thick of marine limestone that caps an extinct and submerged volcanic mountain range rising more than 14,000 feet (4,300 m) above the ocean floor; the limestone surface is overlain by a shallow layer of fertile soil. The islands are fringed by coral reefs and have little surface drainage; there are no lakes or rivers, but the soil is highly porous and standing water is not a problem.

The climate is mild, humid, and equable. August is the warmest month, with an average daytime high of 86° F (30° C), and February is the coldest month, with an average nighttime low of 57° F (14° C). Mean annual precipitation is about 57 inches (1,450 mm). Occasional dry spells can be critical, as the supply of drinking water depends entirely on rainfall. The relative humidity is persistently high. Vegetation is subtropical and includes flowering shrubs such as bougainvillea, Easter lilies, oleander, hibiscus, and poinsettia. Palm, pine, casuarina, and mangrove trees are found on most of the islands. Animal life is limited to lizards and frogs; a number of migratory birds visit the islands annually.

The people. About three-fifths of the population is descended from African slaves brought to Bermuda before Britain outlawed the slave trade in 1807. Whites include the British and descendants of Portuguese labourers from Madeira and the Azores who went to Bermuda in the mid-19th century. English is the major and official language, but some Portuguese is also spoken. Christianity predominates, and more than one-third of the population belongs to the Church of England. Bermuda's average annual rate of population growth is low by world standards, and the birth and death rates are among the lowest in the West Indies. Less than one-fourth of the population is younger than 15 years.

Only about 20 of Bermuda's islands are inhabited, and Great Bermuda is the most densely populated. The resident population is fairly evenly distributed over this main island.

The economy. Bermuda has a predominantly market economy based largely on tourism, international financial services, and expenditures by U.S. military personnel. The gross national product (GNP) per capita, which is growing as rapidly as the population, is the highest in the West Indies and is at a level comparable to that of the major industrialized countries.

Agriculture is of negligible importance in the overall economy, and most food must be imported. Fresh vegetables, bananas, citrus fruits, and milk are produced locally. Mineral industries are limited to the production of sand and limestone for local construction. There are a few light-manufacturing industries that produce paint, pharmaceuticals, and printed material.

Tourism accounts for the major share of the GNP and employs virtually all the work force directly or indirectly. A large number of tourists visit Bermuda each year; most come from the United States. Many insurance companies have established offices in Bermuda because there are no income taxes; the government derives most of its revenues from tariffs and various taxes on real estate and tourism. Principal trading partners include the United States, which supplies more than one-half of Bermuda's imports, the United Kingdom, Canada, and Italy.

Government and social conditions. Bermuda is an internally self-governing British colony with a parliamentary government. Under its 1968 constitution, the British monarch, represented by the governor, is the head of state. The governor maintains control over external affairs, defense, internal security, and the police. In other matters, he acts on the advice of the Cabinet, headed by the premier, who is head of government and leader of the majority party in the legislature. The bicameral legislature is composed of the House of Assembly, with 40 elected members, and the Senate, with 11 members appointed by the governor, 5 on the advice of the prime minister, 3 on the advice of the leader of the opposition, and 3 at the governor's discretion. Members of both houses serve five-year terms. The Supreme Court heads the judicial system.

Social-security provisions, first enacted in 1965, include old-age, disability, and survivor pensions and compulsory hospitalization insurance for all citizens.

Bermuda enjoys a high standard of health, as reflected in the average life expectancy of about 69 years for men and 76 years for women and a relatively low infant-mortality rate.

Nearly the entire population is literate. Education is compulsory and free between the ages of 5 and 16. There is one college, and government scholarships are available for overseas study.

History. The Spanish navigator Fernández de Oviedo sailed close to the islands in 1515 and attributed their discovery to his countryman Juan Bermúdez, probably between 1503 and 1511. In 1612 Bermuda was included in the third charter of the Virginia Company, and 60 English settlers were sent to colonize the islands. Indian and African slaves were transported to Bermuda beginning in 1616, and soon the slave population outnumbered the white settlers.

In 1684 the colony became jointly administered by the crown and the company. From 1797 until the later 1950s the islands maintained a military garrison and naval base. The colonial capital was transferred from St. George to Hamilton on Great Bermuda Island in 1815. Slavery was abolished in Bermuda and the rest of the British Empire in 1834.

During the American Civil War, Bermuda was a staging area for blockade runners to Southern ports. Rum was smuggled into the United States from the island during the Prohibition period (1919–33). In the 20th century the colony developed a thriving tourist industry. The U.S. government acquired a 99-year lease for naval and air bases in 1941. The British garrison was withdrawn in 1957, but a small naval establishment remains.

The first Bermudan political party, the Progressive Labour Party, organized in 1963, claimed to represent the nonwhite citizens and advocated total independence from Britain. In 1968 a new constitution gave strong powers to the elected head of the majority political party in the legislature, and the next election placed the United Bermuda Party in power with a substantial majority.

Political tensions increased in 1973 when the governor, Sir Richard Sharples, was assassinated. Political unrest, assassinations, and rioting in 1977 led to official efforts to end de facto racial discrimination and to begin independence talks, which were later suspended, the question remaining under review. A movement to reopen independence discussions resurfaced in the early 1980s.

Bermuda grass (*Cynodon dactylon*), perennial grass of the family Poaceae that is native to the Mediterranean region.

Bermuda grass usually is 10 to 40 cm (4 to 16 inches) tall, with short, flat leaves. The spikelets are borne in four or five slender spikes at the tips of the upright stems. Extensively creeping stolons and rhizomes (aboveground and underground horizontal stems) enable Bermuda grass to establish a dense turf. It is used in warmer parts of North America as a lawn and pasture grass and for golf greens.

Bermuda high, recurring centre of high atmospheric pressure that develops over the western North Atlantic Ocean in summer. *See* Azores high.

Bermuda Race, one of the world's major ocean races for sailing yachts. The race originated in 1906 and has been held biennially since 1924 (except during World War II); since 1936 it has covered the 635-mile (1,020-kilometre) distance from Newport, R.I., U.S., to Bermuda. The race is cosponsored by the

Cruising Club of America and the Royal Bermuda Yacht Club, with the winners determined by a handicapping formula. Beginning in 1986 separate awards were given to the winners of the two main divisions, or classes, of ships in the Bermuda Race; one for the fastest cruiser/racer yacht and one for the fastest grand prix racer. The yachts in these two divisions race under the rules, respectively, of the International Measurement System (formerly the Measurement Handicap System) and the International Offshore Rule. A race record was established in 1956, when the yawl "Bolero," owned by Sven Salen of Sweden, covered the distance in 70 h 11 min 37 s. *See* Sporting Record: *Yachting*.

Bermuda Triangle, section of the North Atlantic Ocean in which more than 50 ships and 20 airplanes are said to have mysteriously disappeared. The area, whose boundaries are not universally agreed upon, comprises a vaguely triangular shape marked by the southern U.S. coast, Bermuda, and the Greater Antilles.

Reports of unexplained occurrences in the region date to the mid-19th century. Some ships were discovered completely abandoned for no apparent reason; others transmitted no distress signals and were never seen or heard from again. Aircraft have been reported and then vanished, and rescue missions are said to have vanished when flying in the area. However, wreckage has not been found, and some of the theories advanced to explain the repeated mysteries have been fanciful. Scientific searches have revealed nothing to substantiate the storied peril of the region—wherever it may be. Boaters and fliers continue to venture through the triangle without event.

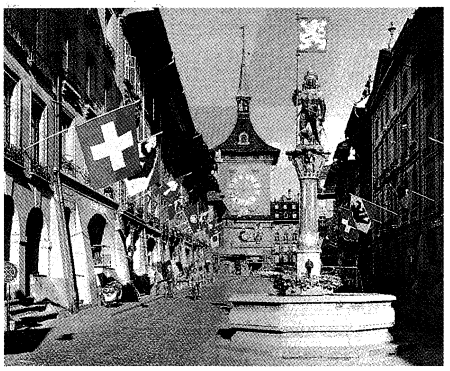
Bern, also spelled BERNE, the second most populous and second largest of the Swiss cantons. Situated in the western and central part of Switzerland, it has an area of 2,335 square miles (6,049 square km), of which about 100 square miles (260 square km) are occupied by glaciers. Bordering Jura canton (until 1979 part of Bern canton) to the north, it is bounded on the west by the cantons of Neuchâtel, Fribourg, and Vaud; south by Valais; and east by Uri, Unterwalden, Luzern, and Solothurn. It is drained mainly by the Aare River and its affluents. Three physical divisions may be distinguished. The Bernese Highlands in the south includes the Alps, culminating in the Finsteraarhorn (14,022 feet [4,274 m]) and the Jungfrau (13,642 feet), and the famous resorts of Interlaken, Thun, Meiringen, Grindelwald, Mürren, and Kandersteg. This region is extremely mountainous and is noted for its great scenic beauty. The Midlands (Mittelland) comprises the Aare Valley below Thun, the Emme Valley, the foothills of the high Alps, and the plain around the city of Bern. In the north of the canton lies the Lake Region around Lake Biel.

The Lauterbrunnen Valley, Bern canton, Switzerland
Shostal Assoc.—EB Inc.

The canton comprises the districts acquired by the city of Bern (*q.v.*), the cantonal capital, between the 14th and the 16th centuries. From 1803 to 1814 the canton of Bern was one of the six directorial cantons of the Swiss Confederation. The existing constitution dates from 1893, but the direct popular election of the nine-member executive (*Regierungsrat*) was introduced in 1906.

In the Highlands the principal economic factors are the year-round tourist trade, agriculture, cattle breeding, cheese making (at the Emmental), and hydroelectric power generation. There is also wood carving at Brienz and pottery making near Thun. The Midlands is a fertile agricultural region and is also the most industrialized part of the canton. A nuclear power station is located at Mühleberg. There is vine culture around Lake Biel. The population of the canton is mainly German-speaking and Protestant. Pop. (1987 est.) 925,300.

Bern, also spelled BERNE, capital of Switzerland and of Bern canton, northwest-central Switzerland. It lies along a narrow loop of the Aare River. The existence of the ancient castle of Nydegg, guarding a crossing over the Aare, probably led Berthold V, duke of Zähringen, to found Bern in 1191 as a military post on the frontier between the German-speaking Alamannians and the French-speaking Burgundians. After the extinction of the Zähringen dynasty (1218), Bern became a free imperial city. Gradually it extended its power by acquiring surrounding territory, becoming an independent state that in 1353 entered the Swiss Confederation, founded in 1291. It soon took the lead in the confederation. It was the scene of a disputation in 1528 between Catholics and reformers that led to its acceptance and subsequent championship of Protestant doctrines. In the 18th century, Bern governed 52 territories, and its patricians exercised considerable power. The whole system of Bernese patrician government was swept away by the French in 1798 and, although partially revived in 1815, ended in 1831. Bern became the political capital of the Swiss Confederation in 1848.



The medieval Clock Tower, Bern, Switz., seen from the Marktgasse; in the foreground is the Zähringen fountain surmounted by a bear in armour, the city's heraldic device
Josef Muench

Old Bern, connected by several bridges to newer parts of the city on the right bank, preserves more of its medieval appearance than any other Swiss city. Old Bern is characterized by arcades, towers, and 16th-century fountains. The Gothic Münster (cathedral; 1421–1598) with its 328-foot (100-metre) spire (completed 1893) is the dominant landmark. Also notable are the city hall (1406–16, restored 1942) and the Nydegg Church (1494). The Federal Palace (Bundeshaus; 1852–1901) houses the Swiss federal parliament; it also houses the administrative and executive offices of the federal government. The famous Clock Tower (Zeitglockenturm), with a 16th-century clock and puppets that revolve at the hour, and the Cage Tower (Käfigturm) are the two remaining towers of the old walls that once protected the city. A favourite decorative motif is the bear (Old High German: *bero*), the town's heraldic device and said to be the source of its name; perhaps the most famous Bern landmark is the bear pit, where several bears have been kept on display at the city's expense since 1513.

The University of Bern was founded in 1834 and incorporates the Theological School (founded 1528). The City and University Library contains many manuscripts and rare books. The Swiss National Library is also in Bern, as is the headquarters of the Swiss National Bank. There are historical, natural history, art, rifle, and Alpine museums.

As well as being the federal capital, Bern is the headquarters of the international postal, telegraph, railway, and copyright unions. Its industries include the manufacture of chocolate, machinery, electrical equipment, textiles, and chemical and pharmaceutical products. It is also a market for agricultural produce and a busy rail junction. The airport at Belpmoos, 6 miles (9.6 km) southeast, has a regular summer service linking Bern with Zürich's international airport. The population is mainly German-speaking and Protestant. Pop. (1986 est.) 138,574.

Bern Convention (copyright): *see* Berne Convention.

Bernadette OF LOURDES, SAINT, original name MARIE-BERNARDE SOUBIROUS (b. Jan. 7, 1844, Lourdes, Fr.—d. April 16, 1879, Nevers; canonized Dec. 8, 1933; feast day April 16, but sometimes February 18 in France), miller's daughter whose visions led to the founding of the shrine of Lourdes.

St. Bernadette
BBC Hulton Picture Library

Frail in health, Bernadette was the eldest of nine children from a poverty-stricken family. She contracted cholera in the epidemic of 1854 and suffered from asthma and other ailments throughout her life. Between February 11 and July 16, 1858, at the age of 14, she had a series of visions of the Virgin Mary, who revealed her identity with the words "I am the Immaculate Conception." Bernadette steadfastly defended the genuineness of these visions despite strong opposition from her parents, the local clergy, and civil authorities, and she faithfully transmitted Mary's messages. To escape public attention she became a boarder

in the local school run by the Sisters of Charity of Nevers. In 1866 she was granted admission into the novitiate in the mother house at Nevers. There she completed her religious instruction and passed her remaining years in prayer and seclusion, happy and loved for her kindliness, holiness, and wit, despite almost constant sickness and pain. She died in agony, willingly accepting her great sufferings in faithful fulfillment of her "Lady's" request for penance. She was canonized by Pope Pius XI. Celebration of her feast is optional in the Roman calendar. The chapel of the St. Gildard convent, Nevers, contains her body.

Bernadotte, HOUSE OF, royal dynasty of Sweden, from 1818. The name derives from a family of old lineage of Béarn, France, whose earliest known member (17th century) owned an estate in Pau known as "Bernadotte."

In 1810, Jean-Baptiste-Jules Bernadotte, a celebrated marshal of France under Napoleon, was elected crown prince of Sweden, went to Stockholm, acted officially as regent during the illnesses of the aged, childless king Charles XIII, and in 1818 became king, as Charles XIV John. Succeeding rulers were his son Oscar I (reigned 1844–59), Charles XV (1859–72), Oscar II (1872–1907), Gustav V (1907–50), Gustav VI Adolf (1950–73), and Charles XVI Gustav (or Carl XVI Gustaf; 1973–).

Bernadotte (af Wisborg), Folke, Greve (Count) (b. Jan. 2, 1895, Stockholm—d. Sept. 17, 1948, Jerusalem), Swedish soldier, humanitarian, and diplomat who was assassinated while serving the United Nations as mediator between the Arabs and the Israelis.

Count Bernadotte, 1945
Archiv fur Kunst und Geschichte, West Berlin

A nephew of King Gustav V of Sweden, Bernadotte was commissioned in the Swedish Army in 1918. He became an official of the Boy Scout movement and during World War II he headed the Swedish Red Cross, securing the exchange of many prisoners of war and being credited with saving some 20,000 inmates of German concentration camps. His excellent reputation among all the combatant nations in Europe led the Nazi official Heinrich Himmler to employ him to transmit a fruitless offer (April 24, 1945) that Germany surrender unconditionally to the United Kingdom and the United States but not to the Soviet Union.

Appointed mediator in Palestine by the United Nations Security Council on May 20, 1948, Bernadotte obtained the grudging acceptance by the Arab states and Israel of a UN cease-fire order, effective June 11. He soon made enemies by his proposal that Arab refugees be allowed to return to their homes in what had become the nation of Israel. Following a number of threats against his life, he and André-Pierre Serot, a French Air Force colonel and UN observer, were murdered by Jewish extremists.

Bernadotte, Jean-Baptiste: *see* Charles XIV John *under* Charles (Sweden).

Bernal, John Desmond (b. May 10, 1901, Nenagh, County Tipperary, Ire.—d. Sept. 15, 1971, London), physicist and X-ray crystallographer known for his studies of the atomic structures of solid compounds, during which he made major contributions to X-ray crystallography. He was professor of physics (1938–63) and of crystallography (1963–68) of the University of London. Bernal has also conducted research into molecular biology, the origin of life, and the structure and composition of the Earth's crust.

Bernanos, Georges (b. Feb. 20, 1888, Paris—d. July 5, 1948, Neuilly-sur-Seine, Fr.), novelist and polemical writer whose masterpiece, *The Diary of a Country Priest*, established him as one of the most original and independent Roman Catholic writers of his time.

Bernanos began life as a Royalist journalist and later worked as an inspector for an insurance company. Like his predecessor, the French Catholic writer Léon Bloy, Bernanos

Bernanos
H. Roger-Viollet

was a visionary for whom the supernatural world was never far away. He was also a man of humour and humanity who abhorred materialism and compromise with evil. His vehement sincerity is seen in his political pamphlets *La Grande Peur des bien-pensants*, a polemic on the materialism of the middle classes (1931; "The Great Fear of Right-Thinking People"), and *Les Grands Cimetières sous la lune* (1938; *A Diary of My Times*, 1938), a fierce attack on Fascist excesses during the Spanish Civil War and on the church dignitaries who supported them.

As a novelist he made his theme the struggle between the forces of good and evil for the soul of man, a conflict particularly exemplified in his studies of priests. His characters, representing extremes of human behaviour from saintliness to utter depravity, are powerfully imagined and realistically drawn.

Bernanos' first novel was *Sous le soleil de Satan* (1926; *The Star of Satan*, 1939; *Under the Sun of Satan*, 1949), partly based on the experiences of the Curé d'Ars. In 1936 Bernanos published *Journal d'un curé de campagne* (*The Diary of a Country Priest*, 1937), a story of a young priest's war against sin. It was made into a motion picture by the French director Robert Bresson in 1951. Other notable works were *La Joie* (1929; *Joy*, 1946), *Nouvelle Histoire de Mouchette* (1937; *Mouchette*, 1966), and *Monsieur Ouine* (1943; *The Open Mind*, 1945).

Political events troubled Bernanos increasingly. In July 1938 he went into self-imposed exile with his wife and six children and began an unsuccessful farming venture in Brazil. He felt acutely what he regarded as the moral degradation of the Munich Agreement ("Scandale de la vérité," 1939; "Scandal of the Truth"). In June 1940 he gave his support to his former classmate Gen. Charles de Gaulle. His broadcast messages and his *Lettre aux Anglais* (1942; *Plea for Liberty*, 1944) influenced his compatriots during World War II. A return to France in 1945 brought disillusionment with his country's lack of spiritual renewal, and he lived thereafter in Tunis until he returned to France suffering from his final illness. Shortly before his death Bernanos completed *Dialogue des Carmélites*, a film script dealing with 16 nuns martyred during the French Revolution. An opera by Francis Poulenc was based on this work.

Bernard (personal name): *see under* Bernhard, or Bernardino, except as below.

Consult the INDEX *first*

Bernard DE CHARTRES (b. late 11th century, Brittany—d. *c.* 1130, possibly Paris), Humanist and philosopher, head of the celebrated school of Chartres, in France, whose attempt to reconcile the thought of Plato with that of Aristotle made him the principal representative of 12th-century Platonism in the West.

A teacher of logic and grammar at the cathedral school of Chartres (where his brother, Thierry de Chartres, also taught) from 1114, Bernard was elected chancellor of the school in 1119. He seems to have played some part in the movement that was to turn grammar into a field of philosophical speculation. For Bernard as grammarian, the relation of the primitive word to its derivatives was of the same sort as the relation of the Platonic Idea to its immersion in the material world. Thus, a white object, for example, immediately suggested to Bernard the source of its reality in the eternal Idea of whiteness. Apparently called to teach philosophy at Paris in 1124, he had as a student John of Salisbury, later secretary to Thomas Becket, archbishop of Canterbury, and bishop of Chartres. John's treatises are the chief sources for data on Bernard's life and thought.

According to the *Metalogicon* (1159) of John of Salisbury, Bernard wrote three works: a treatise, *De expositione Porphyrii* ("On the Interpretation of Porphyry," the 4th-century Neoplatonist logician); a verse form of the same tract; and a comparative study of Plato and Aristotle. Although only three fragments of Bernard's verse are extant, his philosophical doctrine can be determined from a résumé given in John's *Metalogicon*. Reflecting the early Platonism of the anonymous 5th-century philosopher known as Pseudo-Dionysius and his 9th-century interpreter John Scotus Erigena, Bernard proposed the basic Platonic dichotomy between the real world of eternal Ideas and the apparent world of material objects. According to Bernard, reality is composed of three invisible, immutable principles: God, Ideas, and matter. The Ideas are not coeternal with God but possess only a derived eternity. The manner of the Ideas' existence in the world of matter is that of a *forma nativa* ("begotten form"), or a projected copy of the eternal exemplar immanent in God. Immersed in matter, the "begotten form," Bernard held, constitutes sensible objects able to move. Matter of itself is immobile.

The texts of Bernard preserved in John of Salisbury's *Metalogicon* are contained in the series *Patrologia Latina*, edited by J.-P. Migne, vol. 199 (1890).

Bernard DE CLAIRVAUX, SAINT (b. 1090, probably Fontaine-les-Dijon, near Dijon, Burgundy—d. Aug. 20, 1153, Clairvaux, Champagne; canonized Jan. 18, 1174; feast day August 20), Cistercian monk and mystic, the founder and abbot of the abbey of Clairvaux and one of the most influential churchmen of his time.

Early life and career. Born of Burgundian landowning aristocracy, Bernard grew up in a family of five brothers and one sister. The familial atmosphere engendered in him a deep respect for mercy, justice, and loyal affection for others. Faith and morals were taken seri-

St. Bernard of Clairvaux, detail of an altarpiece by the Florentine School, early 15th century; in the Staatliche Museen zu Berlin

By courtesy of the Staatliche Museen zu Berlin, D.D.R.

ously, but without priggishness. Both his parents were exceptional models of virtue. It is said that his mother, Aleth, exerted a virtuous influence upon Bernard only second to what Monica had done for Augustine of Hippo in the 5th century. Her death, in 1107, so affected Bernard that he claimed that this is when his "long path to complete conversion" began. He turned away from his literary education, begun at the school at Châtillon-sur-Seine, and from ecclesiastical advancement, toward a life of renunciation and solitude.

Bernard sought the counsel of the abbot of Cîteaux, Stephen Harding, and decided to enter this struggling, small, new community that had been established by Robert of Molesmes in 1098 as an effort to restore Benedictinism to a more primitive and austere pattern of life. Bernard took his time in terminating his domestic affairs and in persuading his brothers and some 25 companions to join him. He entered the Cîteaux community in 1112, and from then until 1115 he cultivated his spiritual and theological studies.

Bernard's struggles with the flesh during this period may account for his early and rather consistent penchant for physical austerities. He was plagued most of his life by impaired health, which took the form of anemia, migraine, gastritis, hypertension, and an atrophied sense of taste.

Founder and abbot of Clairvaux. In 1115 Stephen Harding appointed him to lead a small group of monks to establish a monastery at Clairvaux, on the borders of Burgundy and Champagne. Four brothers, an uncle, two cousins, an architect, and two seasoned monks under the leadership of Bernard endured extreme deprivations for well over a decade before Clairvaux was self-sufficient. Meanwhile, as Bernard's health worsened, his spirituality deepened. Under pressure from his ecclesiastical superiors and his friends, notably the bishop and scholar William of Champeaux, he retired to a hut near the monastery and to the discipline of a quack physician. It was here that his first writings evolved. They are characterized by repetition of references to the Church Fathers and by the use of analogues, etymologies, alliterations, and biblical symbols, and they are imbued with resonance and poetic genius. It was here, also, that he produced a small but complete treatise on Mariology (study of doctrines and dogmas concerning the Virgin Mary), "Praises of the Virgin Mother." Bernard was to become a major champion of a moderate cult of the Virgin, though he did not support the notion of Mary's immaculate conception.

By 1119 the Cistercians had a charter approved by Pope Calixtus II for nine abbeys under the primacy of the abbot of Cîteaux. Bernard struggled and learned to live with the inevitable tension created by his desire to serve others in charity through obedience and his desire to cultivate his inner life by remaining in his monastic enclosure. His more than 300 letters and sermons manifest his quest to combine a mystical life of absorption in God with his friendship for those in misery and his concern for the faithful execution of responsibilities as a guardian of the life of the church.

It was a time when Bernard was experiencing what he apprehended as the divine in a mystical and intuitive manner. He could claim a form of higher knowledge that is the complement and fruition of faith and that reaches completion in prayer and contemplation. He could also commune with nature and say:

> Believe me, for I know, you will find something far greater in the woods than in books. Stones and trees will teach you that which you cannot learn from the masters.

After writing a eulogy for the new military order of the Knights Templar he would write about the fundamentals of the Christian's spiritual life, namely, the contemplation and imitation of Christ, which he expressed in his sermons "The Steps of Humility" and "The Love of God."

Pillar of the church. The mature and most active phase of Bernard's career occurred between 1130 and 1145. In these years both Clairvaux and Rome, the centre of gravity of medieval Christendom, focussed upon Bernard. Mediator and counsellor for several civil and ecclesiastical councils and for theological debates during seven years of papal disunity, he nevertheless found time to produce an extensive number of sermons on the Song of Solomon. As the confidant of five popes, he considered it his role to assist in healing the church of wounds inflicted by the antipopes (those elected pope contrary to prevailing clerical procedures), to oppose the rationalistic influence of the greatest and most popular dialectician of the age, Peter Abelard, and to cultivate the friendship of the greatest churchmen of the time. He could also rebuke a pope, as he did in his letter to Innocent II:

> There is but one opinion among all the faithful shepherds among us, namely, that justice is vanishing in the Church, that the power of the keys is gone, that episcopal authority is altogether turning rotten while not a bishop is able to avenge the wrongs done to God, nor is allowed to punish any misdeeds whatever, not even in his own diocese (parochia). And the cause of this they put down to you and the Roman Court.

Bernard's confrontations with Abelard ended in inevitable opposition because of their significant differences of temperament and attitudes. In contrast with the tradition of "silent opposition" by those of the school of monastic spirituality, Bernard vigorously denounced dialectical Scholasticism as degrading God's mysteries, as one technique among others, though tending to exalt itself above the alleged limits of faith. One seeks God by learning to live in a school of charity and not through "scandalous curiosity," he held. "We search in a worthier manner, we discover with greater facility through prayer than through disputation." Possession of love is the first condition of the knowledge of God. However, Bernard finally claimed a victory over Abelard, not because of skill or cogency in argument but because of his homiletical denunciation and his favoured position with the bishops and the papacy.

Pope Eugenius III and King Louis VII of France induced Bernard to promote the cause of a Second Crusade (1147–49) to quell the prospect of a great Muslim surge engulfing both Latin and Greek Orthodox Christians. The crusade ended in failure because of Bernard's inability to account for the quarrelsome nature of politics, peoples, dynasties, and adventurers. He was an idealist with the ascetic ideals of Cîteaux grafted upon those of his father's knightly tradition and his mother's piety, who read into the hearts of the crusaders—many of whom were bloodthirsty fanatics—his own integrity of motive.

In his remaining years he participated in the condemnation of Gilbert de La Porrée—a scholarly dialectician and bishop of Poitiers who held that Christ's divine nature was only a human concept. He exhorted Pope Eugenius to stress his role as spiritual leader of the church over his role as leader of a great temporal power, and he was a major figure in church councils. His greatest literary endeavour, "Sermons on the Canticle of Canticles," was written during this active time. It revealed his teaching, often described as "sweet as honey," as in his later title *doctor mellifluus*. It was a love song supreme: "The Father is never fully known if He is not loved perfectly." Add to this one of Bernard's favourite prayers, "Whence arises the love of God? From God. And what is the measure of this love? To love without measure," and one has a key to his doctrine.

St. Bernard was declared a doctor of the church in 1830 and was extolled in 1953 as *doctor mellifluus* in an encyclical of Pius XII.

(J.R.M.)

BIBLIOGRAPHY. *Works.* The *Works* (of St. Bernard of Clairvaux), trans. by a Priest of Mount Melleray, 6 vol. (1920–25); and *The Works of Bernard of Clairvaux,* "Cistercian Fathers Series" (1970–), two English-language collections; *Sancti Bernardi Opera,* ed. by J. Leclercq, C.H. Talbot, and H.M. Rochais, 6 vol. (1957–), the best critical text.

Works on St. Bernard. St. Bernard of Clairvaux: The Story of His Life As Recorded in the Vita Prima Bernardi . . ., trans. by G. Webb and Adrian Walker (1960), a chief biographical source by several contemporaries of Bernard, which therefore must be read with reserve as it presents a different type of historical biography; E. Vacandard, *Vie de saint Bernard, abbé de Clairvaux,* 2 vol. (1895), was the definitive chronology and remains quite authoritative; I. Vallery-Radot, *Bernard de Fontaines: Abbé de Clairvaux,* 2 vol. (1963–69), highly definitive as a chronological study as well as reviewing all contributions since the 19th century; Watkins Williams, *St. Bernard of Clairvaux* (1935), concentrates upon Bernard's political activity. E.C. Butler, *Western Mysticism: The Teaching of Saints Augustine, Gregory and Bernard on Contemplation and the Contemplative Life* (1922), on the mystical doctrine of Bernard; Henri Daniel-Rops, *Saint Bernard et ses fils* (1962; *Bernard of Clairvaux,* 1964), a popular biography and description of the historical development of the Cistercian order; Étienne Gilson, *La Théologie mystique de Saint Bernard* (1934; *The Mystical Theology of Saint Bernard,* 1940), on the mystical doctrine of Bernard and his contemporaries; Bruno Scott James, *St. Bernard of Clairvaux* (1957), a personality study; Jean Leclercq, *L'Amour des lettres et le désir de Dieu* (1957; *The Love of Learning and the Desire for God: A Study of Monastic Culture,* 1961), indispensable for an adequate and appreciative understanding of the entire cultural context of Bernard; Denis Meadows, *A Saint and a Half: A New Interpretation of Abelard and St.*

Bernard of Clairvaux (1963), a quite thorough and readable treatment of the controversy and personalities involved; Thomas Merton, *The Last of the Fathers: Saint Bernard of Clairvaux and the Encyclical Letter, Doctor Mellifluus* (1954); Albert Victor Murray, *Abelard and St. Bernard: A Study in Twelfth-Century Modernism* (1967), a technical and scholarly approach to the issue.

Bernard DE CLUNY, also called BERNARD DE MORLAIX (fl. mid-12th century), monk, poet, and Neoplatonic moralist whose writings condemned man's search for earthly happiness and criticized the immorality of his times. He is also noted for his valuable chronicle of monastic customs.

Among the scant references to Bernard's life is an unconfirmed tradition that described him as a native of England or Brittany who became a monk at the abbey of Saint-Sauveur d'Aniane, in central France. He then transferred *c.* 1125 to the great Benedictine foundation of Cluny, near Lyon, where he studied literature and theology under the learned Abbot Hugh of Cluny.

Bernard's major work, *De contemptu mundi* ("On Condemning the World"), was written *c.* 1140 and was dedicated to Abbot Peter the Venerable. A poem of about 3,000 lines in dactylic hexameter, *De contemptu mundi* expresses the disdain for the material world characteristic of Neoplatonism, a philosophical school that ascribed reality only to the world of Ideas. Decrying the transitory nature of earthly life, Bernard maintained that man's satisfaction could be found only in the spiritual existence of the next world, which could be reached most directly by a rigorous asceticism. With biting satire, he also censured the moral decay of the Western Church. He concluded on an apocalyptic note with a vivid description of heaven and hell that may have influenced Dante's portrayal of them in *The Divine Comedy.* Notable also is Bernard's compilation of the *Consuetudines Cluniacenses* ("Customs of Cluny"), a systematic, annotated collection of the monastic principles and usages governing the Cluniac reform of the 6th-century Benedictine Rule.

Bernard's devotional verse dedicated to the Virgin Mary became widely popular in medieval piety. *De contemptu mundi* was edited by H.C. Hoskier in 1929. An edition of *Consuetudines Cluniacenses* by P.B. Albers appeared in 1905.

Bernard DE MENTHON, SAINT, also called BERNARD OF AOSTA, Italian SAN BERNARDINO DE MENTONE, or D'AOSTA (d. 1081?; feast days May 28 and June 15), vicar general of Aosta diocese (now in Italy) who reestablished and was patron of hospices at the summits of two Alpine passes, renamed after him the Great and Little St. Bernard passes. Also named for him in time were the hospices' St. Bernard dogs, famed for rescuing lost travellers.

Bernard became concerned for the safety of travellers, often pilgrims to Rome, who crossed the mountains by way of the two passes leading into Aosta. The rest houses he established there were tended by clerics and laymen and welcomed all travellers. In 1923 Pope Pius XI named him patron saint of mountain climbers.

Bernard DE VENTADOUR, also called BERNART DE VENTADORN (b. Limousin province, Aquitaine—d. 1195?, Dalon), Provençal troubadour whose poetry is considered the finest in the Provençal language.

Bernard is known to have travelled in England in 1152–55. He lived at the court of Eleanor of Aquitaine and that at Toulouse, in later life retiring to the abbey of Dalon. His short love lyrics, 45 of which survive, express emotional power remarkably combined with lyric delicacy and simplicity. He also composed his own music; 19 of his tunes have survived. *See also* troubadours, music of the.

Bernard OF SIENA, SAINT, Italian SAN BERNARDINO DA SIENA (b. Sept. 8, 1380, Massa Marittima, Siena—d. May 20, 1444, L'Aquila, Kingdom of the Two Sicilies; canonized 1450; feast day May 20), Franciscan theologian and preacher of great eloquence who, with SS. John of Capistrano and James of the March, led the growth of the Observants, a strict branch of the Franciscan order (*see* Franciscans) that subsequently spread throughout Europe.

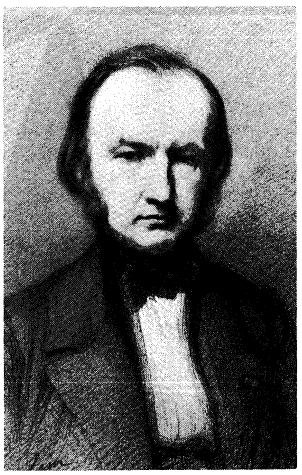
Of noble birth, Bernard was orphaned early. He completed his education in Siena, where he then served the sick in the hospitals (1400), contracting and nearly dying of plague. In 1402 he entered the Observants.

Bernard became a priest in 1404 but did not begin his renowned preaching tours through Italy until 1417. Appalled by the breakdown in morals, the lawlessness, and the civil strife that resulted from the Great Western Schism, he strove to restore morals by inculcating a deep personal love of Jesus Christ.

He took part in the Council of Florence in 1439, furthering the short-lived union of the Greek Church with Rome. The centre of his movement was Il Gesù, a small chapel in Rome, later given to St. Ignatius of Loyola. Numerous miracles are said to have occurred at his tomb.

Bernard OF PISA (pope): *see* Eugenius III.

Bernard, Claude (b. July 12, 1813, Saint-Julien, Fr.—d. Feb. 10, 1878, Paris), French physiologist known chiefly for his discoveries concerning the role of the pancreas in digestion, the glycogenic function of the liver, and the regulation of the blood supply by the vasomotor nerves.



Claude Bernard, detail of a lithograph by A. Laemlein, 1858

By courtesy of the National Library of Medicine, Bethesda, Maryland

On a broader stage, Bernard played a role in establishing the principles of experimentation in the life sciences, advancing beyond the vitalism and indeterminism of earlier physiologists to become one of the founders of experimental medicine. His most seminal contribution was his concept of the internal environment of the organism, which led to the present understanding of homeostasis—*i.e.,* the self-regulation of vital processes.

Early training. Bernard's father, Pierre, was a winegrower; his mother, Jeanne Saulnier, of peasant background. There was one other child, a girl. When Claude was very young, his father failed in a wine-marketing venture and tried to make ends meet by teaching school. Despite his efforts, the family never prospered and, when he died, the survivors were left in debt. It was his mother whom Claude Bernard was always to cherish and remember. Educational opportunities were scarce for a poor winegrower's son in the France of Louis XVIII. The boy studied Latin with the local priest and then was enrolled in a Jesuit-conducted school at Villefranche, where no natural science was taught. At 18 he ended his secondary schooling at Thoissey without a diploma and was apprenticed to an apothecary in a Lyon suburb.

Bernard's days were spent in menial tasks relieved by errands to a veterinary school or, on his rare times off, by visits to a theatre. He wrote a playlet, *La Rose du Rhône,* now lost, and received 100 francs for it. Next, he began writing *Arthur de Bretagne,* a historical drama in five acts. His employer was not pleased, however, and the apprenticeship came to a halt, the youth returning home in July 1833. By November 1834 he was in Paris with the completed manuscript of *Arthur de Bretagne* and a letter of introduction. The literary critic Saint-Marc Girardin read his play and advised him to try medicine instead of playwriting. Many years later the two met again, as members of the French Academy.

Bernard enrolled that same winter in the school of medicine and, in due course, was admitted as an extern in the hospitals. Outwardly reserved and even shy at that time, he had an inner strength that was to overcome poverty and discouragements. Of 29 students passing the examination for the internship, Bernard ranked 26th. Serving in Paris hospitals were the celebrated doctors Pierre Rayer and François Magendie, and Bernard studied under the latter at both the Hôtel-Dieu and the Collège de France. Magendie noticed Bernard's skillful dissections, but his gruff manner disheartened the student, and Bernard almost resigned himself to settling in Beaujolais in a country practice. Fortunately, Rayer gave him new hope, and Magendie took him on as a research assistant.

Bernard became involved in Magendie's research on spinal nerves. His first publication dealt with another nerve, the chorda tympani, while his medical dissertation was devoted to the function of the gastric juice in nutrition (1843). These maiden publications were prophetic, for much of his later research concerned neurology and metabolism. Failing in the examination that would have qualified him to teach in the medical school, he collaborated with others in research on digestion and on the exotic poison curare, thus treading two paths that would lead him to fame. He was rather old at the age of 31 to be content with a research assistantship, however, and resigned the position late in 1844. Left in financial straits, he turned his thoughts again toward medical practice.

To save his research career, a friend arranged a marriage of convenience for him with Marie-Françoise Martin, daughter of a Paris doctor. The marriage brought him a dowry of 60,000 francs but was destined to be painfully unhappy. Their separation was to follow his election to the French Academy and his appointment to the Imperial Senate—a poignant contrast between personal unhappiness and public renown.

Research on the pancreas and the liver. All of that, however, was in the future in 1845. Bernard's first son was born in 1846 but did not survive. In 1847 his father died, his daughter, Tony, was born, and he became Magendie's substitute at the Collège de France. This period was marked by a veritable explosion of discoveries, beginning in 1846, when Bernard solved the mystery of the carnivorous rabbits. Puzzled one day by the chance observation that some rabbits were passing clear—not cloudy—urine, just like meat-eating animals, he inferred that they had not been fed and were subsisting on their own tissues. He confirmed his hypothesis by feeding meat to the

famished animals. An autopsy of the rabbits disclosed an unexpected but remarkable discovery concerning the role of the pancreas in digestion: the secretions of the pancreas broke down fat molecules into fatty acids and glycerin. Next, he took a step toward explaining diabetes by showing that sugar in the blood is not always a symptom of the disease, though his hopes to conquer diabetes were premature because of the many unknowns still connected with the problem.

His work on the pancreas led to research on the liver, culminating in his second great discovery, the glycogenic function of the liver; and his dissertation on this subject won him the doctorate of science in 1853. Simultaneously, he was nearing his third great achievement—explanation of the regulation of the blood supply by the vasomotor nerves. This experiment overlapped in time with a fourth discovery, one concerning curare. He showed how this dread poison causes paralysis and death by attacking the motor nerves, while having no effect on the sensory nerves. He demonstrated that, because of this selectivity, curare could be used as an experimental tool in differentiating neuromuscular from primary muscular mechanisms.

Recognition and later work. Within less than a decade, from obscurity in the shadow of Magendie, he had risen to a commanding position in science. In 1854 a chair of general physiology was created for him in the Sorbonne, and he was elected to the Academy of Sciences. When Magendie died in 1855, Bernard succeeded him in the Collège de France.

Magendie's empirical method of conducting experiments without a guiding hypothesis was by then out of date, partly as a result of his own discoveries. Bernard's historic role was to demonstrate the experimenter's need for a guiding hypothesis to be either confirmed or refuted by the results.

For various reasons, a shift was occurring in Bernard's scientific interests. The productive researcher was turning into a philosopher of science. Failing health after 1860 led him to spend more time at Saint-Julien, less time in the laboratory. Louis Pasteur would blame the unhealthful conditions here for his colleague's long illness. By odd coincidence, Bernard suffered apparently from chronic enteritis, with symptoms affecting the pancreas and the liver. By way of compensation, the enforced leisure left him time for reflection, out of which would come his masterpiece, *Introduction à la médecine expérimentale* (1865; *An Introduction to the Study of Experimental Medicine,* 1927).

This work was planned as a preface, if a very long one, to a work of greater magnitude, never completed. Bernard's aim in the *Introduction* was to demonstrate that medicine, in order to progress, must be founded on experimental physiology. The other points in his argument are that (1) the physical and chemical sciences provide the foundation for physiology, although it is not reducible to them; (2) the notion of "vital force" does not explain life; (3) vivisection is indispensable for physiological research; and (4) biology depends on the principle of scientific determinism; *i.e.,* the principle that, under identical conditions, the phenomena will be identical. He was skeptical regarding statistics and did not anticipate the later usefulness that statistical techniques would achieve. Still germane for modern science is his presentation of the concept of the *milieu intérieur,* or "internal environment."

The book brought new honours to Bernard, notably election to the French Academy. After the breakup of his marriage, he found some consolation in a platonic friendship with Marie Raffalovich, a handsome woman of Russian-Jewish origin. She attended his lectures and translated scientific works for him. His friends included such literary figures as Ernest Renan, Hippolyte Taine, and the Goncourts, besides such scientists as Pasteur and Marcelin Berthelot.

The most renowned of the students trained by Bernard were Albert Dastre, Paul Bert, and Arsène d'Arsonval. Bert succeeded Bernard in the Sorbonne when the latter transferred to the Musée d'Histoire Naturelle. Bernard's own experiments were taking new directions. The phenomena common to animals and plants formed the subject of lectures published posthumously. He also began research on fermentation. His findings were published after his death by Berthelot and, because they conflicted with Pasteur's views, cast a cloud over the microbe hunter's memory of his late colleague.

Bernard's health had declined precipitously in the autumn of 1877. On New Year's Day he caught cold, and shortly afterward inflammation of the kidneys set in. Soon he was confined to his bed. Mme Raffalovich and her daughter nursed him, and students and friends gathered around; his daughter Tony stopped short of his threshold. A travelling rug was laid over his legs, of which he is reported to have said: "This time it will serve me for the journey from which there is no return." His sister called in the priest to hear his confession, though his closest friends were convinced that there was no deathbed conversion. There was a national funeral, the first ever granted to a scientist in France. (R.Vi.)

BIBLIOGRAPHY. Editions of Bernard's works include *Introduction à la médecine expérimentale* (1865; Eng. trans. by H.C. Green, with a new foreword by I. Bernard Cohen, 1957); *L'Oeuvre de Claude Bernard,* with addresses by Ernest Renan *et al.,* and a bibliography by G. Malloizel (1881); and *Cahier de Notes 1850–1860,* a useful edition of a Bernard notebook by M.D. Grmek (1965). J.M.D. Olmsted, *Claude Bernard: Physiologist* (1938), is the fullest biography but may be supplemented by J.M.D. and E.H. Olmsted, *Claude Bernard and the Experimental Method in Medicine* (1952); and Reino Virtanen, *Claude Bernard and His Place in the History of Ideas* (1960).

Bernard, Émile (b. 1868—d. April 16, 1941, Paris), French painter who is sometimes credited with founding Cloisonnism (*see* Pont-Aven school; Synthetism); he is noted for his remarkable friendships with such artists as Vincent van Gogh, Paul Gauguin, Odilon Redon, and Paul Cézanne.

In 1886 Bernard went to Pont-Aven, where he theorized a Cloisonnist style of painting bold forms separated by dark contours that somewhat influenced Gauguin. He also did sculpture and woodcuts and designed furniture and tapestries. As a poet and writer, he studied religious mysticism and philosophy. Part of the fame of Cézanne and Redon rests on Bernard's prophetic admiration of their early work. He toured Italy in 1894 and settled in Egypt for 10 years. Returning to France in 1904, he founded and edited the review *La Rénovation Esthétique* and published correspondence with van Gogh, Gauguin, Redon, and Cézanne—a major contribution to the understanding of modern art.

Bernard, Henriette Rosine (actress): *see* Bernhardt, Sarah.

Bernard, Jean-Jacques (b. July 30, 1888, Enghien-les-Bains, Fr.—d. Sept. 12, 1972, Paris), French playwright and chief representative of the "school of silence" (more exactly, the "drama of the unexpressed"), in which the dialogue does not express the characters' real attitudes. As in *Martine* (1922), perhaps the best example of his work, emotions are implied in gestures, facial expressions, fragments of speech, and silence.

The son of the dramatist Tristan Bernard, he began writing plays before World War I. Unconscious jealousy is the theme of *Le Feu qui reprend mal* (1921) and *Le Printemps des autres* (1924). In *L'Âme en peine* (1926), two characters who never meet feel an inexplicable disquiet whenever they are near one another. Among his later plays are the more conventional *À la recherche des coeurs* (1931) and *Jeanne de Pantin* (1933).

Jean-Jacques Bernard, 1963
H. Roger-Viollet

Bernard's nondramatic writings include *Le Camp de la mort lente* (1944; *The Camp of Slow Death,* 1945), a description of the German concentration camp at Compiègne, in which he, as a Jew, was interned, and *Mon ami le théâtre* (1958). J.L. Frith's translation of several of Bernard's plays appeared under the title *The Sulky Fire* (1939).

Bernard, Jessie (Shirley), married name MRS. LUTHER LEE BERNARD (b. June 8, 1903, Minneapolis, Minn., U.S.), U.S. sociologist whose feminist point of view provided new insights into women, sex, marriage, and the interaction of the family and community.

Educated at the University of Minnesota, where she received her B.A. (1923) and M.A. (1924), and at Washington University, where she received her Ph.D. (1935), Bernard worked as a social science analyst for the U.S. Bureau of Labor Statistics (1935–39). She began her teaching career at Lindenwood College for Women, St. Charles, Mo. (1940–47) and was professor of sociology at the University of Pennsylvania (1947–64).

Bernard's writings include *American Family Behavior* (1942; reprinted 1973), a seminal work, with original perceptions that she would explore later in greater depth; *American Community Behavior* (1949; reprinted 1962), and *Academic Women* (1964; reprinted 1974). *Marriage and Family Among Negroes* (1966) is a work that examines the effects of racism on black culture. Later works, which reflect her more pronounced feminism, include *The Sex Game* (1968; reprinted 1972), *Women and the Public Interest* (1971), *The Future of Marriage* (1972; reprinted 1973), *The Future of Motherhood* (1974), and *The Female World* (1981).

Bernard, Samuel, COMTE (count) DE COUBERT (b. Oct. 29, 1651, Sancerre, Fr.—d. Jan. 18, 1739, Paris), French financier who became a symbol of Protestant banking. He had the same name as his father, a well-known painter.

He started off in business selling gold brocade and jewelry, but soon went into banking, helped by refugee Protestants in other countries. Bernard had renounced Protestantism in 1676, but it was a device that fooled no one.

By 1695 Bernard was considered the greatest banker in Europe. Louis XIV, although never comfortable with Bernard's religious affiliations, overlooked them in order to have Bernard mobilize the capital of Europe to finance the French military campaigns. Bernard, at Louis XIV's request, lent France 11,000,000 francs in 1697 and another 19,000,000 in 1708. For these services, Louis gave him a title of nobility with the unusual stipulation that Bernard remain in commerce so the

state could always depend on him. Notorious for his flattery to the King, Bernard was made comte de Coubert (1725) and counsellor of state (1730). Bernard's wealth was made through war profiteering and speculation, and many felt that he aggrandized his own fortune at the expense of the country. He died leaving an estate of 33,000,000 francs.

Bernard, Tristan, pseudonym of PAUL BERNARD (b. Sept. 7, 1866, Besançon, Fr.—d. Dec. 7, 1947, Paris), French playwright, novelist, journalist, and lawyer who wrote for the *théâtre de boulevard,* a genre meant to entertain middle-class Parisian audiences on Sunday afternoons. His merit consisted in limiting his literary ambitions to his capabilities. His works were characterized by a tone of light cynicism, a cross fire of lively dialogue, and a keen insight into the foibles of his bourgeois audiences. Among his most successful plays were *L'Anglais tel qu'on le parle* (1899; "English As It Is Spoken"), *Triplepatte* (1905, written in collaboration with André Godfernaux), and *Monsieur Codomat* (1907). He also wrote several humorous novels: *Les Mémoires d'un jeune homme rangé* (1899; "Memoirs of a Proper Young Man") and *La Féerie bourgeoise* (1924; "The Bourgeois Fairyland"). His son Jean-Jacques Bernard, also a playwright, wrote a memoir, *Mon père Tristan Bernard* (1955).

Bernardin de Saint-Pierre, Jacques-Henri (b. Jan. 19, 1737, Le Havre, Fr.—d. Jan. 21, 1814, Éragny), French writer who is best remembered for *Paul et Virginie,* a pastoral of innocent love.

Bernardin's army service as an engineer on the island of Mauritius in the Indian Ocean provided him with material for *Voyage à l'Île de France* (1773), with which he opened his literary career. The work brought him to the attention of Rousseau, whose friendship did much to mold the views expressed in Bernardin's *Études de la nature* (1784). To the third edition of *Études* (1788) he appended *Paul et Virginie,* the story of two island children whose love for each other, begun in their infancy, thrives in an unspoiled natural setting but ends tragically when civilization interferes. In a later work, *La Chaumière indienne* (1790), a traveller finds wisdom in the cottage of an Indian outcast. Cultural primitivism, which Bernardin was one of the first to celebrate, became one of the central ideas of the Romantic movement.

Bernardin de Saint-Pierre, detail of an engraving by J.-F. Ribault, 1805, after a drawing by L. Lafitte

J.E. Bulloz

Bernardine: *see* Cistercian.

Bernart DE VENTADORN (troubadour): *see* Bernard de Ventadour.

Bernays, Edward L. (b. Nov. 22, 1891, Vienna), pioneer U.S. publicist generally considered to have first developed the idea of the professional public relations counselor, *i.e.,* one who draws on the social sciences in order to motivate and shape the response of a general or particular audience.

Bernays was a year old when his parents moved to New York City from Austria, where his uncle, the psychoanalyst Sigmund Freud, was beginning his work. His mother was Freud's sister, Anna, and his father was a successful grain merchant. After graduating from high school at age 16, Bernays attended Cornell University where, to placate his father, he won a degree in agriculture in 1912. He abandoned farm products after a brief obligatory sally into the grain market and found work editing a medical review. This brought to his attention a play, *Damaged Goods,* whose would-be producer found popular taboos against the subject—venereal disease—insuperable. Bernays organized a scheme to muster endorsements of the play by civic leaders, and as a result the play was produced successfully and Bernays had found his true calling.

Subsequently, Bernays publicized several theatrical producers and performers, including Henry Miller and Enrico Caruso. After World War I, Bernays and Doris Fleischman (d. July 10, 1980), whom he later married, opened their own public relations office. Their first clients included the U.S. War Department, which wanted to persuade businesses to hire returning war veterans; and the Lithuanian government, which was lobbying for recognition by the U.S. For one client, Venida hair nets, Bernays publicized the danger of women workers' long, loose hair in factories and restaurants. As a result several U.S. states passed laws requiring factory workers and female food service employees to wear hair nets. He organized soap carving competitions for the Ivory soap of his client Procter and Gamble.

A vigorous spokesman and advocate for public relations into his 90s, Bernays was the author of many books, among the most influential of which were *Crystallizing Public Opinion* (1923), *Public Relations* (1952), and the work in which his oft-quoted definition of public relations appears in the title, *The Engineering of Consent* (1955).

Bernays, Paul (Isaak) (b. Oct. 17, 1888, London—d. 1977, Zürich), Swiss mathematician and logician who is known for his attempts to develop a unified theory of mathematics.

After obtaining his doctorate from the University of Göttingen (1912), Bernays taught at the University of Zürich (1912–17), the University of Göttingen (1917–33), and the Technische Hochschule of Zürich (1934–59). It was at Göttingen that he formed his association with the prominent mathematician David Hilbert, who was his teacher, mentor, and collaborator. They wrote what is regarded as a classic work on mathematics, *Grundlagen der Mathematik* (2 vol., 1934–39; reissued 1968–70; "Foundations of Mathematics"), based on Hilbert's earlier version. In 1956 Bernays revised a work of Hilbert's, *Grundlagen der Geometrie* (1899; *The Foundations of Geometry,* 1902), which went through several editions. Influenced by Hilbert's belief that the entire underlying structure of mathematics could be brought together into a single coherent entity, Bernays delved into the realm of set theory, trying to develop a set of axioms on which such a unifying system could be based. He wrote a series of articles under the title "A System of Axiomatic Set Theory" (published in the *Journal of Symbolic Logic,* 1937–54), from which the principal theses were published as *Axiomatic Set Theory* (1958). Here he simplified and organized the work of the logician John von Neumann on logic and set theory; these modifications would be further developed by the mathematician Kurt Gödel.

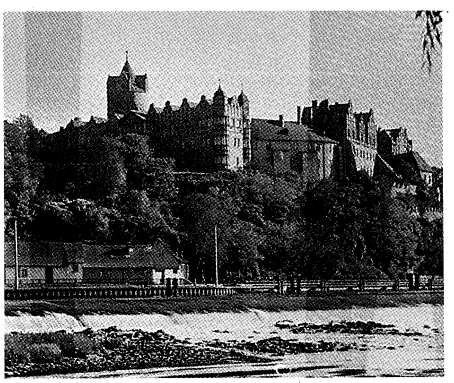
Bernbach, William (b. Aug. 13, 1911, New York City—d. Oct. 2, 1982, New York City), U.S. advertising executive and copywriter, a pioneer of the subtle, low-pressure advertising that became a hallmark of the agency he helped found, Doyle Dane Bernbach, Inc. The firm quickly became one of the most influential in the business, and Bernbach's approach to advertising copy was widely adopted.

Bernbach was the son of a clothing designer, and as a boy he was interested in art and wrote verse. He was educated in New York public schools and earned a B.A. degree from New York University. His first job was in the mail room of Schenley Distillers. While there he wrote an advertisement for Schenley and sent it unsolicited to the advertising department. In due course the ad was recognized as having merit, but its origin had been lost. It was inserted—verbatim—in *The New York Times.* Bernbach saw the ad and quickly claimed authorship to Schenley's chairman, Lewis Rosenstiel, who gave him an immediate salary increase and transferred him to the advertising department. He worked for other agencies and began to develop an interest in advertising graphics.

After U.S. Army service in World War II, Bernbach joined Grey Advertising as a copywriter, and it was there that he met Ned Doyle. The two joined forces with Maxwell Dane in 1949 to form Doyle Dane Bernbach. Their first account was a bargain department store in need of a new image. Bernbach's campaign created a fashionable, sophisticated image and made the store's name, Ohrbach's, a watchword. One of his most successful campaigns was for Volkswagen automobiles: "Think small." He turned the Avis car rental's second rank in its industry into an asset by claiming that Avis "tries harder." A writer from the start, Bernbach was in charge of the agency's creative activities, aiming always to create advertising that was fresh and original. For years he alone approved each campaign before it was presented to a client.

After stepping down as president of Doyle Dane Bernbach in 1967, Bernbach assumed the position of chairman of the board, and later chairman of the executive committee, a position he held at his death in 1982. When he started the firm, its billings were $1,000,000; when he died it approximated $1,000,000,000. He was a leader in the affairs of the American Association of Advertising Agencies.

Bernburg, city, Halle *Bezirk* (district), southwest central East Germany, on the Saale River at the mouth of the Wipper River, south of Magdeburg. First mentioned in 961, it was important in the Middle Ages for its position on an old trade route. Its castle, probably dating from the 10th century and later converted into a Renaissance-style chateau, was the residence of the dukes when the town was the capital of the Duchy of Anhalt-Bernburg (1251–1468, 1603–1863). Bernburg consisted of two almost completely separate and independent communities; both were chartered in



The castle at Bernburg, E.Ger., overlooking the Saale River

Wolfgang Krammisch—Bruce Coleman Inc.

1311 and were united in 1561. The hill settlement (now called Bergstadt) became a town in 1457 and was incorporated with Bernburg in 1825.

There are important potash and rock-salt mines, a large soda plant, sugar refineries, and machinery plants. A school of agriculture was established in 1961. Pop. (1983) 41,016.

Berne (canton and city, Switzerland): *see* Bern.

Berne Convention, Berne also spelled BERN, formally INTERNATIONAL CONVENTION FOR THE PROTECTION OF LITERARY AND ARTISTIC WORKS, international copyright agreement adopted by an international conference in Bern (Berne) in 1886 and subsequently modified several times (Berlin, 1908; Rome, 1928; Brussels, 1948; Stockholm, 1967; and Paris, 1971). Signatories of the Convention constitute the Berne Copyright Union.

The core of the Berne Convention is its provision that each of the contracting countries shall provide automatic protection for works first published in other countries of the Berne union and for unpublished works whose authors are citizens of or resident in such other countries.

Each country of the union must guarantee to authors who are nationals of other member countries the rights that its own laws grant to its nationals. If the work has been first published in a Berne country but the author is a national of a nonunion country, the union country may restrict the protection to the extent that such protection is limited in the country of which the author is a national. The works protected by the Rome revision of 1928 include every production in the literary, scientific, and artistic domain, regardless of the mode of expression, such as books, pamphlets, and other writings; lectures, addresses, sermons, and other works of the same nature; dramatic or dramatico-musical works, choreographic works and entertainments in dumb show, the acting form of which is fixed in writing or otherwise; musical compositions; drawings, paintings, works of architecture, sculpture, engraving, and lithography; illustrations, geographical charts, plans, sketches, and plastic works relative to geography, topography, architecture, or science. It also includes translations, adaptations, arrangements of music, and other reproductions in an altered form of a literary or artistic work, as well as collections of different works. The Brussels revision of 1948 added cinematographic works and photographic works. In addition, both the Rome and Brussels revisions protect works of art applied to industrial purposes so far as the domestic legislation of each country allows such protection.

In the Rome revision the term of copyright for most types of works became the life of the author plus 50 years, but it was recognized that some countries might have a shorter term. Both the Rome and the Brussels revisions protected the right of making translations; but the Stockholm Protocol and the Paris revision somewhat liberalized the rights of translation, in a compromise between developing and developed countries.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Berners, John Bourchier, 2nd Baron (b. *c.* 1469, Tharfield, Hertfordshire, Eng.—d. March 16, 1533, Calais?, Fr.), English writer and statesman, best known for his translation from the French of Jean Froissart's *Chroniques* in which the style matches Froissart's fresh and energetic simplicity.

Berners' active political and military career started early when at the age of 15 he was defeated in a premature attempt to make Henry Tudor, earl of Richmond (later Henry VII), king. He helped to suppress the 1497 Cornish rebellion in favour of Perkin Warbeck, pretender to the English throne, and served the crown in campaigns in France and Scotland. He was involved in English diplomacy concerning Henry VIII's alliances with France and Spain and was present at the Field of Cloth of Gold, at which Henry and Francis I of France met to pledge their friendship. His appointment in 1520 as deputy of Calais helped him to a stable income, ending the royal loans he had been constantly receiving. He held the post, except from 1526 to 1531, until his death.

Berners' translation of the French romance *The Boke Huon de Bordeuxe,* which introduces Oberon, king of the fairies, into English literature, is almost as successful as his translation of Froissart. Near the end of his life, he translated into English prose two of the newly fashionable courtesy books: *The castell of love,* by Diego de San Pedro, and *The golden boke of Marcus Aurelius,* by Antonio de Guevara. The latter was by far the most popular of his works.

Bernese Alps, also called BERNESE OBERLAND, German BERNER ALPEN, or BERNER OBERLAND, French ALPES BERNOISES, segment of the Central Alps lying north of the Upper Rhône River and south of the Brienzer and Thunersee (lakes) in Bern and Valais cantons of southwestern Switzerland. The mountains extend east-northeastward from the bend of the Rhône near Martigny-Ville to Grimsel Pass and Haslital (valley of the upper Aare River). Many peaks rise to more than 12,000 ft (3,660 m); Finsteraarhorn (14,022 ft), Jungfrau, and Aletschhorn are among the highest. Of the numerous glaciers in the range, the Aletsch is one of the longest in the Alps. The Bernese Alps are crossed by the Lötschen, Gemmi, and Pillon passes and the Lötschberg (railway) Tunnel. The magnificent Alpine scenery has helped establish the nearby resorts of Interlaken, Grindelwald, Mürren, Wenger, Kandersteg, Leukerbad, and Gstaad. Mountain climbing has long been a popular activity in the region.

Mürren, in the Bernese Oberland, Switzerland, with (left to right) the Eiger, Mönch, and Jungfrau peaks

Willi Burkhardt—De Wys Inc.

Bernese mountain dog, breed of Swiss working dog brought to Switzerland over 2,000 years ago by invading Romans. The breed was widely used in Switzerland to pull carts and to drive cattle to and from their pastures. The Bernese mountain dog is noted for its hardiness. It has a broad chest, hanging, V-shaped ears, and a long, silky, black coat with brown spots on the chest and forelegs and over the eyes and, sometimes, white on the chest, nose, feet, and tail tip. The Bernese mountain dog stands 21 to 28 inches (53 to 70 centimetres) and weighs 50 to 70 pounds (23 to 32 kilograms).

Bernese mountain dog

Walter Chandoha

Bernhard (Danish, Dutch, German, etc., personal name): *see under* Bernard, except as below.

Bernhard (b. Aug. 16, 1604, Weimar, Saxe-Weimar—d. July 18, 1639, Neuenburg, Breisgau), duke of Saxe-Weimar (Sachsen-Weimar), a politically ambitious Protestant general during the Thirty Years' War (1618–48). One of the most successful field commanders of his age, he won a number of important victories over the forces of the Austrian Habsburgs.

Having served in the armies of the Rhenish Palatinate, Baden, and Denmark (1622–31), Bernhard joined Gustavus II Adolphus, the Swedish king, in 1631. An able officer, he had progressed from colonel of the King's guards to general by 1632, and, on Gustavus' death at the Battle of Lützen (now in East Germany; Nov. 16, 1632), he took command and decided the battle against the forces of the Habsburg emperor Ferdinand II. He and the Swedish general Gustav Horn then invaded southern Germany. He was awarded the duchy of Franconia for victories that helped bring about the downfall of the Emperor's general Albrecht Wenzel von Wallenstein.

Quarrelling with Horn and Swedish chancellor Count Axel Oxenstierna, both of whom advocated a defensive strategy, Bernhard lost

his newly acquired territories after his and Horn's defeat at the decisive Battle of Nördlingen (now in West Germany; Sept. 5–6, 1634). In 1635 he pledged himself to the French crown in return for the landgraviate of Alsace and the bailiwick of Hagenau. Operating in southwestern Germany, he captured Rheinfelden, Freiburg, and the key fortress of Breisach (Dec. 17, 1638), effectively breaking the Austrian and Spanish stranglehold around France. When he died suddenly of smallpox or typhoid, Cardinal de Richelieu took over his army and territories for France.

Bernhard, PRINCE OF THE NETHERLANDS, PRINCE OF LIPPE-BIESTERFELD, Dutch in full BERNHARD LEOPOLD FREDERIK EVERHARD JULIUS COERT KAREL GODFRIED PIETER, PRINS DER NEDERLANDEN, PRINS VAN LIPPE-BIESTERFELD (b. June 29, 1911, Jena, Ger.), prince of The Netherlands who, during World War II, served as liaison between the Dutch government-in-exile and the British armed forces and commanded The Netherlands Forces of the Interior (1944–45).

Bernhard was the son of Prince Bernhard Casimir and nephew of Leopold IV, the last reigning prince of Lippe-Biesterfeld. He was educated at the universities of Lausanne, Munich, and Berlin, where he studied political science. Following the majority of German princelings after 1933, he joined the Reiter SS Corps. In 1936, while working for the German chemical concern IG Farbenindustrie in Paris, he met Crown Princess (later Queen) Juliana, and on Jan. 7, 1937, they were married. Bernhard, who took Dutch citizenship and received the title of prince of The Netherlands, opposed Germany's invasion of The Netherlands. After taking his family to safety in England (May 12, 1940), he immediately returned to lead Dutch troops in battle against the Germans; after the Dutch surrender (May 14, 1940), he fled to England with the remnants of his troops.

After being appointed, in August 1940, a captain in the Dutch Navy and a colonel in the army, Prince Bernhard assumed increased responsibilities and, by 1944, as commander of The Netherlands Forces of the Interior, he directed all Dutch armed forces. Also serving as Dutch liaison officer with the British armed forces, Bernhard became a pilot and flew with the Royal Air Force (1942–44). He led the Dutch troops during the Allied offensive in The Netherlands and was present during the armistice negotiations and German surrender at Wageningen (in The Netherlands) on May 5, 1945. After World War II and Juliana's accession in 1948, he served as The Netherlands' goodwill ambassador, encouraging international trade and cultural activities.

In 1976 he was implicated in a bribery scandal involving the Lockheed Aircraft Corporation. After initial revelations in the U.S. Congress, a special Dutch commission found that Prince Bernhard had accepted large sums of money from Lockheed for promoting Dutch purchases of aircraft manufactured by the company. The scandal precipitated a constitutional crisis that jeopardized the monarchy.

Bernhardt, Sarah, original name HENRIETTE ROSINE BERNARD, byname THE DIVINE SARAH, French LA DIVINE SARAH (b. Oct. 22/23, 1844, Paris—d. March 26, 1923, Paris), celebrated French actress who performed throughout Europe and in America and became one of the best known figures in the history of the stage. She was made a member of the Legion of Honour in 1914.

Early life and training. Bernhardt was the illegitimate daughter of Judith Van Hard, a notorious Dutch courtesan who had established herself in Paris, and Edouard Bernard, a law student. As the presence of a baby

Sarah Bernhardt, photograph by Napoleon Sarony, 1880

By courtesy of the Library of Congress, Washington, D.C.

interfered with her mother's life, Sarah was brought up at first in a *pension* and, later, in a convent. A difficult, willful child of delicate health, she wanted to become a nun, but one of her mother's lovers, the Duc de Morny, Napoleon III's half brother, decided that she should be an actress and, when she was 16, arranged for her to enter the Conservatoire, the government-sponsored school of acting. She was not considered a particularly promising student, and, although she revered some of her teachers, she regarded the Conservatoire's methods as antiquated.

Sarah Bernhardt left the Conservatoire in 1862 and, thanks to the Duc de Morny's influence, was accepted by the national theatre company, the Comédie-Française, as a beginner on probation. During the obligatory three debuts required of probationers, she was scarcely noticed by the critics. Her contract with the Comédie-Française was cancelled in 1863 after she had slapped the face of a senior actress, who had been rude to her younger sister. For a time she found employment at the Théâtre du Gymnase-Dramatique. After playing the role of a foolish Russian princess, she entered a period of soul-searching, questioning her talent for acting. During these critical months she became the mistress of Henri, prince de Ligne, and gave birth to her only child, Maurice.

In 1866 she signed a contract with the Odéon theatre and, during six years of intensive work with a congenial company there, gradually established her reputation. Her first resounding success was as Anna Damby in the 1868 revival of *Kean,* by the novelist and playwright Alexandre Dumas *père.* Bernhardt's greatest triumph at the Odéon, however, came in 1869, when she played the minstrel Zanetto in the young dramatist François Coppée's one-act verse play *Le Passant* ("The Passerby")—a part that she played again in a command performance before Napoleon III.

During the Franco-German War in 1870, she organized a military hospital in the Odéon theatre. After the war, the reopened Odéon paid tribute to France's great 19th-century writer Victor Hugo with a production of his verse-play *Ruy Blas.* As Queen Maria, Bernhardt charmed her audiences with the lyrical quality of her voice. It was then that Hugo coined the phrase "golden voice," though her critics usually called her voice "silvery," as resembling the tones of a flute.

In 1872 she left the Odéon and returned to the Comédie-Française. One of her remarkable successes there was in the title role of Voltaire's *Zaïre* (1874); generally, however, she received only minor parts. Eventually, she was given the chance to play the title role in Racine's *Phèdre,* a part for which the critics supposed she lacked the resources needed to portray violent passion. Her performance, however, made them revise their estimate and write enthusiastic reviews. In Hugo's *Hernani,* her portrayal of Doña Sol was said to have brought tears to the author's eyes.

In 1879, when the Comédie-Française appeared in London, Bernhardt played in the second act of *Phèdre* and triumphed in spite of a violent attack of stage fright. An international career lay before her; yet critics still refused to succumb to her spell—the novelist Henry James commented on the "admirable delicacy and grace" with which she had handled the plaintive passages, but added that "in the violent scenes she forces her note beyond all reason, and becomes painfully shrill and modern." Her success with London audiences made Sarah Bernhardt overbearing and led to fits of bad temper in the sedate halls of the Comédie-Française.

International success. In 1880 Bernhardt formed her own travelling company and soon became an international idol. She appeared fairly regularly in England but extended her itinerary to the European continent, the United States, and Canada. New York City saw her for the first time on Nov. 8, 1880. Eight visits to the United States followed. In 1891–93 Bernhardt undertook a world tour that included Australia and South America. Aside from her appearances as Phèdre, there were two parts that audiences all over the world clamoured to see her in: Marguérite Gautier, the redeemed courtesan in *La Dame aux Camélias* of Alexandre Dumas *fils,* and the title role of the popular playwright Eugène Scribe's *Adrienne Lecouvreur.*

In the 1880s a new element had entered her artistic life with the emergence of Victorien Sardou as chief playwright for melodrama. With Bernhardt in mind, Sardou wrote *Fédora* (1882), *Théodora* (1884), *La Tosca* (1887), and *Cléopâtre* (1890). Sardou, directing his own plays in which she starred, taught her a broad, flamboyant style of acting, relying for effect on lavish decors, exotic costumes, and pantomimic action.

In 1905, during a South American tour, she injured her right knee when jumping off the parapet in the last scene of *La Tosca.* By 1915 gangrene had set in, and her leg had to be amputated. Carried about in a litter chair the patriotic Bernhardt insisted on visiting the soldiers at the front during World War I. In 1916 she began her last tour of the United States. Her indomitable spirit sustained her during 18 gruelling months on the road. In November 1918 she arrived back in France but soon set out on another European tour, playing parts she could act while seated. New roles were provided for her by the playwrights Louis Verneuil, Maurice Rostand, and Sacha Guitry. She collapsed during the dress rehearsal of the Guitry play *Un Sujet de roman* but recovered again sufficiently to take an interest in the Hollywood motion picture *La Voyante,* which was being filmed in her own house in Paris at the time of her death.

For a while Sarah Bernhardt had attempted sculpturing and painting as a hobby. In 1920 she published a novel, *Petite idole,* not without interest since the actress-heroine constitutes an idealization of Bernhardt's own career and ambitions. Facts and fiction are difficult to disentangle in her autobiography, *Ma Double Vie; Mémoires de Sarah Bernhardt* (1907), written in part to counteract the slanderous and scabrous *Les Mémoires de Sarah Barnum* (1883) by Marie Colombier, who had capitalized on the actual and alleged eccentricities of the actress' private life. Bernhardt's treatise on acting, *L'Art du théâtre* (1923), is revealing in its sections on voice training: the actress had always considered voice as the key to dramatic character. (A.M.N.)

BIBLIOGRAPHY. E. Pronier, *Une Vie au théâtre: Sarah Bernhardt* (1942), the only scholarly and critical work eliminating much legendary material; L. Verneuil, *La Vie merveilleuse de Sarah Bernhardt* (1942; *The Fabulous Life of Sarah Bernhardt,* 1942), an intimate biography by a dramatist who provided Bernhardt with two acting vehicles; A.W. Row, *Sarah the Divine* (1957), many personal recollections of the author who was Bernhardt's press representative during the last years of her life; C.O. Skinner, *Madame Sarah* (1967), a successful, primarily biographical attempt at separating facts from fiction; W. Emboden, *Sarah Bernhardt* (1976), biography.

Berni, Francesco (b. 1497/98, Lamporecchio, Tuscany—d. May 26, 1535, Florence), poet and translator important for his Tuscan version of Matteo Boiardo's epic poem *Orlando innamorato* (1483) and for the distinctive style of his Italian burlesque, which was called *bernesco,* and imitated by many poets.

Berni spent his early years in Florence. In 1517 he entered the service of Cardinal Bernardo da Bibbiena and Bibbiena's nephew, Angelo Dovizi, and then went to Verona as secretary to its bishop, Matteo Giberti. Back in Florence he became enmeshed in court intrigues and, according to some sources, was poisoned for refusing to cooperate in a plan to kill Cardinal Giovanni Salviati.

Berni's agile Tuscan translation of *Orlando innamorato* was for a long time preferred to Boiardo's original, which had been written in the difficult and less popular Ferrarese dialect. His *La Catrina* (1567), a lively rustic farce, was also highly regarded, though his fame rests squarely on his burlesque poetry. Most of this is in one of two forms: the tailed sonnet, to which he often gave three-line extensions; or the *capitolo,* a lengthy satiric poem in terza rima. Some poems are savagely satirical, including those against his contemporaries Pietro Aretino, Hadrian VI, and Clement VII. His most masterly *capitoli,* however, are rollicking exaggerations on unimportant subjects (peaches, thistles, and a friend's shorn beard), which mock the lofty tone of contemporary Petrarchan verse.

Berni, detail of an oil painting, early 16th century; in a private collection

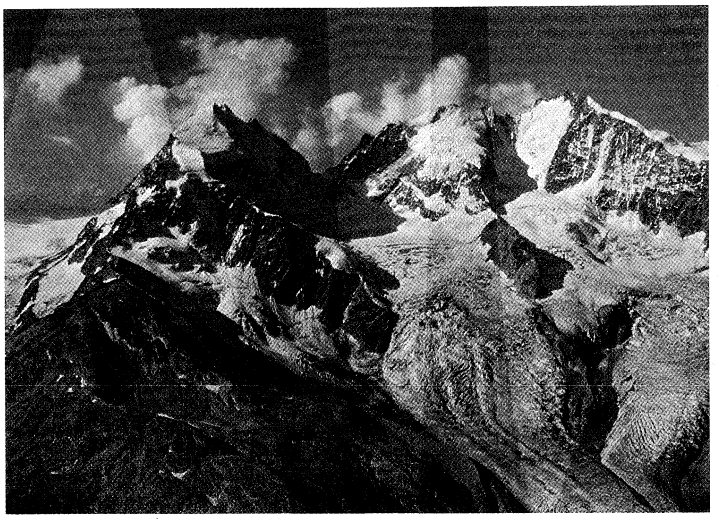
Mannelli–Alinari from Art Resource/EB Inc.

Bernice (queens and princesses of Egypt): *see under* Berenice.

Bernice P. Bishop Museum (Honolulu): *see* Bishop Museum.

Bernicia, a northern Anglo-Saxon kingdom that by the last quarter of the 7th century had become permanently united with its neighbour Deira to form the kingdom of Northumbria (*q.v.*). Bernicia stretched northward from the River Tyne, ultimately reaching the Firth of Forth and beyond the Solway Firth. It had a royal residence at Bamburgh on the coast and another at Yeavering, about 20 miles (32 kilometres) inland, where excavation has revealed an impressive group of buildings. The first recorded king of Bernicia is Ida, who acceded in 547. His grandson Aethelfrith, reigning from 593 to 616, united Bernicia and Deira, and Aethelfrith's successor, King Edwin of Deira, ruled both kingdoms. Aethelfrith's son Oswald also ruled both kingdoms, but, after his death in 641, his brother succeeded in Bernicia, while other kings were chosen by the Deirans and ruled independently until 678.

Bernina Alps, part of the Rhaetian Alps in eastern Switzerland along the Italian border, lying southeast of the Engadin (valley of the Upper Inn River). The scenic range rises to Piz Bernina (13,284 ft [4,049 m]), which was first ascended in 1850 by the Swiss climber Johann Coaz. Bernina Pass (7,638 ft), generally closed by snow from November to May, lies 10 mi (16 km) southeast of Sankt Moritz and is crossed by a railway and a highway. Part of the range extends northeast into the Swiss National Park. Mountain climbing and winter sports are popular activities.

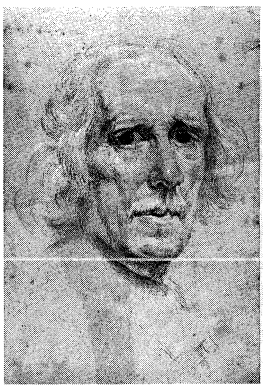


Piz Bernina, in the Bernina Alps of Switzerland

Photo Research International

Bernini, Gian Lorenzo (b. Dec. 7, 1598, Naples—d. Nov. 28, 1680, Rome), greatest sculptor of the Baroque period in Italy, also an architect, painter, and dramatist. He created the Baroque style of sculpture and developed it to such an extent that other artists are of only minor importance in a discussion of the style.

Early years. Bernini's career began under his father, Pietro (1562–1629), a Florentine sculptor of some talent who ultimately moved to Rome. The young prodigy worked so diligently that he earned the praise of the painter Annibale Carracci and the patronage of Pope Paul V, and soon established himself as a wholly independent sculptor. He was strongly influenced by his close study of the antique Greek and Roman marbles in the Vatican, and one of his early groups, "The Goat Amalthea with the Infant Jupiter and a Faun," may have been produced as a forgery of an antique work. He also had an intimate knowledge of High Renaissance painting of the early 16th century. His study of Michelangelo is revealed in the "St. Sebastian" (*c.* 1617), carved for Cardinal Maffeo Barberini, who was later Pope Urban VIII and Bernini's greatest patron.



Gian Lorenzo Bernini, self-portrait drawing, *c.* 1665; in the Royal Library, Windsor Castle

By gracious permission of Her Majesty Queen Elizabeth II

Bernini's early works attracted the attention of Cardinal Scipione Borghese, a member of the reigning papal family. Under his patronage, Bernini carved his first important life-size sculptural groups. The series shows Bernini's progression from the almost haphazard single view of "Aeneas, Anchises and Ascanius Fleeing Troy" to the hallucinatory vision of "Apollo and Daphne," which was intended to be viewed from one spot as if it were a relief. With such works, his sensual awareness of the surface textures of skin and hair and his novel sense of colour broke with the tradition of Michelangelo and marked the emergence of a new period in the history of Western sculpture.

Patronage of Urban VIII. With the pontificate of Urban VIII (1623–44) Bernini entered a period of enormous productivity and artistic development. Urban VIII urged his protégé to paint and to practice architecture. Although Bernini's paintings are of minor importance, a few, notably two self-portraits (*c.* 1620 and *c.* 1640; Borghese Gallery, Rome), show merit. His first architectural work was the remodelled church of Sta. Bibiana in Rome.

At the same time Bernini was commissioned to build a symbolic structure over the tomb of Peter. The result is the famous immense gilt-bronze baldachin executed between 1624 and 1633. The twisted columns and metal "drapery" recall honorific canopies placed over persons and sites of significance. Bernini's most original contribution to the final work is the upper framework of orb and cross that appear to be supported by four angels. The baldachin is also a personal papal symbol: near the top of the baldachin is the papal tiara, and the entire monument is studded with bees, suns, and laurel tendrils, emblems of the Barberini family. The baldachin is perfectly proportioned to its setting, and one hardly realizes that it is as tall as a four-story building. The baldachin is also the centre of a programmatic decoration within St. Peter's: the four piers supporting the dome were ornamented with colossal statues, one of which, "St. Longinus," was designed by Bernini.

Bernini's architectural duties became major after the death of Carlo Maderno in 1629, when Bernini became architect of St. Peter's and of the Palazzo Barberini. By this time he was not only executing works himself but also having to rely on assistance from others as the number of his commissions grew. He became supremely successful in organizing his studio and planning his work so that sculptures and ornamentations produced by a team actually seem to be all of a piece. Bernini's work, then and always, was also shaped by his fervent Catholicism (he attended mass every day and took communion twice a week). He would agree with the formulations of the Council of Trent (1545–63), that the purpose of religious art was to teach and inspire the faithful and to serve as propaganda for the Catholic Church. Religious art should always be intelligible and realistic, and, above all, it should serve as an emotional stimulus to piety. The development of Bernini's religious art was largely determined by his conscientious efforts to conform to those principles.

Under Urban VIII Bernini also began to produce new and different kinds of monuments—tombs and fountains. The tomb of Urban VIII shows the Pope seated with his arm raised in a commanding gesture. Below, flanking the gilt-bronze sarcophagus, are two white marble Virtues, Charity and Justice. Above the sarcophagus a figure of Death seems to write Urban's name on a leaf that serves as a marker for the tomb, an example of Bernini's use of the *concetto* ("idea," or the archaic "conceit"), an animating thematic idea unifying the diverse elements of the novel and richly coloured tomb. In these years Bernini also designed a revolutionary series of small tomb memorials, of which the most impressive is that of Maria Raggi (1643).

Bernini's fountains are his most obvious contribution to the city of Rome. His first, the "Barcaccia" in the Piazza di Spagna (1627–29), is analogous to the baldachin in its fusion of sculpture and architecture. The "Triton" is a dramatic transformation of a Roman architectonic fountain—the superposed basins of the traditional geometric piazza fountain appearing to have come alive. Four dolphins raise a huge shell supporting the sea god, who blows water upward out of a conch.

Bernini's early architectural projects, however, were not invariably successful. In 1637 he began to erect campaniles, or bell towers, over the facade of St. Peter's. But, in 1646, when their weight began to crack the building, they were pulled down, and Bernini was temporarily disgraced.

Patronage of Innocent X and Alexander VII. Bernini's most spectacular public monuments date from the mid-1640s to the 1660s. The Fountain of the Four Rivers in Rome's Piazza Navona supports an ancient Egyptian obelisk over a hollowed-out rock, surmounted by four marble figures symbolizing the four major rivers of the 17th-century world: the Danube of Europe, the Nile of Africa, the Ganges of Asia, and the Rio de la Plata of the Americas. The papal arms and the dove with an olive branch (the family symbol of Pope Innocent X) above the obelisk make the meaning clear—the restored and invigorated papacy rules the world under God. Despite its obvious symbolism, Bernini's fountain is his most spectacular permanent work.

Bernini's synthesizing imagination is also present in his theatrical works, a few of which are preserved. The essence of Bernini's theatre was the same as that of his art. He broke through familiar conventions to establish an immediate and often surprising contact with the audience. He is known to have used real fire in his theatrical productions, and once he even flooded the stage, making the spectator—at least for a moment—a passionate actor in the spectacle he was watching.

The greatest single example of Bernini's mature art is the Cornaro Chapel in Sta. Maria della Vittoria, in Rome, which completes the evolution begun early in his career. The chapel, commissioned by Cardinal Federigo Cornaro, is in a shallow transept in the small church. Its focal point is "The Ecstasy of St. Teresa," a depiction of a mystical experience of the great Spanish Carmelite reformer, Teresa of Avila (1515–82). In representing Teresa's vision, during which an angel pierced her heart with a fiery arrow of divine love, Bernini followed Teresa's own description of the event. The sculptured group, showing the transported saint swooning in the void, covered by cascading drapery, is revealed in celestial light within a niche over the altar, where the architectural and decorative elements are richly joined and articulated. At left and right, in spaces resembling opera boxes, numerous members of the Cornaro family are found in spirited postures of conversation, reading, or prayer. The Cornaro Chapel carries Bernini's ideal of a three-dimensional picture to its apex. The figures of St. Teresa and the angel are sculptured in white marble, but the viewer cannot tell whether they are in the round or merely in high relief. The natural daylight that falls on the figures from a hidden source above and behind them is part of the group, as are the gilt rays behind. "The Ecstasy of St. Teresa" is not sculpture in the conventional sense. Instead, it is a framed pictorial scene made up of sculpture, painting, and light that also includes the worshipper in a religious drama.

Bernini's greatest architectural achievement is the colonnade enclosing the piazza before St. Peter's. The chief function of the large space was to hold the crowd that gathered for the papal benediction on Easter and other special occasions. Bernini planned a huge oval attached to the church by a trapezoidal forecourt—forms that he compared to the encircling arms of the mother church. The free-standing colonnades were a novel solution to the need for a penetrable enclosure. The piazza guides the visitor toward the church and counterbalances the overly wide facade of St. Peter's. Bernini's oval encloses a space centred on the Vatican obelisk, which had been moved before the church by Sixtus V in 1586. Bernini moved an older fountain by Maderno into the long axis of the piazza and built a twin on the other side to make a scenographic whole. The analogies to Bernini's oval plan of S. Andrea al Quirinale are fascinating, as are the differences in meaning and function.

Bernini's most spectacular religious decoration is the Throne of St. Peter, or the Cathedra Petri (1657–66), a gilt-bronze cover for the medieval wooden throne (cathedra) of the pope. Bernini's task was not only to make a decorative cover for the chair but also to create a meaningful goal in the apse of St. Peter's for the pilgrim's journey through the great church. The seat is seemingly supported by four imposing bronze figures representing theological doctors of the early church: SS. Ambrose, Athanasius, John Chrysostom, and Augustine. Above, a golden glory of angels on clouds and rays of light emanates from the Dove of the Holy Spirit, which is painted on an oval window. The natural light on which the Dove is borne becomes the visible symbol of the stream of God's grace flowing over the world through the agency of his church. The cathedra was produced at about the same time as the piazza, and the contrast between these two works shows Bernini's amazing versatility. Both works were done for the Chigi pope, Alexander VII (1655–67).

In addition to his large works, Bernini continued to produce a few portrait busts. The first of these, of Francesco I d'Este, duke of Modena (1650–51; Galleria e Museo Estense, Modena), culminates his revolution in portraiture. Much of the freedom and spontaneity of the bust of Cardinal Scipione Borghese is kept, but it is united with a heroic pomp and grandiose movement that portray the ideals of the Baroque age as much as the man.

Trip to France. Bernini went to Paris at the end of April 1665, remaining there until the middle of November; it represented his only prolonged absence from Rome. The trip was made in response to invitations that for many years had been extended to him by King Louis XIV and with the encouragement of Father Oliva, general of the Jesuits. The purpose was the design of a new royal residence.

By this time, Bernini was so famous that crowds lined the streets of each city along the route to watch him pass. His initial reception in Paris was equally triumphant, but he soon offended his sensitive hosts by imperiously praising the art and architecture of Italy at the expense of that of France. He described the now-destroyed Tuileries Palace, for example, as "a big little thing" reminiscent of "a great squadron of tiny children" and remarked that one painting by the Italian artist Guido Reni was worth more than all of Paris. Such statements made him unpopular at the French court and were to some degree responsible for the rejection of his designs for the Louvre.

The only relic of Bernini's visit to France is his great bust of Louis XIV, a linear, vertical, and stable portraiture, in which the Sun King gazes out with godlike authority. The image set a standard for royal portraits that lasted 100 years.

Later years. Bernini's late works in sculpture are inevitably overshadowed by his grandiose projects for St. Peter's, but a few of them are of outstanding interest. For the Chigi Chapel in Sta. Maria del Popolo in Rome, he carved two groups, "Daniel in the Lions' Den" and "Habakkuk and the Angel" (1655–61). These works show the beginnings of his late style: elongation of the body, expressive gesture, and simplified yet emphatic emotional expression. The same characteristics are already found in the figures supporting the Throne of St. Peter and culminate in the moving "Angels" for the Ponte Sant'Angelo in Rome, which Bernini redecorated with the help of assistants between 1667 and 1671. Pope Clement IX (1667–69) so prized the "Angels" carved by Bernini that they were never set up on the bridge and are now in the Roman church of S. Andrea delle Fratte. They were replaced by copies, of which one, the "Angel with the Superscription INRI," is actually a variation by Bernini himself.

Bernini completed one more decoration in St. Peter's in his last years: the altar of the Cappella del SS. Sacramento (1673–74). The pliant, human adoration of the angels contrasts with the timeless architecture of the bronze tabernacle they flank and typifies Bernini's late style. In his last years he seems to have found the inexorable laws of architecture a consoling antithesis to the transitory human state.

Bernini's greatest late work is the simple Altieri Chapel in S. Francesco a Ripa (*c.* 1674) in Rome. The relatively deep space above the altar reveals a statue representing the death of the Blessed Ludovica Albertoni. Bernini consciously separated architecture, sculpture, and painting for different roles, reversing the process that culminated in the Cornaro Chapel. In that sense, the Altieri Chapel is more traditional, a variation on his church interiors of the preceding years. Instead of filling the arched opening, "Ludovica Albertoni" lies at the bottom of a large volume of space, illuminated in her death by a heavenly light, maintained in her faith by the devotional image painted above, watched over by the Holy Spirit.

Bernini died at the age of 81. He had served eight popes.

Assessment. Bernini's theory of art was traditional. He believed in studying the art of Greco-Roman antiquity to counteract the imperfections of nature, but he may have deliberately overstressed his own relationship to antique works. Although Bernini's sketches and clay models (*bozzetti*) often show a dependence on recognizable antique sources, the finished works are far removed in both form and meaning. His working practice is well known, thanks to preserved drawings and *bozzetti.*

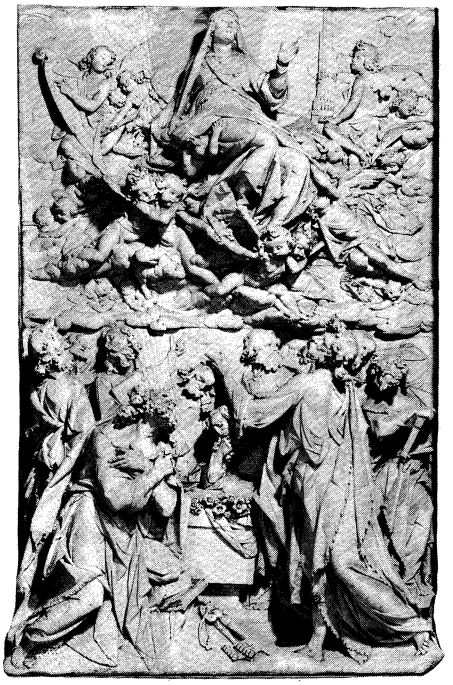
Bernini's style was carried on for at least two more generations in various parts of Europe, and Italian sculpture of the 18th century is predicated on his achievement. Bernini's death, however, marked the end of Italy's artistic hegemony in Europe. He was the last of Italy's remarkable series of universal geniuses, and the Baroque style he helped to create was the last Italian style to become an international standard. Bernini's world was one of religious and political absolutism, and, in spite of his obvious intelligence, he did not question the worth of that world. Perhaps more than any other artist, Bernini was the personification of one dominant aspect of his age, and it was largely his enthusiastic embrace of the status quo that assured his immense success. When he died, he was widely considered not only Europe's greatest artist but also one of its greatest men.

MAJOR WORKS. *Sculpture.* (unless stated located in Rome) "Aeneas, Anchises and Ascanius Fleeing Troy" (1619; Borghese Gallery); "Neptune and Triton" (*c.* 1620; Victoria and Albert Museum, London); "Pluto and Proserpina" (1621–22; Borghese Gallery); "Apollo and Daphne" (1622–24; Borghese Gallery); "David" (1623–24; Borghese Gallery); "Santa Bibiana" (1624–26; church of Sta. Bibiana); "St. Longinus" (1629–38; St. Peter's); "Cardinal Scipione Borghese" (1632; Borghese Gallery); Tomb of Urban VIII (1628–47; St. Peter's); Triton Fountain (1642–43; Piazza Barberini); Fountain of the Four Rivers (1648–51; Piazza Navona); "The Ecstasy of St. Teresa" (1645–52; Cornaro Chapel, Sta. Maria della Vittoria); Cathedra Petri (1657–66; St. Peter's); "Constantine" (1654–70; Scala Regia, Vatican Palace); "Louis XIV" (1665; Versailles, Fr.); "Angels" (1667–69; S. Andrea delle Fratte); "Gabriele Fonseca" (*c.* 1668–75; S. Lorenzo in Lucina); "Ludovica Albertoni" (*c.* 1674; S. Francesco a Ripa); Tomb of Alexander VII (1671–78; St. Peter's).

Architecture. (unless stated located in Rome) baldachin (1624–33; St. Peter's); S. Andrea al Quirinale (1658–70); piazza and colonnade, St. Peter's (1656–67); Scala Regia, Vatican (1663–66); unexecuted designs for the Louvre, Paris (1664–65).

BIBLIOGRAPHY. The earliest and most authoritative life of Bernini is Filippo Baldinucci, *Vita del cavaliere Gio. Lorenzo Bernino* (1682; Eng. trans. by C. Enggass, *The Life of Bernini,* 1966). A diary kept by Paul Freart de Chantelou gives a precious record of Bernini's activities and conversations during his epoch-making visit to France in 1665: *Journal de voyage du chev. Bernin en France,* ed. by L. Lalanne (1885). A short but revealing discussion of all aspects of Bernini's work is found in R. Wittkower, *Art and Architecture in Italy, 1600 to 1750,* 2nd rev. ed., pp. 96–129 (1965), which contains the only satisfactory survey of Bernini's architecture. The basic catalog of sculpture, with bibliography, is Wittkower's *Gian Lorenzo Bernini: The Sculptor of the Roman Baroque,* 2nd ed. (1966). A popular introduction to Bernini's work, life, and times is H. Hibbard, *Bernini* (1965).

Bernini, Pietro (b. 1562, Tuscany—d. 1629, Rome), Italian late Mannerist sculptor who was invited to Rome in 1605/06 to work for Pope Paul V (Camillo Borghese; 1605–21) on the decorations of the Cappella Paolina (Borghese) in the basilica of Sta. Maria Maggiore, where he carved the coronation of Clement VIII (1612–13), as well as the marble relief "Assumption of the Virgin" (1607–10) in the Baptistery, Sta. Maria Maggiore. For the Barberini Chapel in S. Andrea della Valle he made St. John the Baptist (1616).



"The Assumption," marble relief by Pietro Bernini; in the baptistery of Sta. Maria Maggiore, Rome

Anderson—Alinari from Art Resource/EB Inc.

Although trained in Tuscany, he worked in Naples (1584) until he was called to Rome. His son, the great Baroque figure Gian Lorenzo Bernini (1598–1680), was born in Naples. In Naples, Pietro made three statues—Charity in the church of Monte di Pietà, St. Matthew in the church of Gesù Nuovo, and the Virgin in the Museo Nazionale di S. Martino (reworked by Cosimo Fanzago). He also carved the Fontana Medina there. His son was taught marble cutting by his father, and the father's patrons, the powerful Borghese and Barberini families, offered him early commissions.

Articles are alphabetized word by word, not letter by letter

Bernis, François-Joachim de Pierre de (b. May 22, 1717, Saint-Marcel d'Ardèche, Fr.—d. Nov. 3, 1794, Rome), French statesman and cardinal who played an important part in the diplomatic revolution of 1756–57, in the suppression of the Society of Jesus by the papacy in 1773, and in the unsuccessful negotiations in 1790–91 between the French government and Pius VI for the recognition of the Constituent Assembly's ecclesiastical reforms.

Born of aristocratic parentage, Bernis was trained for the church and did not become prominent in French politics until 1745, when he became a member of the entourage of Mme Le Normant, later known as Mme de Pompadour. Diplomatic experience acquired as ambassador to Venice between 1752 and 1755 and the favour of Mme de Pompadour caused his nomination as confidential and secret intermediary to discuss with the Austrian ambassador in Paris Austria's proposals for a French alliance (August 1755). Strongly supported by Louis XV himself, these negotiations led to the first (defensive) treaty of Versailles between France and Austria (May 1, 1756) and then to the second (offensive) treaty of Versailles (May 1, 1757). This alliance with France's old enemy and the abandonment of the former alliance with Prussia formed the diplomatic prelude to the Seven Years' War.

Bernis held office as French foreign minister from June 17, 1757, until December 1758, when his fall was precipitated by French military reverses, by his desire to reform the financial system, and by the hostility of Mme de Pompadour. He became a cardinal in 1758 and archbishop of Albi in 1764. Though he used his influence with Pope Clement XIV to promote the suppression of the Jesuits, he exercised a moderating influence on French policy and did not approve of the drastic pressure exerted on the papacy by Charles III of Spain.

Between 1769 and 1794 he acted as French ambassador to Rome. Hostile to the ecclesiastical reforms of the Revolution, which affected his status and income as a prelate, he was in touch with the French émigré princes and played an ambiguous part in helping to crystallize papal opposition to the Civil Constitution of the Clergy. There is an edition of his *Mémoires et lettres* by F. Masson, 2 vol. (1878).

Bernkastel-Kues, city, Rheinland-Pfalz *Land* (Rhineland-Palatinate state), western West Germany, on the Moselle (Mosel) River, northeast of Trier. Formerly two separate towns, Bernkastel lies on the river's left bank and Kues on the right. Bernkastel belonged to the electors of Trier from 1280 and was chartered in 1291. The ruined electoral fortress of Landshut is nearby; the Renaissance city hall (1608) is notable. Kues was the birthplace (1401) of the scientist-philosopher-cardinal Nicholas of Cusa (Nicolaus Cusanus), and the hospital he founded (1447) still stands. Bernkastel-Kues is noted for Moselle wine and champagne (*Sekt*). Pop. (1983) 6,772.

Bernoises, Alpes (Switzerland): *see* Bernese Alps.

Bernoulli, Daniel (b. Feb. 8 [Jan. 29, old style], 1700, Groningen, Neth.—d. March 17, 1782, Basel, Switz.), the most distinguished of the second generation of the Bernoulli family of Swiss mathematicians. He investigated not only mathematics but also such fields as medicine, biology, physiology, mechanics, physics, astronomy, and oceanography. The Bernoulli theorem (*q.v.*), which he derived, is named after him.

Daniel Bernoulli was the second son of Johann Bernoulli, who first taught him mathematics. After studying philosophy, logic, and medicine at the universities of Heidelberg, Strasbourg, and Basel, he received an M.D. degree (1721); and in 1723–24 he wrote *Exercitationes quaedam Mathematicae* on differential equations and the physics of flowing water, which won him a position at the influential Academy of Sciences in St. Petersburg, Russia. He lectured there until 1732 in medicine, mechanics, and physics; and he researched the properties of vibrating and rotating bodies and contributed to probability theory. That year he returned to Basel to accept the post in anatomy and botany. By then he was widely esteemed by scholars and admired by the public throughout Europe.

Daniel's reputation was established in 1738 with *Hydrodynamica,* in which he considered the properties of basic importance in fluid flow, particularly pressure, density, and velocity, and set forth their fundamental relationship. He put forward what is called Bernoulli's principle, which states that the pressure in a fluid decreases as its velocity increases. He also established the basis for the kinetic theory of gases and heat by demonstrating that the impact of molecules on a surface would explain pressure and that, assuming the constant, random motion of molecules, pressure and motion increase with temperature. About 1738 his father published *Hydraulica;* this attempt by Johann to obtain priority for himself was another instance of his antagonism toward his son.

Between 1725 and 1749 Daniel won 10 prizes from the Paris Academy of Sciences for work on astronomy, gravity, tides, magnetism, ocean currents, and the behaviour of ships at sea. He also made substantial contributions in probability. He shared the 1735 prize for work on planetary orbits with his father, who, it is said, threw him out of the house for thus obtaining a prize he felt should be his alone. Daniel's prizewinning papers reflected his success on the research frontiers of science and his ability to set forth clearly before an interested public the scientific problems of the day. In 1732 he accepted a post in botany and anatomy at Basel; in 1743, one in physiology; and in 1750, one in physics.

Bernoulli, Jakob (b. Jan. 6, 1655 [Dec. 27, 1654, old style], Basel, Switz.—d. Aug. 16, 1705, Basel), first of the Bernoulli family of Swiss mathematicians. He introduced the first principles of the calculus of variation. The Bernoulli number (*q.v.*), which he developed, was named after him.

The scion of a family of drug merchants, Jakob Bernoulli was compelled to study theology but became interested in mathematics

Jakob Bernoulli, oil painting by Nikolaus Bernoulli, 1687; in a private collection

By courtesy of the Offentliche Bibliothek der Universitat, Basel, Switz.

despite his father's opposition. His travels led to a wide correspondence with mathematicians. Refusing a church appointment, he accepted a professorial chair of mathematics at the University of Basel in 1687; and, following his mastery of the mathematical works of John Wallis, Isaac Barrow (both English), René Descartes (French), and G. W. Leibniz, who first drew his attention to calculus, he embarked upon original contributions. In 1690 he became the first to use the term integral in analyzing a curve of descent. His 1691 study of the catenary, or the curve formed by a cord suspended between its two extremities, was soon applied in the building of suspension bridges. In 1695 he also applied calculus to the design of bridges. During these years, he often engaged in disputes with his brother Johann Bernoulli (*q.v.*) over mathematical issues.

Jakob Bernoulli's pioneering work *Ars Conjectandi* (published posthumously, 1713; "The Art of Conjecturing") contained many of his finest concepts: his theory of permutations and combinations; the so-called Bernoulli numbers, by which he derived the exponential series; his treatment of mathematical and moral predictability; and the subject of probability—containing what is now called the Bernoulli law of large numbers, basic to all modern sampling theory. His works were published as *Opera Jacobi Bernoullii*, 2 vol. (1744).

Bernoulli, Johann (b. Aug. 6 [July 27, old style], 1667, Basel, Switz.—d. Jan. 1, 1748, Basel), major member of the Bernoulli family of Swiss mathematicians. He investigated the then new mathematical calculus, which he applied to the measurement of curves, to differential equations, and to mechanical problems.

Johann Bernoulli, oil painting by Johann Jakob Meyer, 1720; in a private collection

By courtesy of the Offentliche Bibliothek der Universitat, Basel, Switz.

The son of a pharmacist, Johann studied medicine and obtained his doctor's degree in Basel in 1694, with a thesis on muscular contraction. However, he turned to mathematics despite his father's opposition. In 1691–92 he wrote two texts, not published until later, on differential and integral calculus. In 1692 he taught calculus to the mathematician Guillaume-François-Antoine de L'Hospital, who agreed to pay him for mathematical discoveries. From 1695 to 1705 he taught mathematics at Groningen, Neth., and, on the death of his elder brother, Jacob, assumed a professorship at Basel.

Johann exceeded his brother in the number of contributions he made to mathematics. He applied calculus to the determination of lengths and areas of curves, such as the isochrone, along which a body will fall at constant speed, and the tautochrone, which was found to be important in clock construction. He also made contributions to the theory of differential equations, the mathematics of ship sails, and optics. Johann sent to L'Hospital in Paris a method or rule for solving problems involving limits that would apparently be expressed by the ratio of zero to zero, now called L'Hospital's rule on indeterminate forms because it was included in L'Hospital's influential textbook of 1696, *Analyse des infiniment petits* ("Analysis of the Infinitely Small").

The Bernoulli brothers often worked on the same problems, but not without friction. Their most bitter dispute concerned finding the equation for the path followed by a particle from one point to another in the shortest time, if the particle is acted upon by gravity alone, a problem originally discussed by Galileo. In 1697 Jakob offered a reward for its solution. Accepting the challenge, Johann proposed the cycloid, the path of a point on a moving wheel, pointing out at the same time the relation this curve bears to the path described by a ray of light passing through strata of variable density. A protracted, bitter dispute then arose when Jakob challenged the solution and proposed his own. The dispute marked the origin of a new discipline, the calculus of variations.

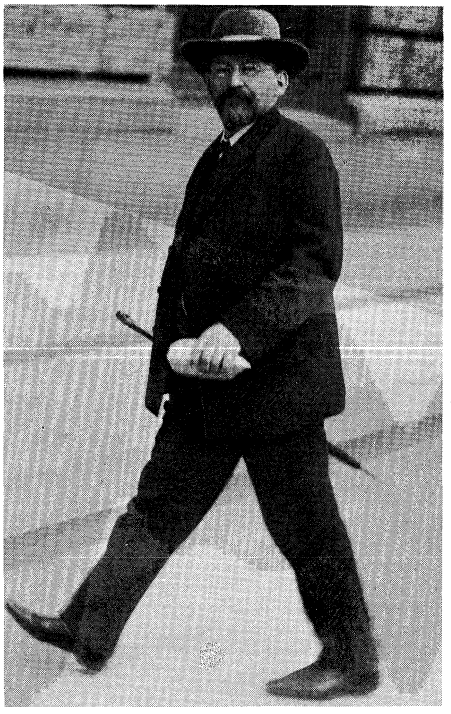
Ardent in his friendships and keen in his resentments, Johann zealously defended the cause of G.W. Leibniz in the dispute with Isaac Newton over who had originated calculus. His text in integral calculus appeared in 1742 and his differential calculus shortly afterward. During his last years he worked mainly on the principles of mechanics. His works were published in *Opera Johannis Bernoullii*, 4 vol. (1742).

Bernoulli's theorem, in fluid dynamics, relation among the pressure, velocity, and elevation in a moving fluid (liquid or gas), the compressibility and viscosity (internal friction) of which are negligible and the flow of which is steady, or laminar. First derived (1738) by the Swiss mathematician Daniel Bernoulli, the theorem states, in effect, that the total mechanical energy of the flowing fluid, comprising the energy associated with fluid pressure, the gravitational potential energy of elevation, and the kinetic energy of fluid motion, remains constant. Bernoulli's theorem is the principle of energy conservation for ideal fluids in steady, or streamline, flow.

Bernoulli's theorem implies, therefore, that if the fluid flows horizontally so that no change in gravitational potential energy occurs, then a decrease in fluid pressure is associated with an increase in fluid velocity. If the fluid is flowing through a horizontal pipe of varying cross-sectional area, for example, the fluid speeds up in constricted areas so that the pressure the fluid exerts is least where the cross section is smallest. This phenomenon is sometimes called the Venturi effect, after the Italian scientist G.B. Venturi (1746–1822), who first noted the effects of constricted channels on fluid flow.

Bernoulli's theorem is the basis for many engineering applications, such as aircraft-wing design. The air flowing over the upper curved surface of an aircraft wing moves faster than the air beneath the wing, so that the pressure underneath is greater than that on the top of the wing, causing lift.

Bernstein, Eduard (b. Jan. 6, 1850, Berlin—d. Dec. 18, 1932, Berlin), Social Democratic propagandist, political theorist, and historian, one of the first Socialists to attempt a revision of Karl Marx's tenets, such as abandoning the ideas of the imminent collapse of the capitalist economy and the seizure of power by the proletariat. Although he was not a distinguished theoretician, Bernstein, called "the father of revisionism," envisaged a type of social democracy that combined private initiative with social reform.



Eduard Bernstein, *c.* 1918

Archiv fur Kunst und Geschichte, West Berlin

Bernstein was born into a Jewish family that had come to the capital of Prussia from Danzig. His father was a railroad engineer,

and his uncle Aaron Bernstein was the editor of the *Berliner Volks-Zeitung,* a newspaper widely read in progressive working-class circles. It was thus not surprising that at a young age Eduard shared the aspirations of many educated Germans for national unity and democracy. Of an engaging and candid disposition, he retained the goodwill of his superiors when, in 1872, as a young bank clerk he announced that he had joined the Social Democratic Party. The turbulent years after Prussia's 1871 defeat of France also contributed to the formation of his political beliefs. Yet the ever-genial Bernstein tended to be attracted more to Socialism of an undogmatic, pragmatic kind than to radical Marxism. He preferred the democratic and pacifist Social Democrats to the somewhat authoritarian Allgemeiner Deutscher Arbeiterverein (General German Workers' Association).

In joining the party he became associated with the German Socialist organ, *Die Zukunft* ("The Future"). The economic crisis of 1873, which continued into the 1890s, reinforced his belief in the fragility of capitalism. It was, however, Chancellor Otto von Bismarck's anti-Socialist laws that finally impelled him toward a more radical position. Exiled from Germany, he emigrated to Switzerland, abandoning the "ethical Socialism" of Karl Höchberg, the wealthy patron of *Die Zukunft.* With Marx's consent, he became the editor of the Zürich edition of *Der Sozialdemokrat,* a periodical that was the rallying centre of the underground Socialist party. Expelled from Switzerland at the request of Bismarck in 1888, Bernstein continued the publication of the periodical in London. There he became a close friend of Friedrich Engels, Marx's collaborator and patron, and also came to know intimately the leaders of the influential Fabian Society, which advocated a gradualist development of Socialism. Bernstein set forth his revised views in a series of articles and in a letter to the Social Democratic Party meeting at Stuttgart in 1898. In the following year he published *Die Voraussetzungen des Sozialismus und die Aufgaben der Sozialdemokratie* (*Evolutionary Socialism,* 1909).

When Bernstein returned to Germany in 1901, he became the theoretician of the growing revisionist school of the reformist labour movement. He held that Socialism is the final result of the liberalism that is an inherent part of human aspiration and not the mere product of a revolt against the capitalist middle class. He no longer believed in the imminent collapse of capitalism, nor did he any longer regard the bourgeoisie as exclusively parasitic and oppressive. In addition, he believed that the concentration of productive industry was not taking place in all fields as thoroughly or as fast as Marx had predicted. Citing such reforms as factory legislation and the freeing of labour unions from legal restrictions, he pointed out that, under pressure from the Socialist movement, a reaction had set in against the exploitive inclinations of capital. Thus, he argued, the prospects for lasting success lay in a steady advance rather than in a violent upheaval.

In 1902 Bernstein was elected a member of the Reichstag, or Parliament, to which he was reelected several times. He remained a member of the Reichstag up to 1928. Eventually revisionism became Social Democratic ideology, while the dogmatic Marxism of the Socialist theoretician Karl Kautsky and the eclectic Marxism of the German labour leader August Bebel faded into the background. Bernstein, however, who was opposed to violence between nations as well as between classes, lent his voice to that of the left to fight against militarism. During World War I, although a leading member of his party's right wing, he sided with the Independent Socialists (USPD) to protest his party's support of the war. As soon as peace was restored, however, he returned to his old party and opposed those who wanted to transform the political revolution of November 1918 into a social revolution. He believed that the establishment of the parliamentary republic opened the way to uninterrupted progress, and after the war he served as secretary of state for economy and finance in 1919.

Social Democracy had finally become the great popular and reformist movement he had desired for more than 20 years, and, as an adviser respected by his party, he inspired much of its program. If he helped to discourage the Germans from following the Russian example of 1917, he could not dissuade them from imitating the Italian Fascist model of 1922. He regarded the bloody outrages of the Nazis and their predecessors as the thoughtless actions of unbalanced minds; he was unable to comprehend the nature of National Socialism and remained powerless to prevent its seizure of power. Less than six weeks after his death, the democratic state on which he had set all his hopes was to give way to the dictatorship of Adolf Hitler. (P.R.A.)

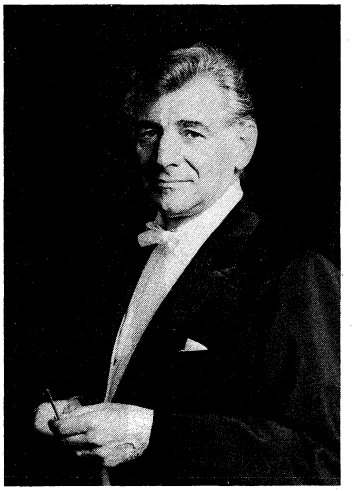
BIBLIOGRAPHY. Eduard Bernstein, "Entwicklungsgang eines Sozialisten," in Felix Meiner (ed.), *Die Volkswirtschaftslehre der Gegenwart in Selbstdarstellungen,* vol. 1 (1924), assists the reader in understanding Bernstein's development as a Socialist; it is complemented by his *Sozialdemokratische Lehrjahre* (1928). Pierre Angel, *Eduard Bernstein et l'évolution du socialisme allemand* (1961), is an intellectual biography that attempts to explain the evolution of the Socialist movement in the Germany of Bismarck and William II. Also interesting is Peter Gay, *The Dilemma of Democratic Socialism: Eduard Bernstein's Challenge to Marx* (1952), which emphasizes Bernstein's anti-Marxist feelings.

Bernstein, Henry (-Léon-Gustave-Charles) (b. Jan. 20, 1876, Paris—d. Nov. 27, 1953, Paris), French playwright who achieved his initial popularity with a series of sensational melodramas but later turned to more serious themes, experimented with new forms, and campaigned against anti-Semitism and Nazism.

Son of a wealthy Jewish banker, he attended Cambridge and later inherited a fortune from his mother. His first play, *Le Marché* ("The Market"), was produced in 1900 at the Théâtre-Libre (Free Theatre) in Paris, a playhouse established by André Antoine to present modern and realistic drama. A comedy, *Frère Jacques* (1904; "Brother Jacques"), written in collaboration with Pierre Véber, increased his reputation; it was later translated and presented in the U.S. His *La Rafale* (1905; "The Whirlwind"), *La Griffe* (1906; "The Claw"), and *Samson* (1907; Eng. trans., 1907), quick-moving and violent, emphasized character study. *Israël* (1908; "Israel") and *Après moi* (1911; "After Me") commented adversely on anti-Semitism in France; there were riots after the premiere of the latter play, forcing its closing.

In *Le Secret* (1913; *The Secret,* 1913), he stressed unconscious motivation. The influences of Sigmund Freud, founder of psychoanalysis, and Luigi Pirandello, the innovative Italian playwright, are obvious in *La Galerie des glaces* (1924; "The Gallery of Mirrors") and other plays written in the 1920s, which also reflect the spiritual unrest of the times. Experimenting with the dramatic form, Bernstein copied film techniques in *Mélo* (1929) and those of the novel in *Le Voyage* (1937). In 1940 his anti-Nazi *Elvire* was produced; it played in Paris until the city fell to the Germans. Bernstein escaped to the U.S., where he campaigned against the Nazis and the collaborationist Vichy government. After the war, he returned to Paris and continued writing plays until a year before his death.

Bernstein, Leonard (b. Aug. 25, 1918, Lawrence, Mass.), internationally renowned U.S. conductor and composer noted for his accomplishments in serious music and his pedagogic flair, especially in concerts for young people.



Leonard Bernstein
By courtesy of Columbia Records

In 1943 Bernstein was appointed assistant conductor of the New York Philharmonic; his first signal success came on Nov. 14, 1943, when he was summoned unexpectedly to substitute for conductor Bruno Walter, who was indisposed. His technical self-assurance under difficult circumstances and his interpretive excellence made an immediate impression and marked the beginning of a brilliant career. He subsequently conducted the New York City Center orchestra (1945–47) and appeared as guest conductor in the United States, Europe, and Israel. In 1958 Bernstein became permanent conductor of the New York Philharmonic, sometimes, as piano soloist, conducting from the keyboard. With this orchestra he made several international tours, in Latin America, Europe, the Soviet Union, and Japan. His popularity increased through his appearances on television not only as conductor and pianist but also as a commentator and entertainer. In 1969 he retired as conductor.

As a serious composer, Bernstein has made skillful use of diverse elements ranging from Jewish liturgical themes, as in the *Jeremiah Symphony* (1942) and the oratorio *Kaddish* (1963), to jazz rhythms, as in the *Age of Anxiety* (after W.H. Auden), for piano and orchestra (1949). For Christian liturgy he wrote *Chichester Psalms* (1965). His *Mass,* written especially for the occasion, was performed at the opening of the John F. Kennedy Center for the Performing Arts in Washington, D.C., in September 1971. Three of his works were premiered in 1977 at the Kennedy Center by the National Symphony under Mstislav Rostropovich: *Slava! (A Political Overture);* three *Meditations* for cello and orchestra; and *Songfest,* a cycle for six vocalists and orchestra. His other works include musical comedies—among them *On the Town* (1944), *Wonderful Town* (1953), *Candide* (1956), and the very popular *West Side Story* (1957)—and the scores for the ballets *Fancy Free* (1944), *Facsimile* (1946), and *Dybbuk* (1974). He also composed the music for the film *On the Waterfront* (1954). He published a collection of lectures, *The Joy of Music* (1959); *Young People's Concerts, for Reading and Listening* (1962, rev. ed. 1970); and *The Infinite Variety of Music* (1966).

Bernstein, Morris: *see* Louis, Morris.

Bernstorff, Albrecht, Graf von (count of) (b. March 22, 1809, Dreilützow, Mecklenburg,

Ger.—d. March 26, 1873, London), Prussian statesman known for his charm and diplomatic skill. A widely travelled career diplomat, he was dispatched to Vienna during the 1848 Revolution and quickly distinguished himself as a conservative opponent of the then current schemes for German unification. Gradually, however, he came to accept the idea of German unity, though under Prussian rather than Austrian leadership. Bernstorff's subsequent opposition to the German policy of the Austrian prime minister, Prince Felix zu Schwarzenberg, prompted his diplomatic recall. Sent to head the Prussian embassy in London shortly before the outbreak of the Crimean War (1854–56), he enlisted his considerable charm to promote good Anglo-Prussian relations.

In 1861 Bernstorff left his London post to become foreign minister, but his designs for a Prussian-led German union were undercut by the mistrust of both liberal and conservative elements. Displaced from his ministry by Otto von Bismarck in 1862, he thereafter repeatedly criticized the Machiavellian policies of his successor. Bernstorff soon was reassigned to the London embassy, where he remained as Prussian (and, after 1871, as German imperial) ambassador until his death.

Bernstorff, Andreas Peter, Graf von (b. Aug. 28, 1735, Hannover, Hanover—d. June 21, 1797, Copenhagen), statesman who maintained the neutrality of Denmark during the last quarter of the 18th century and who took a leading part in Danish domestic reform.

In 1758 he joined the Danish Foreign Office, from which he was dismissed in 1770. He returned to the office in 1772 and became foreign minister the next year. On Aug. 12, 1773, he concluded a partly defensive and partly anti-Swedish treaty of alliance between Denmark and Russia.

During the American Revolution, Bernstorff sympathized with England, and in 1779 he favoured England's proposal for a triple alliance among Great Britain, Denmark-Norway, and Russia. The court, however, favoured the Russian proposal for an armed league of all the neutral powers to protect neutral shipping. Bernstorff, fearing that the Russian proposal was aimed exclusively against England, unwillingly acceded to it on July 9, 1780, after having reached a separate agreement with England five days earlier on what constituted "contraband of war." Russian resentment over such independent action forced Bernstorff's resignation on November 13.

Recalled to office in April 1784, Bernstorff, until his death, served as foreign minister in a moderate liberal government. He supported a series of reform measures including the regulation of landlord–peasant relations and the emancipation of the serfs. In foreign affairs, Bernstorff carefully pursued a policy of neutrality. When the French Revolution broke out, he condemned any interference in the domestic affairs of France and avoided every anti-French coalition. In March 1794 he negotiated a neutrality treaty with Sweden for protecting the merchant shipping of both countries by combined squadrons.

Bernstorff's foreign policy won him the respect of European diplomats; his domestic policy gained him such popularity among the Danes that his death was regarded as a national calamity.

Andreas Peter, Graf von Bernstorff, oil painting by Jens Juel; in Frederiksborg Castle, Denmark

By courtesy of Det Nationalhistoriske Museum paa Frederiksborg, Denmark

Bernstorff, Christian Günther, Graf von Danish GREVE AF BERNSTORFF (b. April 3, 1769, Copenhagen—d. March 28, 1835, Berlin), Danish and Prussian diplomat and an architect of the German customs union (*Zollverein*).

Christian Günther, Graf von Bernstorff, oil painting by Joseph-Friedrich-August Darbès, 1794; in Frederiksborg Castle, Denmark

By courtesy of Det Nationalhistoriske Museum paa Frederiksborg, Denmark

The son of the diplomat Andreas Peter, Graf von Bernstorff, he served as Danish ambassador in Stockholm from 1794 to May 1797, and in June succeeded his father as foreign minister. In 1812 he was appointed Danish ambassador to Austria and strove to obtain favourable peace conditions for Denmark (which was allied with Napoleon) from the Allies. He was present at the signing of the Treaty of Paris in May 1814 and represented Denmark at the Congress of Vienna. In 1816 he became Danish ambassador to Berlin, and in 1818 at the invitation of Prince Hardenberg he entered Prussian service.

Bernstorff attended the congress at Aix-la-Chapelle (October 1818) as a Prussian diplomat and returned to Berlin as foreign minister. By nature opposed to the principles of the French Revolution, Bernstorff was initiated as a Prussian minister by the reactionary Johann Peter Friedrich Ancillon. He is accused of having subordinated the interests of Prussia to the European policy of Metternich and the Holy Alliance. But although he supported the Carlsbad Decrees (1819), the Vienna Final Act, and Metternich's policy at the congresses of Laibach (Ljubljana, Yugos.), Troppau (Opava, Czech.), and Verona, Italy, he was also one of the founders of the *Zollverein,* which became the basis of Prussian hegemony in Germany. He supported Russia's war against Turkey over the Greek question in 1828, and in the crisis of 1830 he did much to confine the troubles in Poland and Belgium to those countries.

Bernstorff, J(ohann) H(artwig) E(rnst), Graf von (b. May 13, 1712, Hannover, Hanover—d. Feb. 18, 1772, Holstein), Danish statesman who as foreign minister preserved Denmark's neutrality during the Seven Years' War and strengthened the rights of the Danish crown against Russia in the duchy of Holstein.

J.H.E., Graf von Bernstorff, detail of a portrait by Louis Tocqué, 1758; in Frederiksborg Castle, Denmark

By courtesy of Det Nationalhistoriske Museum paa Frederiksborg, Denmark

Born of an ancient Mecklenburg family, Bernstorff was introduced into the Danish diplomatic service in 1733 by relatives holding ministerial appointments under King Christian VI; his first post was as Danish envoy to Saxony, where he remained until being appointed ambassador to France in 1744. In 1751 he became foreign minister, and for the next 19 years his opinion was decisive in the Danish council of state. His most important accomplishment, for which he was created a count, was his negotiation of a treaty (April 1767) with the empress Catherine II of Russia, whereby Catherine renounced certain of her claims to parts of the duchy of Holstein. With the accession (1766) of the mentally unstable Christian VII, however, Bernstorff's position became increasingly precarious; he was dismissed from office on Sept. 15, 1770, and retired to his estates in Holstein.

Bernstorff, Johann-Heinrich, Graf von (b. Nov. 14, 1862, London—d. Oct. 6, 1939, Geneva), German diplomat who represented his country in London and Cairo and, as ambassador, in Washington, D.C. (1908–17).

The son of a Prussian diplomat (Count Albrecht von Bernstorff, who was Prussian minister and German ambassador in London, 1854–61 and 1862–73), Bernstorff entered the diplomatic service in 1899, was secretary of legation successively at Belgrade, Dresden, St. Petersburg, and Munich and (1902–06) was councillor of the embassy in London. He then went as consul-general to Cairo, whence he proceeded as German ambassador in 1908 to Washington, and remained there until America's declaration of war against Germany in April 1917. He made great efforts to facilitate mediation by President Wilson, but he did not receive the support he expected from authoritative quarters in Berlin. On the American declaration of war he returned to Germany and was sent as ambassador to Constantinople, where he was employed until 1918.

In various publications, and in his reminiscences on his term of office as ambassador in Washington, he endeavoured to prove that Germany, if it had followed the proper policy, could have avoided war with America. This statement of his views excited much controversy in his own country. When the revolution broke out in 1918, Bernstorff left the diplomatic service, but he later took an active part in parliamentary politics as a member of the Democratic Party in the Reichstag and also maintained a close connection with international affairs, as chairman of the German League of Nations Union until 1933.

After Hitler's advent he went into exile at Geneva, Switz.

Beroea (Greece): *see* Véroia.

Berosus, also spelled BEROSSUS, BEROSSOS, or BEROSOS, Akkadian BEL-USUR (fl. *c.* 290 BC), Chaldean priest of Bel in Babylon who wrote a work in three books (in Greek) on the history and culture of Babylonia; it was widely used by later Greek compilers, whose versions

in turn were quoted by religious historians such as Eusebius and Josephus. Thus Berosus, though his work survives only in fragmentary citations, is remembered for his passing on knowledge of the origins of Babylon to the ancient Greeks.

In his first book Berosus described the land of Babylonia, to which the half man-half fish Oannes and other divinities coming out of the sea brought civilization, and told the story of the creation according to the native legend, which led to his account of Chaldean astrology. The second and third books contained the chronology and history of Babylonia and of later Assyria, beginning with the "ten kings before the flood," then the story of the flood itself, followed by the restoration of kingship with a long line of kings "after the flood," then "five dynasties," and finally the late age of history under the Assyrians, the last Babylonian kingdom, and the Persians. Cuneiform texts written in the Akkadian (Assyro-Babylonian) language have corroborated several elements of Berosus' account. The original names of seven of Berosus' bringers of civilization (Oannes and his brethren) are included in a late-Babylonian tablet found at Uruk (modern Warka). His scheme of chronology and history, although imperfectly preserved in quotations, has been elaborately investigated by modern scholars and compared with the cuneiform literature.

Berr, Henri (b. Jan. 31, 1863, Lunéville, Fr.—d. Nov. 19, 1954, Paris), French historian and philosopher who founded a series of Parisian institutes and journals dedicated to the synthesis of historical and scientific scholarship.

Educated at the École Normale Supérieure in Paris (1881–84), Berr taught for several years in Douai and Tours and between 1896 and 1925 was a professor at the Lycée Henri IV in Paris, meanwhile earning his doctorate in 1899 with a thesis on philosophy and history. In 1900 he founded the *Revue de synthèse historique*, a journal devoted to the integration of history and the social sciences, and in 1924 he founded the Centre International de Synthèse in Paris. Meanwhile, he undertook the enormous task of editing a cooperative enterprise entitled *L'Évolution de l'humanité*, 100 vol. (65 published between 1920 and 1954), a series of historical monographs intended as a synthetic survey of civilization from prehistory to the present.

Berr himself developed a rather complicated theory of historical synthesis based on a distinction of three types of causal relations: the succession of facts, constant relations or necessity, and the internal or rational connection of facts. His other contributions included the establishment of another journal, *Science*, in 1936; a series of books on the question of Alsace-Lorraine and Germany; and a philosophical novel, *L'Hymne à la vie* (1942; "Hymn to Life").

Berra, Yogi, byname of LAWRENCE PETER BERRA (b. May 12, 1925, St. Louis, Mo., U.S.), American professional baseball catcher, manager, and coach, who established catcher's records for most home runs (313), most consecutive errorless games (148), and most consecutive chances accepted (950).

As a boy in the Italian district of St. Louis, Berra played softball, baseball, soccer, football, and roller hockey. He first played organized baseball with a Y.M.C.A. team and later played American Legion baseball. He batted left-handed and threw right-handed. In 1942 he signed a contract with the American League New York Yankees. After a season in the minor leagues, he served in the U.S. Navy during World War II (1943–46) and played minor league baseball again in 1946. He came up to the New York Yankees toward the end of that season and played with them as their regular catcher through 1963. At first his catching was erratic, and he played mostly in the outfield until 1949. From then on he hit 20 or more home runs a season through 1958. He was named the American League's most valuable player, an honour seldom bestowed on catchers, in 1951, 1954, and 1955. He played in 14 World Series (1947, 1949–53, 1955–58, 1960–63), catching in more series games (75) than any other catcher. He hit a home run in his first World Series appearance; 12 in all.

After retiring as a player, Berra managed the Yankees in 1964, winning the pennant and losing the World Series, and was fired. He was a coach for the National League New York Mets (1965–72). He managed the Mets (1972–75) and thereafter was a coach with the Yankees. In 1983 he was once again made manager of the Yankees but was fired during the 1985 season. He was elected to the Baseball Hall of Fame in 1972.

Berri, town, southeastern South Australia, on the Murray River. The area was explored by Charles Sturt in 1830; and the town's name is from an Aboriginal word for a bend in the river. In 1910 an irrigation area was proclaimed at Berri, and the town was gazetted the following year. It now has one of the largest winery–distillery complexes in the Southern Hemisphere and also cans food and produces fruit juices. Adelaide lies to the west via the Sturt Highway and a railway, and tourists visit Berri for the Riverland Harvest Festival and for paddle-steamer tours. Pop. (1981) 3,419.

Berriasian Stage, standard, worldwide division of Lower Cretaceous rocks and time (the Cretaceous Period began about 136,000,000 years ago and lasted about 71,000,000 years). The Berriasian underlies the Valanginian Stage and is the lowermost stage of the Cretaceous. In Great Britain and elsewhere in northern Europe, the Berriasian is represented by the lower portions of the Wealden Series. The stage is characterized by a distinctive fossil ammonite (mollusk) fauna.

Berrighen, Claes Pietersz(oon) (Dutch painter): *see* Berchem, Claes Pietersz(oon).

Berruguete, Alonso (b. *c.* 1488, Paredes de Nava, Valladolid, Castile—d. 1561, Toledo, Castile), the most important Spanish sculptor of the Renaissance, who is especially known for his intensely emotional Mannerist sculptures of figures portrayed in spiritual torment or in transports of religious ecstasy.

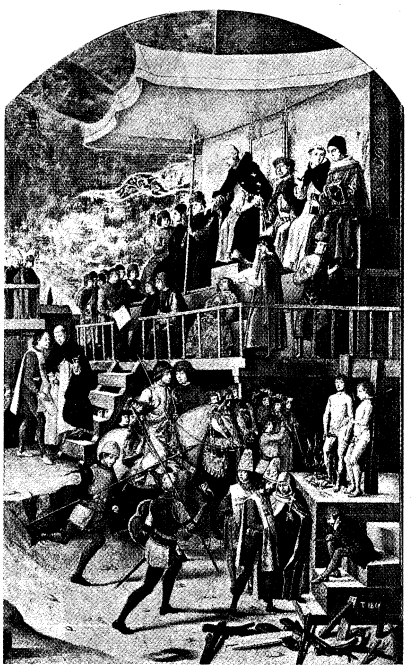
After studying under his father, the painter Pedro Berruguete (*q.v.*), Alonso went to Italy (*c.* 1504/08). Most of his sojourn was spent in Florence and Rome, where he was influenced by the works of Michelangelo and such examples of Hellenistic sculpture in the Vatican collections as the "Laocoon." Berruguete's painting of "Salome" (Uffizi Gallery, Florence) suggests that his Italian paintings were in the early Mannerist style of Jacopo Pontormo and Rosso Fiorentino.

Berruguete returned to Spain *c.* 1517, and in 1518 he was made court painter to Charles V and settled at Valladolid. Since he did not follow the Emperor to Germany in 1520, however, he received no royal commissions for paintings. Berruguete turned, therefore, to sculpture and architecture, and in the period 1518–21 executed sculpture for the tomb of Juan Selvagio in the church of Santa Engracia at Zaragossa, carved the relief of the "Resurrection" in the cathedral of Valencia (*c.* 1517), and submitted plans in 1521 for the Capilla Real (Royal Chapel) in Granada, which, not meeting with official approval, were never realized. Among his major sculpture commissions of the Valladolid period were the retables, or altarpieces, for the monastery of La Mejorada at Olmedo (1526), for San Benito at Valladolid (1527–32), for the Colegio de los Irlandeses at Salamanca (1529–32), and for the church of Santiago at Valladolid (1537).

In 1539 the great Spanish Humanist and art patron Cardinal Tavera asked Berruguete to come to Toledo, where he executed the choir stalls on the epistle side of the cathedral (1539–43), as well as the alabaster "Transfiguration" at the west end of the choir (1543–48). These carvings are somewhat more moderate and classical in feeling than his earlier works. At the time of his death Berruguete was working on the tomb for Cardinal Tavera (1552–61) in the Hospital de San Juan de Bautista at Toledo. Berruguete's use of a rather rich and extravagant but delicate ornamentation in his church decorations is typical of Spain's Plateresque style.

Berruguete, Pedro, also called PEDRO ESPAÑOL, OR PIETRO SPAGNUOLO (b. mid-15th century, Paredes de Navas, Valladolid, Castile—d. Jan. 6, 1504, Avila, Castile), the first great Renaissance painter in Spain, and the father of Alonso Berruguete, the greatest Spanish sculptor of the 16th century.

Berruguete is believed to have studied in Naples under Colantonio and worked in 1477 at the ducal palace in Urbino, returning to Spain to produce works for the cathedral in Toledo (1483–99) and then moving to Avila to work on the cathedral there until his death.



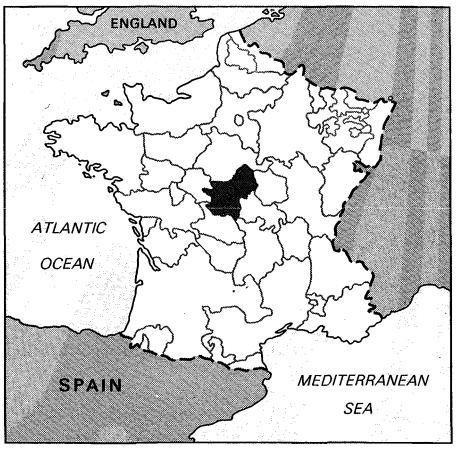
"St. Dominic Presiding at an Auto-da-fe," panel by Pedro Berruguete, *c.* 1503; in the Prado, Madrid
Archivo Mas, Barcelona

Berruguete's paintings are marked by elegance and dignity combined with a profound feeling for space and atmosphere. The style is often eclectic, a mixture of Flemish, Spanish Gothic, and Italian Renaissance, but it is never imitative. This combination of influences may be seen in his masterpiece, the main altarpiece in the convent of San Tomás in Avila (1499–1503). In these panels, representing scenes from the life of St. Thomas of Avila, there is a combination of luxurious ornament and gold decoration with a simplicity and ease of depiction.

Berry, historic and cultural region encompassing the central French *départements* of Indre and Cher, and coextensive with the former province of Berry.

The following article summarizes the political history, geography, and modern culture of Berry; for additional treatment of its geography and history, *see* MACROPAEDIA: France.

The province of Berry encompassed the *départements* of Cher (corresponding roughly to Upper Berry) and Indre (Lower Berry). The home of a people called the Bituriges Cubi in



The *gouvernement* of Berry in 1789

Roman times, the country later passed to the Visigoths (AD 475), the Franks (*c.* 507), and the Carolingians. The chief authority in Berry eventually passed to the viscounts of Bourges, who, while recognizing the royal suzerainty, preserved a certain independence until 1101, when the fief was sold to the crown. When Aquitaine was acquired by Henry II of England, Berry became a matter of dispute between England and France. After 1360 it was held as an appanage of the French crown, usually by a member of the royal family. Jean de France, duc de Berry (1340–1416), was an important patron of the arts, for whom a number of famous illuminated manuscripts were produced (notably the Limburg brothers' *Très Riches Heures du duc de Berry*).

In 1601 on the death of Henry III's widow, Louise of Lorraine, the country was finally reabsorbed into the royal domain. The title duc de Berry was subsequently granted to Louis XIV's grandson Charles (1686–1714) and to Louis XVI's nephew Charles-Ferdinand (1778–1820).

Physically Berry is an upland adjoining France's Massif Central on the northwest. It is a region of bocage (mixed small forests and pastures), wheat fields, orchards, and vineyards. The pastures support extensive herds of sheep.

The population is predominantly Roman Catholic, although there are small Calvinist parishes in Cher, at Bourges and Sancerre. The population is largely of Celtic origin, but numerous immigrants from Poland, Italy, and Spain have been assimilated since 1950.

The regional dialect is derived from French and closely resembles the dialects of Bourbonnais (which borders Berry to the east) and Touraine (west). The dialect of Berry is distinguished by numerous words of late Latin origin and continues to be spoken in Cher around Sancergues, Sancerre, and Sancoins and in Indre around La Châtre. The *Noëls berriauds* (1898) and *Bestiaire berrichon* (1919) of Hughes Lapaire helped to revive the folkloric literature of Berry. Folkloric traditions show strong Celtic influences from Auvergne, Brittany, Scotland, and Ireland. La Borne in Cher and Verneuil-sur-Igneraie in Indre continue to produce traditional pottery.

Regional cuisine is simple and relies on local produce. Dishes are usually cooked over a low fire. Soups of vegetables, pickled pork, or bread are simmered in a crock and served with cream. *Poulet en barbouille* is chicken cooked in brandy and served with a sauce made from blood, cream, yolk, and chopped liver. Wines from Quincy and Sancerre in Cher and Reuilly in Indre are produced from Sauvignon vines and have a flinty taste.

berry, simple, fleshy fruit that usually has many seeds, such as the banana, tomato, and cranberry. The middle and inner layers of the fruit wall often are not distinct from each other. Any small, fleshy fruit is popularly called a berry, especially if it is edible. Raspberries, blackberries, and strawberries are not true berries but aggregate fruits—fruits that consist of a number of smaller fruits. The date is a one-seeded berry whose stone is hard nutritive tissue. The leathery-rinded berry of citrus fruits is called a hesperidium, and the elongated, tough-skinned berrylike fruits of the watermelon, cucumber, and gourds are referred to as pepos.

Berry, DUKES OF, titled French nobility, royal princes of the blood, grouped below chronologically and indicated by the symbol •.

• **Berry, Jean de France, duc de** (duke of) (b. Nov. 30, 1340, Vincennes, Fr.—d. June 15, 1416, Paris), third son of King John II the Good of France and a leading patron of the arts; he controlled at least one-third of the territory of France during the middle period of the Hundred Years' War.

Count of Poitiers from 1356, he was appointed king's lieutenant (1358) for Auvergne, Languedoc, Périgord, and Poitou while his father was in captivity in England. It was thus that he came to control so much of France, despite the opposition of his brother, the dauphin Charles. Berry and Auvergne, newly raised to the rank of duchies, were granted to him by his father in 1360.

After 1364, during his brother Charles V's reign, Berry heavily taxed his lands for the defense of the kingdom. His oppressive policies eventually led to a peasants' revolt (1381–84) after Charles's death (Sept. 16, 1380). Acting as a member of the regency council of young Charles VI from 1380 to 1388, he shared royal powers while Charles was too young to rule. Berry maintained power by serving on a Council of 12 that he helped create to aid in the administration of France. On the council, Berry worked for peace with England by negotiating with John of Gaunt, duke of Lancaster, calling for papal mediation, and by helping to postpone an attack on England.

Initially arranging a temporary reconciliation in 1405 between the conflicting factions of John the Fearless, duke of Burgundy, and his own brother Louis, duc d'Orléans, Berry allied himself in 1410 with the Orléanist, later called the Armagnac, faction. After he was attacked by the Burgundians (1412), he resumed his role as mediator in the peace of Auxerre in 1412 and of Pontoise in 1413. Berry also helped deliver Charles VI's unsuccessful cession plan (the retirement of two rival popes for the election of a single pope) to the antipope Benedict XIII in Avignon.

Throughout his life, Berry had spent lavishly to promote the arts, and at his death there was not enough money to pay for his funeral. He had invested fortunes on the treasures that remain as his monument—paintings, tapestries, jewelry, and illuminated manuscripts (including the world-famous *Très riches heures du duc de Berry*).

• **Berry, Louis-Auguste, duc de** (duke of) *see* Louis XVI *under* Louis (France).

• **Berry, Charles-Ferdinand de Bourbon, duc de** (duke of) (b. Jan. 24, 1778, Versailles, Fr.—d. Feb. 14, 1820, Paris), French prince whose murder by the fanatic Louvel marked a turning point in the history of the Restoration monarchy (1814–30). His death hastened the downfall and replacement of the Decazes government and the polarization into liberal and royalist groups.

Taken abroad by his father, the Comte d'Artois (afterward Charles X of France), at the outbreak of the French Revolution (1789), he served in the Prince de Condé's army (1792–97) and went with Condé to Russia, where the tsar Paul gave him a cavalry regiment. From 1801 to 1814, however, he lived in England. There he began a liaison with an Englishwoman, Emma (Amy) Brown, by whom he had two daughters (afterward Baronne de Charette and Comtesse de Faucigny-Lucinge). Having returned to France in 1815, Berry retired to Ghent during the Hundred Days, but returned again to Paris at the Second Restoration. On June 17, 1816, he married Caroline, eldest daughter of Francis I of the Two Sicilies (by whom he had one daughter, Louise, later duchess and regent of Parma). On Feb. 13, 1820, as he was leaving the Paris Opéra, he was mortally wounded by a saddler, Louis-Pierre Louvel. He died the next day.

His posthumous son, the Duc de Bordeaux (later Comte de Chambord), represented the last hope for the Bourbon dynasty.

Berry, Marie-Caroline de Bourbon-Sicile, duchesse de (duchess of) (b. Nov. 5, 1798, Caserta, Italy—d. April 16, 1870, Brunnsee, Austria), daughter of Francis I of the Two Sicilies, who in 1832 staged a brief rebellion in western France against the king, Louis-Philippe, in a vain attempt to gain the crown for her son, Henri Dieudonné, comte de Chambord. Her husband, the Duc de Berry, a son of Charles X of France, had been assassinated in 1820. When Charles was overthrown in 1830, she tried to secure the succession for her son but was forced into exile. In 1832, disguised as a peasant, she crossed the French border from Italy and made her way to the Vendée, where she succeeded in instigating a brief but abortive insurrection (June 1832). She was arrested in Nantes November 7 and imprisoned at Blaye but was freed in July 1833 with the discovery of her recent marriage to an obscure Italian nobleman, Count Ettore Lucchesi-Palli, an act that exempted her from the French throne. She lived in Austria and Italy until her death.

Berry, Chuck, byname of CHARLES EDWARD ANDERSON BERRY (b. Oct. 18, 1926, St. Louis, Mo., U.S.), U.S. songwriter and singer, one of the first and best to shape big-beat blues into what came to be called rock and roll and to achieve widespread popularity with white audiences.

In his youth, Berry served a three-year term in reform school for attempted burglary. His early musical interest was in country music. While working at various daytime jobs in the early 1950s, he led a blues trio that played in black nightclubs in the St. Louis area. In 1955, armed with a number of songs he had written, he travelled to Chicago, where a remarkable congregation of outstanding black musicians had made the South Side the legendary blues capital of the world. Berry made his first record, "Maybellene," in that year. It was an immediate sensation among teenagers. As the novelty evolved into a popular genre, took the name rock and roll, and attracted a huge following among the young, Berry remained for some years at the forefront of popularity as a composer and performer with such songs as "Roll Over, Beethoven," "School Days," "Sweet Little Sixteen," "Rock and Roll Music," "Johnny B. Goode," and "Memphis," all of which combined the standard heavy beat and melodic patterns with the composer's own singular brand of ironic lyrics. He also appeared in four films.

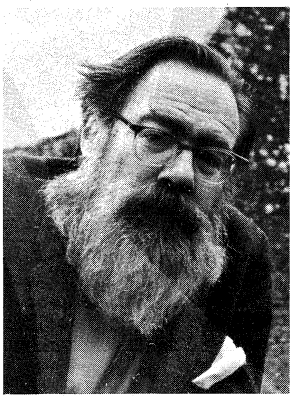
In 1959 he was convicted under the Mann Act for transporting a woman across state lines for immoral purposes and served a two-year sentence. Released in 1964, he prospered both as a performer and a recording artist into the 1970s. In 1979 he pled guilty to a charge of income tax evasion and was sentenced to

four months imprisonment and 1,000 hours of community service doing benefit concerts.

Berryman, John (b. Oct. 25, 1914, McAlester, Okla., U.S.—d. Jan. 7, 1972, Minneapolis, Minn.), U.S. poet whose importance was assured by the publication in 1956 of the long poem *Homage to Mistress Bradstreet.*

Berryman was brought up a strict Roman Catholic in the small Oklahoma town of Anadarko, moving at 10 with his family to Tampa, Fla. When the boy was 12, his father killed himself. Berryman attended a private school in Connecticut and graduated from Columbia University, where he was influenced by his teacher, the poet Mark Van Doren. After study at the University of Cambridge in 1938, he returned to the U.S. to teach at Wayne State University, Detroit, beginning a career that included posts at Harvard, Princeton, and the University of Minnesota.

He began to publish in little magazines during the late 1930s, and in 1940 *Five Young American Poets* contained 20 of his poems. Two other volumes of poetry—*Poems* (1942) and *The Dispossessed* (1948)—followed. A



Berryman
By courtesy of the University of Minnesota

richly erotic autobiographical sequence about a love affair, *Berryman's Sonnets,* appeared in 1967. Berryman was a versatile man of letters: "The Lovers" appeared in *The Best American Short Stories of 1946,* and his story "The Imaginary Jew" (1945) is often anthologized. His biography of Stephen Crane was published in 1950.

Homage to Mistress Bradstreet is a monologue that pays tribute to Anne Bradstreet, the first American woman poet: sometimes her voice is heard, sometimes Berryman's, and throughout a loving and intimate grasp of the details of American history is manifest. His new technical daring was also evident in *77 Dream Songs* (1964), augmented to form a sequence of 385 "Dream Songs" by *His Toy, His Dream, His Rest* (1968). Berryman's work bears some relation to the "confessional" school of poetry that flourished among many of his contemporaries, but in his case bursts of humour sporadically light up the troubled interior landscape. This autobiographical note continued to be sounded in *Love & Fame* (1970), in which he conveys much in a deceptively offhand manner.

Berryman committed suicide by jumping from a bridge onto the ice of the Mississippi River. *Recovery,* an account of his struggle against alcoholism, was published in 1973.

berserker, Norwegian BERSERK, Old Norse BESERKR ("bearskin"), in premedieval and medieval Norse and Germanic history and folklore, a member of unruly warrior gangs that worshipped Odin, the supreme Norse deity, and attached themselves to royal and noble courts as bodyguards and shock troops.

The berserkers' savagery in battle and their animal-skin attire contributed to the development of the werewolf legend in Europe. It is unclear whether the berserker warriors wore bear and wolf skins into battle or fought naked; tapestries and other sources represent both possibilities. The berserkers were in the habit of raping and murdering at will in their host communities (thus going "berserk"), and indeed in the Norse sagas they were often portrayed as villains. Berserkers are known to have formed the household guard of Norway's king Harald I Fairhair (reigned 872–930).

Bert, Paul (b. Oct. 17, 1833, Auxerre, Yonne, Fr.—d. Nov. 11, 1886, Hanoi), French physiologist, politician, and diplomat, founder of modern aerospace medicine, whose research

Bert
BBC Hulton Picture Library

into the effects of air pressure on the body helped make possible the exploration of space and the ocean depths. While professor of physiology at the Sorbonne (1869–86), he found that the illness suffered by animals at high altitudes is caused mainly by the low oxygen content of the sparse atmosphere.

Bert also made a study of decompression sickness, suffered by deep-sea divers (who know its agonizing pain as "the bends") when they are brought too quickly to the surface from the great pressures of the depths. Bert demonstrated that high external pressures force large quantities of atmospheric nitrogen to dissolve in the blood. During rapid decompression the nitrogen forms gas bubbles that obstruct capillaries. His classic *La Pression barométrique, recherches de physiologie expérimentale* (1878; *Barometric Pressure: Researches in Experimental Physiology,* 1943) was of fundamental importance to aviation medicine during World War II and to aerospace research in general.

An anticlerical leftist, Bert represented Yonne in the Chamber of Deputies (1872–86) and served as minister of education (1881–82) in Léon Gambetta's Cabinet. He was a proponent of French colonial policy in Indochina and was appointed governor general in Annam and Tonkin (1886). Despite his short tenure, his impact in Indochina was considerable. He took steps to liberalize French rule in the region, increasing the administrative role of the Vietnamese court and lessening the influence of the military in civil affairs. His various political and social reforms eased tensions in the area and served as a model for later French administrators.

Bertani, Agostino (b. Oct. 19, 1812, Milan—d. April 10, 1886, Rome), physician who collaborated with Mazzini and Garibaldi in the movement for Italian liberation.

Bertani took part in the March insurrection in Milan in 1848, organized an ambulance service for the republicans during their defense of Rome in 1849, and distinguished himself by his service in Genoa with Mazzini during the cholera epidemic of 1854. He was a surgeon in Garibaldi's corps in the Austro-Sardinian War of 1859. In 1860 he was one of the strategists of the attack on Sicily and Naples known as the March of the Thousand. He became Garibaldi's secretary general after the occupation of Naples (September 1860), in which office he reorganized the police and planned the suppression of the religious orders and the sanitary reconstruction of the city. In 1862 he treated Garibaldi's wounds received at Aspromonte. In the war against Austria (1866), he organized the medical service for Garibaldi's 40,000, and in 1867, during Garibaldi's march on Rome, he fought in the Battle of Mentana although he was opposed to the campaign.

Entering the new Italian Parliament in 1861, Bertani became the leader of the chamber's extreme left. In 1866 he founded *La Riforma,* a journal advocating social reforms. When the left came to power in 1876 with Premier Agostino Depretis, who introduced a system known as transformism in which he built up his following by taking ministers from both right and left, Bertani, hostile to the system, remained in opposition.

Berthelier, Philibert (b. *c.* 1465, Virieu-le-Grand, Burgundy—d. Aug. 23, 1519, Geneva), political martyr and leader of the Genevese anti-Savoyard faction (Eidguenots) that struggled against the powerful duke of Savoy, Charles III, to maintain the independence of Geneva.

Though no more than a minor public official, Berthelier took an active part in Geneva's political controversies. In 1508 he championed the rights of military corporations against the city council, and in 1509 his protests led to the dismissal of the incumbent *vidomne,* the episcopal official charged with civil and criminal jurisdiction. He opposed the installation of a Savoyard puppet, John, as bishop and temporal lord of Geneva (1513) and in 1515 formed a league of patriots, the Enfants de Genève, to resist the Bishop's encroachments on citizen's rights. Further opposition to the Bishop and his Savoyard connection led to Berthelier's arraignment on a charge of lèse-majesté (March 16, 1518); and, although acquitted by the citizens' committees (syndics), he was nonetheless summarily arrested and executed. His struggles against Savoyard influence in Geneva were continued and ultimately brought to a successful conclusion under the leadership of his friend Bezanson Hugues.

Berthelot, (Pierre-Eugène-) Marcellin (b. Oct. 27, 1827, Paris—d. March 18, 1907, Paris), French organic and physical chemist, science historian, and government official whose creative thought and work significantly influenced the development of chemistry in the latter part of the 19th century.

Berthelot began his career as a staff assistant to Antoine-Jérôme Balard at the Collège de France, Paris (1851). His doctoral thesis, based on a continuation and amplification of Michel-Eugène Chevreul's work with glycerol, established his reputation. Appointed professor of organic chemistry at the École Supérieure de Pharmacie, Paris (1859), he accepted a chair in organic chemistry created for him at the Collège de France (1865). Inspector of higher education (1876), he continued an ac-

Marcellin Berthelot, engraving by Philippe-Auguste Cattelain
H. Roger-Viollet

tive interest in educational problems. He was elected a life senator in 1881. He was also minister of public instruction (1886–87) and of foreign affairs (1895–96).

Berthelot did important research in alcohols and carboxylic acids, in the synthesis of hydrocarbons (including acetylene), and in reaction velocities. As a result of his work on explosives, he discovered the detonation wave. He discredited the generally held contention that the formation of organic substances requires the involvement of life processes. He also held that chemical phenomena are not governed by any laws peculiar to themselves but are explicable in terms of the laws of mechanics in operation throughout the universe. He introduced the terms exothermic and endothermic and rediscovered the action of microorganisms in the fixation of nitrogen in soils. His writings in the history of alchemy and chemistry are classics in the field.

Berthelot published some 1,600 books and papers on various aspects of chemistry. His other works include translations of Greek, Syriac, and Arabic treatises on alchemy and chemistry. He also contributed many articles to *La Grande Encyclopédie*, which he helped to establish. The final period of his work was devoted to agricultural chemistry as well as to his historical writing. In 1889 he succeeded Louis Pasteur as secretary of the Académie des Sciences, Paris.

Berthelot, Philippe (-Joseph-Louis) (b. Oct. 9, 1866, Sèvres, Fr.—d. Nov. 22, 1934, Paris), French diplomat who in his long career in the Ministry of Foreign Affairs played an influential role in international relations during World War I and in the postwar administrations of Aristide Briand.

Philippe Berthelot

By courtesy of the Bibliotheque Nationale, Paris

Son of the famous chemist Marcellin Berthelot, the young Philippe was reared in the society of illustrious literary and scientific figures. He began his diplomatic career in 1889, serving in China from 1902 to 1904, when he entered the Ministry of Foreign Affairs. At the outbreak of World War I, he was active in Balkan negotiations and served in inter-Allied liaison. After participating in the Versailles Peace Conference, he was appointed in 1919 as the director of political and commercial affairs and counsellor of state, one of the highest positions in the ministry. In September 1920 the post of secretary general was created expressly for him. In 1921 he resigned after being accused of using his influence improperly in connection with the affairs of the Industrial Bank of China, of which his brother was a director. Reappointed secretary general in 1925, he accompanied Briand to Locarno and to London and conducted negotiations for resuming Franco-Russian relations. From then until 1932 he virtually controlled the internal organization of the ministry, following a policy that he described as one of "close union with England and of rapprochement with Germany." Ill health forced his resignation in 1932, and he died of a heart attack two years later.

Berthier, Louis-Alexandre, PRINCE DE WAGRAM (b. Nov. 20, 1753, Versailles, Fr.—d. June 1, 1815, Bamberg, Bavaria), French soldier and the first of Napoleon's marshals. Though Berthier was not a distinguished commander, Napoleon esteemed him highly as chief of staff of the Grande Armée from 1805. Responsible for the operation of Napoleon's armies, he was called by the Emperor "the man who has served me longest and has never failed me."

The son of an ennobled court works surveyor, Berthier gained military experience in the American Revolution, serving with Lafayette, and then in the French Revolution as survey and staff officer and finally as chief of staff (1791–92). Sent to fight the royalists in western France in March 1793, he was recalled, as a noble, after four months' dangerous service and driven underground by the Revolutionary Terror. He reappeared as general of division and chief of staff in the Army of the Alps and of Italy. Commanding in Italy, he occupied Rome in February 1798 but later joined Napoleon in Egypt.

As chief of staff of the Grande Armée, Berthier directed a staff of six generals and eight colonels. His duties included dispatching direct orders from Napoleon to his marshals. In spite of his professed impersonality in carrying out Napoleon's orders, a certain amount of friction developed between Berthier and the marshals as the power of the chief of staff grew. Napoleon recognized his loyalty by making him sovereign prince of Neuchâtel in 1806 and gave him the French title of prince de Wagram in 1809.

Berthier remained with Napoleon in Russia to the end of the retreat in 1812 and, after the Emperor's departure, struggled devotedly to preserve order in the army. After Napoleon's abdication Berthier submitted to Louis XVIII and, as captain of his guards, escorted him out of France when Napoleon returned from Elba for the Hundred Days. He then retired to Bavaria, where he soon died from a fall. There were stories of suicide or murder, but the accident was probably due to illness.

Berthold VON HENNEBERG, also called BERTHOLD VON MAINZ (b. 1442, Germany—d. Dec. 21, 1504, Germany), archbishop-elector of Mainz, imperial chancellor and reformer, who worked unsuccessfully for an increase in the powers of the clerical and lay nobility at the expense of the Holy Roman emperor.

Berthold von Henneberg, detail from his tomb monument attributed to Hans Backoffen; in Mainz Cathedral, W.Ger.

By courtesy of the Bischofliches Dom und Diozesan-museum, Mainz, W.Ger.

Berthold was elected archbishop of Mainz in 1484 and played a leading role in securing the election of Maximilian I, a Habsburg, as king of the Romans (prospective successor to the Holy Roman emperor) in 1486. With his appointment as imperial chancellor in 1493, he pursued a policy of internal reform for the next decade. The reform program presented to Maximilian by the nobility at the Diet of Worms (1495), almost certainly Berthold's work, prescribed the establishment of a permanent high court for the Reich and a 17-member aristocratic council of government.

Maximilian, trying to reestablish imperial authority, opposed the formation of a council, even though the Diet threatened to cut off funds for his war efforts; but, having granted the court in 1495, he finally granted the council also, in 1500. Because neither court nor council members were paid as promised, however, both soon dispersed, and these bodies in effect ceased to exist.

Berthold, Ernst Kuno (German philosopher): *see* Fischer, Kuno.

Bertholet, Alfred (b. Nov. 9, 1868, Basel, Switz.—d. Aug. 24, 1951, Münsterlingen), Protestant Old Testament scholar, who also wrote on the phenomenology of religion.

After serving as pastor of the German-Dutch church at Leghorn (Livorno) for 18 months, he took his doctorate in Basel (1895) and taught there (1896–1912) and later in Tübingen (1913), Göttingen (1914), and Berlin (1928–39). In biblical criticism he moved progressively toward the school of comparative religion.

His *Apokryphen und Pseudepigraphen* (1906; "Apocrypha and Pseudopigraphia") was an important contribution to Jewish literary history, and the second volume of *Biblische Theologie* (1911; "Biblical Theology"), conceived as a history of Old Testament religion, broke new ground. His works on the history of religion, such as *Dynamismus und Personalismus in der Seelenauffassung* (1930; "Dynamism and Personalism in the Knowledge of the Soul"), *Götterspaltung und Göttervereinigung* (1933; "The Division and the Unification of Gods"), and *Das Geschlecht der Gottheit* (1934; "Sex in Godhood"), also are marked by immense care in the collection of material and by the skill with which problems are laid bare and solutions to them offered.

Berthollet, Claude-Louis, Comte (Count) (b. Dec. 9, 1749, Talloires, near Annecy, Fr.—d. Nov. 6, 1822, Arcueil), French chemist who was the first to note that the completeness of chemical reactions depends in part upon the masses of the reacting substances; he thus came close to formulating the law of mass action. Though he incorrectly concluded that elements unite in all proportions, his resulting controversy with the chemist Joseph-Louis Proust led to the establishment of the law of definite proportions.

Educated in medicine at Turin, Italy, Berthollet later became associated with Antoine Lavoisier, whom he assisted in reforming chemical nomenclature. His researches with hydrocyanic (prussic) acid and hydrogen sulfide led him to disagree with Lavoisier's contention that oxygen was an essential element in all acids. Berthollet discovered the composition of ammonia (1785) and introduced chlorine as a bleaching agent.

During the French Revolution he served on many scientific committees and became a commissioner of the national mint (1792). Appointed commissioner of agriculture and professor at the polytechnic and normal schools (1794), he helped reorganize the academy as the Institut National (1795) and in 1796 headed a commission sent to Italy to select

choice ancient and modern artworks for the national galleries of Paris. He accompanied Napoleon on his expedition to Egypt (1798), where he helped to form an institute modelled on the Institut National and first presented his ideas on chemical equilibria in his book *Essai de statique chimique* (1803).

During the Napoleonic Wars he determined how to obtain iron from ore and convert it into steel. Though his preparation of potassium chlorate did not provide the substitute for saltpetre in gunpowder that he had intended, it did make possible the manufacture of coloured fireworks. Berthollet was also a senator and a grand officer of the Legion of Honour and became a count under the French empire. In retirement he maintained a laboratory and sponsored meetings of distinguished scientists, whose discussions were published between 1807 and 1817.

Berthoud, Ferdinand (b. March 19, 1727, Plancemont, Switz.—d. June 20, 1807, Groslay, Fr.), outstanding horologist and author of extensive treatises on timekeeping.

Berthoud was apprenticed to his brother, a clockmaker at Plancemont, and he subsequently studied in Paris. His indefatigable inventiveness and many publications soon made him influential in horological circles, and he became involved in the attempt to solve the problem of determining longitude at sea.

Berthoud's major achievement was his development of an accurate and practical marine clock, or chronometer. Such an instrument had previously been constructed in expensive and delicate prototypes by Pierre Leroy of France and John Harrison of England. Berthoud's improvements to the chronometer have been largely retained in present-day designs.

He was succeeded in his work by his nephew Pierre-Louis Berthoud (1754–1813), a celebrated chronometer maker in his own right.

Bertillon, Alphonse (b. April 23, 1853, Paris—d. Feb. 13, 1914, Münsterlingen, Switz.), chief of criminal identification for the

Alphonse Bertillon, photograph by Nadar

Archives Photographiques—J.P. Ziolo

Paris police (from 1880) who developed an identification system known as anthropometry, or the Bertillon system, that came into wide use in France and other countries.

The younger brother of the statistician and demographer Jacques Bertillon, Alphonse Bertillon in 1882 introduced his system of identification, which incorporates a series of refined bodily measurements, physical description, and photographs. The Bertillon system was superseded by fingerprinting as the primary method of identification, though it remains an excellent means of furnishing a minutely descriptive portrait, valuable to investigators. Bertillon wrote extensively on his method, one work being *La Photographie judiciaire* (1890). A biography by H.T.F. Rhodes, *Alphonse Bertillon: Father of Scientific Detection,* was published in 1954.

Bertillon, Jacques (b. Nov. 11, 1851, Paris—d. July 7, 1922, Valmondois, Fr.), French statistician and demographer whose application of quantitative methods to the analysis of a variety of social questions gave impetus to the increased use of statistics in the social sciences.

Though educated as a physician, Bertillon in the 1870s turned to the analysis of statistics, publishing articles on comparative divorce and suicide rates among nations; in 1883 he succeeded his father, Louis-Adolphe Bertillon, as head of the Paris bureau of vital statistics. Over the next 30 years, the bureau, under his direction, increased the kinds of data gathered and developed more elaborate kinds of analysis.

Bertillon worked to establish uniform international statistical standards and saw his "Bertillon classification" of causes of deaths come into use in a number of nations. To facilitate the collection of data in French government offices, he wrote an elementary course in administrative statistics (1895). Increased alcoholism in France and a decline in French population growth relative to the rates in other countries were problems that particularly interested Bertillon. These questions gave rise to several works, including *L'Alcoolisme et les moyens de le combattre jugés par l'expérience* (1904; "Alcoholism and Ways of Combatting It Judged from Experience") and *La Dépopulation de la France* (1911; "The Depopulation of France").

Bertinoro, Obadiah (ben Abraham Yare) of (b. *c.* 1450, Bertinoro, Papal States—d. before 1516), Italian rabbinic author whose commentary on the Mishnah (the codification of Jewish Oral Law), incorporating literal explanations from the medieval commentator Rashi and citing rulings from the philosopher Moses Maimonides, is a standard work of Jewish literature and since its first printing in 1548 has been published in almost every edition of the Mishnah.

Bertinoro is also remembered as the author of three celebrated letters describing his three-year journey (1486–88) to Jerusalem and containing invaluable descriptions of the people and customs of the Jewish communities he visited on the way, from Italy to Palestine. The letters, written to Bertinoro's father and brother during the period 1488–90, have been published under the titles *Darkhei Ẓiyyon* and *HaMassa le-Ereẓ Yisrael* and translated into several languages. He lived in Jerusalem almost continuously after 1488, acting as spiritual head of the Jewish community there.

Bertoia, Harry (b. March 10, 1915, San Lorenzo, Udine, Friuli-Venezia Giulia, Italy—d. Nov. 6, 1978, Barto, Pa., U.S.), Italian-born American sculptor and designer, best known for his monumental architectural sculptures and his classic Bertoia chair.

The Diamond chair designed by Harry Bertoia, 1952

By courtesy of Knoll International

Bertoia attended the Cranbrook Academy of Art in Bloomfield Hills, Mich., and taught painting and metalworking there from 1937 to 1943. He worked in California with designer Charles Eames (*q.v.*) before joining Knoll Associates in New York City in 1950. His achievements there included the Diamond chair (more commonly known as the Bertoia chair), made of polished steel wire, sometimes vinyl coated, and covered with cotton or with elastic Naugahyde upholstery.

Bertoia claimed that his sculpture evolved when the jewelry he was designing "kept getting larger and larger." Some of his later works, the "sound sculptures," were designed to be activated by the wind or by hand to produce pleasing metallic or airy sound patterns. His numerous major works for public areas include huge decorative flow-welded metal "Sculpture Screens" for major corporations and educational institutions, a large copper and bronze fountain, "Waves," for the Philadelphia Civic Center; the bronze sculpture "View of Earth from Space" at Dulles International Airport near Washington, D.C.; and a "sounding" fountain piece for the sunken outdoor plaza of the Standard Oil building in Chicago.

Bertoldo DI GIOVANNI (b. 1420—d. 1491, Poggio a Caiano, Republic of Florence), Italian Renaissance sculptor and medallist who was a student of Donatello and a teacher of Michelangelo.

He and Bartolomeo Bellano of Padua were the two bronze specialists associated with Donatello, and Bertoldo's earliest known work was executed between 1460 and 1470 on the San Lorenzo pulpits, which had been left unfinished by Donatello. He had the major responsibility for the frieze and also executed work on the relief of the entombment.

Bertoldo produced for his friend Lorenzo de' Medici a battle relief influenced by a Greco-Roman sarcophagus found at Pisa. Toward the end of his life, he was selected as curator of the antiquities collection belonging to Lorenzo de' Medici and as director and teacher in the painting and sculpture school that de' Medici had established in his gardens near San Marco; Michelangelo studied at the school for several years. Other notable works produced by Bertoldo include a relief of "The Crucifixion with Attending Saints," and a bronze statuette of Orpheus and one of Apollo. As a sculptor Bertoldo is notable for his energetic, anatomically precise figures grouped in dynamic compositions.

Bertolucci, Bernardo (b. March 16, 1940, Parma, Italy), Italian film director best known for his film *Last Tango in Paris* (1972), the erotic content of which created an international sensation.

Bertolucci was raised in an atmosphere of comfort and intellectualism. His father—a poet, anthologist, teacher of art history, and film critic—was a strong early influence. Bertolucci's early childhood interest in films came as a result of attending frequent screenings with his father. His first two films, shorts about children, were filmed when Bertolucci was 15 years old. His first book, *In cerca del mistero* (1962; "In Search of Mystery") won the Premio Viareggio, one of Italy's top literary awards. A short time later he embarked on his film career as assistant director to Pier Paolo Pasolini. After his work on Pasolini's *Accattone* (1961) Bertolucci left the University of Rome without graduating and set off on an independent study of film.

Bertolucci made his feature film *La commare seca* (1962; *The Grim Reaper*), which he filmed on location in Rome. The film brought him recognition as a promising young director but was a box office failure. His second feature, *Prima della rivoluzione* (1964; *Before*

the Revolution), fared no better commercially but won notice at the Cannes Film Festival. Unable to obtain financial backing for his film projects, Bertolucci directed documentary films and worked with Julian Beck and his Living Theatre on *Agonia* ("Agony"), *Amore e rabbia* (*Love and Rage*), and other productions. He joined the Communist Party in the late 1960s, but later became an outspoken critic of filmmakers who mix politics with moviemaking. His next film, *La strategia del ragno* (1970; *The Spider's Stratagem*), reflects an increasing interest in the interior life of his characters, a development that Bertolucci attributed to his own experience of psychoanalysis. It follows a young man as he visits the Po Valley town where his father, a local anti-Fascist hero, is believed to have been murdered by followers of Mussolini 30 years earlier. The son discovers that his father was a traitor and learns that the historical truth underlying myth is often best left buried. His *Il conformista* (1970; *The Conformist*) is the film in which Bertolucci attained full maturity as a director. The film's protagonist is a young civil servant who attempts to deal with his own inadequacies through conformity to the prevailing social order. *Ultimo tango a Parigi* (*Last Tango in Paris*), released two years later, portrayed a level of eroticism previously considered taboo in general-release films in its study of an affair between a middle-aged widower and a young actress.

Bertolucci's later films included the grandly scaled *Novecento* (1976; *1900*), the intimate *Luna* (1979; "Moon"), and *La tragedia di un uomo ridicolo* (1981; *The Tragedy of a Ridiculous Man*).

Bertoua, city, southeastern Cameroon, west central Africa, in the transition zone between the southern forest and the northern savanna. It has been a traditional regional administrative and commercial centre but was isolated until the construction of the railroad to nearby Bélabo and the opening of an airport in 1976 improved communications with the rest of the country. Other development projects of the 1970s and '80s included the construction of an improved road from Bertoua to Bélabo, the creation of a cassava processing complex, and the construction of a peanut (groundnut) oil factory. Pop. (1981 est.) 18,254.

Bertran DE BORN (b. *c.* 1140, Viscounty of Limoges, Fr.—d. 1212–15, Abbey of Dalon), French soldier and celebrated medieval troubadour.

Viscount of Hautefort and lord of vast domains, Bertran twice warred with his brother Constantin for sole possession of the family heritage. Their liege lord, Richard the Lion-Heart, duke of Aquitaine, initially favoured Constantin, successfully besieging Bertran's fortress of Hautefort and expelling him (1183). Later, however, lord and vassal were reconciled; and Bertran, restored to his lands, abetted Richard and his brothers in their rebellions against their father, Henry II of England. After Richard became king of England (1189), Bertran accompanied him on the crusade to Palestine. After returning to France, he wrote violently militant poetry, egging on Richard in his wars with Philip II of France.

Bertran produced some of the most serene and beautiful poetry—as well as some of the most militaristic—in Provençal literature, 45 pieces of which are extant. He is represented in Dante's *Inferno,* in which he carries his severed head before him like a lantern and is compared with the biblical Achitophel, who also incited royal sons against their father (David).

Bertrand DU GUESCLIN (French soldier): *see* Guesclin, Bertrand du.

Bertrand, Henri-Gratien, Comte (Count) (b. March 28, 1773, Châteauroux, Fr.—d. Jan. 31, 1844, Châteauroux), military engineer and general, friend of Napoleon I and his companion in exile, first at Elba (1814–15), then at St. Helena (1815–21). His diary is considered invaluable for its frank account of Napoleon's character and life in exile. It was decoded, annotated, and published by P. Fleuriot de Langle as *Cahiers de Sainte-Hélène, 1816–21,* 3 vol. (1949–59, "Notebooks from St. Helena").

Comte Bertrand, detail from a lithograph by F. Cereghetti, *c.* 1827
By courtesy of the Bibliotheque Nationale, Paris

Bertrand entered the army at age 19 as an engineer. After service in Italy (1797), where he first met Napoleon, he was sent to Egypt (1798–99) and directed the fortification of Alexandria. He was appointed brigadier general in 1800. Named aide-de-camp to Napoleon in 1804, he further distinguished himself during the Austrian campaign. The bridges he built for the French crossing of the Danube at Wagram in 1809 were described by Napoleon as the finest since the Romans. Bertrand was created comte in 1808. Appointed grand marshal of the palace in 1813, he later accompanied Napoleon into exile.

After Napoleon's death in 1821, Bertrand returned to France, where a death sentence that had been passed on him in absentia (1817) was annulled. In 1840, with the Prince de Joinville, he escorted Napoleon's body from St. Helena to France for its final burial.

Bertrand, Joseph(-Louis-François) (b. March 11, 1822, Paris—d. April 5, 1900, Paris), French mathematician and educator remembered for his elegant applications of differential equations to analytical mechanics, particularly in thermodynamics, and for his work on statistical probability and the theory of curves and surfaces.

Bertrand graduated from the École Polytechnique in 1839 with a doctorate in thermodynamics and continued his work in engineering at the École Nationale Supérieure des Mines while teaching at the Collège Saint-Louis. He later also taught at the École Normale Supérieure and the Collège de France.

The author of several mathematical textbooks, Bertrand gave his name to curves with a linear relationship between first and second curvature. In 1899 Bertrand's research on infinitesimal analysis led to his important work, *Calcul des probabilités,* which introduced a problem in continuous probabilities known as Bertrand's paradox. Bertrand was a member of the French Academy of Science and, in 1884, became a member of the Académie Française.

Bertrand, Louis (-Jacques-Napoléon), also called ALOYSIUS BERTRAND (b. April 20, 1807, Ceva, Piedmont [Italy]—d. April 29, 1841, Paris), writer whose *Gaspard de la nuit* ("Gaspard of the Night") introduced the prose poem into French literature and was a source of inspiration to the Symbolist poets.

After his family settled in Dijon, Fr., in 1815, Bertrand developed a consuming interest in the ancient Burgundian capital, joining the Société d'Études and collecting historical material, some of which he used in early poems published under the title *Volupté.* His contributions to a local newspaper, of which he was manager, won the favourable notice of Victor Hugo and Charles-Augustin Sainte-Beuve, and he was drawn to Paris, but he found no suitable employment there. Returning to Dijon, he wrote for a liberal newspaper until its suspension by the ordinances of Charles X against freedom of press and speech that provoked the Revolution of 1830. For three years after the Revolution he edited the revolutionary *Le Patriote de la Côte d'Or.*

In 1836 Bertrand sold *Gaspard de la nuit,* which deals with medieval Dijon, to a publisher, who later decided that the manuscript ran counter to current interest in classicism and failed to publish it. Bertrand died of tuberculosis aggravated by starvation.

Published posthumously in 1842, *Gaspard* at first aroused slight interest; but, discovered a few years later by Charles-Pierre Baudelaire and Stéphane Mallarmé, it secured for its author a place in literary history.

Bertrand, Marcel-Alexandre (b. July 2, 1847, Paris—d. Feb. 13, 1907, Paris), French geologist who introduced the theory that certain mountains, in particular the Alps, were formed by folding of the Earth's crust.

In 1886, two years after he first proposed his theory of mountain building, Bertrand became instructor at the École Nationale Supérieure des Mines. During summers he did fieldwork for the French Geological Survey and also attempted to determine how the European mountain chains were created. In 1887 he developed a wave concept of mountain building, postulating successive periods of massive folding of the Earth's crust during which the Caledonian, Hercynian, and Alpine orogenies gradually built up the European system of mountains. Later he introduced a fourth period, the Huronian orogeny, of the Precambrian Era.

His work and publications established modern tectonic research, especially in the Alps, but his publications were few and his ideas were spread chiefly by his students. He was elected to the Académie des Sciences in 1896.

Bérulle, Pierre de (b. Feb. 4, 1575, Sérilly, near Troyes, Fr.—d. Oct. 2, 1629, Paris), cardinal and statesman who founded the French Congregation of the Oratory, reforming clerical education in France.

Bérulle, detail of a portrait by Philippe de Champaigne
Giraudon—Art Resource/EB Inc.

Raised in a deeply religious family and educated in theology by the Jesuits and at the Sorbonne, Bérulle was ordained in 1599; in that year he was also named honorary almoner to King Henry IV of France, the first of many religious and political services he performed for the French throne. In 1604, under the influence of his cousin Madame Acarie, a Catholic mystic whose house was the centre of the French Catholic revival, he went to Spain. He returned with seven nuns who established the reformed Order of the Discalced Carmelites in France.

As a result of his interest in the clerical

reforms that had been proposed by the Council of Trent (1545–63), Bérulle founded the French Oratory (1611), modelled after but independent of the Oratory of St. Philip Neri. The Oratorians, a congregation of priests with no binding vows, founded new seminaries, improved preaching, promoted theological studies, and ultimately caused a general revival of the French clergy. Bérulle's Oratory served as a model for those new congregations of priests that characterize the religious history of 17th-century France: the Lazarists, the Sulpicians, and the Eudists. He exercised a decisive influence on the religious development of the Abbé de Saint-Cyran and so, through him, on Port-Royal, the centre of Jansenism and of literary activity in 17th-century France.

Bérulle, always interested in political affairs, unsuccessfully opposed the Cardinal de Richelieu, Louis XIII's minister, and his anti-Spanish policy. He and Richelieu cooperated in the suppression of the Protestants in La Rochelle (1627–28) but broke in 1628, when Bérulle, then the principal adviser of the Queen Mother, Marie de Médicis, advocated the destruction of Protestantism throughout Europe. Richelieu favoured supporting the German Protestants in order to humble the Habsburgs. By the time Bérulle died he was completely out of favour at court.

Bérulle expressed his personal spirituality in a series of devotional writings, the best known of which is the *Discours de l'état et de la grandeur de Jésus* (1623). His interest in meditation and prayer also found its way into his educational policies and became a major part of the clerical reform.

Beruni (India): *see* Bāruni.

Berwald, Franz (Adolf) (b. July 23, 1796, Stockholm—d. April 3, 1868, Stockholm), most important Swedish composer of the 19th century.

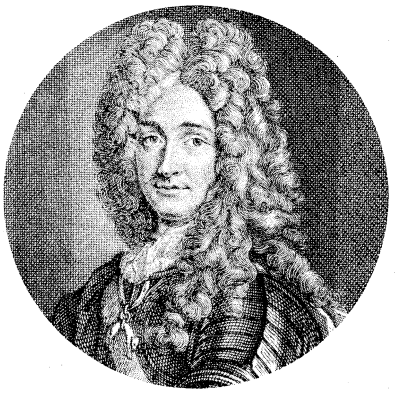
Born into a renowned family of musicians, Berwald studied violin with his father and composition with J.B.E. Du Puy. He lived in Berlin (1829–41) and Vienna (1842), returned to Sweden, and in 1846–49 was in Paris and Vienna. Unable to earn a living by music, from 1850 to 1858 he managed a glassworks in Ångermanland. After teaching at the Stockholm Academy (1864–67), he became professor of composition at the Stockholm Conservatory.

Berwald is considered the founder of musical Romanticism in Sweden and was the first important Swedish symphonist. His music, somewhat influenced by Louis Spohr and Carl Maria von Weber, is highly original in formal construction and use of harmonic resources. His works include six symphonies (1820–45; the fourth was lost) of which the G minor (*Sérieuse*) and the C major (*Singulière*) are particularly esteemed; an opera, *Estrella di Soria*; five cantatas; and concerti for violin, bassoon, and piano.

Berwick, also called BERWICKSHIRE, former county, southeastern Scotland, since the reorganization of 1975 in Berwickshire, Roxburgh, and Ettrick and Lauderdale (*qq.v.*) districts of Borders region.

Berwick, James Fitzjames, duke of, DUC (duke) DE FITZ-JAMES (b. Aug. 21, 1670, Moulins, Fr.—d. June 12, 1734, Philippsburg, Württemberg), English nobleman and marshal of France, a leading commander in the French service in the earlier wars of the 18th century.

Fitzjames was the illegitimate son of James, duke of York (later King James II of England) and Arabella Churchill, the sister of John Churchill, later 1st duke of Marlborough. Educated in France, he was created duke of Berwick by James II in 1687 and appointed governor of Portsmouth the following year, but he fled to France when James was deposed. Berwick nominally commanded an army of his father's supporters against Marl-



Duke of Berwick, engraving, 17th century
By courtesy of the Bibliotheque Nationale, Paris

borough in Ireland and was present at the Battle of the Boyne in 1690. In 1693 he accepted a commission as lieutenant general in the French Army.

In 1701 the dispute over the succession to the Spanish throne brought France and Spain to war with the British, the Austrians, and the Dutch. After brief service in Spain in 1704, Berwick held a command against the Huguenot insurgents (Camisards) in Languedoc. By capturing Nice from Eugene of Savoy (1706), he earned the title marshal of France. Returning to Spain, he recaptured Madrid from the Allies, and on April 25, 1707, he decisively defeated the British at the Battle of Almanza, compelling them to evacuate Aragon and enabling the Bourbon king Philip V to maintain his crown. Although Louis XIV made him duc de Fitz-James in 1710, Berwick received only secondary commands for the duration of the war. On Sept. 11, 1714, he stormed Barcelona, the last stronghold of Catalan resistance to Philip V.

Berwick's invasion of Spain in 1719 put an end to Philip V's pretensions to regency in France. Berwick was killed by a cannon shot while besieging Philippsburg during the War of the Polish Succession. Sir Charles Petrie's *Marshal Duke of Berwick* was published in 1953.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Berwick-upon-Tweed, district (borough), county of Northumberland, England. The northernmost district of England, it has an area of 376 sq mi (974 sq km).

From the 12th century, when the River Tweed became the Anglo-Scottish boundary, the border town of Berwick was long disputed between English and Scots but, after changing hands 13 times, was finally surrendered to England in 1482. Its ramparts were originally built by Edward I, who gave the town its first English charter in 1302; rebuilt by Elizabeth I, they are in good repair, but little remains of the Norman castle, which was already in ruins when its site was encroached upon to make way for the railway station. The parish church (1648–52) is noteworthy as one of the few built during the Commonwealth. The oldest of the three bridges that cross the Tweed near Berwick dates from 1634; the modern road bridge was built in 1928. Upstream, the Royal Border Bridge, a striking viaduct 126 ft (38 m) high with 28 arches, built by Robert Stephenson in 1847–50, carries the railway.

The district extends southeastward along the North Sea coast, including Holy Island and the Farne Islands (*qq.v.*), and southwestward to the Cheviot Hills. Pop. (1981 prelim.) town, 12,169; (1982 est.) district, 26,200.

Berwickshire, district, Borders region, southeastern Scotland; created by the reorganization of 1975, it includes most of the former county of Berwick. The district, area 338 sq mi (875 sq km), extends from the Lammermuir Hills in the north to the wide valley of the Merse in the south, where the River Tweed marks the border with England; on the east, cliffs front the North Sea. The upland moors support sheep and grouse, and the Whiteadder and Blackadder are trout streams running into the fertile Merse. Duns is the seat of the district authority, and Eyemouth is the chief fishing harbour. Pop. (1982 est.) 18,324.

Berwiński, Ryszard Wincenty (b. Feb. 28, 1819, Polwica Poznań, Pol.—d. Nov. 9, 1879, Constantinople), poet and writer, best known for his *Poezje* (1844; "Poems"), which marked him as a poet of social radicalism.

In his *Studia o literaturze ludowej* (1854; "Studies on Folk Literature") Berwiński took an international view of folk traditions, stressing their universality and challenging nationalist interpretations popular at the time. Unlike many of his colleagues, he had a university education, having studied in Germany as a young man. A committed and unsentimental revolutionary, he was twice imprisoned, first by the Austrians and later by the Prussians. The Revolution of 1848 freed him, and he became a Polish deputy to the Prussian Parliament, a post he left to travel to Crimea, where he aided a Polish poet, Adam Mickiewicz, in organizing a Polish armed force. After the war the Prussians refused to let him return home; he continued his work in Constantinople, a lonely and forgotten man.

beryl, mineral composed of beryllium aluminum silicate, $Be_3Al_2(SiO_3)_6$, a commercial source of beryllium. It has long been of interest because several varieties are valued as gemstones. These are aquamarine (pale blue-green); emerald (deep green); heliodor (golden yellow); and morganite (pink). Beryl is a minor constituent of many granitic rocks and associated pegmatite dikes, in gneisses, and in mica schists. The gem varieties (other than emerald) commonly are found in cavities in pegmatites. Emeralds occur in mica schist and in bituminous limestone. Common beryl of non-gem quality is present in many pegmatites, usually disseminated in small crystals. Large crystals, however, have been found: a 200-ton crystal was found in Brazil; a crystal 5.8 metres (19 feet) long and 1.5 m in diameter was discovered in the Black Hills, S.Dak., U.S.; and a radiating group of large crystals, the largest (18 tons) with a length of 5 m and a diameter of 1 m, was discovered in Albany, Me., U.S. Beryl is not common in detrital deposits. For detailed physical properties, *see* silicate mineral (table); *see also* aquamarine; emerald; morganite.

Before 1925 beryl was used only as a gemstone. Thereafter, many important uses were found for beryllium, and common beryl has been widely sought as the ore of this rare element. No large deposits have been found, and much of the production is a by-product in the mining of feldspar and mica. Although the amount of beryl mined fluctuates from year to year, it has increased rather steadily since 1930. Brazil became the major producer; others are Zimbabwe, South Africa, South West Africa/Namibia, and the United States.

berylliosis, systemic industrial disease caused by poisoning with beryllium, usually involving the lungs but occasionally affecting only the skin. There are two forms: an acute illness occurring most frequently in workers extracting beryllium metal from ore or manufacturing beryllium alloys, and a slow-developing chronic disease occurring in scientific and industrial workers who are exposed to beryllium-containing fumes and dust.

The acute disease involves both skin and lungs, causing a burning rash, eye irritation, nasal discharge, a cough, and chest tightness. The skin disease is caused by direct contact with beryllium salts and the lung disease by inhalation of metal dust or beryllium compounds. Most of those affected by acute beryliosis recover within a few months, but a small number of patients develop a highly fatal inflammation of the lung within 72 hours after a brief, massive exposure to beryllium. The chronic disease may occur more than 15 years after exposure, although the later it develops, the milder it is likely to be. It generally causes shortness of breath, especially after exercise, exhaustion, and a dry cough and can produce a permanent, though moderate, disability.

beryllium (Be), formerly (until 1957) GLUCINIUM, chemical element, one of the alkaline-earth metals of Group IIa of the periodic table, used in metallurgy as a hardening agent and in many space and nuclear applications. Beryllium was discovered (1798) as the oxide by Louis-Nicolas Vauquelin in beryl and in emeralds, and was isolated (1828) as the metal independently by Friedrich Wöhler and A.-A.-B. Bussy by the reduction of its chloride with potassium.

Properties, occurrence, and uses. Beryllium is a steel-gray metal, quite brittle at room temperature. It does not occur free in nature. Beryllium is estimated to occur in the Earth's igneous rocks to the extent of 0.0006 percent. The minerals beryl (a beryllium aluminum silicate) and bertrandite (a beryllium silicate) have been found in sufficient quantities to constitute commercial ores from which beryllium hydroxide is industrially extracted. The metal itself is industrially produced from beryllium fluoride by reduction with magnesium and from beryllium chloride by electrolysis.

Beryllium is the only stable light metal with a relatively high melting point. These properties, coupled with its excellent electrical conductivity, high heat capacity and conductivity, good mechanical properties at elevated temperatures, oxidation resistance, and very high modulus of elasticity (one-third greater than that of steel), make it of interest for structural and thermal applications as well as for nuclear reactors. Beryllium transmits X-rays 17 times as well as aluminum and has been extensively used in making windows for X-ray tubes. Beryllium is fabricated into gyroscopes, accelerometers, and computer parts for inertial guidance instruments and other devices for missiles, aircraft, and space vehicles, and heavy-duty brake drums and similar applications where a good heat sink is important.

Much beryllium is used as a low-percentage component of hard alloys, especially with copper as the main constituent but also with nickel- and iron-based alloys, for products such as springs. Beryllium–copper is made into tools where sparking might be dangerous, as in powder factories. Beryllium itself contributes nothing to the reduction of sparking but strengthens the copper, which does not form sparks upon impact. Small amounts of beryllium added to oxidizable alloys generate protecting surface films, reducing inflammability in magnesium and tarnishing in silver alloys.

Neutrons were discovered (1932) by Sir James Chadwick as particles ejected from beryllium bombarded by alpha particles. Since then beryllium mixed with an alpha emitter such as radium has been used as a neutron source; for example, by Enrico Fermi to trigger in uranium the first controlled-fission chain reaction (1942).

The only naturally occurring isotope is the stable beryllium-9. Artificial isotopes have been produced, such as beryllium-10 (2,700,000-year half-life) and beryllium-8 (which spontaneously fissions into two alpha particles in less than 10^{-15} second).

Compounds. Beryllium has an exclusive +2 oxidation state in all of its compounds. The compounds are generally colourless and have a distinctly sweet taste from whence came the element's former name glucinium. Soluble compounds in the form of solutions, dry dust, or fumes are toxic; they may produce dermatitis or, when inhaled, acute effects similar to those caused by the poison gas phosgene.

The oxygen compound beryllium oxide (BeO) is a high-temperature refractory material characterized by an unusual combination of high electrical resistance and dielectric strength with high thermal conductivity. It has various applications, as in making ceramic ware used in high-temperature nuclear devices. The chlorine compound beryllium chloride ($BeCl_2$) catalyzes the Friedel-Crafts reaction and is used in cell baths for electrowinning or electrorefining beryllium. Basic beryllium carbonate [$BeCO_3 \cdot x Be(OH)_2$] precipitated from ammonia (HN_3) and carbon dioxide (CO_2), is utilized as a starting material for synthesis of beryllium salts. Basic beryllium acetate [$Be_4O(C_2H_3O_2)_6$] is used for the same purpose. Beryllium forms organic coordination compounds and bonds directly with carbon in several organometallic compounds (*e.g.,* beryllium alkyls and aryls).

atomic number	4
atomic weight	9.0122
melting point	1,278° C
boiling point	2,970° C
specific gravity	1.85 (20°C)
valence	2
electronic config.	2-2 or $1s^2 2s^2$

Berzelius, Jöns Jacob (b. Aug. 20, 1779, near Linköping, Swed.—d. Aug. 7, 1848, Stockholm), Swedish scientist, one of the

Berzelius, detail of an oil painting by Olof Johan Södermark, 1843; in the Royal Swedish Academy of Sciences, Stockholm

By courtesy of Svenska Portrattarkivet, Stockholm

founders of modern chemistry. He is especially noted for his determination of atomic weights, the development of modern chemical symbols, his electrochemical theory, the discovery and isolation of several elements, the development of classical analytical techniques, and his investigation of isomerism and catalysis, which were both given their names by him. He was a strict empiricist and insisted that any new theory be consistent with the sum of chemical knowledge.

As a boy Berzelius developed an interest in chemistry. Except for his fine performance in physics, however, he nearly failed in his medical studies at Uppsala, but he did receive an M.D. degree (1802) and became assistant professor of medicine, botany, and pharmacy at Stockholm. A full professor by 1807, he was elected to the Stockholm Royal Academy of Science the following year and became permanent secretary in 1818. Professor of chemistry at the Royal Caroline Medico-Chirurgical Institute in Stockholm (1815–32), he was made a baron by Charles XIV in 1835.

About 1807 Berzelius began his analysis of the composition of chemical compounds. Working in his spare time and with meagre kitchen laboratory facilities and techniques of his own improvisation and development, he studied about 2,000 compounds over a 10-year period. He used oxygen as the basis of reference for the atomic weights of other elements and was guided by the law of multiple proportions, atomic theory, the principles of isomorphism, and Gay-Lussac's law of combining volumes. His resulting table of combining proportions and atomic weights, published in 1818 and revised in 1826, attained a remarkable degree of accuracy.

In the meantime Berzelius had begun experiments on the electrolysis of various solutions. This work led to his dualistic electrochemical theory that compounds are made up of two electrically different (positively and negatively charged) components. In attempting to extend his hypothesis to include organic as well as inorganic compounds, he contributed to the founding of radical theory.

Berzelius discovered the elements cerium (1803), selenium (1817), and thorium (1828). He isolated silicon (1823), zirconium (1824), and titanium (1825); classified minerals on a chemical basis; and made detailed studies of the compounds of tellurium, vanadium, molybdenum, tungsten, uranium, and other elements. Sometimes called the father of gravimetric analysis, he introduced the use of the water bath, desiccator, wash bottle, filter paper, rubber tubing, and improved blowpipe technique.

He published more than 250 original papers, mostly in Swedish, in the *Transactions* of the Stockholm Academy. His progress reports on chemistry and physics and his textbook of chemistry, which went through five editions and was translated into German and French, greatly influenced the development of chemistry in his time.

Berzsenyi, Dániel (b. May 7, 1776, Egyházashetye, Hung.—d. Feb. 24, 1836, Nikla), poet who first successfully introduced classical metres and themes in Hungarian poetry.

Berzsenyi was a country squire who lived far from any town and was for many years unconnected with any literary circle. His activity as a poet was discovered by chance, and he became known through the efforts of Ferenc Kazinczy, a leading advocate of reform in Hungarian prosody. His only volume of poetry was published in 1813. In 1817 Ferenc Kölcsey, another Hungarian poet of the period, made an unduly severe judgment on Berzsenyi's work. Deeply hurt, Berzsenyi thereafter virtually ceased to write poetry. This loss to Hungarian literature Kölcsey himself, in a moving funeral oration on Berzsenyi, deplored bitterly.

Berzsenyi was imbued with the spirit of the classics. The influence of Latin poetry, partic-

Berzsenyi, engraving by Miklós Barabás, 1859

Interfoto MTI, Hungary

ularly that of Horace, is noticeable not only in the form of his poems but also in his vocabulary, his choice of subjects, and his philosophy. The grandeur of his thought and the concise vigour of his expression are impressive. His love of Hungary and his attachment to the ideals dictated by an uncompromising moral rectitude are the source of several splendid odes. One of these, "A magyarokhoz" ("To the Hungarians") bitterly castigates the decadence of his compatriots.

Bes, also called BISU, ancient Egyptian god of recreation, represented as a dwarf with large head, goggle eyes, protruding tongue, bowlegs, bushy tail, and usually a large crown of feathers on his head. His figure was that of a grotesque mountebank, intended to inspire joy or drive away pain and sorrow, his hideousness being perhaps supposed to scare away evil spirits. He was portrayed on mirrors, ointment vases, and other articles of the toilet. He

Bes represented as a dwarf, statue; in the Louvre

Giraudon—Art Resource/EB Inc.

was often associated with children and with childbirth and was represented in the "birth houses" devoted to the cult of the child god. Bes may have been of non-Egyptian origin—African, Arabian, or even Babylonian; he was often named "Coming from the Divine Land" (*i.e.,* the east or Arabia), or "Lord of Puoni" (Punt; *i.e.,* the African coast of the Red Sea). Contrary to the usual rule of representation, he was commonly shown full faced instead of in profile.

Besançon, city, capital of Doubs *département,* Franche-Comté region, eastern France, on a horseshoe bend of the Doubs River, east of Dijon. A populated place in the Hallstatt period (Early Iron Age), it was the chief town (Vesontio) of the Sequani Gauls and in 58 BC was taken by Julius Caesar. After the Romans the barbarians came, and local legend ascribes the origin of "ogre" to the ferocious *Hongrois* (Hungarians), who ate raw meat and indulged in massacres. The archbishopric dates from the end of the 2nd century and the prelates acquired considerable temporal power. In 1184 Frederick Barbarossa made Besançon a free imperial city; citizens boast that this was acquired by asking the emperor to confirm a nonexistent charter of liberties. This freedom within the Franche-Comté (Free Countship) endured until the region became French in 1674. Besançon was fortified by the great French military engineer Sébastien le Prestre de Vauban in the 17th century, and his citadel, which still stands (387 ft [118 m]) high on a rock behind the town, replaced the Roman castrum. The parliament, the university (founded in 1422), and the mint were moved from Dole, which Besançon succeeded as capital of Franche-Comté in 1676. Besançon was bombarded by the Austrians in 1814 and was damaged in World War II.

Roman remains include a triumphal arch (Porte Noire), a theatre or amphitheatre, and an aqueduct. One of the modern bridges incorporates a Roman bridge. The cathedral of Saint-Jean has been reconstructed several times since its founding in the 4th century.

The Palais Granvelle (1534–40), on an arcaded courtyard in the centre of town, was built by Nicolas Perrenot de Granvelle, chancellor to Charles V. The river is bordered by fine quays and shady promenades. The Roman Grande Rue is still the main street, with many notable buildings; Victor Hugo was born at No. 140. The old city is separated from the newer residential and industrial quarters by a main road. The industrial suburbs, including the spa of Besançon-la-Mouillère, are across the river to the north. Watch- and clockmaking were introduced from Switzerland in the 18th century, the rayon industry in the late 19th. Besançon is still the centre of the French watch and clock industries, and their techniques (precision machinery miniaturization) support related industries. There are also textile and leather works. The city is the capital of the Franche-Comté economic planning region. Pop. (1982) 112,023.

Besant, Annie, *née* WOOD (b. Oct. 1, 1847, London—d. Sept. 20, 1933, Adyar, Madras), British social reformer, sometime Fabian Socialist, theosophist, and Indian independence leader.

Besant had been the wife of an Anglican clergyman. They separated in 1873, and Besant became associated for many years with the atheist and social reformer Charles Bradlaugh. She was an early advocate of birth control, and in the late 1880s she became a prominent Fabian Socialist under the influence of George Bernard Shaw. Finally, in 1889, she was converted to the doctrines of the Russian-born religious mystic Helena Blavatsky, a cofounder of the Theosophical Society. The teachings of the society emphasized human service, a spiritual evolutionism drawn from both Eastern and Western esoteric philosophy, and the role of suprahuman masters of wisdom. Besant plunged vigorously into theosophical work, lecturing and writing widely. Her numerous books and articles are still considered among the best expositions of theosophical belief. She was international president of the Theosophical Society from 1907 until her death, residing principally at its headquarters in Madras. She was active in educational and humanitarian work in India and became involved in the Indian independence movement, establishing the Indian Home Rule League in 1916. She promoted her protégé, Jiddu Krishnamurti, whom she believed to be a potential world teacher, in the years before his renunciation of formal theosophy in 1929. A standard biography is Arthur Nethercot, *The First Five Lives of Annie Besant* (1960) and *The Last Four Lives of Annie Besant* (1963).

Besant, Sir Walter (b. Aug. 14, 1836, Portsmouth, Hampshire, Eng.—d. June 9, 1901, London), novelist and philanthropist,

Walter Besant, engraving by G. Kruell

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

whose best work describing social evils in London's East End helped set in motion movements to aid the poor.

From 1861 to 1867 Besant taught at the Royal College, Mauritius, and in 1868 he became secretary to the Palestine Exploration Fund. In 1871 he began a literary collaboration with James Rice, editor of *Once a Week,* which lasted until Rice's death (1882), producing 14 romantic, improbable, and verbose novels.

In 1882 Besant published his first independent novel, *All Sorts and Conditions of Men,* based on impressions of the East London slums, which he saw as joyless rather than vicious. The "Palace of Delights" he projected in his book became a reality when the People's Palace was founded (1887) in Mile End Road, London, to provide opportunities for education and amusement to the slum dwellers of the area; Besant cooperated in its establishment. The *Children of Gibeon* (1886) also described slum life.

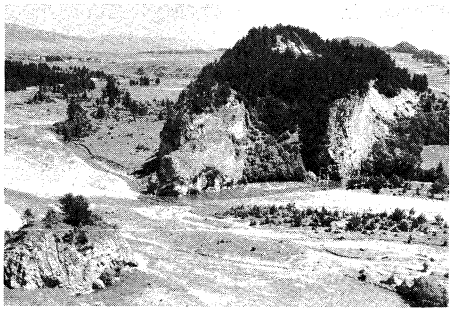
Besant wrote 32 novels in the 19 years after Rice's death. His biographies include *Rabelais* (1879), and he also wrote critical and topographical studies, notably about London, and an autobiography (1902). He helped to found the Society of Authors in 1884 and edited its journal until his death. He was knighted in 1895.

Besenyo (Turkic people): *see* Pechenegs.

Besharreh (Lebanon): *see* Bsharrī.

Beshṭ (Jewish mystic): *see* Baʿal Shem Ṭov.

Beskids, Czech BESKYDY, Polish BESKIDY, discontinuous series of forested mountain ranges lying partly in Czechoslovakia and partly in Poland. The Czech sections at the western end of the Carpathian Mountains lie south and east of the Moravian Gate and are identified locally by smaller units. Moravskoslezské Beskydy (Moravian-Silesian Beskids) are made up of the Radhošť and Lysá hora



Pieniny range in the Beskids, Poland

Eastfoto

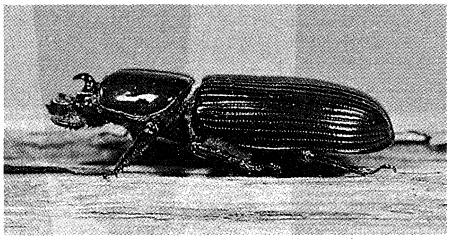
(Bald Mountain) groups. The highest points in the range are Babia Góra (*q.v.*; 5,659 ft [1,725 m]) in Poland and Pilsko (5,108 ft [1,557 m]) in Czechoslovakia. Around this central section are grouped the Těšinské Beskydy, to the north; the Hostýnské vrchy (mountains), southwest; the Vsatské, or Vsetínské vrchy, south; and, further south, along the Moravian–Slovak border, the Javorníky (*q.v.*). The Slovenské Beskydy (Polish Beskid Żywiecki) lie to the east along the Czech side of the frontier with Poland. Iron deposits in the northwest foothills led to the establishment of the iron and steelworks of the Ostrava district in Czechoslovakia.

The Beskid group has a mountain climate: dry summers are suitable for pasture and sheep breeding; the ample snow encourages winter sports centred on Frenštát and Vsetín. Villages are small, scattered, and often difficult of access. An ornate Wallachian costume continues to be worn on special occasions.

Beskra (Algeria): *see* Biskra.

bess beetle, also called BESS-BUG, BETSY BUG, or HORNED PASSALUS BEETLE, any of the approximately 800 species of the insect family Passalidae (order Coleoptera). They occur mainly in the tropics, although several species have been found in North America (*e.g., Passalus cornutus*). Bess beetles are rather large, ranging between 30 and 40 millimetres (about 1.5 inches) in length. Because of their shiny black wing covers (elytra), they are sometimes called patent leather beetles. They are rather flat and squarish with a horn that points forward on the top of the head.

Bess beetles live together under the bark of decaying logs in a primitive social organization. Both the male and female process the food (decaying wood) and feed it to the larvae. Similar sharing of work between males and females occurs only in termite societies. Bess beetle adults and larvae communicate by



Bess beetle (*Popilius disjunctus*)
Richard Parker

sounds that are audible to man. The adult rubs its wings across rough patches on the abdomen, and the larva rubs its vestigial (degenerate) hind pair of legs against its middle legs.

Bessa Luís, Maria Agustina (b. Oct. 15, 1922, Vila Meã, Port.), novelist and short-story writer influenced by Marcel Proust and Franz Kafka whose fiction diverged from the predominantly Neorealistic regionalism of mid-20th-century Portuguese literature to incorporate elements of Surrealism.

Of the more than a dozen novels Bessa Luís had published by the early 1980s, the best known was *A Sibila* (1954; "The Sybil"), which won the Eça de Queirós prize and in which the boundary between physical, psychological, and ironic reality is tenuous and the characters gain an almost mythic quality. In Bessa Luís's fiction, notions of time and space become vague, and planes of reality flow together, dimming the sense of a logical order of events. Her prose has been called "metaphysical" and "ultra-psychological," and Kafkaesque elements may be distinguished in the fictional world she creates. Other well-known novels of Bessa Luís include *Os Incuráveis* (1956; "The Incurables"), *A Muralha* (1957; "The Stone Wall"), *O Susto* (1958; "The Fright"), *O Manto* (1961; "The Mantle"), and *O Sermão de Fogo* (1963; "The Sermon of Fire").

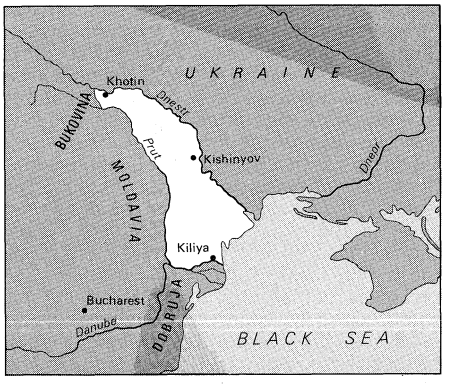
Bessa Victor, Geraldo, Victor also spelled VÍTOR (b. Jan. 20, 1917, São Paulo de Luanda, Angola), African lyric poet whose work expresses the dream of racial harmony and the need to recapture the openness and purity of childhood.

Bessa Victor's poetry in Portuguese includes *Ecos dispersos* (1941; "Scattered Echoes"), *Ao som das marimbas* (1943; "To the Sound of the Marimbas"), *Mucanda* (1946), *Debaixo de céu* (1949, 2nd. ed. 1966; "Under the Sky"), *Cubata abandonada* (1958; "The Abandoned Vat"), and *Monandengue* (1973; "Child"). A selection of his work was translated into French by Gaston-Henry Aufrère and published as *Poèmes africains* (1967; "African Poems"). A controversial poet, Bessa Victor has been criticized for his exoticism and his failure to articulate the rage of oppressed Africans; others have praised his vision, the musicality of his verse, and his capacity to see the best in both African and European civilizations.

Bessa Victor also wrote a collection of short stories, *Sanzala sem Batuque* (1967; "The Slave House with Gaiety"), and books on Kimbundu proverbs, Angolan history, and African literary themes. In *Quinjango no folclore angolense* (1970) he describes and analyzes Angolan folklore. He continues the Angolan tradition of the poet-scholar that has been prominent since the late 19th century. In all his writings, there is a warmth of tone and gentleness of expression. He lived for many years in Lisbon.

Bessarabia, Russian BESSARABIYA, Romanian BASARABIA, Turkish BESARABYA, region in eastern Europe that passed successively, during the 15th to 20th century, to Moldavia, the Ottoman Empire, Russia, Romania, and the Soviet Union. It is bounded physically by the Prut River on the west, the Dnestr (Dniester) on the north and east, the Black Sea on the southeast, and the Kiliya (Chilia) arm of the Danube delta on the south. Bessarabia borders Bukovina (an area divided in 1947 between Romania and the U.S.S.R.), Romanian Moldavia, the Ukraine, and Dobruja (an area on the Black Sea divided in 1940 between Romania and Bulgaria).

Although the early history of Bessarabia is obscure, it is known that Greek colonies were founded along its Black Sea coast (7th century BC) and that it was probably included in the kingdom of Dacia (2nd century AD). The Slavs began to enter the area in the 6th century, but their settlement was interrupted by invasions of other peoples from the East (ending with the Mongol invasion in the 13th century).



Bessarabia

At the end of the 14th century the southern portion of the region became part of Walachia (the name Bessarabia probably is derived from the Walachian dynasty Basarab); and in the 15th century the entire province was incorporated into the principality of Moldavia. Shortly thereafter the Turks invaded and captured Akkerman and Chilia (1484) and annexed the southern portion of Bessarabia, dividing it into two *sancak*s (districts) of the Ottoman Empire. The remainder of Bessarabia fell under Turkish domination when Moldavia submitted to the Turks in the 16th century. The region remained under Turkish control until the 19th century.

Then Russia, whose interest in the area had developed during the 18th century (it had occupied the region five times between 1711 and 1812), acquired Bessarabia and half of Moldavia (Treaty of Bucharest, 1812). The name Bessarabia was applied to the entire region. Russia retained control of the region until World War I (with the exception of a strip of southern Bessarabia, which was in Moldavia's possession from 1856 to 1878). During the beginning of the 19th century Russia granted Bessarabia autonomy (1818–28) and allowed it a Moldavian governor and archbishop. But by the end of the century, Russification in both the civil and ecclesiastical administrations was the dominant policy.

A nationalist movement developed in Bessarabia after the Russian Revolution of 1905; and in November 1917 (after the Russian revolutions of 1917) a council (*sfatul ţărei*) was established. It declared Bessarabia's independence on Jan. 24, 1918, and voted to unite with Romania in December. The Treaty of Paris (Oct. 28, 1920) confirmed this union, but the Soviet Union never recognized Romania's right to the province. After the German–Soviet Treaty of Nonaggression was signed (Aug. 23, 1939), the Soviet Union demanded (June 26, 1940) that Romania cede Bessarabia and the northern portion of Bukovina. The Romanian government complied; Soviet troops entered the region on June 28. In August 1940 the Moldavian Soviet Socialist Republic was created out of the central districts of Bessarabia and a strip of Ukrainian territory on the other side of the Dnestr; Kishinev became its capital. The northern region of Bessarabia (Khotin) and the coastal plain from the Danube to the Dnestr were incorporated into the Ukrainian S.S.R. During World War II Romanians occupied Bessarabia and temporarily reorganized it as part of Romania. The Soviet Union seized it in 1944, and the territorial arrangements of 1940 were reestablished.

Bessarabia contains much of archaeological interest, including mounds and barrows of early epochs, remains of a wall built by Trajan, some traces of Greek and Roman towns, and some forts along the Dnestr built by the Genoese in the 14th century. *See also* Moldavian Soviet Socialist Republic.

Bessarion, John, original name BASIL BESSARION (b. Jan. 2, 1403, Trebizond, Trebizond Empire—d. Nov. 18, 1472, Ravenna), Byzantine Humanist and theologian, later a Roman cardinal, and a major contributor to the revival of letters in the 15th century.

Bessarion was educated at Constantinople and became a monk in 1423. In 1437 he was made archbishop of Nicaea (now Iznik, Tur.) by the Byzantine emperor John VIII Palaeologus. He accompanied John to Italy in order to negotiate a union between the Byzantine and Western churches as a means of mobilizing assistance against the Turks, who had invaded the Balkan Peninsula and threatened Constantinople.

At the councils held in the Italian cities of Ferrara and Florence, Bessarion supported union, which was unacceptable to others in the Byzantine Church. Bessarion, however, remained in communion with Rome and gained the favour of Pope Eugenius IV, who made him cardinal in 1439. Thereafter, he lived in Italy. At Rome he contributed to the development of the Roman Academy of History and of Archaeology, and, with his former teacher Gemistus Plethon, the celebrated Neoplatonist, he founded in 1442 the Accademia Platonica at Florence for the study of Greek literature and Plato's philosophy. From 1450 to 1455 he served as papal governor of Bologna and was sent on embassies to various foreign princes, including King Louis XI of France in 1471.

One of the most learned scholars of his time, Bessarion spread knowledge of Greek language and learning by building a personal library that included a large collection of Greek manuscripts, by his patronage of scholars, and by his writing. He later donated his library to the Senate of Venice. Bessarion was made patriarch of Constantinople in 1463. His most important work is considered to be

In calumniatorem Platonis, a treatise defending Plato against the fervid Aristotelianism of George of Trebizond. His attempts to reconcile the two philosophies influenced Italian philosophy, which assimilated the Byzantine philosophical tradition after the fall of Constantinople in 1453.

Bessel, Friedrich Wilhelm (b. July 22, 1784, Minden, Brandenburg—d. March 17, 1846, Königsberg, Prussia), German astronomer whose measurements of positions for about 50,000 stars allowed the first accurate determination of interstellar distances; he was the first to measure the distance of a star other than the Sun. He also made important contributions in geodesy.

Life and accomplishments. Bessel was born in Westphalia (now in West Germany), the son of a poor government employee. At the age of 15, he entered an export-import firm.

Bessel, engraving by E. Mandel after a painting by Franz Wolf
The Bettmann Archive

During his apprenticeship, dreaming of travel, he studied languages, geography, the habits of distant peoples, and the principles of navigation, which led him to astronomy and mathematics. Working at night, in 1804 he wrote a paper on Halley's Comet in which he calculated the orbit from observations made in 1607. He sent it to Olbers, who was so impressed that he arranged its publication in *Monatliche Correspondenz* (x, 1804) and proposed Bessel as assistant at the Lilienthal observatory of the celebrated early lunar observer J.H. Schröter. Bessel, who was liked and appreciated by his commercial firm, was obliged to choose between a position of relative affluence if he remained in it and poverty and the stars if he left it. He decided for the latter.

After only four years at Lilienthal, the Prussian government charged him with the construction at Königsberg (now Kaliningrad) of the first big German observatory. In 1810 he was appointed professor of astronomy at Königsberg, where he worked assiduously on the reconstruction of the whole science of astronomical observations, directing the observatory from the date of its completion in 1813 until the end of his life.

In geodesy, Bessel's contributions include a correction in 1826 to the seconds pendulum, the length of which is precisely calculated so that it requires exactly one second for a swing. During 1831–32 he directed geodetical measurements of meridian arcs in East Prussia, and in 1841 he deduced a value of $1/299$ for the ellipticity of the Earth, the amount of elliptical distortion by which the Earth's shape departs from a perfect sphere. He was the first to make effective use of the heliometer, an instrument designed for measuring the apparent diameter of the Sun. He introduced corrected observations for the so-called personal equation, a statistical bias in measurement characteristic of the observer himself that must be eliminated before results can be considered reliable, and he made a systematic study of the causes of instrumental errors. His own corrected observations were more accurate than any previous ones, and his methods offered the way to great advances in the field.

Bessel early recognized where his potential genius lay; and he succeeded in realizing it in a profession entirely different from the one that he originally followed. Heinrich Wilhelm Matthäus Olbers (1758–1840), the German astronomer who calculated numerous comet orbits and took a leading part in the discovery of the minor planets, later said that the greatest service he had rendered astronomy was that he recognized and furthered Bessel's genius.

The later achievements of Bessel were possible only because he first established the real framework of the universe by making accurate measurements of the positions and motions of the nearest stars, making corrections for various measuring errors caused by imperfections in his telescopes and by disturbances in the atmosphere. Having established exact positions for thousands of individual stars, he was ready to observe exceedingly small but highly significant motions, relative to one another, among them. Choosing 61 Cygni, a star barely visible to the naked eye and known to possess a relatively high velocity in the plane of the sky, Bessel showed that, after correcting for this, the star apparently moved in an ellipse every year. This back and forth motion, called parallax, he said could only be interpreted as being caused by the motion of the Earth around the Sun. Calculation indicated a distance from Earth to 61 Cygni of 10.3 light-years. (The nearest star known is Alpha Centauri, 4.3 light-years away.) Olbers, presented with these conclusions on his 80th birthday, thanked Bessel and said the gift "put our ideas about the universe for the first time on a sound basis." Bessel was honoured for this achievement by the Royal Astronomical Society of London and others.

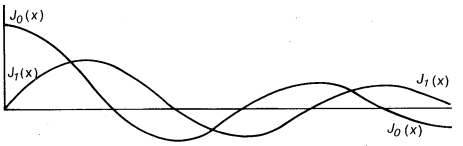
A major discovery by Bessel was that the two bright stars Sirius and Procyon execute minute motions that could be explained only by assuming that they had invisible companions disturbing their motions. The existence of such bodies, now named Sirius B and Procyon B, was confirmed with more powerful telescopes after Bessel's death. An important share in the discovery of the planet Neptune also belongs to Bessel. In a paper read in 1840, he called attention to exceedingly small irregularities in the orbit of Uranus, which he had observed and concluded were caused by an unknown planet beyond.

He published a number of major articles and introduced a multivolume series, *Astronomische Beobachtungen auf der K. Sternwarte zu Königsberg* (1815–44). His minor papers number more than 350.

Assessment. Bessel was a scientist whose works laid the foundations for a better determination than any previous method had allowed of the scale of the universe and the sizes of stars, galaxies, and clusters of galaxies. In addition, he made fundamental contributions to accurate positional astronomy, the exact measurement of the positions of celestial bodies; to celestial mechanics, dealing with their movements; and to geodesy, the study of the Earth's size and shape. Further, he enlarged the resources of pure mathematics by his introduction and investigation of what are now known as Bessel functions, which he used first in 1817 to investigate the very difficult problem of determining the motion of three bodies moving under mutual gravitation. Seven years later he developed Bessel functions more fully for the treatment of planetary perturbations. Much credit for the final establishment of a scale for the universe in terms of solar system and terrestrial distances, which depends vitally on accurate measurement of the distances of the nearest stars from the Earth, must go to Bessel.

BIBLIOGRAPHY. Additional biographical information may be found in the *Dictionary of Scientific Biography*, ed. by Charles C. Gillispie, vol. 2, pp. 97–102 (1970), and in works on astronomy, such as Henry S. Williams, *The Great Astronomers* (1930); and Agnes M. Clerke, *A Popular History of Astronomy During the Nineteenth Century*, 4th ed. rev. (1902).

Bessel function, also called CYLINDER FUNCTION, any of a set of mathematical functions systematically derived around 1817 by the German astronomer Friedrich Wilhelm Bessel during an investigation of solutions of one of Kepler's equations of planetary motion. Particular functions of the set had been formulated earlier by the Swiss mathematicians Daniel Bernoulli, who studied the oscillations of a chain suspended by one end, and Leonhard Euler, who analyzed the vibrations of a stretched membrane.



Bessel functions

After Bessel published his findings, other scientists found that the functions appeared in mathematical descriptions of many physical phenomena, including the flow of heat or electricity in a solid cylinder, the propagation of electromagnetic waves along wires, the diffraction of light, the motions of fluids, and the deformations of elastic bodies. One of these investigators, Lord Rayleigh, also placed the Bessel functions in a larger context by showing that they arise in the solution of Laplace's equation (*q.v.*) when the latter is formulated in cylindrical (rather than Cartesian or spherical) coordinates.

Specifically, a Bessel function is a solution of the differential equation

$$x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+(x^2-n^2)\,y=0,$$

which is called Bessel's equation. For integral values of n, the Bessel functions are

$$J_n(x)=\frac{x^n}{2^n n!}\left[1-\frac{x^2}{2(2n+2)}+\frac{x^4}{2\cdot 4(2n+2)(2n+4)}-\cdots\right].$$

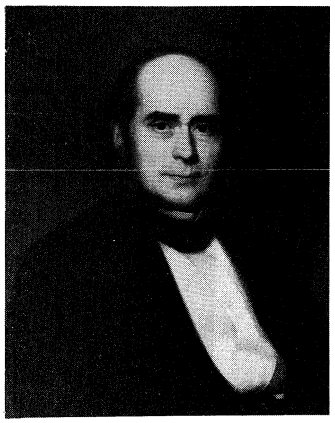
The graph of $J_0(x)$ looks like that of a damped cosine curve, and that of $J_1(x)$ looks like that of a damped sine curve (*see* Graph).

Certain physical problems lead to differential equations analogous to Bessel's equation; their solutions take the form of combinations of Bessel functions and are called Bessel functions of the second or third kind.

Bessemer, city, Jefferson County, north central Alabama, U.S. Named after Sir Henry Bessemer, it was founded on the site of Ft. Jonesboro in 1887 by Henry F. DeBardeleben, a local coal baron who built the first steel plant in the area. In 1886 the Bessemer Land Company (now Bessemer Coal, Iron, and Land Company) was formed. In 1922 an explosion at the nearby dolomite mine killed 100 persons. The city was planned as a steel centre, and its manufactures include railroad cars, pipe, structural materials, chemicals, and explosives. Bessemer's Bell furnace produced the first basic iron in Alabama. Inc. 1887. Pop. (1980) 31,729.

Bessemer, Sir Henry (b. Jan. 19, 1813, Charlton, Hertfordshire, Eng.—d. March 15,

1898, London), inventor and engineer who developed the first process for manufacturing steel inexpensively (1856), leading to the development of the Bessemer converter. He was knighted in 1879.



Bessemer, detail of an oil painting by Rudolf Lehmann; in the Iron and Steel Institute, London

By courtesy of The Iron and Steel Institute, London; photograph, The Science Museum, London

Bessemer was the son of an engineer and typefounder. He early showed considerable mechanical skill and inventive powers. After the invention of movable stamps for dating deeds and other government documents, and the improvement of a typesetting machine, he went to the manufacture of "gold" powder from brass for use in paints. The florid decoration of the time demanded great quantities of such material, and Bessemer's secret process soon brought him great wealth.

He developed other inventions, notably sugarcane-crushing machinery of advanced design, but he was soon devoted to metallurgy. In his time there were but two iron-based construction materials: cast iron made by the treatment of iron ore with coke in the blast furnace and wrought iron made from cast iron in primitive furnaces by the laborious manual process of "puddling" (stirring the melted iron to remove carbon and raking off the slag). Cast iron was, and still is, excellent for loadbearing purposes, such as columns or bridge-piers, and for engine parts, but for girders and other spans, and particularly for rails, only wrought iron was suitable. Puddling removed carbon, which makes cast iron brittle, and produced a material that could be rolled or forged, but only in "blooms," or large lumps of 100–200 pounds, and that was full of slag. The blooms had to be laboriously forged together by steam hammers before they could be rolled to any useful length or shape. The only material known as steel was made by adding carbon to pure forms of wrought iron, also by slow and discontinuous methods; the material was hard, would take an edge, and was used almost entirely for cutting tools.

During the Crimean War, Bessemer invented an elongated artillery shell that was rotated by the powder gases. The French authorities with whom he was negotiating, however, pointed out that their cast-iron cannon would not be strong enough for this kind of shell. He thereupon attempted to produce a stronger cast iron. In his experiments he discovered that the excess oxygen in the hot gases of his furnace appeared to have removed the carbon from the iron pigs that were being preheated—much as the carbon is removed in a puddling furnace—leaving a skin of pure iron. Bessemer then found that blowing air through melted cast iron not only purified the iron but also heated it further, allowing the purified iron to be easily poured. This heating effect is caused by the combustion of the carbon (and some silicon) in the iron. Utilizing these new techniques, which later became known as the Bessemer process *(q.v.)*, he was soon able to produce large, slag-free ingots as workable as any wrought-iron bloom, and far larger; he invented the tilting converter into which molten pig iron could be poured before air was blown in from below. Eventually, with the aid of an iron-manganese alloy, which was developed at that time by Robert Forester Mushet, Bessemer also found how to remove excess oxygen from the decarburized iron.

His announcement of the process in 1856 before the British Association for the Advancement of Science in Cheltenham, Gloucestershire, brought many ironmasters to his door, and many licenses were granted. Very soon, however, it became clear that two elements harmful to iron, phosphorus and sulfur, were not removed by the process—or at least not by the fireclay lining of Bessemer's converter. It was not until 1878 that the British metallurgist Sidney Gilchrist Thomas developed a lining that removed phosphorus and made possible the use of phosphoric ores of the Continent.

Bessemer had, unknown to himself, been using phosphorus-free iron, but the ironmasters were not so lucky. Their iron was perfectly satisfactory for the puddling process, in which phosphorus is removed because the temperatures are lower, but it could not be used in the Bessemer process. Bessemer was forced to call in his licenses and find a phosphorus-free source of iron in northwestern England; thus he was able to enter the steel market on his own. Once the phosphorus problem was recognized and solved, he became a licensor once again, and vast profits flowed in. It became clear that "mild steel"—as it was known to distinguish it from the hard tool steels—could more clearly and reliably be used in place of wrought iron for ship plate, girders, sheet, rods, wire, rivets, and other items. The invention of the open-hearth (Siemens-Martin) process in the late 1860s eventually outstripped that of the Bessemer process. This has now yielded place, in great measure, to oxygen steelmaking, a development of the Bessemer process.

In his later years—the process had not become a clear success until he was nearing 70—Bessemer continued to invent and make discoveries. The solar furnace he built was more than a successful toy; he designed and built an astronomical telescope for his own amusement; he developed a set of machines for polishing diamonds that helped to reestablish that trade in London; his lifelong susceptibility to seasickness led him to develop a stabilized cabin for steamships, but it was not wholly successful.

Apart from his knighthood, he received many honours, such as the Fellowship of the Royal Society, the Freedom of the City of London, and the presidency of the Iron and Steel Institute, as well as many foreign distinctions.

(J.P.S.)

BIBLIOGRAPHY. Sir Henry Bessemer, *An Autobiography,* with a concluding chapter by his son, Henry Bessemer (1905), the only comprehensive work, and the source of most material written since; "The Manufacture of Iron Without Fuel," *The (London) Times,* p. 10, col. 5–6 (Aug. 14, 1856), the complete address to the British Association at Cheltenham, reprinted from Bessemer's original text.

Bessemer process, the first method discovered for mass-producing steel, although the priority in the invention lies with William Kelly of the United States rather than with Sir Henry Bessemer of England. In 1846 Kelly, a businessman-scientist of Pittsburgh, began experiments aimed at developing a revolutionary means of removing impurities from pig iron by an air blast; Kelly theorized that not only would the air, injected into the molten iron, supply oxygen to react with the impurities, converting them into oxides separable as slag, but that the heat evolved in these reactions would increase the temperature of the mass, keeping it from solidifying during the operation. After several failures, he succeeded in proving his theory and rapidly producing steel ingots.

In 1856 Bessemer, working independently in Sheffield, developed and patented the same process. Another Englishman, Robert Forester Mushet, found that adding an alloy of carbon, manganese, and iron after the air-blowing was complete restored the carbon content of the steel while neutralizing the effect of remaining impurities, notably sulfur. A Swedish ironmaster, Goran Goransson, redesigned the Bessemer furnace, or converter, making it reliable in performance. The end result was a means of mass-producing steel. The resultant volume of low-cost steel in Britain and the U.S. soon revolutionized building construction and provided steel to replace iron in railroad rails and many other uses.

The Bessemer converter is a cylindrical steel pot about 20 feet (6 metres) high, originally lined with a siliceous refractory. Air is blown in through openings (tuyeres) near the bottom, creating oxides of silicon and manganese, which become part of the slag, and of carbon, which are carried out in the stream of air. Within a few minutes an ingot of steel can be produced, ready for the forge or rolling mill.

The original Bessemer converter was not effective in removing the phosphorus present in sizable amounts in most British and European iron ore, but the invention in England, by Sidney Gilchrist Thomas, of what is now called the Thomas–Gilchrist converter, lined with a basic material such as burned limestone, overcame this problem. Another drawback to Bessemer steel, its retention of a small percentage of nitrogen from the air blow, was not corrected until the 1950s; meanwhile the open-hearth process, which did not suffer from this difficulty, became the dominant steelmaking process in most of the world.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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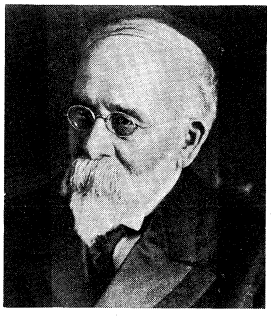
Bessey, Charles E(dwin) (b. May 21, 1845, near Milton, Ohio, U.S.—d. Feb. 25, 1915, Lincoln, Neb.), botanist who introduced to the United States the systematic study of plant morphology and the experimental laboratory



Bessey, *c.* 1910

By courtesy of W.A. Archer and the Hunt Institute, Pittsburgh

for botanical instruction on the college level. His arrangement of angiosperm (flowering plant) taxa, emphasizing the evolutionary divergence of primitive forms, is considered by many as the system most likely to form the basis of a modern, comprehensive taxonomy of the plant kingdom. Because of its emphasis on North American species, however, Bessey's taxonomy in its original form, representing 23 years of development (1893–1915), has found

application only in the north central region of the United States.

At Iowa State Agricultural College, Ames, where he taught botany (1870–84), Bessey established a European laboratory method of undergraduate instruction with rudimentary facilities that included a single compound microscope. By 1884, when he accepted the chair of botany at the University of Nebraska, (a position that he held until 1915), he had developed the experimental study of plant morphology to such a degree that the recently founded university immediately became one of the nation's outstanding centres for botanical research.

Bessey's works include *Botany for High Schools and Colleges* (1880), *The Essentials of Botany* (1884), and *Essentials of College Botany* (1914), all widely popular textbooks that dominated botanical instruction in the United States for more than half a century.

Bessières, Jean-Baptiste, DUC (duke) D'ISTRIE (b. Aug. 6, 1768, Prayssac, Fr.—d. May 1, 1813, Rippach, Saxony), French soldier and, as one of Napoleon's marshals, commander of the imperial guard after 1804. His appointment as marshal signalled Napoleon's intention to develop the imperial guard. A polished but unpretentious man, he was one of the Emperor's few intimate friends.

In 1792 Bessières joined Louis XVI's constitutional guard as a private. After serving in Catalonia as a captain, he was chosen to command Napoleon's escort in Italy in 1796. He fought bravely at Aboukir, Egypt, in 1798 and two years later commanded 800 men of the consular guard at the Battle of Marengo (June 14). In 1805, with 9,000 guards, he led the famous charge against the Russian guard cavalry at Austerlitz (December 2).

Bessières, engraving

By courtesy of the Bibliotheque Nationale, Paris

In Spain Bessières's victory at Medina de Ríoseco (1808) enabled Napoleon's brother Joseph to reach Madrid and establish himself as king of Spain. Commanding the cavalry corps against Austria in 1809, Bessières led charges to cover the retreat in the Battle of Aspern-Essling (May 22) and to gain time at the Battle of Wagram (July 5–6), where he was severely wounded. Yet he was soon sent to end the British Walcheren expedition in Flanders. In 1809 he was created duke of Istria. Sent back to Spain in command of 50,000 men to hold the north, he was unable to bring more than a few of his cavalry to join André Masséna for the Battle of Fuentes de Oñoro (May 3, 1811). In 1812 Bessières led the guard cavalry to Russia and lost them almost without fighting. On the day before the Battle of Lützen (May 2), he was killed in a clash at nearby Rippach while on reconnaissance.

Besson, Jacques (b. 1540, Grenoble, Fr.—d. 1576, Orléans), engineer whose improvements in the lathe were of great importance in the development of the machine tool industry and of scientific instrumentation.

Besson's designs, published in his illustrated treatise *Theatrum instrumentorum* (1569), introduced cams and templates (patterns used to guide the form of a piece being made) to the screw-cutting lathe, thus increasing the operator's mechanical control of tool and workpiece and permitting the production of more accurate and intricate work in metal. He also improved the drive and feed mechanism of the ornamental lathe and described a more efficient form of waterwheel, considered a prototype of the water turbine.

Bessus (d. *c.* 329 BC), Achaemenid satrap (governor) of Bactria and Sogdiana under King Darius III of Persia. In 330, after Alexander the Great had defeated Darius in several major battles, Bessus murdered Darius and assumed the kingship as Artaxerxes IV. He then attempted to continue resistance against Alexander in the eastern part of the empire but was captured and killed for his regicide.

Best, Charles H(erbert) (b. Feb. 27, 1899, West Pembroke, Maine, U.S.—d. March 31, 1978, Toronto), physiologist who, with Sir Frederick Banting, was the first to obtain

Best

By courtesy of the University of Toronto; photograph, Ashley & Crippen, Toronto

(1921) a pancreatic extract of insulin in a form that controlled diabetes in dogs. Successful use of insulin in treating human patients followed. Because Best was only an undergraduate at the time of the discovery, he did not share the Nobel Prize for Physiology or Medicine awarded to Banting and J.J.R. Macleod in 1923 for their role in the work. Best also discovered the vitamin choline and the enzyme histaminase. He was the first to introduce anticoagulants in treatment of thrombosis (blood clots).

In May 1921, while still an undergraduate, Best became a laboratory assistant to Banting at the University of Toronto. He continued as research associate in the Banting and Best Department of Medical Research, created at the university in 1923, and succeeded Banting as director (1941–67). With Banting he wrote *Internal Secretions of the Pancreas* (1922).

Best Friend of Charleston, first locomotive built in the United States for regular railway service. A vertical boiler mounted on a four-wheel carriage, the "Best Friend" was built by the West Point Foundry of New York and put into service on a broad-gauge line from Charleston to Hamburg, S.C., by the South Carolina Canal and Rail Road Company on Dec. 25, 1830. The line later became part of the Southern Railway System.

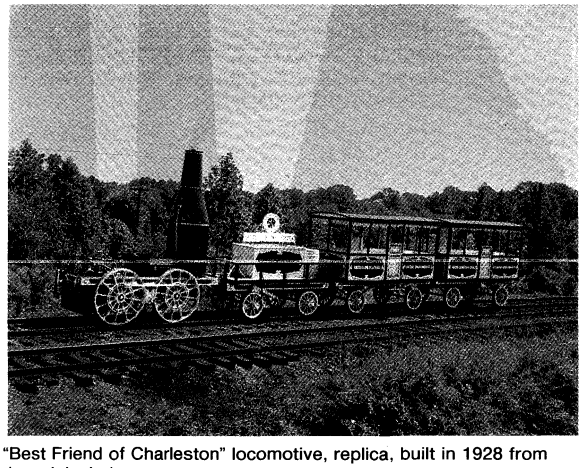
best of all possible worlds, in the philosophy of the 17th- and 18th-century philosopher Gottfried Wilhelm Leibniz, the present world of monads (infinitesimal psychophysical entities) coordinated in preestablished harmony. Among all possible worlds that God could have created, his actual choice of one over the others required a "sufficient reason," which, for Leibniz, was the fact that this world was the "best"—despite the existence of evident evils; for any other "possible world" would have had evils of its own sort of even greater magnitude. Had it lacked a sufficient reason to explain its existence (and implicitly its contingency), the world for Leibniz would have existed of necessity. Voltaire's *Candide* (1759) was a satirical rejection of Leibniz' optimistic view of the world.

best-seller, book that, for a time, leads all others of its kind in sales, a designation that serves as an index of popular literary taste and judgment. *Bookman,* a U.S. magazine of literature and criticism, began running best-seller lists in 1895, when it began publication. The list was compiled from reports of sales at bookstores throughout the country. Similar lists began to appear in other literary magazines and in metropolitan newspapers. The lists most commonly considered authoritative in the United States are those of *Publisher's Weekly* and *The New York Times.* The practice spread from the United States; the British list generally considered most authoritative is that of *The Sunday Times* (London), reprinted in *Bookseller.*

Such lists are obviously of greatest use to publishers and booksellers. From the beginning there has been a tendency among both critics and the general public to suppose that because a book is a best-seller it cannot have literary merit. This is not necessarily true.

Students of popular literary taste point out that the leading categories of books, in terms of sales, are religious and "inspirational" books, books of advice for self-improvement, romantic and semi-historical novels, and novels of sex and sensationalism.

Excluded from such lists are the works of Shakespeare, the Bible, and direct-mail and book-club sales. The all-time best-seller in the English-speaking world—said to be unequalled in sales—is the Bible. Indeed, in the



"Best Friend of Charleston" locomotive, replica, built in 1928 from the original plans

By courtesy of the Southern Railway System

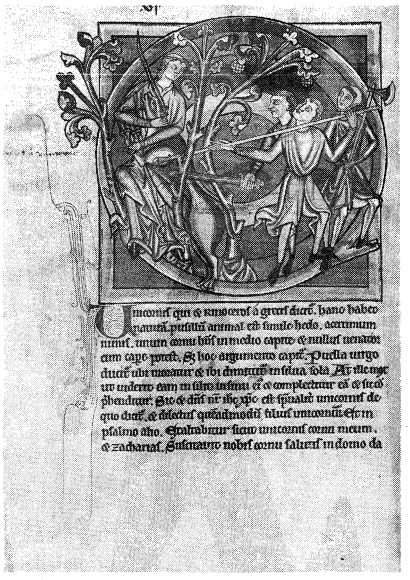
United States, in the period since 1895, the only book that has outsold it in a given month is Margaret Mitchell's *Gone with the Wind* (1936), a historical novel set in the South during the U.S. Civil War and Reconstruction periods. Other all-time best-selling titles, such as Charles Sheldon's *In His Steps* (an estimated 8,000,000 copies since 1897), Lloyd C. Douglas' *The Robe* (1942), and Henry Morton Robinson's *The Cardinal* (1950), reveal the popularity of books with religious themes. Also highly popular among U.S. readers are books of self-improvement or self-help, such as Dale Carnegie's *How to Win Friends and Influence People* (1937), Benjamin Spock's *The Common Sense Book of Baby and Child Care* (1946), and Thomas Harris' *I'm O.K., You're O.K.* (1969).

The advent of the mass-produced paperback, which began in the late 1930s, resulted in separate paperback best-seller lists, beginning in 1976. Other categories that are highly successful are cookbooks (*Better Homes and Gardens Cook Book* has sold more than 18,000,000 copies since 1930) and crime—both fiction and nonfiction (*e.g.,* Mario Puzo's *The Godfather* [1969] and Carl Bernstein and Robert Woodward's *All the President's Men* [1974]). The taboo against sexual explicitness that earlier resulted in censorship or moral disapproval had disappeared by the second half of the 20th century, so that Jacqueline Susann's novel *Valley of the Dolls* (1966) and David Reuben's *Everything You Always Wanted to Know about Sex but Were Afraid to Ask* (1969) were both among the top 20 all-time best-sellers.

bestiality (sexual deviation): *see* zoophilia.

bestiary, in the Middle Ages, a literary genre, a collection of stories, each of which was based on a description of certain qualities of an animal, plant, or even stone. The stories presented Christian allegories for moral and religious instruction and admonition.

The numerous manuscripts of medieval bestiaries ultimately are derived from the Greek *Physiologus,* a text compiled by an unknown author before the middle of the 2nd century AD. It consists of stories based on the "facts" of natural science as accepted by someone called Physiologus (Naturalist), about whom nothing further is known, and from the compiler's own religious ideas.



Decorated initial for the story about the unicorn in a late 12th-century Latin bestiary (Harley MS. 4751, folio 6v); in the British Library

Reproduced by permission of the British Library Board

The *Physiologus* consists of 48 sections, each dealing with one creature, plant, or stone and each linked to a biblical text. It probably originated in Alexandria and, in some manuscripts, is ascribed to one or other of the 4th-century bishops Basil and Epiphanius, though it must be older. The stories may derive from popular fables about animals and plants. Some Indian influence is clear, *e.g.,* in the introduction of the elephant and of the Peridexion tree, actually called Indian in the *Physiologus.* India may also be the source of the story of the unicorn, which became very popular in the West.

The popularity of the *Physiologus,* which circulated in the early Middle Ages only less widely than the Bible, is clear from the existence of many early translations. It was translated into Latin (first in the 4th or 5th century), Ethiopian, Syriac, Arabic, Coptic, and Armenian. Early translations from the Greek also were made into Georgian and into Slavic languages.

Translations were made from Latin into Anglo-Saxon before 1000. In the 11th century an otherwise unknown Thetbaldus made a metrical Latin version of 13 sections of the *Physiologus.* This was translated, with alterations, in the only surviving Middle English *Bestiary,* dating from the 13th century. It, and other lost Middle English and Anglo-Norman versions, influenced the development of the beast fable. Early translations into Flemish and German influenced the satirical beast epic. Bestiaries were popular in France and the Low Countries in the 13th century, and a 14th-century French *Bestiaire d'amour* applied the allegory to love. An Italian translation of the *Physiologus,* known as the *Bestiario toscano,* was made in the 13th century.

Many of the medieval bestiaries were illustrated; the manuscript of the earliest known of these is from the 9th century. Illustrations accompanying other medieval manuscripts are often based on illustrations in the *Physiologus,* as are sculptures and carvings (especially in churches) and frescoes and paintings well into the Renaissance period.

The religious sections of the *Physiologus* (and of the bestiaries that were derived from it) are concerned primarily with abstinence and chastity; they also warn against heresies. The frequently abstruse stories to which these admonitions were added were often based on misconceptions about the facts of natural history: *e.g.,* the stag is described as drowning its enemy, the snake, in its den; and the ichneumon as crawling into the jaws of the crocodile and then devouring its intestines. Many attributes that have become traditionally associated with real or mythical creatures derive from the bestiaries: *e.g.,* the phoenix' burning itself to be born again, the parental love of the pelican, and the hedgehog's collecting its stores for the winter with its prickles. These have become part of folklore and have passed into literature and art, influencing the development of allegory, symbolism, and imagery, though their source in the bestiary may be frequently overlooked.

Bestuzhev-Ryumin, Aleksey Petrovich, Graf (Count) (b. June 1 [May 22, old style], 1693, Moscow—d. April 21 [April 10, O.S.], 1766, Russia), diplomat and statesman who controlled Russia's foreign affairs during the reign of the empress Elizabeth.

Sent by Peter the Great to Copenhagen and Berlin for his education, Bestuzhev began his diplomatic career in the service of the Elector of Hanover at the Congress of Utrecht, which met in 1712 to end the War of the Spanish Succession. He subsequently went to London when the Elector became George I of England and then served briefly in the court of Anna (duchess of Courland and future empress of Russia). In 1721 he became the Russian minister at Copenhagen. The death of Peter (1725), however, prevented Bestuzhev's further advancement until 1740, when he was recalled to Russia by Ernst J. Biron, the empress Anna's chief adviser.

After a brief period of imprisonment following Biron's fall from power (1740), Bestuzhev was appointed vice chancellor by the new empress Elizabeth (1741). He soon became convinced that Russia's interests conflicted with those of France and Prussia and sought to ally Russia with Austria and Great Britain. Despite opposition within Elizabeth's court, Bestuzhev, aided by his brother, the diplomat Mikhail Petrovich, concluded an Anglo-Russian defensive alliance in December 1742.

His opponents subsequently prevented Bestuzhev from forcing Sweden (which was France's ally) to cede all of Finland to Russia, despite Russia's victory in the Russo-Swedish War of 1741–43, and also concluded a Russo-Prussian defensive alliance (March 1743). But Bestuzhev, appointed chancellor in 1744, continued to prepare for an alliance with Austria, which, after much court intrigue, he finally concluded on May 22, 1746.

After the War of the Austrian Succession (1740–48), in which Russia fought from 1746 as the ally of Austria and Great Britain against France and Prussia, Bestuzhev tried to maintain his alliance system. In 1756, however, Prussia and Great Britain allied against France and Austria, and, in response, Bestuzhev's Council of Ministers proposed in March 1756 that Russia enter an alliance with Austria, France, and Poland against Prussia and Great Britain. Bestuzhev, stubbornly opposed to any Russian alliance with France, refused to support the proposal. Instead, he plotted with the grand duchess Catherine (future Catherine II the Great) to gain her support for his policies in return for his future support in making her regent when Elizabeth died. These intrigues only further weakened his influence, which already was insufficient to stop his opponents from concluding an alliance with France (Dec. 31, 1756) and drawing Russia into the Seven Years' War (1756–63).

In 1758 Bestuzhev was accused of engaging in treasonous activities, arrested, and condemned to death; in April 1759 his sentence was commuted to banishment to his estate at Goretovo. Despite his public exoneration when Catherine ascended the throne (1762), he never resumed a leading role in public affairs.

Besztercebánya (Czechoslovakia): *see* Banská Bystrica.

Bet Alfa, also spelled BEIT ALPHA, or BEIT ALFA, ancient site in northeastern Israel, noted for the remains of a synagogue (founded 6th century AD) that was discovered in 1928 by kibbutz workers digging drainage ditches. The kibbutz was founded in 1922 by Polish Jewish immigrants, who revived the historical name of Bet Alfa for their settlement.

Little remains of the synagogue building, thoroughly excavated in 1929, except the floor and wall outlines. The mosaic floor, in three panels, depicts Noah's Ark, the signs of the zodiac, and the sacrifice of Isaac. The building was probably destroyed by an earthquake in the 6th century.

bet din, also spelled BETH DIN (Hebrew: "house of judgment"), plural BATTE DIN, Jewish tribunal empowered to adjudicate cases involving criminal, civil, or religious law. The history of such institutions goes back to the time the 12 tribes of Israel appointed judges and set up courts of law (Deut. 16:18).

During the period of the Second Temple of Jerusalem (516 BC–AD 70), three types of *batte din* operated side by side. The highest court, called Great Bet Din or Sanhedrin, consisted of 70 or 71 members and convened on the Temple grounds to legislate and interpret Jewish Law. Its powers included the right

to appoint judges for the two types of lower courts; the higher of these was called the Small Sanhedrin, had 23 members, presided over criminal cases, and functioned in virtually every town of 120 or more male inhabitants. The smallest of the *batte din* had three judges each.

Historically, the functions and power of *batte din* varied according to the social and political conditions of the Jewish communities under their jurisdiction. Thus, in Spain, because of its large Jewish population, the king granted the *bet din* jurisdiction over criminal cases, and in Poland, Jews had recourse to a *bet din* as a court of last appeal until 1764. Elsewhere the powers of *batte din* were sometimes restricted to questions of ritual only.

Batte din still operate throughout the modern world under the direction of rabbinic scholars who adjudicate questions affecting their Jewish communities. In Israel all questions of personal status (*e.g.*, divorce and marriage) are resolved by religious courts. In countries where civil law requires that all divorces be granted by civil courts, Orthodox and Conservative Jews are nonetheless required to obtain a religious divorce before remarriage from either a *bet din* or a rabbi who is competent to preside over affairs of divorce.

Bet Leḥem (Israeli-occupied Jordan): *see* Bethlehem.

Bet She'an, also spelled BETH-SHAN, Arabic BAYSĀN, or BEISĀN, town, northeastern Israel, principal settlement in the low 'Emeq Bet She'an (*'emeq,* "valley"), site of one of the oldest inhabited cities of ancient Palestine. It is about 394 ft (120 m) below sea level.

Roman amphitheatre, Bet She'an, Israel
A. Riwkin—Ostman Agency

Overlooking the town to the north is Tel Bet She'an (Arabic Tall al-Ḥuṣn), one of the most important stratified mounds in Palestine. It was excavated in 1921–33 by University of Pennsylvania archaeologists, who found that the lowest strata date from the late Chalcolithic period in the country (*c.* 4000–3000 BC) and progress successively upward to Byzantine times (*c.* AD 500). A series of buildings, including temples and administrative buildings, span the Egyptian period—the earliest from the time of Thutmose III (ruled 1504–1450 BC), and the latest dating to Ramses III (1198–66 BC). The local Canaanite deity Mekal was especially venerated. Important stelae (stone monuments) tell of the conquests of Pharaoh Seti I (1318–04 BC) and of the worship of the goddess Astarte. It was to the temple of this goddess that King Saul's armour was brought after his death, and his body was hung from the city wall (I Sam. 31:10). Later, the town's Jewish community is mentioned in rabbinic literature.

During the Hellenistic period, the city was called Scythopolis; it was taken by the Romans in 64 BC and given the status of an imperial free city by Pompey. In 1960 a finely preserved Roman amphitheatre, with a seating capacity for about 5,000, was uncovered. The city was an important centre of the Decapolis (a league of 10 Hellenistic cities) and under Byzantine rule was the capital of the northern province of Palaestina Secunda. It declined after the Arab conquest (AD 636).

Although an Arab town for centuries, Bet She'an long had a Jewish settlement; in the Middle Ages the topographer Ashtori ha-Parḥi settled there and completed his work *Kaftor wa-ferah,* the first Hebrew book on the geography of Palestine (1322).

In modern times the town was one of the centres of Arab terrorism, 1936–39. Part of the territory allocated to Israel by the United Nations partition plan of November 1947, it was taken by the Haganah, the Jewish defense forces, on May 12, 1948, three days before the proclamation of Israel's statehood. The Arab population fled; after the Arab–Israeli War (1948–49), the town was resettled with new immigrants, including many refugees from Arab countries. Bet She'an is a centre of Israel's chief cotton-growing region, and many of its residents work in the neighbouring kibbutzim. Local industries include a textile mill and clothing factory. Pop. (1982 est.) 13,400.

Bet She'arim, agricultural cooperative settlement (moshav) and archaeological site in northern Israel, near the western end of the Plain of Esdraelon. Ancient Bet She'arim (Hebrew: House [of the] Gates), about 3 mi (5 km) east-northeast of the modern settlement (founded in 1936), is frequently mentioned in rabbinic sources. These recount that Rabbi Judah ha-Nasi (*c.* AD 135–220) presided over the Sanhedrin, or supreme Jewish rabbinical tribunal there, and that upon his death his remains were transferred to Bet She'arim for burial. In the following two centuries the town became the central necropolis of Jewry. The bodies of prominent Jews who died abroad were brought to Bet She'arim for burial. Destroyed in the 4th century, the site lay forgotten for centuries, until rediscovered in 1875. Excavations, begun in 1936 under the auspices of the Jewish Palestine Exploration Society, revealed the ruins of one of the largest synagogues of ancient Palestine (now partially restored), destroyed in 352.

Burial at Bet She'arim was in elaborate catacombs, of which more than 20 have been discovered. The sarcophagi there and the catacomb walls have funerary inscriptions in Hebrew, Aramaic, and Greek and are a valuable primary source for Jewish history of the Talmudic period. The presence of many decorative motifs on the sarcophagi, contrary to the Mosaic Law, shows strong Hellenistic influence among the Jews of the period. Bet She'arim is frequently called Sheikh Abreiq in archaeological literature. Pop. (1982 est.) 370.

Bet Yerah: *see* Beth Yerah.

beta-aminoisobutyric acid excretion, also called BAIB EXCRETION, a metabolic process under simple genetic control in human beings and the higher primates, the significance of which is not currently fully understood. Beta-aminoisobutyric acid (BAIB), an amino acid end product of pyrimidine metabolism, is excreted in trace quantities into the urine in almost all human beings, but the excretion of relatively large quantities of BAIB appears to be the result of a simple autosomal recessive allele. Although excretion of amino acids in the urine is frequently a symptom of a metabolic disorder, often genetic in nature, the excretion of high levels of BAIB does not appear to be deleterious, but neither is its adaptive significance yet clear. It has been observed that women excrete increased amounts of BAIB during pregnancy, an example of a nongenetic high BAIB excretion.

The number of persons showing high levels of BAIB excretion (*i.e.,* the frequency of the recessive allele governing the trait) has a racial distribution: Europeans, Australian Aboriginals, and Indic peoples rarely show it (fewer than 12 percent of the population); it is moderately common among Asians and American Indians (45–50 percent); and it is quite common in Melanesians (about 85 percent).

beta blocker, in full BETA-ADRENERGIC BLOCKING AGENT, any of a group of synthetic drugs used to treat a wide range of diseases and conditions of the sympathetic nervous system.

Stimulation by adrenalin of beta-type receptor sites, which predominate in cells of the heart and are present in vascular and other smooth muscle, results in excitation of the sympathetic nervous system. The administering of a beta blocker diminishes reaction at the beta receptor sites, thereby preventing or decreasing excitation. The drugs are prescribed to control anxiety and hypertension and to treat a variety of cardiac conditions, including anginal pain and cardiac arrythmias. The drugs have proved to be successful in reducing a patient's risk of a second heart attack.

Beta Centauri, 11th brightest star in the night sky, a visual binary star with apparent magnitude of 0.61. It is the second brightest star (after Alpha Centauri) in the southern constellation Centaurus and is about 300 light-years from the Earth.

beta decay, any of three processes of radioactive disintegration by which some unstable atomic nuclei spontaneously dissipate excess energy and undergo a change of one unit of positive charge without any change in mass number. The three processes are called electron emission, positron (positive electron) emission, and electron capture. Beta decay was named (1899) by Ernest Rutherford when he observed that radioactivity was not a simple phenomenon. He called the less penetrating rays alpha and the more penetrating rays beta. Most beta particles are ejected at speeds approaching that of light.

All atoms heavier than ordinary hydrogen have a nucleus consisting of neutrons and protons (neutral and positively charged particles), surrounded by negative electrons; these orbital electrons are not involved in electron emission. In electron emission, also called negative beta decay (symbolized β^--decay), an unstable nucleus ejects from itself an energetic electron (of relatively negligible mass) and an antineutrino (with no rest mass), and a neutron in the nucleus becomes a proton that remains in the product nucleus. Thus, negative beta decay results in a daughter nucleus, the proton number (atomic number) of which is one more than its parent but the mass number (total number of neutrons and protons) of which is the same. For example, hydrogen-3 (atomic number 1, mass number 3) decays to helium-3 (atomic number 2, mass number 3). The energy lost by the nucleus is carried away by the ejected electron and the antineutrino, so that beta particles from a radioactive material have energy ranging from zero to a distinct maximum, characteristic of the unstable parent.

In positron emission, also called positive beta decay (β^+-decay), a proton in the parent nucleus decays into a neutron that remains in the daughter nucleus and ejects a positron, which is a positive particle like an ordinary electron in mass but of opposite charge, along with a neutrino, which has no mass. Thus, positive beta decay produces a daughter nucleus, the atomic number of which is one less than its parent and the mass number of which is the same. Positron emission was first observed by Irène and Frédéric Joliot-Curie in 1934.

In electron capture, an electron orbiting around the nucleus combines with a nuclear proton to produce a neutron, which remains in the nucleus, and a neutrino, which is ejected. Most commonly the electron is captured from the innermost, or *K*, shell of electrons around the atom; for this reason, the process often is called *K*-capture. As in positron emission, the nuclear positive charge and hence the atomic number decreases by one unit, and the mass number remains the same.

Each chemical element consists of a set of isotopes the nuclei of which have the same number of protons but differ in the number of neutrons. Within each set the isotopes of intermediate mass are stable or at least more stable than the rest. For each element, the lighter isotopes, those deficient in neutrons, generally tend toward stability by positron emission or electron capture, whereas the heavier isotopes, those rich in neutrons, usually approach stability by electron emission.

In comparison with other forms of radioactivity, such as gamma or alpha decay, beta decay is a relatively slow process. Half-lives for beta decay are never shorter than a few milliseconds.

Beta Lyrae, eclipsing binary star, the two component stars of which are so close together that they are greatly distorted by their mutual attraction; they exchange material and share a common atmosphere. Beta Lyrae is of about third magnitude and lies in the northern constellation Lyra.

The variable character of Beta Lyrae was discovered in 1784 by the English amateur astronomer John Goodricke. Its period of about 13 days is increasing by about 10 seconds per year, probably because the stars are steadily losing mass to a continually expanding gaseous ring surrounding them.

beta particle, electron (unit negative charge) or positron (unit positive charge) spontaneously emitted by certain unstable atomic nuclei in the radioactive disintegration process of beta decay (*q.v.*).

Betancourt, Rómulo (b. Feb. 22, 1908, Guatiré, Miranda, Venezuela—d. Sept. 28, 1981, New York City), left-wing, anti-Communist politician who, as president of Venezuela, pursued policies of agrarian reform, industrial development, and popular participation in government.

Betancourt
Lee Matig

While a student at the University of Caracas, Betancourt was jailed (1928) for his activities against the dictatorial regime of Juan Vicente Gómez. Released after a few weeks, he continued to demonstrate against Gómez and was exiled, remaining abroad until 1936. During this period he wrote a book about his experiences and briefly joined the Communist Party in Costa Rica.

He returned to Venezuela in 1937 but was again exiled in 1939; he was permitted to return in 1941, in which year he helped found Acción Democrática, a left-wing anti-Communist party that came to power in 1945 following a coup against the government of Gen. Isaias Medina Angarita.

Appointed provisional president after the coup, Betancourt established a new constitution and inaugurated a program of moderate social reform, providing land for the peasants and exercising greater control over the petroleum industry. He resigned in 1948 to permit the election of a successor, but a coup a few months later, led by Marcos Pérez Jiménez, drove him once again into exile.

Betancourt spent the next 10 years in the United States, Cuba, Puerto Rico, and Costa Rica, directing the remnants of the outlawed Acción Democrática. Jiménez was overthrown in 1958, and Betancourt returned to Venezuela and was elected president. Harassed by pro-Cuban Communists on one side and frightened conservatives on the other, he steered a middle course, passing an agrarian law to expropriate large estates, initiating an ambitious program of public works, and fostering industrial development to prevent complete dependence on petroleum revenues. He retired as president in 1964 and lived for eight years in self-imposed exile in Switzerland, finally returning to Venezuela in 1972 and campaigning unsuccessfully for reelection to the presidency in 1973. At the time of his death he was visiting New York City.

betatron, device that accelerates electrons (beta particles) to high speeds in a circular orbit. The first successful betatron was completed in 1940 at the University of Illinois, Champaign-Urbana, under the direction of the American physicist Donald W. Kerst, who had deduced the detailed principles that govern the operation of such a device.

The betatron consists of an evacuated tube formed into a circular loop and embedded in an electromagnet in which the windings are parallel to the loop. Alternating electric current in these windings produces a varying magnetic field that periodically reverses in direction. During one quarter of the current cycle, the direction and strength of the magnetic field at the orbit, as well as the rate of change of the field inside the orbit, all assume the values needed to accelerate electrons in one direction.

The acceleration is brought about by two forces, one acting in the direction of the electrons' motion and the other at right angles to that direction. The force in the direction of the motion is exerted by the electric field induced along the circle by the strengthening of the magnetic field within the circle. The perpendicular force arises as the electrons move through the magnetic field at the orbit.

At the beginning of the proper quarter-cycle, electrons are injected into the betatron, where they traverse hundreds of thousands of orbits, gaining energy all the while. At the end of the quarter-cycle, the electrons are deflected to a target to produce X rays or other phenomena. Large betatrons have produced electron beams with energies greater than 340 MeV (million electron volts) for use in research. Weight problems become severe with high-energy betatrons; the electromagnet of a 340-MeV unit weighs about 330 tons. X rays generated by betatron beams of about 20 MeV are widely used in industrial radiography.

betel, also called ARECA NUT, PINANG, or PENANG, either of two different plants whose fruit is used in combination for chewing, or masticatory, purposes throughout wide areas of southern Asia and the East Indies. Betel chewing is a habit of an estimated one-tenth of the world's population. The betel nut is the seed of the areca, or betel palm (*Areca catechu*), family Palmae, and the betel leaf is from the betel pepper, or pan plant (*Piper betle*), family Piperaceae.

The areca palm, cultivated in India, Sri Lanka, Thailand, Malaysia, and the Philippines, has a slender, unbranched trunk reaching 12 or 15 metres (40 or 50 feet) high and about 45 centimetres (18 inches) in circumference and is topped by a crown of six to nine very large, spreading, pinnate fronds. The fruit is about the size of a small hen's egg. Within its fibrous rind is the seed, or nut, the albumen of which is hard and has a mottled gray and brown appearance.

The betel nut, seed of the areca palm (*Areca catechu*)
Wayne Lukas–Group IV—The National Audubon Society Collection/Photo Researchers

The fruits of the areca palm, gathered between August and November, before they are quite ripe, are husked, boiled in water, cut into slices, and dried in the sun, becoming dark brown or black.

For chewing, a small piece of the areca palm's fruit is wrapped in a leaf of the betel pepper, along with a pellet of shell lime or chunam to cause salivation and release the stimulating alkaloids. In some cases cardamom, turmeric, or another aromatic is added for flavour and stimulation. Chewing results in a copious flow of brick-red saliva, which may temporarily dye the mouth, lips, and gums orange brown. Contrary to general belief, the teeth of habitual chewers are not blackened by the betel juice, but chewers often artificially stain the teeth black. Betel nuts are a source of inferior catechu (*q.v.*); its chief alkaloid is arecoline, a drug used by veterinarians as a worming agent.

Betelgeuse, also called ALPHA ORIONIS, brightest star in the constellation Orion, marking the eastern shoulder of the hunter. Its name is derived from the Arabic word *bat al-dshauzâ,* which means "the giant's shoulder." Betelgeuse has an apparent magnitude of 0.4 and is one of the most luminous stars in the night sky. Though modern astronomers have detected little or no variability in its brightness, the English astronomer John Herschel claimed to have detected a small, irregular variability in 1836. Betelgeuse is easily discernible to even the casual observer, not only because of its brightness and position in the brilliant Orion but also because of its deep-reddish colour. The star is approximately 310 light-years from the Earth.

Betelgeuse is one of the largest stars known. It is classified as a red supergiant; its diameter varies between 430 and 625 times the diameter of the Sun over a period of 5.8 years. For comparison, Mars's orbit around the Sun has a diameter that is 328 times that of the Sun.

beth din (Judaism): *see* bet din.

Beth-Shan (Israel): *see* Bet She'an.

Beth Yerah, also spelled BET YERAḤ, Arabic KHIRBET KERAK, ancient fortified settlement located at the southern tip of the Sea of Galilee. Beth Yerah was settled in the Early Bronze Age (*c.* 3100–2300 BC) and was also populated from the Hellenistic to the Arab periods (*c.* 2nd century BC to 12th century AD). Archaeological findings suggest that it may be the location of Philoteria, a town built by Ptolemy II of Philadelphus, and Sennabris, identified

by Josephus as the northernmost point of the Jordan valley.

Among the important archaeological finds at Beth Yerah are a Roman fort and bath, a synagogue, and a Christian basilica that was built in the 5th century AD and destroyed in the 7th century. A type of black and red Early Bronze Age pottery of Anatolian origin was discovered there and named Khirbet Kerak ware.

Bethanie, also spelled BETHANIEN, village, southern South West Africa/Namibia. Bethanie is situated at the site of a spring in an arid region; the region edges into the extremely arid Namib Desert on the west. It lies at an elevation of 3,773 feet (1,150 m), 19 miles (31 km) north of a station on the country's main rail line, 165 miles (265 km) inland from the Atlantic fishing port of Lüderitz. In 1814 Heinrich Schmelen, a missionary of the London Missionary Society, established at Bethanie the first mission station in South West Africa. The mission was set up for the Nama (local Khoikhoin [Hottentot]) and the Oorlams (people of white and Khoikhoin ancestry who arrived with Schmelen from the Cape Colony). His home at Bethanie is believed to be the oldest European dwelling in South West Africa/Namibia. Although abandoned shortly thereafter, the mission was reopened in the early 1840s by Hans Christian Knudsen, a Norwegian missionary of the Rhenish (German Lutheran) Missionary Society. Schmelen and Knudsen made the earliest (independent) attempts at putting the difficult Nama (Khoisan) language into written form. German colonial troops were stationed at Bethanie in 1894. The region surrounding Bethanie has long been one of the principal Karakul (Persian lamb) ranching areas in South West Africa/Namibia, and Bethanie is the area's most important local market centre. Pop. (1970) 1,207.

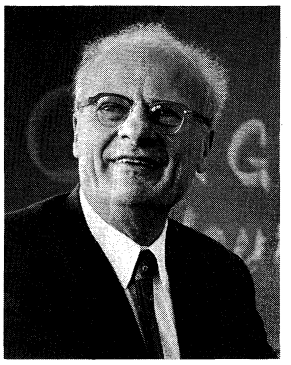
Bethany, Arabic AL-'AYZARĪYAH, small village and biblical site on the eastern slopes of the Mount of Olives, just outside Jerusalem. It was under Jordanian control from 1949 to 1967; after the Six-Day War of 1967, it became part of the West Bank (Judaea and Samaria) territory under Israeli administration.

Bethany is mentioned frequently in the New Testament. It was the home of Mary and Martha and their brother Lazarus, and the miracle of Lazarus' resurrection took place there (John 11). The Arabic name al-'Ayzarīyah is derived from the name Lazarus. Bethany was also the home of Simon the Leper (Matthew 26; Mark 14). Jesus lodged there after his entry into Jerusalem (Matthew 21:17), and it was from the village that he parted from his disciples (Luke 24:50–51). There are many traditional holy sites in Bethany, including the crypt of Lazarus, who is revered locally. Although churches have been built there from at least the 3rd century AD, most of them are now in ruins, and the traditional sites are ascribed to differing Gospel accounts. Bethany is widely visited by Christian pilgrims. Pop. (latest census) 3,560.

Bethany, city, Oklahoma County, central Oklahoma, U.S., immediately west of Oklahoma City. It was established in 1909 as a religious colony, centred on Bethany Nazarene College (established as Oklahoma Holiness College in 1899). The early emphasis on religious values remains, and pool halls, dance halls, theatres, and the use of alcoholic beverages are prohibited. Bethany's industry, like that of Oklahoma City, is based on the manufacture of aviation equipment and the processing of agricultural products. Inc. 1931. Pop. (1985 est.) 22,979.

Bethe, Hans Albrecht (b. July 2, 1906, Strassburg, Ger.), German-born American theoretical physicist who helped to shape classical physics into quantum physics and increased the understanding of the atomic processes responsible for the properties of matter and of the forces governing the structures of atomic nuclei. He received the Nobel Prize for Physics in 1967 for his work on the production of energy in stars. Moreover, he was a leader in emphasizing the social responsibility of science.

Bethe studied physics at the University of Frankfurt and did research in theoretical physics at the University of Munich, where he obtained the doctorate in 1928. His doctoral thesis, on the theory of electron diffraction, remains of fundamental value in understanding



Bethe
By courtesy of Cornell University, Ithaca, New York

observational data. His work on term splitting in crystals in 1929 showed how the symmetrical electric field by which an atom in a crystal is surrounded affects its energy states. In 1931 he worked with Enrico Fermi in Rome. He returned to Germany and served as a lecturer at the University of Tübingen until 1933. After a stay in Manchester he emigrated to the United States and became, in 1934, a lecturer at Cornell University in Ithaca, N.Y., which remained his home in spite of many offers from other universities. He was a professor there from 1937 to 1975, when he became professor emeritus.

In 1939 Bethe calculated the Sun's energy production, which results from the fusion of four hydrogen atoms (each of mass 1.008) into one helium atom (mass 4.0039). No direct fusion is possible, but Bethe showed that the probabilities of the four steps of the "carbon cycle" can account for the energy output. A carbon isotope of mass 12 reacts successively with three hydrogen nuclei (protons) to form the nitrogen isotope of mass 15; energy is produced through the fusion of a fourth hydrogen nucleus to release a helium nucleus (alpha particle) and the original carbon isotope.

Bethe became a U.S. citizen in 1941. At the beginning of World War II, Bethe had no U.S. clearance for military work. But, after reading in the *Encyclopædia Britannica* that the armour-piercing mechanism of grenades was not well understood, he formulated a theory that became the foundation for research on the problem. His work, unpublished except in classified reports, illustrated his faculty for developing highly mathematical theories to the point that their numerical results could be compared with the actual measurements.

After working at the Massachusetts Institute of Technology on the development of radar, Bethe headed the Theoretical Physics Division of the Manhattan Project in Los Alamos, N.M. The development of the atomic bomb and the dropping of it on Hiroshima and Nagasaki created a strong feeling of social responsibility in Bethe and other Los Alamos physicists. He was one of the organizers and original contributors to *The Bulletin of the Atomic Scientists.* Moreover, he lectured and wrote on the nuclear threat in order to increase public awareness of it.

Bethe was awarded the Max Planck Medal in 1955 and the U.S. Atomic Energy Commission's Enrico Fermi Award in 1961. He became, in 1957, a foreign member of the Royal Society of London, as well as a member of the National Academy of Sciences in Washington, D.C.

The discovery of neutron stars led Bethe back to fundamental research in astrophysics in 1970. Although his main interest was in the rapidly developing subjects of atomic and nuclear processes, he also applied classical mathematical methods to the calculation of electron densities in crystals, the order–disorder states in alloys, the operational conditions of reactors, the ionization processes in shock waves, and the detection of underground explosions from seismographic records.

(P.P.E./Ed.)

BIBLIOGRAPHY. Bethe's later works include *Elementary Nuclear Theory* (1948), a discussion of the experimental evidence concerning the forces acting inside the atomic nucleus, and *Intermediate Quantum Mechanics,* 2nd ed. (1968), a theoretical description of atomic structure. See R.E. Marshak (ed.), *Perspectives in Modern Physics* (1964), for further bibliography.

Bethel, ancient city of Palestine, located just north of Jerusalem. Originally called Luz and in modern times Baytin, Bethel was important in Old Testament times and was frequently associated with Abraham and Jacob. Excavations, carried out by the American School of Oriental Research and the Pittsburgh-Xenia Theological Seminary, suggest that Bethel may have been the actual scene of the events described in the Old Testament as having taken place at Ai during the Israelite conquest of Canaan.

After the division of Israel, Jeroboam I (10th century BC) made Bethel the chief sanctuary of the northern Kingdom (Israel), and the city was later the centre for the prophetic ministry of Amos. The city apparently escaped destruction by the Assyrians at the time of the fall of Samaria (721 BC), but it was occupied by Josiah of Judah (reigned *c.* 640–*c.* 609 BC).

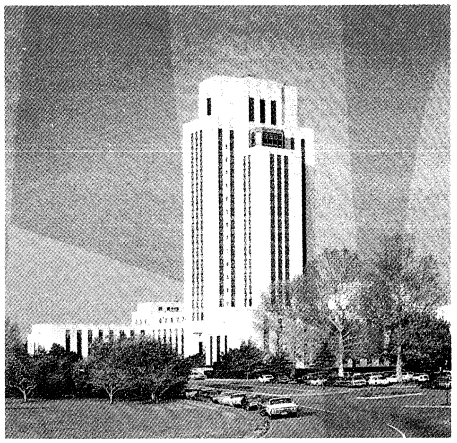
To make the best use of the Britannica, consult the INDEX *first*

Béthencourt, Jean de (b. *c.* 1360—d. 1422, Grainville, Fr.), Norman-French explorer, renowned as the conqueror of the Canary Islands.

Béthencourt set out for the Canaries from La Rochelle, Fr., on May 1, 1402, in a joint expedition with Gadifer de La Salle. Soon after their arrival (June), Béthencourt, by agreement with Gadifer, departed for Spain to seek help. He returned after about 18 months, with the title of king, bestowed upon him by Henry III of Castile, and with a bull from the antipope Benedict XIII recognizing the conquest. Béthencourt's title caused a quarrel with Gadifer, who had meanwhile explored and taken possession of the islands. The associates sought the arbitration of the king of Castile; he decided in Béthencourt's favour and Gadifer returned to France. Béthencourt then profited from Gadifer's efforts to colonize the Canaries with Norman peasants. Béthencourt entrusted the kingdom to his nephew, Maciot de Béthencourt, and returned to France in 1406.

Bethesda–Chevy Chase, northwestern suburbs of Washington, D.C., in Montgomery County, Maryland, U.S. It is not an incorporated entity but a group of communities that, prior to 1949, were governed by county commissioners and thereafter came mostly under the jurisdiction of a chartered popularly elected council. The district takes its name from the Bethesda Presbyterian Church, built

in 1820 on the Georgetown–Frederick Pike (Old National Road), and Chevy Chase village (incorporated 1910). Residential development greatly increased after World War II. Government installations accounted for much of the expansion, which began in 1935 with the



National Naval Medical Center, Bethesda, Md.
Milt and Joan Mann from CameraMann

National Cancer Institute, followed by the National Institutes of Health, the National Naval Medical Center (1942), and various research institutes. Industrial facilities are oriented toward federal agencies. Pop. (1980) Bethesda, 63,022; Chevy Chase, 12,232.

Bethlehem, Arabic BAYT LAḤM ("House of Meat"), Hebrew BET LEḤEM ("House of Bread"), town in ancient Judah, central Palestine. It is situated in the Judaean Hills, 5 miles (8 km) south of Jerusalem. Bethlehem was the site of the nativity of Jesus Christ according to the Gospels (Matthew 2; Luke 2); Christian theology has linked this with the belief that his birth there fulfills the Old Testament prophecy of Israel's future ruler coming from Bethlehem Ephrathah (Micah 5:2). Some modern New Testament scholars believe parts of the Gospel accounts to be later accretions and hold that Jesus was born in Nazareth, his childhood home, but normative Christian belief has sanctified Bethlehem as Jesus' birthplace for almost two millennia.

In modern times, Bethlehem was in the Palestine mandate (1923–48); after the Arab–Israeli War of 1948–49, it was in the territory annexed by Jordan in 1950 and placed in al-Quds (Jerusalem) *muḥāfaẓah* (governorate). Since the Six-Day War (1967), it has been in the West Bank (Judaea and Samaria) territory under Israeli administration.

In the Old Testament, the city is often referred to as Bethlehem Ephrathah, or Bethlehem-Judah. An ancient settlement, it is possibly mentioned in the Amarna Letters (14th-century-BC diplomatic documents found at Tell el-Amarna, Egypt), but the reading there is uncertain. Bethlehem is first mentioned in the Bible in connection with Rachel, who died on the wayside near there (Genesis 35:19). It is the setting for most of the Book of Ruth and was the presumed birthplace, and certainly the home, of her descendant, King David; there he was anointed king of Israel by the prophet Samuel (I Samuel 16). The town was fortified by Rehoboam, David's grandson and first king of Judah after the division of the state between Israel and Judah (II Chronicles 11). During the Jewish return to Palestine after the Babylonian Captivity (516 BC and following), the town was repopulated; later, a Roman garrison was there during the Second Jewish Revolt led by Bar Kokhba (AD 135).

The site of the Nativity of Jesus was identified by St. Justin Martyr, a 2nd-century Christian apologist, as a manger in "a cave close to the village"; the cave, now under the nave of the Church of the Nativity in the heart of the town, has been continuously venerated by Christians since then. St. Helena (*c.* 248–*c.* 328), mother of the first Christian Roman emperor (Constantine I), had a church built over the cave; later destroyed, it was rebuilt in substantially its present form by Emperor Justinian (reigned 527–565). The Church of the Nativity is thus one of the oldest Christian churches extant. Frequent conflicts have arisen over the jurisdiction of various faiths at the sacred site, often incited by outside interests; thus, for example, the theft, in 1847, of the silver star marking the exact traditional locus of the Nativity was an ostensible factor in the international crisis over the Holy Places that ultimately led to the Crimean War (1854–56). The church is now divided between the Greek Orthodox, Roman Catholic, and Armenian Orthodox faiths.

The town has been a monastic centre for centuries; St. Jerome built a monastery there and, with the aid of Palestinian rabbis, translated the Old Testament into Latin from the original Hebrew (5th century AD). This, together with the New Testament, which he had translated from the Greek before coming to Palestine, constitutes the Vulgate, the standard Latin translation of the Bible used by the Roman Catholic Church.

Modern Bethlehem is an agricultural market and trade town that is closely linked to nearby Jerusalem. For a long time the town has been important as a pilgrim and tourist centre, and its trade has sharply increased since the abolition of the artificial armistice line between it and Israel (including western Jerusalem) as a result of the 1967 war. The manufacture of religious articles, chiefly of mother-of-pearl, is a traditional industry, as is the carving of olivewood. The town forms a conurbation with adjoining Bayt Jālā, to the northwest, and Bayt Sāḥūr, to the southeast. Bethlehem and its suburbs have many churches, convents, schools, and hospitals, supported by Christian denominations the world over. A large proportion of the town's population is Christian. A university was established in Bethlehem in 1973 and offers instruction in both Arabic and English. Pop. (1984 est.) Bethlehem proper

Christmas procession at the Church of the Nativity, Bethlehem
Braum—FPG/EB Inc.

(not counting 1,874 in refugee camp), 20,000; (1980 est.) Bethlehem, Bayt Jālā, and Bayt Sāḥūr, 58,819.

Bethlehem, town, northeastern Orange Free State, South Africa, located near the northernmost point of Lesotho, at an elevation of 5,368 feet (1,636 m). Founded in 1860, it was named Bethlehem ("House of Bread"), after its Biblical counterpart, because wheat thrived in the region. The river flowing through the town (since dammed to form Lake Athlone) was named Jordaan. Bethlehem was the temporary seat of the government of the Orange Free State in 1900 during the South African War. The town has railway workshops, cold-storage plants, flour mills, a dairying and malting industry, furniture-manufacturing plants, and textile mills. It is a centre for the distribution of agricultural produce and has major rail, air, and road links. The Pretorius Valley Bird Sanctuary has been created where the Jordaan River passes through Pretorius Valley, and Lake Athlone is a recreation area. Pop. (1984 est.) mun., 54,100.

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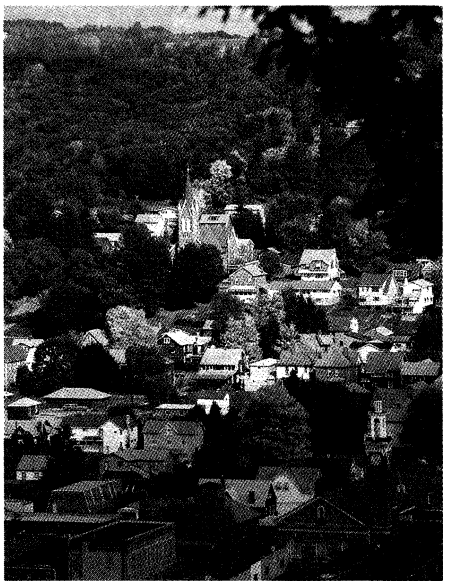
Bethlehem, city, Northampton and Lehigh counties, eastern Pennsylvania, U.S., on both



A residential neighbourhood in Bethlehem, Pa.
© Robert E. Mayer—CLICK/Chicago

sides of the Lehigh River (bridged); with Allentown and Easton it forms an urban industrial complex. Founded in 1741 by Moravian missionaries, it received its name from a carol about Jesus Christ's traditional birthplace, sung at Christmas Eve services (1741) attended by the group's German patron, Count Nikolaus Zinzendorf. During the Revolutionary War wounded Americans were treated in the old Colonial Hall and British prisoners were quartered in the town. For a short time the Sun Inn was the refuge for members of the Continental Congress including George Washington, Benjamin Franklin, and John Hancock.

One of the first pumped waterworks in North America started operations in Bethlehem on June 27, 1755. Industrialization began with the opening of the Lehigh Canal (1829) and its resulting traffic in coal. Bethlehem became a station on the Lehigh Valley Railroad (1855), and the Saucona Iron Company (now Bethlehem Steel) was formed April 8, 1857. The north bank borough of Bethlehem (inc. 1845) and South Bethlehem (inc. 1865) were united in 1917.

The economy, dominated by the Bethlehem Steel Corporation, has diversified to include textiles, cement, foundry, machine, and hand metal products, furniture, and chemicals.

The city is the seat of Lehigh University (1865), Moravian College (1742), and

Northampton County Area Community College (1966). It has gained a national reputation as a music centre; the first performance in America (1888) of Bach's *St. John Passion* has given rise to an annual (May) Bach Festival. Moravian traditions are annually observed in the city's Christmas festivities. The 1761 tannery and 1762 waterworks at the colonial industrial area (Historic Bethlehem) have already been restored, and further restoration projects are planned. The Lost River Caverns are nearby. Pop. (1980) 70,419.

Bethlehem, Star of, celestial phenomenon mentioned in the Gospel According to Matthew as leading "wise men from the East" to the birthplace of Jesus Christ. Natural events that might well have been considered important omens and described as stars include exploding stars (novae and supernovae), comets (Halley's Comet was visible in 12 and 11 BC), meteors, and planetary conjunctions—*i.e.*, apparent close approaches of two or more planets to each other.

The year of Jesus' birth is uncertain but can be narrowed down to probably between 6 and 4 BC. The biblical account indicates two sightings of the star, one before the wise men began their journey (probably from Babylonia or Persia) and the other near their journey's end, when the omen "came and stood over where the young child was." A celestial object near the horizon of any given observer might be considered by him as pointing out some spot on Earth below.

Chinese annals record novae in 5 BC and 4 BC; in the early 17th century, Johannes Kepler advanced the view that the Star of Bethlehem may have been a nova occurring in or near some conjunction of bright planets.

Several striking planetary conjunctions took place within 10 years of the chronological point now taken as the beginning of the Christian era. A triple conjunction in early 6 BC, in which Mars, Jupiter, and Saturn stood at the points of a triangle, has often been mentioned as a possible explanation of the star. Prior to that, in 7 BC, Jupiter and Saturn were for eight months within three degrees of each other and three times within that period passed within one degree. Several years later, on June 17, 2 BC, the bright planets Venus and Jupiter would have appeared to observers in Babylon to have merged just before setting in the general direction of Bethlehem to the west.

Bethlehem Royal Hospital (United Kingdom): *see* Bedlam.

Bethlehem Steel Corporation, U.S. corporation first incorporated on Dec. 10, 1904, for the purpose of consolidating Bethlehem Steel Company (of Pennsylvania), the Union Iron Works (with shipbuilding facilities in San Francisco), and a few other smaller manufacturing and shipbuilding companies. The corporation was newly incorporated on July 1, 1919. Headquarters are in Bethlehem, Pa.

The company's history traces to 1857, when a group of railroaders and investors of the city of Bethlehem founded the Saucona Iron Company, which four years later was renamed Bethlehem Iron Company; the works was designed principally to turn out wrought-iron railroad rails. In 1899 the facilities were acquired by a newly formed enterprise, the Bethlehem Steel Company.

The major founder of the corporation in 1904–05 was Charles M. Schwab (1862–1939), who had earlier been one of the major figures in the creation of United States Steel Corporation (1901). In August 1901 he had bought control of Bethlehem Steel Company, only to see it fail in a financial scandal. Schwab borrowed and invested heavily to save the company's assets, absorb other companies, and launch the Bethlehem Steel Corporation. The corporation thrived, partly as a result of the expanding orders for guns, munitions, and naval vessels from European powers both before and during World War I. In the first four decades of its existence, the corporation absorbed a number of iron-ore, coal, and steel-producing properties from coast to coast. It became virtually self-contained, owning large reserves of its important raw materials. During World War II and the postwar years, it continued to expand. Like other U.S. steel companies, Bethlehem began to diversify during the 1970s in the face of strong competition from foreign companies; its other activities include the production of plastics and related chemical products and the mining of nonferrous ores.

Bethlen, Gábor, in full GÁBOR IKTÁRI BETHLEN, German GABRIEL BETHLEN VON IKTÁR (b. 1580—d. Nov. 15, 1629, Gyulafehérvár, Transylvania), Calvinist prince of Transylvania and briefly titular king of Hungary (August 1620 to December 1621), in opposition to Ferdinand II.

Born into a leading Protestant family of northern Hungary, Bethlen as a young man

Bethlen, engraving by E. Sadeler, 1620
By courtesy of the Magyar Nemzeti Muzeum, Budapest

was sent to the court of Prince Sigismund Báthory. Later he helped István Bocskay gain the throne of Transylvania and supported his successor, Gábor Báthory. Differences between Bethlen and Báthory, however, forced Bethlen to take refuge with the Turks. The Ottoman sultan Ahmed I, suzerain of Transylvania, provided Bethlen with an army and proclaimed him prince of Transylvania. When Báthory was defeated, Bethlen was proclaimed prince by a Diet at Kolozsvár in 1613. Bethlen did much to promote the arts and sciences in Transylvania and founded the Academy of Weissemburg (Karlsburg).

During the Thirty Years' War (1618–48), while the Holy Roman emperor Ferdinand II was occupied with the Bohemian revolt of 1618, Bethlen took over most of northern Hungary, captured Pozsony (now Bratislava, Czech.), and seized the crown of St. Stephen. After the collapse of negotiations between Bethlen and Ferdinand, the Diet at Besztercebánya elected Bethlen king of Hungary (Aug. 20, 1620). Realizing that Hungarian Catholic nobles would never accept a Protestant king, however, he refused to be crowned. At this point war between Bethlen and Ferdinand broke out. After the Bohemians, who were supporters of Frederick (the so-called Winter King), were defeated at White Mountain in 1620, Bethlen concluded peace with Ferdinand, and the following year he agreed to renounce the throne and return the crown of St. Stephen. Ferdinand II agreed to reaffirm the 1606 Treaty of Vienna and guarantee liberty of worship to Protestants; he promised to summon the national Diet within six months. Bethlen became a prince of the Holy Roman Empire and secured for himself seven counties in northeastern Hungary.

Bethlen did not, however, give up his aim of expelling Ferdinand from Hungary and restoring his Protestant friend Frederick to the Bohemian throne. He renewed war against Ferdinand in 1623 and, while successful in Bohemia, was unable to continue the war after the defeat of the Protestant forces in Germany. The 1624 Treaty of Vienna that followed essentially reaffirmed the provisions of the 1621 treaty with Ferdinand.

Plans for an eastern alliance aimed at expelling the Turks from Hungary and Europe then engaged Bethlen. Hoping to gain aid from Ferdinand, he sought to marry one of Ferdinand's daughters but was rejected. He then joined the German princes and again occupied Habsburg Hungary in 1626, but victories by Catholic and imperial armies forced him to come to terms once more with Ferdinand in the Treaty of Pozsony in 1626. Following Pozsony, although Bethlen became involved in negotiations with the Poles and with King Gustavus II Adolphus of Sweden, his declining health precluded further military action.

Bethlen, István, Gróf (Count) (b. Oct. 8, 1874, Gernyeszeg, Transylvania, Austria-Hungary—d. Oct. 5, 1946, Moscow?), statesman and Hungarian prime minister from 1921 to 1931, who maintained the old order in Hungary after World War I.

Born into an old aristocratic Transylvanian family, Bethlen was elected to Parliament as a Liberal (1901). Later he joined the national opposition and became active in the counterrevolutionary movement against Béla Kun's Communist regime (1918–19). When Kun fell, Bethlen returned to the Hungarian Parliament and, in April 1921, became prime minister with the hope of establishing a strong conservative regime.

Bethlen's domestic policy was authoritarian. He tried to preserve the old feudal aristocratic privileges, ended land redistribution, reintroduced a system of public voting in the nonurban areas, and restricted suffrage.

His foreign policy aimed ultimately at a revision of the Treaty of Trianon (1920; which alienated territory from Hungary), but he realized the necessity of first gaining internal security and the right friends abroad. Meanwhile, he negotiated Hungary's admission to the League of Nations, obtained a reconstruction loan, and facilitated the influx of private capital from abroad. In 1927 he broke through the encirclement of the Little Entente (a triangular coalition of Czechoslovakia, Yugoslavia, and Romania against Hungary) to sign a treaty of friendship with Italy.

Hungary's economic and political gains were shattered by the world economic crisis of 1929. Unable to cope with the financial situation, Bethlen resigned in 1931. He retained some political significance as the leader of the forces opposing the new right-wing radicals. After the German occupation (March 1944), Bethlen went into hiding, but the Russians captured him in 1945 and took him to Moscow, where he was reported to have died.

Bethmann Hollweg, Theobald (Theodor Friedrich Alfred) von (b. Nov. 29, 1856, Hohenfinow, Brandenburg—d. Jan. 1, 1921, Hohenfinow, Ger.), German imperial chancellor before and during World War I. The first to be appointed from the administrative grade of the German bureaucracy, he possessed talents for administration but not for governing.

A member of a Frankfurt banking family, Bethmann Hollweg studied law at Strassburg, Leipzig, and Berlin and entered the civil service. He was appointed Prussian minister of the interior in 1905 and state secretary in the Imperial Office of the Interior in 1907. He succeeded Prince Bernhard von Bülow, who resigned as chancellor on July 14, 1909.

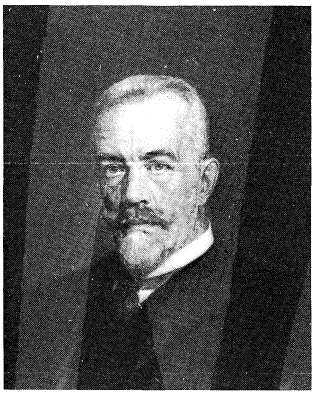
Bethmann's domestic policies were mildly liberal for their time and place, but he almost invariably yielded to persons more extreme and more forceful than himself. In foreign policy, his negotiations with the British over reduction of naval armaments (March 1909 and February 1912) came to nothing because of the opposition of Adm. Alfred von Tirpitz, supported by the emperor William II. Bethmann's secretary of state, Alfred von Kiderlen-Wächter, created the Moroccan (Agadir) crisis of July–November 1911, in which Germany backed down before France and Great Britain. Bethmann and Sir Edward Grey, the British foreign secretary, worked successfully to prevent the expansion of the Balkan Wars into a major conflict between Austria-Hungary and Russia; this was probably Bethmann's greatest success in foreign affairs.

At home, the enactment of his legislation for enlarging the army did not reduce anxiety about Germany's international situation. Although he believed that a democratic monarchy based on a Reichstag majority was inevitable, he was not an enthusiast of parliamentary government, and his half-hearted electoral reforms were largely ineffective.

Having no desire for war, Bethmann nonetheless is thought to have initiated the July crisis of 1914 with the "blank check" to Austria-Hungary for measures against Serbia. Subsequent German warnings to Austria-Hungary and its prospective opponent Russia could not prevent the outbreak of war. Bethmann capitulated to the German general staff, which wanted war immediately.

It is no longer universally thought that Bethmann then simply worked for a negotiated peace, with no idea of German annexations, although this was doubtless his own preference. He made more concessions to nationalist-expansionist feeling and to military demands than were once supposed. In 1916, however, he tried to secure the mediation of the U.S., and, realizing that U.S. entry into the war would be decisive, he resisted the advocates of unrestricted submarine warfare.

On April 7, 1917, Bethmann further angered military leaders and civilian conservatives by



Bethmann Hollweg, detail from a portrait by Brant, 1909
Archiv fur Kunst und Geschichte, West Berlin

his promise of electoral reforms in Prussia. In the debates on the peace resolution that was passed by the Reichstag in July 1917, Bethmann was forced to resign; he was replaced by Georg Michaelis on July 13. In retirement he wrote *Betrachtungen zum Weltkriege* (two parts, 1919–21; Eng. trans. of Part I, *Reflections on the World War*, 1920).

Bethsabee (Old Testament): *see* Bathsheba.

Béthune, town, Pas-de-Calais *département,* Nord-Pas-de-Calais region, northern France, at the confluence of the Lawe River and the Canal d'Aire, southwest of Lille. Founded in the 12th century, Béthune was an independent county until 1248. Thereafter held successively by the counts of Artois and Flanders, the dukes of Burgundy, and the Habsburgs,

The 14th-century belfry, Béthune, Fr.
Editions "La Cigogne"—Hachette

it was ceded to France by the Treaty of Nijmegen (1678). Badly damaged in World Wars I and II, Béthune is still dominated by its 14th-century belfry. Its traditional coal mining has been supplanted by the automobile industry. Pop. (1982) 24,839.

Bethune, David: *see* Beaton, David.

Bethune, James: *see* Beaton, James (1470?–1539); Beaton, James (1517–1603).

Bethune, Louise Blanchard, *née* JENNIE LOUISE BLANCHARD (b. July 21, 1856, Waterloo, N.Y., U.S.—d. Dec. 18, 1913, Buffalo), first professional woman architect in the United States.

In 1876 Louise Blanchard began work as an apprentice draftsman with the Buffalo architectural firm of Richard A. Waite. In 1881 she opened an independent office and was soon joined by her new husband, Robert Armour Bethune (1855–1915). The firm of R.A. and L. Bethune designed several hundred buildings in Buffalo and throughout New York state, specializing in schools. They also designed hotels, apartment houses, churches, factories, and banks, many of them in the Romanesque Revival style popular in the late 19th century.

Louise Bethune helped organize the Buffalo Society of Architects in 1886; it later became the Buffalo chapter of the American Institute of Architects. She also promoted a licensing law for architects, as well as equal pay for women in the field. In 1888 she became the first woman elected to the American Institute of Architects.

Bethune, Mary McLeod (b. July 10, 1875, Mayesville, S.C., U.S.—d. May 18, 1955, Daytona Beach, Fla.), U.S. educator who was active in national black affairs and a special adviser to Pres. Franklin D. Roosevelt on the problems of minority groups.

Bethune's parents had been slaves before the American Civil War. She graduated from the Scotia Seminary (later Barber-Scotia College) at Concord, N.C., in 1893 and graduated from the Moody Bible Institute in Chicago in 1895. After teaching in southern schools, in 1904 she opened an institute for girls at Daytona Beach, Fla., which was merged in 1923 with the Cookman Institute for Men, Jacksonville, Fla., to form Bethune-Cookman College at Daytona Beach. She served as president of the college until her retirement in 1942 and again from 1946 to 1947.

Active in Negro American affairs, she was director of the Division of Negro Affairs of the National Youth Administration, 1936–44, and during World War II she assisted the secretary of war in selecting officer candidates for the Women's Army Auxiliary Corps. She was a special adviser to President Roosevelt on the problems of blacks and members of other minority groups in the United States. She was also an observer for the U.S. Department of State at the United Nations Conference on International Organization in San Francisco in 1945.

Béthune, Maximilien de: *see* Sully, Maximilien de Béthune, duc de (duke of).

Beti, Mongo, also called EZA BOTO, pseudonyms of ALEXANDRE BIYIDI (b. June 30, 1932, Mbalmayo, Cameroon), African novelist and political essayist. An essential theme of Beti's early novels, which advocate the removal of all vestiges of colonialism, is the basic conflict of traditional modes of African society with the system of colonial rule.

Beti's first important novel, *Le Pauvre Christ de Bomba* (1956; "The Poor Christ of Bomba"), satirizes the destructive influence of missionary activities in Cameroon through his character Father Dumont, who, after serving the church for many years in Africa, is finally forced to realize that under a colonial system the missionary becomes, despite his good intentions, the involuntary servant of the administration. *Mission terminée* (1957; Eng., *Mission to Kala,* and U.S., *Mission Accomplished,* 1958), which was awarded the Prix Sainte-Beuve, attacks the French policy through a young man who, returning to his village with some hesitation because he has failed his college examinations, finds himself not only revered by the villagers for his achievements but also alienated from their way of life.

Preoccupied with family, politics, and doctoral studies, Beti stopped writing for more than a decade. *Main basse sur le Cameroun* (1972; "Rape of Cameroun"), a book explaining the emplacement of a neo-colonial regime in his homeland, was immediately banned in France and in Africa. Two years later a pair of novels appeared, *Perpétue et l'habitude du malheur* (1974; *Perpetua and the Habit of Unhappiness,* 1977) and *Remember Ruben* (1974). *Perpetua* is a mystery story of the murder of a young woman of promise by the combined forces of backward traditions and neo-colonial evils. *Remember Ruben* chronicles the lives of several revolutionaries up to "independence," when they are driven into the bush to take up guerrilla war against the new French-backed regime. A sequel presents the success of the guerrillas' countryside campaign: *La Ruine presque cocasse d'un polichinelle* (1979; "The Nearly Comical Ruin of a Puppet"). In 1981 Beti began serializing *L'Enfance précaire et cahoteuse de Guillaume Dzewatama* (1981; "The Precarious and Chaotic Childhood of Guillaume Dzewatama"), a novel about the trials of the son born to a man who becomes a henchman of a vicious fascist state.

In 1978 Beti launched *Peuples Noirs/Peuples Africains* ("Black Peoples/African Peoples"), a political and cultural bimonthly periodical devoted to the exposure and defeat of neo-colonialism in Africa. His home in exile was Rouen, Fr., where he was a professor of classics in a lycée.

Betjeman, Sir John (b. Aug. 28, 1906, London—d. May 19, 1984, Trebetherick, Cornwall, Eng.), British poet known for his nostalgia for the near past, his exact sense of place, and his precise rendering of social nuance, which made him widely read in England at a time when much of what he wrote about was rapidly vanishing. The poet, in near-Tennysonian rhythms, satirized lightly the promoters of empty and often destructive "progress"

and the foibles of his own comfortable class. As an authority on English architecture and topography, he did much to popularize Victorian and Edwardian building and to protect what remained of it from destruction.

The son of a prosperous businessman, Betjeman grew up in a London suburb, where T.S. Eliot was one of his teachers. He later studied at Marlborough and Oxford. The years from early childhood until he left Oxford were detailed in *Summoned by Bells* (1960), blank verse interspersed with lyrics.

Betjeman's first book of verse, *Mount Zion,* and his first book on architecture, *Ghastly Good Taste* (new ed., 1971), in which the two interests are related, appeared in 1933. Churches, railway stations, and other elements of a townscape figure largely in both. Four more volumes of poetry appeared before publication of *Collected Poems* (1958). Later collections were *High and Low* (1966), *A Nip in the Air* (1974), *Church Poems* (1981), and *Uncollected Poems* (1982). His celebration of the more settled Britain of yesteryear seemed to touch a responsive chord in a public suffering the uprootedness of war and its austere aftermath.

Betjeman's prose works include several guidebooks to English counties; *First and Last Loves* (1952), essays on places and buildings; *The English Town in the Last Hundred Years* (1956); and *English Churches* (1964; with Basil Clarke). He was knighted in 1969, and in 1972 he succeeded C. Day-Lewis as poet laureate of England.

Betpak-Dala, also called SEVERNAYA GOLODNAYA STEPPE, desert in the Kazakh Soviet Socialist Republic, situated east of Lake Balkhash. It has an area of about 29,000 sq mi (75,000 sq km) and an average altitude of 1,000–1,150 ft (300–350 m). The desert is generally flat or gently undulating but is more hilly in the east. It receives a total annual precipitation of only 4–6 in. (100–150 mm), and its average temperatures range from 7° F (−14° C) in January to 79° F (26° C) in July. The Betpak-Dala has many shallow, mostly salty lakes. The western part is clayey, wormwood desert, whereas the east is stony. Almost uninhabited, it is used only for spring and autumn pasture.

betrothal, promise or engagement between a man and a woman that they will be married. In societies in which premarital sexual relations are condoned, or in which consensual union is common, betrothal may be unimportant. In other societies, however, betrothal is actually part of the marriage process, and a change of intention by one of the partners after he or she is betrothed is a serious matter, subject in some instances to penalty by fine.

Marriage has historically been so frequently a matter of alliance between kinship groups that mate selection has been more often than not removed from the hands of the participants and negotiated by important or assigned representatives of each kinship group. In many, but by no means all, of such cases, betrothal has been marked by various forms and degrees of mutual visits and gift exchange between the two families. Sometimes, especially when two potentially hostile groups are concerned, child betrothal may be adopted to ensure continuing social, economic, or political harmony.

Betsileo, a Malagasy people living in the central highlands of south central Madagascar. The Betsileo, who are related to the Antaimoro of eastern coastal Madagascar, are an ethnically mixed group and lack a single ruling lineage or clan. They speak a dialect of Malagasy, the West Austronesian language that is common to all Malagasy peoples. River valleys inhabited and farmed by Betsileo are separated from one another by dense montane forest.

The Betsileo were initially divided into a great many autonomous clans. They were conquered by the expanding Merina kingdom to the north in the early 19th century, after which they came under French colonial administration. The Betsileo ("Invincible Multitude") have the three-tiered social stratification common to all Malagasy peoples. They are efficient and productive cultivators of rice on the painstakingly irrigated and terraced hillsides of their native Fianarantsoa province. They also grow cassava, corn (maize), yams, bananas, and sugarcane. Many others have become carpenters, bricklayers, or other skilled craftsmen or have settled in other areas of Madagascar to work as merchants or government employees.

Betsimisaraka, a Malagasy people living along the east central and northeastern coast of Madagascar. The Betsimisaraka speak a dialect of Malagasy, the West Austronesian language that is common to all Malagasy peoples. The Betsimisaraka ("Inseparable Multitude") live along the narrow eastern coastal strip; away from the coast their land rises into dense montane forest. They raise rice, cassava, and corn (maize) using the traditional method of burning off the natural vegetation and planting in the ash-enriched soil. Many Betsimisaraka have turned to growing coffee, vanilla, cloves, and other export crops on their small farms.

The Betsimisaraka kingdom was founded in the early 18th century by Ratsimilaho, a half-English Malagasy. He united the various chiefdoms along a 400-mile stretch of the coast and gave the Betsimisaraka their name, but the kingdom collapsed upon the death of the third ruler of the dynasty in 1791. Most of the Betsimisaraka then fell under the rule of the expanding Merina kingdom to the west until the advent of French colonial rule in the 1890s.

The Betsimisaraka have been historically known as sailors and pirates. In the past, using large canoes that could seat 50 or more, they sailed in fleets of several thousand men and pillaged the Comoro Islands (modern Comoros) northwest of Madagascar. Comoro Islanders were brought back and incorporated into Betsimisaraka society; several clans now trace their ancestry to these captives. The Betsimisaraka were also ardent fishermen and whalers and served as sailors on European vessels from an early date.

betsy bug: *see* bess beetle.

Bettelheim, Bruno (b. Aug. 28, 1903, Vienna), Austrian-born American psychologist known for his extensive work in treating and educating emotionally disturbed children, notably autistic children.

Bettelheim received his Ph.D. from the University of Vienna in 1938, but after the Nazi takeover of Austria that year he was placed in German concentration camps at Dachau and Buchenwald. After his release in 1939, he emigrated to the United States, where he became a research associate with the Progressive Education Association at the University of Chicago. Later he served as an associate professor at Rockford (Ill.) College (1942–44). In October 1943 he wrote an article that won wide and immediate recognition, "Individual and Mass Behaviour in Extreme Situations." Based on his observations and experiences at Dachau and Buchenwald, this pioneer study examined human adaptability to the stresses of concentration camp life and considered the effects of Nazi terrorism on personality.

Bettelheim
By courtesy of the University of Chicago

In 1944 Bettelheim was appointed both assistant professor of psychology at the University of Chicago and head of the university's Sonia Shankman Orthogenic School, a residential laboratory school for 6- to 14-year-old children with serious emotional problems, which became the centre of his work with autistic children. Associate professor from 1947 and professor from 1952, he concerned himself with applying psychoanalytic principles to social problems, especially in relation to the upbringing of children. A number of his writings stem from his work with children and include the books *Love Is Not Enough* (1950) and *Truants from Life* (1954).

In his writings and research Bettelheim tried to determine what can be done therapeutically to relieve the emotional suffering and turmoil of disturbed children and to help them function in socially useful capacities. His writings also provide many insights for dealing effectively with normal children. Other works include *The Informed Heart* (1960); *The Empty Fortress* (1967), on autistic children; *Children of the Dream* (1967), treating the communal rearing of children in Israeli kibbutzim, and suggesting that the traditional family organization and methods of educating the young be reexamined in the light of knowledge of the kibbutz life-style; and *The Uses of Enchantment* (1976), in which Bettelheim argues for the importance of fairy tales in child development.

Better Business Bureau, any of several U.S. and Canadian organizations formed to protect communities from unfair, misleading, or fraudulent advertising and selling practices.

Early in the 20th century, advertising executives realized that fraudulent practices by some advertisers were bringing advertising into public disfavour. In response, they established a National Vigilance Committee to police the industry, with subsidiary organizations formed at the local level. The local organizations became known as Better Business bureaus, and they coordinated their functions through the national Association of Better Business Bureaus. Today, sponsored by all segments of the business community, they investigate and set standards for business practices, receive complaints of improper practices, and conduct educational campaigns alerting the public to methods of deceit and fraud in advertising and selling.

Betterton, Thomas (b. *c.* 1635, London—d. April 28, 1710, London), leading English actor of the Restoration and author of several popular adaptations.

Betterton made his debut in 1660 and in 1661 was hired by Sir William Davenant for the Duke's Company, which played successively at the Lincoln's Inn Fields Theatre and at Dorset Garden. After the collapse of the rival King's Men, the two companies merged (1682), and the joint companies, with Betterton as the artistic leader, played at Drury Lane until 1695, when Betterton and the older players revolted against Christopher Rich, the spokesman for the patentees. Betterton led the secession of the players who moved into Lincoln's Inn Fields Theatre and later into the new Haymarket. He was survived by his wife, the former Mary Saunderson (d. 1712), an actress who had made her mark in

Shakespearean parts. As a couple they were known for their encouragement and training of younger performers.

Betterton's range of characters was extremely wide. He created about 130 new roles, aside from such leading parts in the older dramas as Hamlet, Macbeth, Henry VIII, Mercutio, King

Betterton, detail from an engraving
By courtesy of the Victoria and Albert Museum, London

Lear, Othello, Brutus, and Hotspur. His Hamlet and Sir Toby Belch were said to be equally credible. Contemporary observers agree that Betterton used restraint in his acting.

Betterton-Kroll process, method widely used for removing bismuth from lead by adding calcium and magnesium to a molten lead–bismuth bath. Compounds are formed with bismuth that have higher melting points and lower densities than lead and thus can be separated as a solid dross. Bismuth may then be recovered from the calcium and magnesium by treatment with chlorine. The method, developed for the American Smelting and Refining Company in the 1930s, is sometimes called the Asarco process.

Betti, Enrico (b. Oct. 21, 1823, Pistoia, Tuscany—d. Aug. 11, 1892, Pisa, Kingdom of Italy), mathematician who wrote a pioneering memoir on topology, the study of surfaces and space, and wrote the first rigorous exposition of the theory of equations developed by the noted French mathematician Évariste Galois (1811–32).

Betti studied at the University of Pisa, where he obtained a chair of mathematics in 1857. His early work was in the theory of equations and algebra. He extended and furnished proofs for Galois's work, which had previously been stated in part without demonstrations or proofs. Betti was the first to resolve integral functions of a complex variable into their primary factors.

His later work was decisively affected by the arrival in Pisa of the German mathematician Bernhard Riemann in 1863. They became close friends, and Riemann awakened Betti's interest in mathematical physics, in particular potential theory and elasticity, and inspired Betti's memoir on topology.

Betti, Ugo (b. Feb. 4, 1892, Camerino, Italy—d. June 9, 1953, Rome), the foremost internationally known Italian playwright, after Luigi Pirandello, in the first half of the 20th century.

Educated for the law, Betti fought in World War I and while imprisoned (1917–18) by the Germans wrote a volume of poems, *Il re pensieroso* (1922; "The Thoughtful King"). After the war he became a magistrate in Rome in 1920, rose to a judgeship in 1930, and became librarian at the Ministry of Justice in 1944. His legal career was interspersed with the writing of two more volumes of poetry, three books of short stories, a novel, much miscellaneous writing, and, most important, 26 plays.

His first play, *La padrona* (first performed 1927; "The Landlady"), drew mixed reactions, but later successful plays include *Frana allo scalo Nord* (first performed 1933; Eng. trans., *Landslide,* 1964), the story of a natural disaster and collective guilt; *Delitto all'Isola delle Capre* (first performed 1950; Eng. trans., *Crime on Goat Island,* 1960), a violent tragedy of love and revenge; *La regina e gli insorte* (first performed 1951; Eng. trans., *The Queen and the Rebels,* 1956), a strong argument for compassion and self-sacrifice; and *La fuggitiva* (first performed 1953; Eng. trans., *The Fugitive,* 1964), a story presenting legal courts as a symbol of world salvation. *Corruzione al palazzo di giustizia* (first performed 1949; Eng. trans., *Corruption in the Palace of Justice,* 1962) depicts an unscrupulous judge who, having clawed his way to the presidency of the Supreme Court, realizes his own guilt and gives himself up for trial.

International attention, offsetting lukewarm popular and critical acclaim in Italy, came with Paris productions in the early 1950s of his plays, which were then translated into English.

Bettiah, town, administrative headquarters of Pashchim (West) Champaran district, Bihār state, northeastern India. An agricultural trade centre, it also manufactures brass, metalware, and leather goods. The headquarters of the Bettiah Raj estate, established in the 17th century, it contains the maharaja's palace. There is a Roman Catholic mission, established in 1740. Constituted a municipality in 1869, Bettiah has a college affiliated with the University of Bihār. Just north, at Lauriya Nandangarh, lie an Aśokan pillar and funeral mounds said to be the only indisputably Vedic monuments identified in India. Pop. (1981) 72,167.

Betty, William Henry West, byname THE YOUNG ROSCIUS, also called MASTER BETTY (b. Sept. 13, 1791, Shrewsbury, Shropshire, Eng.—d. Aug. 24, 1874, London), actor who won instant success as a child prodigy.

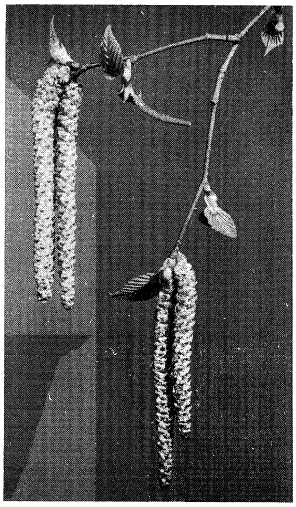
Betty's debut was in Belfast, before he was 12, in an English version of Voltaire's *Zaïre.* He was successful in Dublin, Glasgow, and Edinburgh. In 1804, when he first appeared at Covent Garden, London, troops were called out to preserve order, so great was the crush to obtain admittance. Later he played the great tragic roles of Shakespeare at Covent Garden and Drury Lane, where he received an unprecedented salary. George III presented him to the Queen, and William Pitt on one occasion adjourned the House of Commons so that members could see Master Betty's performance as Hamlet. In 1808 he made his final appearance as a boy actor and entered Christ's College, Cambridge. His attempt in 1812 to perform again was ill received. He retired completely in 1824 and lived off his fortune.

Betty, detail from an engraving by J. Lewis, 1804
By courtesy of the Victoria and Albert Museum, London

Betūl, town, administrative headquarters of Betūl district, Madhya Pradesh state, central India. It is a major road and agricultural trade centre; sawmilling, oilseed milling, essential-oil distilling, and silk growing are its chief industries. Formerly called Badnur, Betūl was constituted a municipality in 1867; it has a government college affiliated with the University of Saugar. A weekly cattle mart is held. The ruined 14th-century Kherla fortress, just to the northeast, was the seat of a major Gond dynasty.

Betūl district (3,885 sq mi [10,061 sq km]) comprises chiefly a fertile central plain of the Sātpura Range, surrounded by forest-covered hill belts and drained by the Tāpti, Ambhira, and Tawa rivers. Wheat, millet, oilseeds, cotton, and sugarcane are the major crops; dense forests produce bamboo, teak, and other timber. There is extensive cattle raising, and coal and graphite deposits are worked. Tribal Gonds and Korkus occupy the northern regions. Pop. (1981) town, 46,293; district, 925,387.

Betulaceae, formerly CORYLACEAE, birch family, contained within the order Betulales, with 6 genera and more than 100 species of de-



Young leaves, male catkins, and (top centre) female flowers of paper birch (*Betula papyrifera*)
Cy Coleman

ciduous trees and shrubs native to temperate and cool regions of the Northern Hemisphere.

A brief treatment of Betulaceae follows. For a full treatment, *see* MACROPAEDIA: Angiosperms.

Many species of birch (*Betula*), alder (*Alnus*), filbert (*Corylus*), hornbeam (*Carpinus*), and hop-hornbeam (*Ostrya; qq.v.*) have economic importance. The Betulaceae have simple, serrate, alternate leaves. Male and female flowers are borne on the same plant, appearing before or with the leaves. The male flowers are borne in long, pendulous catkins; the female in shorter, erect clusters. The fruit is usually a small nut or a short-winged samara. Plants of the Betulaceae provide valuable timber, edible nuts, and oil of betula (similar to wintergreen), processed from twigs; many are cultivated as ornamentals.

Betwa River, Sanskrit VETRAVATĪ, river in northern India, rising in the Vindhya Range just north of Hoshangābād. Its Sanskrit name means "containing reeds." It flows generally northeast through portions of Bhopāl, Vidisha, Guna, and Shivpuri districts of Madhya Pradesh state, enters Jhānsi and Jālaun districts of Uttar Pradesh state, and empties into the Yamuna just east of Hamīrpur after a 380-mi (610-km) course. Nearly one-half of its course, which is not navigable, runs over the Mālwa Plateau before it breaks into the up-

land of Bundelkhand. The Jamni and Dhasān rivers are the main tributaries. The Betwa is dammed at Dukwān and Deogarh in Jhānsi district, forming two large reservoirs that provide for irrigation and hydroelectric projects.

Beust, Friedrich Ferdinand, Graf von (count of), also called (until 1868) FREIHERR (baron) VON BEUST (b. Jan. 13, 1809, Dresden, Saxony—d. Oct. 24, 1886, Schloss Altenberg, near Vienna), prime minister and

Beust, engraving by Joseph Anton Bauer

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

foreign minister of Saxony (1858–66) and of the Austrian Empire (1867–71), who negotiated the *Ausgleich,* or "Compromise" (1867), establishing the Austro-Hungarian monarchy, and who also helped restore the Habsburgs' international position.

A descendant of the Saxon line of an ancient aristocratic family, Beust was the youngest son of Karl Leopold von Beust, a high-ranking member of the law administration. After attending the Kreuzschule in Dresden, he studied law at Göttingen and Leipzig. Relatively progressive, he was inclined toward liberal constitutionalism and devoted himself also to the study of philosophy, history, and politics. Having finished his studies in 1830, he began his diplomatic career, which led him first to Saxon missions in Berlin and Paris; he became head of missions in Munich, London, and, in 1848, Berlin. By that time he had acquired a remarkable practical knowledge of constitutional matters and of important political personalities, among them Otto von Bismarck.

The Saxon king, Frederick Augustus II, favoured the movement for German unity developing out of the revolutions of 1848 but not its tendencies toward democracy. In 1849 he called for Beust, whom he thought to be a stabilizing influence, and appointed him his new minister for foreign affairs. Beust called in Prussian troops to suppress the popular uprisings in Dresden in May and negotiated a conservative alliance of Saxony, Prussia, and Hanover later the same month. He thus proved from the outset to be the dominant force in the Cabinet. As minister of the interior (from 1853) he sought to expand the Saxon economy through a policy of moderate internal reforms. In his foreign policy he aimed at setting up the smaller German states as a third force between Austria and Prussia. Although Saxony's economic interests naturally gravitated toward Prussia, Beust's foreign policy increasingly drew him nearer to Austria, thus forcing him into an ever sharpening opposition to Bismarck.

After Prussia's victory over Austria and its Saxon ally in 1866, Beust had to give up his office under pressure from Bismarck. Beust, who in Saxony had felt like a "horse harnessed to a perambulator," unexpectedly found a wider field of activity. In October 1866 the emperor Francis Joseph appointed him Austrian minister for foreign affairs and in February 1867 imperial chancellor of the Habsburg monarchy (minister president in June 1867). Although a foreigner, Beust, optimistic as usual, did not hesitate to accept this difficult office. His diplomatic experience, political imagination, and a certain cynicism helped him to master his new tasks quickly. He restored constitutional government and temporarily solved the most difficult internal problem by bringing about the "Compromise" (*Ausgleich*) with Hungary, allotting to the Hungarians hegemony in the eastern part of the monarchy. Nevertheless, Beust's attempt to regain German popular sympathy for Austria by establishing a model liberal regime was doomed to failure. In the long run he was not able to harmonize the status of the Germans—the dominant group within the western part of the empire—with the claims of the other nationalities subjected to Habsburg rule, particularly the embittered Czechs.

Beust's foreign policy was finally defeated by national ambitions whose force he underrated. Neither Francis Joseph nor Beust was willing to accept the consequence of Prussia's defeat of Austria in 1866—namely, Austria's enforced exclusion from Germany. Beust was dominated by the idea of revenge, by his rivalry with Bismarck, and by his fear lest Prussia lay hands upon the Habsburgs' German territories. He therefore tried first to prevent the southern German states from uniting with Prussia; he wanted to create the preconditions for later reestablishing Austria's old hegemony, though in an improved form. In pursuing his plan for an alliance with France and Italy to corner Prussia in the east, he proved to be a formidable adversary of Bismarck, much superior to Napoleon III of France in political skill and cleverness. Although his policy moved on the brink of a new war between Austria and Prussia, he was realistic enough to abstain from any attempt to involve Austria-Hungary in the Franco-German War.

Beust was denied the ultimate realization of his political aims; in 1871 he had to recognize that the German *Reich* under Prussian leadership, excluding Austria, had become a historical reality. Francis Joseph, who had raised him to the rank of count in 1868, dismissed him from his post as chancellor in October 1871. Beust continued to serve the Habsburg monarchy as ambassador in London and, after 1878, in Paris until his retirement in 1882.

Beust was the last of the Austrian statesmen who felt bound to further the German mission of the Habsburgs. He was rooted more in the tradition of 18th-century Cabinet politics than in 19th-century nationalism. His policy, although strongly influenced by emotion, was moderate, not lacking a certain grandeur but never attaining decisive victory. As Bismarck remarked in 1866, "There is no room for both of us in Germany." (H.P.)

BIBLIOGRAPHY. An adequate biography is still lacking. Beust's memoirs, *Aus drei Viertel-jahrhunderten* (Eng. trans. ed. by H. de Worms, 2 vol., 1887), are cleverly written but complacent and self-justificatory. E. Grob, *Beusts Kampf gegen Bismarck* (1930), is a short but unbiased and useful essay. Beust's politics in Austria are presented in detail by H. Potthoff, *Die deutsche Politik Beusts* (1968), which includes literature references. General information may be found in A.J. May, *The Habsburg Monarchy, 1867–1914* (1951); and A.J.P. Taylor, *The Struggle for Mastery in Europe, 1848–1918* (1954).

Beuve-Méry, Hubert (b. Jan. 5, 1902, Paris), French publisher and editor who directed *Le Monde* from the paper's founding in 1944 until 1969. Originally established as a continuation of *Le Temps* and meant to be a forum for French Christian Democratic ministers, *Le Monde* became an independent, self-supporting, and highly prestigious daily with a large national and international readership while under Beuve-Méry's direction.

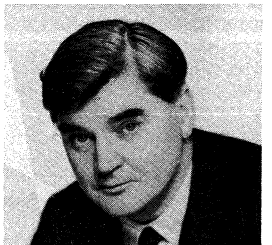
From 1928 to 1939 Beuve-Méry was the director of the legal and economic section of the Institut Français in Prague; meanwhile, he served between 1934 and 1938 as diplomatic correspondent for the newspaper *Le Temps.* For many years he wrote columns of commentary under the pen name "Sirius." Among his books were *Vers la plus grande Allemagne* (1939; "Toward a Greater Germany"), *Réflexions politiques* (1951; "Political Reflections"), and *Le Suicide de la IVe République* (1958; "Suicide of the Fourth Republic").

Beuys, Joseph (b. May 12, 1921, Krefeld, Ger.—d. Jan. 23, 1986, Düsseldorf, W.Ger.), German avant-garde sculptor and performance artist whose works, characterized by unorthodox materials and ritualistic activity, stirred much controversy.

Beuys was educated in Rindern, Ger., and served in the German air force throughout World War II. In 1943 his plane crashed in the frozen Crimea. Those who found him tried to restore his body heat by wrapping him in fat and an insulating layer of felt; these substances would later become recurring motifs in his sculptural works. From 1947 to 1951 he studied art in Düsseldorf and in 1961 he was appointed professor of sculpture at the Staatliche Kunstakademie in Düsseldorf. Beuys was also actively involved in German politics.

Beuys worked in the mid-1960s with the international avant-garde art group known as Fluxus. During this period he began to stage "actions," events at which he would perform acts of a ritual nature. For one of his best known actions, *How to Explain Pictures to a Dead Hare* (1965), Beuys covered his head with honey and gold leaf, wore one shoe soled with felt and one with iron, and walked through an art gallery for about two hours, quietly explaining the art therein to a dead hare he carried. His art was compared by some critics to that of the German Expressionists, both for its obsessive and unsettling qualities and for its linking of artistic revolution and social revolution.

Bevan, Aneurin, byname NYE BEVAN (b. Nov. 15, 1897, Tredegar, Monmouthshire, Eng.—d. July 6, 1960, Chesham, Buckinghamshire), controversial figure in post-World War II British politics and one of the finest orators of the time. To achieve mastery as a speaker, he had first to overcome a speech



Bevan

Elliott and Fry

impediment. He was the architect of the national health service and leader of the left-wing (Bevanite) group of the Labour Party.

The son of a miner, Bevan became a collier's helper at 13 but had to leave the mines in a few years because of eye disease. After two years at Central Labour College, London, he entered politics and in 1929 was elected to the House of Commons as Labour member from Ebbw Vale. Throughout World War II he was a vigorous critic of Winston Churchill's coalition government but was equally critical of his own party. From 1940 to 1945 he was editor of the independent Socialist *Tribune.*

As minister of health in Clement Attlee's

Labour government of 1945, he was responsible for developing housing programs and for establishing the national health service. He became minister of labour in January 1951 but resigned from the government the following April in protest against the rearmament program, which necessitated sharp cutbacks in social expenditures. For the next few years Bevan was the centre of controversy within the Labour Party and involuntarily gave his name to the party's radical wing.

A colourful public personality and a brilliant spontaneous debater, he had great personal charm but was sometimes so rude to opponents that Churchill once called him a "merchant of discourtesy." After his defeat as party leader by Hugh Gaitskell (1955), he accepted his party's policies and became shadow foreign secretary. His autobiography, *In Place of Fear*, appeared in 1952.

Bevan, Brian (b. April 24, 1924, Sydney), Australian rugby player who was the leading try (touchdown) scorer in the history of the sport. Bevan achieved a career total of 796 tries and kicked 34 goals in his first season alone. He made his debut for Warrington (Lancashire, Eng.) in 1946 and stayed with them until the 1961–62 season. Bevan scored 740 of his total tries for Warrington. From 1962 until his retirement in 1964, he played for Blackpool borough.

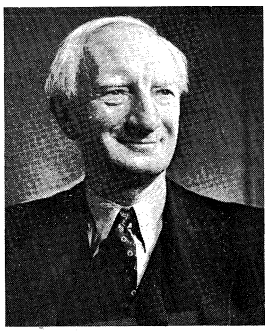
bevel siding: *see* clapboard.

Beveridge, Albert J(eremiah) (b. Oct. 6, 1862, Highland County, Ohio, U.S.—d. April 27, 1927, Indianapolis, Ind.), orator, U.S. senator, and historian. Beveridge was admitted to the Indiana bar in 1887 and began the practice of law in Indianapolis. He first attracted national attention by his eloquent speeches defending the increasing power of the federal government and advocating U.S. territorial expansion overseas.

In 1899 Beveridge was elected as a Republican to the U.S. Senate, where (1900–12) he supported the progressive legislation sponsored by Pres. Theodore Roosevelt. Breaking with the conservative wing of his party, he served as chairman and keynote speaker of the emotion-packed convention that organized the Progressive party and nominated Roosevelt for president in 1912.

Beveridge never again held public office, devoting much of his time after 1912 to the writing of history. His *The Life of John Marshall,* 4 vol. (1916–19), was widely acclaimed and won a Pulitzer Prize. At the time of his death he had completed two volumes of a biography of Abraham Lincoln, published posthumously in 1928. A standard biography is Claude G. Bowers, *Beveridge and the Progressive Era* (1932).

Beveridge (of Tuggal), William Henry Beveridge, 1st Baron (b. March 5, 1879, Rangpur, India—d. March 16, 1963, Oxford),



Lord Beveridge, photograph by Yousuf Karsh
Camera Press

economist who helped to shape Great Britain's post-World War II welfare state policies and institutions through his *Social Insurance and Allied Services* (1942), also known as the Beveridge Report.

The son of a British civil servant in India, Beveridge was educated at Balliol College, Oxford. His lifelong interest in the causes and cure of unemployment began in 1903 with his appointment as subwarden of Toynbee Hall, a London settlement house. After serving as director of Labour Exchanges (1909–16), he became permanent secretary of the Ministry of Food in 1919. He directed the London School of Economics and Political Science from 1919 to 1937, when he was elected master of University College, Oxford. He was knighted in 1919 and was created a baron in 1946.

In his *Unemployment: A Problem of Industry* (1909), Beveridge argued that unemployment was in large measure caused by the organization of industry. His revised views, set forth in *Full Employment in a Free Society* (1944), were strongly influenced by Keynesian economics. Beveridge's crowning achievement came during World War II, when, at the invitation of the government, he helped work out the blueprints of the new British welfare state. His other works include *Insurance for All* (1924), *British Food Control* (1928), *Planning Under Socialism* (1936), *Pillars of Security* (1948), *Power and Influence* (1953), and *A Defence of Free Learning* (1959).

Beverley, district (borough), county of Humberside, England. It has an area of 156 sq mi (404 sq km). Before 1974 it was in Yorkshire.

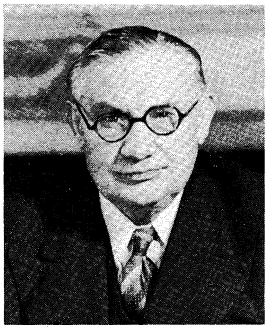
The town of Beverley grew in close association with the minster established in the 7th century. Destroyed by the Danes in 806, the associated monastery was refounded by the Anglo-Saxon king Athelstan (reigned 925–939). The great Beverley Minster that dominates the town is a noted example of Gothic architecture as it developed from Early English to Decorated styles. The first charter (1129) established the community as an important market centre with a flourishing European cloth trade, but, because there has been no large-scale modern industrial development, much of its character as an old-established abbey and market town has been retained. Beverley is also a dormitory suburb for the adjoining city district of Kingston upon Hull. Pop. (1982 est.) 107,400.

Beverly, city, Essex County, northeastern Massachusetts, U.S., on Beverly Harbor, an inlet of the Atlantic Ocean, just north of Salem. Settled around 1626, it was named for Beverley, Eng., when incorporated as a town (township) in 1668. It early developed as a shipping centre, and the schooner "Hannah," claimed to be the first ship of the U.S. Navy, was commissioned (Sept. 5, 1775) at Glover's Wharf in Beverly by George Washington. One of New England's first successful cotton-weaving mills was built (1789) there, and the city now has one of the nation's largest shoe-machinery factories; the electronics industry and summer tourism are also important economically. The city's Beverly Farms section was the summer home of Justice Oliver Wendell Holmes. Historic buildings include Hale House (1694), the Cabot House (1781), and the Balch House (1636). Beverly is also the seat of Endicott College for women (1939) and North Shore Community College (1965). Inc. city, 1894. Pop. (1980) 37,655.

Beverly Hills, city, Los Angeles County, California, U.S., in the foothills of the Santa Monica Mountains, adjoining Hollywood and completely surrounded by the city of Los Angeles. The site, originally El Rancho Rodeo de Las Aguas, was laid out and named in 1906 by the Rodeo Land and Water Company. Incorporated in 1914, it has since become an exclusive residential community characterized by the palatial homes of motion-picture and television personalities and, in the late 1970s, many emigrés from the oil-rich countries. Presenting a legendary facade of beauty, the city has also attracted luxury apartment and elite restaurant and hotel developments. Pop. (1980) 32,367.

Bevin, Ernest (b. March 9, 1881, Winsford, Somerset, Eng.—d. April 14, 1951, London), British trade unionist and statesman, one of the most powerful British union leaders in the first half of the 20th century. He also proved to be a forceful minister of labour and national service during World War II and foreign secretary in the immediate postwar period.

Bevin was reared in a poor family and left school at the age of 11; after holding a series of jobs, he found regular employment on a mineral-water delivery route in Bristol. In 1905 he became the unpaid secretary of the Bristol Right to Work Committee, and in 1910 he formed a carters' branch of the Dockers' Union in that city. By the end of World War I he was functioning as the union's assistant general secretary, although the post was not formally created until May 1920. In 1921 he



Bevin, 1945
Bassano and Vandyk

amalgamated several unions into the Transport and General Workers' Union, of which he was general secretary until 1940 and which became the largest trade union in the world. From 1925 he was a member of the general council of the Trades Union Congress (TUC) and in 1937 was elected its chairman. He was prominent in organizing the British general strike of May 3–12, 1926, and was also instrumental in settling it.

During the early Depression years he criticized Ramsay MacDonald's second Labour Party government (1929–31) for failing to enact radical measures to relieve unemployment, and he refused to support MacDonald's national coalition ministry (1931–35). Through the 1930s he advocated British rearmament and a firm foreign policy to counteract the growing threat of Nazi Germany and Fascist Italy. In May 1940, when Winston Churchill formed his wartime coalition government, Bevin was appointed minister of labour and national service and was included in the War Cabinet.

When Clement Attlee formed his Labour Party government on July 26, 1945, Bevin was chosen as foreign secretary. Quickly losing his optimism about the Soviet Union, he argued (autumn 1945) against recognition of new Soviet-sponsored governments in the Balkans. To facilitate the economic and defensive rebuilding of western Europe, which was then the main theatre of the Cold War, he helped to establish the Brussels Treaty alliance of the United Kingdom, France, Belgium, The Netherlands, and Luxembourg (March 17, 1948) and the Organization for European Economic Cooperation (April 16, 1948). These agreements were followed by the signing of the North Atlantic Treaty (April 4, 1949, in Washington, D.C.). His plans (1947–48) for a federal Jewish–Arab nation or other partition of Palestine collapsed in the face of the Arab–

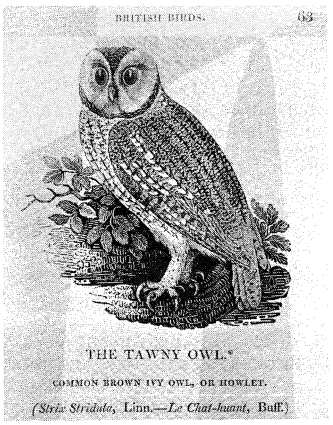
Israeli conflict. On Jan. 6, 1950, the United Kingdom offered recognition to the People's Republic of China, contrary to United States policy. Before ill health forced his resignation on his 70th birthday, March 9, 1951, Bevin initiated the Colombo Plan (effective June 30, 1951) for economic development of South and Southeast Asia. For the last five weeks of his life he was lord privy seal.

Biographies include *Ernest Bevin* (1952) by Francis Williams and *The Life and Times of Ernest Bevin*, 3 vols. (vol. 1, 1960; vol. 2, 1967; vol. 3, 1983) by Alan Bullock.

Bewa (Liberia): *see* Mano River.

Bewcastle Cross, runic monument in Cumbria, Eng., dating from the late 7th or early 8th century. Although the top of the cross has been lost, a weather-beaten, 15-foot (4.5-metre) shaft remains, showing on one face a figure of Christ trampling on the heads of beasts, a runic inscription underneath, and, above Christ's figure, a falconer, possibly St. John the Evangelist with his eagle. On another side elaborate carvings depict a tree, branches, roots, leaves, fruit, birds, and animals. The half-obliterated inscription suggests that the monument was a memorial to Alchfrith, son of Oswiu of Northumbria, and his wife Cynebburh (Cyniburug). The sophistication, artistry, and spirit of the cross link it to the same period and school as the Ruthwell Cross (*q.v.*).

Bewick, Thomas (b. Aug. 12, 1753, Newcastle upon Tyne, Northumberland, Eng.—d. Nov. 8, 1828, Gateshead, North Durham), printmaker and illustrator important for reviving the art of wood engraving and establishing it as a major printmaking technique. Bewick, a precocious youth, was apprenticed to a local metal engraver when he was 14 years old. He progressed rapidly and, after



"The Tawny Owl," wood engraving by Thomas Bewick, from his *History of British Birds*, 1797–1804

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

his apprenticeship, entered into a partnership with his former master in Newcastle, where he remained for most of his life.

Bewick was a brilliant technical innovator, but he did not invent wood engraving as is sometimes claimed. Instead, he rediscovered the technique, which consists of incising a design into endwood with a cutting tool called a burin. Using parallel lines instead of cross-hatching, he achieved a wide range of tones and textures. Moreover, he revived the practice of white-line printing, a method of printing white lines on a dark ground by making impressions from ink rolled onto the surface of the engraved relief instead of from ink held in its furrows. He also discovered that if the area of the block forming the background of the scene were lowered, it would receive less pressure during printing. Consequently, the background would print gray, heightening the effect of atmosphere and space.

Bewick's most important works are illustrations for such books as *A General History of Quadrupeds* (1790) and *A History of British Birds* ("Land Birds," 1797, and "Water Birds," 1804). A bird watcher and amateur naturalist, Bewick based his illustrations on his own watercolour studies made from nature (now in the British Museum, London, and the Hancock Museum, Newcastle upon Tyne).

Bexhill, also called BEXHILL-ON-SEA, town, Rother district, county of East Sussex, England, just west of Hastings on the English Channel. The coastal resort dates from the 1880s, but the old village inland on the cliff top is built around its ancient parish church. A central feature of the resort area is the De la Warr Pavilion (1935–36), by Bauhaus architects Mendelsohn and Chermayeff. There is an annual music festival. Pop. (1981 prelim.) 35,529.

Bexley, outer borough of Greater London, covering an area of 23 sq mi (61 sq km). It lies on the southern bank of the River Thames and extends to the borough of Bromley in the south, where it rises to about 150 ft (45 m) overlooking the valley of the River Cray.

The history of Bexley goes back as far as the Paleolithic period, and deneholes (ancient underground chambers) have been found in the area. Evidence of Roman settlement has been found at Joyden's Wood, and it is thought that the battle of Creccanford (AD 457), when indigenous Britons were defeated by invading Saxons, took place there. Erith was granted a charter as early as the 7th century, later developing as a royal dockyard.

The most rapid development of the borough has been since the 19th century, when Bexley grew as a residential area near London. It has benefitted from the presence of a number of parks and open spaces, notably Danson Park and Lessness Abbey Woods, some of which are associated with historic buildings, such as the ruined Lessness Abbey (an Augustinian house) and the 16th-century Hall Place manor. St. Paulinus Church, Crayford, is the oldest local church, with parts dating from the 11th century; St. Mary's, Bexley, was built in the 13th century.

Industries, based on imported raw materials or on the vast local supplies of water, are concentrated along the Cray Valley and along the Thames at Erith. They include oil-seed processing and the manufacture of paper, plastics, and chemicals, with engineering remaining the dominant occupation. Pop. (1982 est.) 217,900.

bey (Turkish), Old Turkish BEG, Arabic BAY, or BEY, title among Turkish peoples traditionally given to rulers of small tribal groups, to members of ruling families, and to important officials. Under the Ottoman Empire a bey was the governor of a province, distinguished by his own flag (*sancak, liwa*). In Tunis after 1705 the title become hereditary for the country's sovereign. Later "bey" became a general title of respect in Turkish and Arab countries, added after a personal name and equivalent to "esquire" (or "sir" in conversation) in English. In the 20th-century Turkish republic, bey, though surviving in polite conversation, was replaced by *bay* before the name (equivalent to "Mr.").

Bey, Enver (Ottoman general): *see* Enver Paşa.

Beyer, Absalon Pederssøn (b. 1528, Søgn, Nor.—d. 1575), Lutheran Humanist scholar, one of the most advanced thinkers in Norway in his day.

Born on a farm, Beyer was adopted by a bishop and educated at the universities of Copenhagen and Wittenberg, where he studied under the famous Reformation scholar Philipp Melanchthon. He was a lecturer at the Bergen Cathedral School. In an age when Norway was subject to Denmark, his principal work, *Om Norgis rige* ("Concerning the Kingdom of Norway"), written in 1567 and published in 1781, displays an interest in Norway's past and embodies the first stirrings of nationalistic sentiment. His diary, valuable as a historical source, was published in a critical edition in 1963.

Beyer-Garratt, type of steam locomotive characterized by tremendous hauling capacity and light axle loads. This British-built locomotive has two chassis, each with its own wheels, cylinders, and water tanks. These chassis support a girder frame that carries a boiler, cab, and the fuel supply. The Beyer-Garratt is particularly well-suited for rail lines of narrow gauge with lightly laid tracks because the weight of the locomotive is spread over a considerable distance. In addition, the articulated design of the locomotive with its 4-8-2+2-8-4 axle arrangement enables it to operate safely on lines with sharp curves. In such an axle arrangement, each chassis is equipped with 4 pilot wheels and 8 driving wheels, with the larger having an additional 2 wheels under each end of the boiler between the driving mechanisms of the two chassis.

The Beyer-Garratt locomotive was developed by the British engineer Herbert Garratt during the early 1900s. It was named for him and the firm of Beyer, Peacock and Company, which acquired rights to the patent. The locomotive was used throughout the world except North America from the 1920s to the late 1950s. It continues to be widely employed in south and east African countries.

Beyers, C(hristiaan) F(rederik) (b. Sept. 23, 1869, near Stellenbosch, Cape Colony—d. Dec. 7, 1914, Orange Free State Province, Union of South Africa), attorney, politician, and general in the South African War (1899–1902).

A graduate of Victoria College (now Stellenbosch University), Beyers migrated to the Transvaal, where he was naturalized and practiced as a lawyer. Joining the Boer forces in 1899, he rose rapidly to the rank of general and commanded the forces in the northern

Beyers

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Transvaal. A staunch Afrikaner, Beyers joined Louis Botha's party, Het Volk (The People), after the war and was elected speaker of the Transvaal Parliament (1907).

The Union of South Africa was formed in 1910, and when the Union Defence Force was established two years later, Beyers was made the commandant general. Beyers always objected to Botha's conciliatory policy toward Britain. With the outbreak of World War I, when Botha's government decided to aid the British by conquering German South West Africa, Beyers resigned (Sept. 15, 1914). Botha and his defense minister, Jan Smuts, failed to mollify Beyers and other Afrikaner nationalists, who then resorted to armed protest. While trying to elude government forces during the

short-lived rebellion, Beyers drowned in an effort to cross the Vaal River.

Beyla, town and administrative capital of Beyla region, southeastern Guinea, West Africa, in the Guinea Highlands. The town was founded by Dyula traders in the early 13th century as a collecting point for slaves and kola nuts and is now the chief trading centre for rice, cattle, tobacco, coffee, and palm oil and kernels. It is connected by road with Nzérékoré and Kankan. Beyla is the site of a hospital and a tobacco and match factory. There is some alluvial diamond mining west of the town around Bounoudou. Beyla region is mainly inhabited by the Muslim Malinke-Konianke people. The Simandou Mountains in the central part of the region contain iron-ore deposits. Pop. (1977 prelim.) region, 140,000.

Beyle, Marie-Henri (novelist): *see* Stendhal.

Beyrouth (Lebanon): *see* Beirut.

Beza, Theodore, French THÉODORE DE BÈZE (b. June 24, 1519, Vézelay, Fr.—d. Oct. 13, 1605, Geneva), author, translator, educator,

Beza, portrait by an unknown master of the French school, 1605
Archiv fur Kunst und Geschichte, West Berlin

and theologian who assisted and later succeeded John Calvin as a leader of the Protestant Reformation centred at Geneva.

After studying law at Orléans, Fr. (1535–39), Beza established a practice in Paris, where he published *Juvenilia* (1548), a volume of amorous verse that earned him a reputation as a leading Latin poet. On recovering from a serious illness he underwent a conversion experience and in 1548 travelled to Geneva to join Calvin, then deeply involved with his theocratic reforms of Swiss political and educational institutions. A year later Beza became a professor of Greek at Lausanne, where he wrote in defense of the burning of the anti-Trinitarian heretic Michael Servetus (d. 1553). For several years Beza travelled throughout Europe in defense of the Protestant cause, returning to Geneva in 1558.

There, in 1559, with Calvin, he founded the new Geneva academy, destined to become a training ground for promotion of Calvinist doctrines. As its first rector, Beza was the logical successor to Calvin upon the Reformer's death in 1564. Beza remained the chief pastor of the Geneva church for the rest of his life, contributing numerous works that influenced the development of Reformed theology.

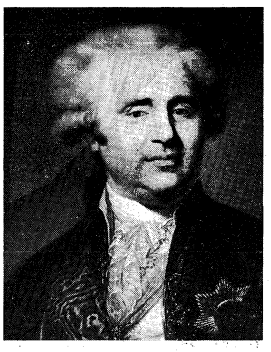
In most matters he reiterated Calvin's views, though with greater stress on ecclesiastical discipline and rigid obedience to authority. Beza's sermons and commentaries were widely read in his time; his Greek editions and Latin translations of the New Testament were basic sources for the Geneva Bible and the King James Version (1611). His *De jure magistratum* (1574), defending the right of revolt against tyranny, grew out of the St. Bartholomew's Day Massacre (1572), from which many surviving French Protestants were welcomed by Beza in Geneva. Beza's book overthrew the earlier Calvinist doctrine of obedience to all civil authority and subsequently became a major political manifesto of Calvinism. In 1581 Beza donated to Cambridge University from his library the celebrated Codex Bezae (D), an important manuscript from about the 5th century bearing Greek and Latin texts of the Gospels and Acts and supplemented by Beza's commentary based on the Calvinist viewpoint. Other works among Beza's own writings include anti-Catholic tracts, a biography of Calvin, and the *Histoire ecclésiastique des Églises réformées au royaume de France* (1580; "Ecclesiastical History of the Reformed Church in the Kingdom of France"). Both as a theologian and as an administrator, despite occasional charges of intolerance made against him, Beza is considered not only Calvin's successor but also his equal in securing the establishment of Calvinism in Europe.

BIBLIOGRAPHY. H.M. Baird, *Theodore Beza* (1899; 1967); P.F. Geisendorf, *Théodore de Bèze* (1949).

Bezborodko, Aleksandr Andreyevich, Knyaz (Prince) (b. March 25 [March 14, old style], 1747, Glukhovo, Ukraine—d. April 17 [April 6, O.S.], 1799, St. Petersburg), Russian foreign minister who was closely linked with the major diplomatic affairs of Catherine II the Great, including her idea of reestablishing the Byzantine Empire under her grandson Constantine.

Recommended to Catherine by Count P.A. Rumyantsev, with whom he had served in the Russo-Turkish War of 1768–74, Bezborodko was appointed secretary of petitions in 1775. He later became postmaster general and "plenipotentiary of all negotiations" in the Foreign Office, and in 1786 he was promoted to the Senate wherein he became Catherine's spokesman. In 1792 he concluded the Treaty of Jassy with the Turks, extending Russia's frontier to the Dniester (Dnestr) River. He also advised Catherine on the second and third partitions of Poland (1793 and 1795).

After Catherine's death (1796) Bezborodko was made a prince of the Russian Empire and imperial chancellor by Paul I, who, despite their disagreement concerning Russia's attitude toward France, regarded Bezborodko with favour.



Bezborodko, portrait by an unknown artist, 18th century; in the State Historical Museum, Moscow
By courtesy of the State Historical Museum, Moscow

Bèze, Théodore de: *see* Beza, Theodore.

Béziers, city, Hérault *département,* Languedoc-Roussillon region, southern France, 9 mi (14 km) from the Mediterranean, on a hilly site overlooking the Orb River where it is intersected by the Canal du Midi, southwest of Montpellier. There are remains of an arena from the Roman colony Beterrae. In the 12th century it was a stronghold of the viscounts of Carcassonne. In 1209 Simon de Montfort, sent by the Pope to extirpate the Catharist heresy of good and evil as creators of the next world and this one, massacred the inhabitants; and the Roman-Gothic church of La Madeleine was a scene of great bloodshed. The city walls, rebuilt in 1289, were destroyed in 1632. The former cathedral of Saint-Nazaire, dominating

The old fortified cathedral of Saint-Nazaire on the Orb River, Béziers, Fr.
By courtesy of the Commissariat General au Tourisme (France); photograph, Boulas

the old town, is a typical ecclesiastical fortification of the 13th–14th centuries. The street named for Paul Riquet, who built the Canal du Midi, separates the old town (west) from the modern.

Béziers distills alcohol and makes artificial fertilizers and spray chemicals for the vineyards. The city is an important railway junction and has a major service facility for the French national railway system. Its principal trade has been in the *vin ordinaire* of Languedoc, notably Muscat, said to have been introduced by the Romans, but this has diminished due to the centralization of the wine industry in Montpellier. Pop. (1982) 74,114.

Bezique, card game, a forerunner of Pinochle. The game is for two players using two 32-card decks in which the deuces through sevens have been removed, the cards ranking in descending order: ace, 10, king, queen, jack, 9, 8. Eight cards are dealt, three, two, and three cards at a time. The remaining cards become the stock, the top card of which is turned up to establish trump.

The play is in two stages. First the nondealer plays a card face up; the dealer may follow suit, not follow suit, or trump as he pleases. The highest card of the suit led or a trump wins the trick. Players score points either by taking aces and 10s (each is called a brisque and counts 10 points) or by declaring (melding) various combinations after a trick is won, as follows:

Marriage (king, queen of same suit)	20
Royal marriage (king, queen of trump)	40
Sequence (ace through jack of trump)	250
Bezique (queen of spades and jack of diamonds)	40
Double bezique	500
Four aces (one in each suit)	100
Four kings (one in each suit)	80
Four queens (one in each suit)	60
Four jacks (one in each suit)	40

A card used and scored in one combination cannot be counted in another lower combina-

tion in the same class (classes are sequences, beziques, and quartets). After declaring, the highest declarer replenishes his hand from the stock, as does the other player, and then leads from his hand or from a declaration on the table. The winner of the last trick when the stock is down below two cards takes the last card and the loser takes the trump card.

In the second stage of play, using only the declared cards, suit must be followed if possible. Game is usually 1,000 or 1,500 points.

Rubicon Bezique has, with Six-Pack Bezique (also called Chinese Bezique), supplanted the original game in popularity. In both Rubicon and Six-Pack, scoring combinations may be declared and scored, broken up during play, restored by adding requisite cards, and scored again. Four 32-card decks are used, and players receive nine cards in Rubicon Bezique; six decks are used in Six-Pack Bezique, and players are dealt 12 cards. In both, the first marriage establishes trump.

Bezruč, Petr, pseudonym of VLADIMIR VAŠEK (b. Sept. 15, 1867, Opava, Silesia, Austrian Empire—d. Feb. 17, 1958, Kostelec, Czech.), one of the finest and most individual Czech poets.

Bezruč studied in Prague and became a postal official in Moravia until his retirement in 1927. His literary reputation rests on a remarkable series of poems written during 1899–1900 and published in the periodical *Čas* between 1899 and 1903. The subject of almost all these poems is the people of Czech Silesia, whom Bezruč saw as a dying race, doomed to denationalization at the hands of German industrialists and Polish priests. From this local theme he created a poetry of national and, indeed, universal validity. The 32 poems of the Silesian issue of *Čas* (1903) had swelled to 88 by the last edition of the collected *Slezske pisne* (1956; "Silesian Songs").

Bezwāda (India): *see* Vijayawāda.

BFBS: *see* British and Foreign Bible Society.

BGN: *see* Geographical Names, U.S. Board on.

Bhadrabāhu I (d. 298 BC, India), Jaina leader and philosopher who, after a 12-year famine, led an exodus from the Jaina stronghold in northeastern India to Srāvana-Belgola in Mysore, southwestern India, in 310 BC.

Bhadrabāhu was a monk who became the spiritual head of the Jainas. He founded a community in Mysore that gave rise to the Digambara sect, whose members lived entirely naked. Bhadrabāhu is believed to have been the author of three of the Jaina sacred books as well as of *Niryuktis*, short commentaries on 10 of the 12 original sacred books. Some authorities say that, after the famine, Bhadrabāhu retired in seclusion to Nepal; others say he remained in Mysore. He is reputed to have died by realizing the Jaina ideal of starving to death.

Bhadracaryā-praṇidhāna (Sanskrit: "Vows of Good Conduct"), also called SAMANTABHADRA-CARYĀ-PRAṆIDHĀNA ("Practical Vows of Samantabhadra"), a Mahāyāna (Greater Vehicle) Buddhist text that has also made an important contribution to the Tantric Buddhism of Tibet. Closely related to the *Avataṃsaka-sūtra* ("Discourse on the Adornments of the Buddha") and sometimes considered its final section, the *Bhadracaryā-praṇidhāna* presents a universe of totally interdependent phenomena manifesting the Buddha. But its main emphasis is on entering into the full realization of such a universe—or into the Pure Land of Amitābha—through actions conforming to the 10 great vows of the *bodhisattva* ("Buddha-to-be") Samantabhadra.

These 10 vows, understood as the essence of the vows and deeds of all past and future Buddhas, came to be used as daily lessons in Chinese monasteries. In Tibet they were incorporated as utterances in a number of rites, thus influencing the development of Tantric ritualism.

Briefly summarized, the vows include: inexhaustible service to all Buddhas; the learning and obedience of all teachings of all Buddhas; the plaint for all Buddhas to descend into the world; the teaching of the *dharma*s and the *pāramitā*s to all beings; the embracing of all universes; the bringing together of all Buddha's lands; the achievement of Buddha's wisdom and powers to help all beings; the unity of all *bodhisattva*s; and the accommodation of all sentient beings through the teaching of wisdom and Nirvāṇa.

Bhadrāvati, town, Shimoga district, central Karnātaka (formerly Mysore) state, southern India, on the Bhadra River, near the Bāba Budan Range. The proximity of iron, manganese, and limestone deposits, along with the Bhadrā hydropower project, have made the site an ideal location for industrial development (including Visvesvaraya Iron and Steel Ltd.). Bhadrāvati has become a planned modern town with accompanying road and rail services. Auxiliary industries produce charcoal, tar products, cement, paper, bricks, wood alcohol, and sandalwood oil. Pop. (1981) town, 53,551; metropolitan area, 130,606.

Articles are alphabetized word by word, not letter by letter

Bhāgalpur, town, administrative headquarters of Bhāgalpur district, Bihār state, northeastern India, just south of the Ganges River. The town has major road and rail connections and trades in agricultural produce and cloth. Major industries include rice and sugar milling and woollen weaving: Bhāgalpur is noted for its silk production. A sericulture institute and an agricultural research station have been established, and the town is the seat of Bhāgalpur University. Formerly called Sujānganj, Bhāgalpur was constituted a municipality in 1864.

Bhāgalpur district (2,184 sq mi [5,656 sq km]) comprises an alluvial plain in the north and forested uplands of the Choṭa Nāgpur Plateau to the south. The Ganges and Chāndan rivers drain the area. Grains and oilseeds are the principal crops; china clay, fireclay, and mica deposits are worked. Rock sculptures (6th–9th century AD) are found at Patharghatta, and Sultānganj is the site of a Gupta temple. Pop. (1981) town, 225,062; district, 2,621,427.

Bhagavadgītā (Sanskrit: "Song of the Lord"), one of the greatest and most beautiful of the Hindu scriptures. It forms part of Book VI of the Indian epic the *Mahābhārata* ("Great Epic of the Bharata Dynasty") and is written in the form of a dialogue between the warrior Prince Arjuna and his friend and charioteer, Krishna, who is also an earthly incarnation of the god Vishnu. The *Gītā* is of a later date than the major parts of the *Mahābhārata* and was probably written in the 1st or 2nd century AD. The poem consists of 700 Sanskrit verses divided into 18 chapters.

The dialogue takes place on the field of battle, just as the great war between the Pāṇḍavas and the Kauravas is about to begin. The two armies stand opposing each other, and on seeing many of his friends and kinsmen among those lined up on the other side, Prince Arjuna hesitates. He considers whether it would not be better to throw down his arms and allow himself to be slain by the enemy rather than to engage in a just, but cruel, war. He is recalled to his sense of duty as a warrior by Krishna, who points out to him that the higher way is the dispassionate discharge of his duty, performed with faith in God, and without selfish concern for personal triumph or gain.

The *Gītā* goes far beyond the ethical question with which it starts to consider broadly the nature of God, and the means by which man can know him. The greatness of the scripture lies in its description of both the end and the means. It gives a synopsis of the religious thought and experience of India through the ages. Since it is a predominantly theistic work, it often describes the ultimate reality as a personal god, identified with Krishna. However, it also quite frequently refers to the supreme as the immanent spirit, as the transcendent absolute, and, finally, as the state of one's own awakened soul. The three paths of the Hindu religious tradition leading to mystic union with God are all described as different aspects of a single way of approach.

The popularity of the *Gītā* is evident from the numerous commentaries, glossaries, and expository books written on it in both ancient and modern times. The earliest commentary that has come down to us is that of the great philosopher Śaṅkara. Other important commentaries of ancient times are those of Bhāskara, Rāmānuja, Madhva, Nīlakaṇṭha, Śrīdhara, and Madhusūdana; and outstanding commentaries of modern times are those of B.G. Tilak, Sri Aurobindo, Mahatma Gandhi, and Sarvepalli Radhakrishnan. The *Gītā* has been translated into many languages.

Bhāgavata (Sanskrit: "One Devoted to Bhagavat [Lord]"), member of the earliest Hindu sect of which there is any record, representing the beginnings of theistic, devotional worship, and of modern Vaiṣṇavism (worship of the Lord Vishnu); the term is commonly used today to refer to a Vaiṣṇava, or devotee of Vishnu.

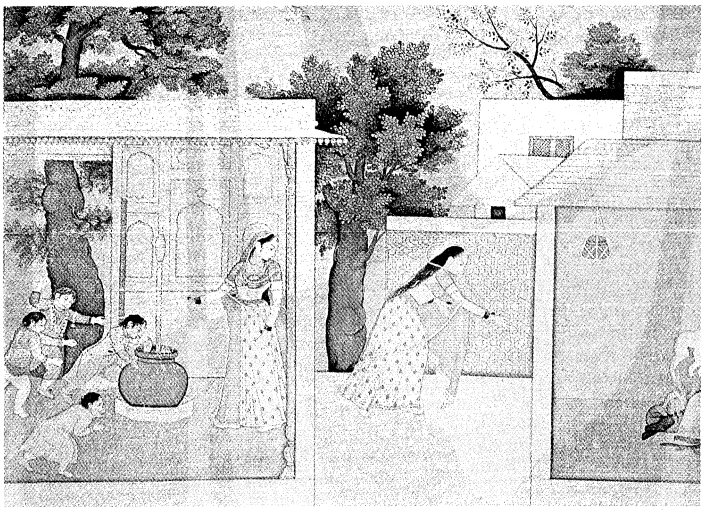
The Bhāgavata sect originated among the Yādava people of the Mathura area in the centuries preceding the beginning of the Christian era. From there it spread as the tribes migrated to western India and the northern Deccan. It was introduced into South India at an early date. The sect continued to be prominent within Vaiṣṇavism until at least the 11th century, when bhakti (devotional worship) was revitalized by the great theologian Rāmānuja.

The Bhāgavata system was a highly devotional faith centred upon a personal god, variously called Vishnu, Vāsudeva, Krishna, Hari, Nārāyaṇa. The school was known as *ekāntikadharma* ("religion with one object"; *i.e.*, monotheism). The religious poem the *Bhagavadgītā* (1st–2nd centuries AD) is the earliest and finest exposition of the Bhāgavata system. By the time of the Gītā Vāsudeva (Krishna), the hero of the Yādava clan was identified with the Vedic Lord Vishnu (*see* Vāsudeva cult). Later, the deified sage Nārāyaṇa, whose followers were originally called Pāñcarātras (*see* Pāñcarātra cult), was assimilated, and, still later, the pastoral and amorous Krishna was added to the multiplicity of traditions.

The Bhāgavatas believed in simple rites of worship and condemned Vedic sacrifices and penances. The sect may have been largely responsible for the spread of image worship among orthodox, upper-class Hindus. Few early Vaiṣṇava images are still extant, but those that have survived are mainly from the Mathura area, perhaps the earliest being the image of Balarāma, the half brother of Krishna, which is attributed to the 2nd–1st century BC.

Bhāgavata-Purāṇa (Sanskrit: "Ancient Stories of the Lord"), the most celebrated text of a variety of Hindu sacred literature in Sanskrit known as the *Purāṇa*s (*see* Purāṇas), and the one held sacred by the Bhāgavata sect. Scholars generally agree that the *Bhāgavata-Purāṇa* was probably composed about the 10th century, somewhere in the Tamil country of South India; its expression of bhakti (religious

devotion) is akin in its emotional fervour to that of the South Indian devotional poets, the Āḻvārs. The *Purāṇa* is made up of some



The child Krishna stealing butter, painting from the *Bhāgavata-Purāṇa,* Kāngra school, 1790–1800; in the F.F. Wadia Collection
The F.F. Wadia Collection, Pune, India

18,000 stanzas divided into 12 books; but it is book 10, which deals with Krishna's childhood and his years spent among the cowherds of Vṛndāvana, that accounts for its immense popularity with Vaiṣṇavas throughout India. The attempts on Kṛishna's life made by his wicked uncle Kaṃsa, the childhood pranks he played on his foster mother Yaśodā, his love for the *gopīs* (the wives and daughters of the cowherds) and their passionate abandonment to him are treated with endearing charm and grace, even while transfused with deep religious significance. The *Bhāgavata-Purāṇa,* in translation and in inspiration, has resulted in an enormous body of related vernacular literature. Its scenes have been carved in stone on temple walls and have been illustrated in beautiful miniatures by Rajasthani and Pahari painters of the 17th and 18th centuries.

Bhāgīrathi River, river in West Bengal state, northeastern India, forming the western boundary of the Ganges (Gaṅgā) Delta. A distributary of the Ganges, it leaves that river just northeast of Jangipur, flows south, and joins the Jalangi at Nabadwīp to form the Hooghly River after a total course of 120 miles (190 km). Until the 16th century, when the Ganges shifted eastward to the Padma, the Bhāgīrathi formed the original bed of the Ganges. Its banks sheltered the great ancient capitals of Bengal, and the river is held sacred by the Hindus.

Bhāī Jeṭhā (Sikh Gurū): *see* Rām Dās.

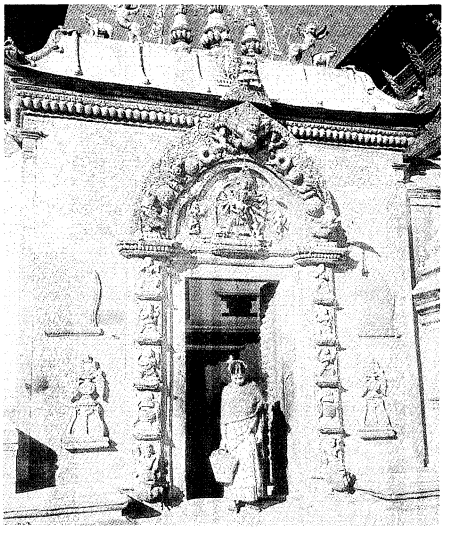
bhāībband (Hindi), Urdu-Persian BERĀDARĪ ("brotherhood"), important instrument of caste self-government in India; the *bhāīband* is the council formed by the heads of families that belong to the same lineage in a particular area, thus constituting an exogamous (those who do not intermarry) unit within the endogamous (those who do intermarry) caste group. One of their concerns, in addition to questions arising as a result of their common lineage, is the securing of exogamous alliances and safeguards against lineage inbreeding. Often the local *bhāīband* may be coterminous with the panchayat, or governing council, of a particular caste section.

Bhaiṣajya-guru (Sanskrit), Tibetan SMAN-BLA-RGYAL-PO, Chinese YAO-SHIH-FO, Japanese YAKUSHI NYORAI, the healing Buddha, widely worshiped in Tibet, China, and Japan. According to popular belief in those countries, some illnesses are effectively cured by merely touching his image or calling out his name. More serious illnesses, however, require the performance of complex ritual acts, as described in the principal scripture of the Bhaiṣajya-guru cult. Bhaiṣajya-guru is associated with the "self-born," eternal Buddha, Akṣobhya (and by some Japanese sects with another eternal Buddha, Vairocana), and rules over the Eastern Paradise.

In Japan the worship of Bhaiṣajya-guru reached a peak during the Heian Period (794–1185), and he is especially venerated by the Tendai, Shingon, and Zen sects. In Japan he is often represented in the garb of a blue-skinned Buddha with his medicine bowl in one hand. In Tibet he often holds the medicinal myrobalan fruit. He has in his retinue 12 divine *yakṣa,* or nature spirit, generals who protect true believers. Chinese Buddhists, in a later phase, connected these generals with the 12 hours of the day and the 12 years of the Chinese calendar's cycle.

The *Bhaiṣajyaguru Sūtra* had four Chinese translations, the earliest from the Eastern Chin (AD 317–420), and two Tibetan versions.

Bhaktapur, also called BHATGAON, or BHĀDGAON, town, central Nepal, in the Nepal Valley, southeast of Kāthmāndu. Said to have been founded by Rājā Ananda Malla in 865, it was for 200 years the most important settlement in the valley. The old palace in Durbar Square, built in 1700, is well preserved and has beautifully carved woodwork and a finely worked gilt gateway. Opposite, on a stone pillar, is the copper-gilt figure of King Bhūpatīndra Malla. There are other temples in the square.



The Golden Gate to Bhaktapur Palace, Nepal
J. Allan Cash—EB Inc.

To the south is another square with the 18th-century Najatapola Dewai, or five-tiered temple, and a temple to Bhairava, guarded by two copper-gilt *singhas* (mythical lions). A local museum is devoted to the conservation of examples of fine woodwork of the past. Pop. (1981) 48,472.

bhakti (from Sanskrit *bhaj,* "to allot," "to revere"), in Hinduism, a devotional movement emphasizing the intense emotional attachment and love of a devotee toward his personal god. Bhakti assumes a dualistic relationship between the devotee and god, in contrast to the monistic ideal of Advaita Vedānta philosophy. The way of bhakti (bhakti-marga) is contrasted with other means of achieving salvation, such as knowledge (jnana-marga), ritual and good works (karma-marga), and ascetic disciplines of the body; it is claimed by its supporters to be a superior way, as well as one open to all, irrespective of the sex, class, or caste status into which they were born.

Though each of the major divinities of Hinduism—Vishnu, Śiva, and Śakti—has its own devotional cults, the bhakti movement most characteristically developed around darshan Vishnu, principally in his two earthly incarnations as Rāma and Kṛishna.

An emotional attraction toward a personal god began to be expressed in the early centuries of the Christian Era. It was an attitude furthered by the Indian epics—the *Mahābhārata* and the *Rāmāyaṇa*—and by the *Purāṇas,* encyclopaedic texts that recount legends of the various incarnations and appearances of the deities, their genealogies, and devotional practices accorded them. These practices included the recitation of God's name, singing of hymns in praise of him, wearing his emblem, undertaking pilgrimages to sacred places associated with him, and serving him in a variety of ways.

The devotional fervour of the 7th–10th-century hymnists of South India, the Āḻvārs and the Nāyaṇārs, also traveled north, until in time bhakti became an extremely widespread and popular form of Hindu religious life, inspiring a substantial quantity of superb religious poetry and art.

During the medieval period (12th to mid-18th century), the various possible relationships of the worshiper to God—based on the analogy of human sentiments, such as that felt by a servant toward his master, friend toward a friend, parent toward a child, child toward a parent, and woman toward her beloved—were explored in separate schools. In Bengal the 15th–16th-century mystic Caitanya stressed the passionate yearning of a woman for her beloved, while his contemporary Vallabha delighted in the exploits of Krishna as the divine child, as well as Krishna as the divine lover. Tulsīdās' retelling of the Rāma legend in the *Rāmcaritmānas* focused on the sentiment of friendship and loyalty. The synthesis in the medieval period of bhakti ideas with Ṣūfī (mystical) elements from Islām can be discovered in the writings of poet-saints such as Kabīr, devotees of a God whom they were unwilling and unable to delimit by sectarian description.

Bhaktivedanta, A(bhay) C(haranaravinda), also called SWAMI PRABHUPĀDA (b. Sept. 1, 1896, Calcutta—d. Nov. 14, 1977, Vrindāvan, Uttar Pradesh, India), Indian religious leader and author who in 1965 founded the International Society for Krishna Consciousness, commonly known as the Hare Krishna movement.

In 1920 Bhaktivedanta completed his B.A. in chemistry at the Scottish Churches' College

in Calcutta; by that time, his family had arranged a marriage for him, and he later established a pharmacy business. In 1922 his guru, a spiritual leader of the Vaiṣṇava Hindu sect, urged him to preach the teachings of Krishna throughout the Western world. Thereafter Bhaktivedanta devoted much time as lecturer, writer, editor, and translator for the Vaiṣṇava and in 1933 was formally initiated as a disciple at Allahābād.

Since his family did not share his religious interests, Bhaktivedanta turned over his business to a son and renounced all family ties in 1954 to devote his full time to religious work. He received the title of swami in 1959 and in 1965 sailed for Boston. Several months later he moved to New York City, where he established the headquarters of the Hare Krishna movement on the Lower East Side. From a storefront, he taught classes on Vedic culture, which he claimed could affect the consciousness of a world afflicted with rampant materialism. The movement became especially popular among young people, and many of the swami's books began to be studied on college and university campuses.

Despite his failing health, Bhaktivedanta by the time of his death had written and published more than 50 books on ancient Vedic culture and had opened more than 100 centres throughout the world. A detailed biography is Satsvarūpa Dāsa Gosvāmī, *Śrīla Prabhupāda-līlāmṛta,* 3 vol. (1980–81).

Bhamo, town, Kachin State, northeastern Upper Burma, on the Irrawaddy River at the head of navigation. It stretches along the river's east bank in a series of villages approached through a narrow passage; the town proper occupies a high ridge running at right angles to the river. It is linked by air and steamer service to Rangoon and by air to Mandalay.

In ancient times Bhamo was capital of the Shan state of Manmaw. Its proximity (40 mi [65 km]) to the Chinese border made it the terminus of land commerce from Yunnan Province until the building of the Burma Road (1937–39). The town was a tributary to China at various times and was occupied by the Chinese in 1287 and in the 1760s. Anawrahta incorporated Bhamo into a united Burma in the 11th century, but as a frontier area its loyalty depended on the relative strength of the individual Burman kings. The town was an important station on the Stilwell Road (*q.v.*), which connects via Myitkyinā (north) with the Burma Road. Bhamo is the site of a sugar factory and a diesel electric plant. Its population has a large proportion of Chinese and Chinese Shans. The Thai-influenced Theindawgyi pagoda is there.

The surrounding area, in the basin of the Irrawaddy, is inhabited chiefly by Kachin hill tribes. The Shan Plateau is east of the river. To the west several ranges enclose the basins of the Kawkkwe and Indaw streams, which are used to transport timber. The Namwan Tract, southeast of Bhamo, was disputed between China and the British and later between China and the Burmese government. The area was leased to the British in perpetuity in 1900; intermittent disputes over the area were not finally resolved until 1960, when China relinquished its claim. Pop. (latest est.) 13,767.

bhāṇavāra (Sanskrit and Pāli: "recitation section"), any of the units, usually 8,000 syllables in length, into which Pāli Buddhist texts were divided in ancient times for purposes of recitation. The system developed as a means of preserving and transmitting canonical material before it was committed to writing and before written texts were in general use among the people.

At first, different groups of *bhāṇaka*s ("reciters") were responsible for different parts of the canon; Dīghabhāṇakas, for example, specialized in the *Dīgha Nikāya* ("Long Collection"). Later, in Ceylon, these groups developed into early schools of interpretation, and their differing views are reflected in some of the commentary literature.

Bhandāra, town, administrative headquarters of Bhandāra district, Mahārāshtra state, western India, on the Wainganga River, east of Nāgpur. As a fording place across the river, it developed as a commercial centre; industries include the manufacture of brassware and cigarettes. It houses a college affiliated with the University of Nāgpur.

Bhandāra district occupies 3,558 sq mi (9,214 sq km) in the northeastern corner of Mahārāshtra state. Rice covers most of the cultivated area, and the forests of the hills surrounding the central Wainganga River Valley are an important economic resource. Nawegaon National Park (33,114 ac [13,401 ha]) is located in the district. The area is rich in mineral resources, particularly manganese, iron, and chromite. Gondia, Pauni, and Tumsar are chief towns. Pop. (1981) town, 56,025; district, 1,837,577.

Bhānder Plateau, plateau in Madhya Pradesh state, north central India, in the South Central Highlands. Having an area of about 4,000 sq mi (10,000 sq km), it comprises a transitional zone between the North Deccan Plateau to the south, the Eastern Plateau to the east, and the alluvial stretch of the Ganges River Plains to the north. The plateau is part of the Vindhya Range and is composed of fluvio-marine deposits of Cambrian age that have been uplifted and peneplained several times and are overlain by dissected sandstone. It has an average elevation of 1,600 ft (500 m) and slopes from west to east. The swift-flowing Tons and Sonār rivers have numerous falls and rapids along their courses and have cut deep gorges in the scarplands of the Vindhya. Forests of teak and catechu trees are characteristic of the plateau. Agriculture is the basis of the economy; rice, wheat, jowar (sorghum), gram (chick-pea), barley, corn (maize), peas, sesame seed, and mustard seed are grown. Although the region is rich in coal and other mineral and forest resources, the only major industrial plant is a large cement factory at Kymore (Katni town); local limestone and coal are utilized. Cottage industries produce brick and tile, stoneware, cement, glass, and shellac; flour, dal (pigeon peas), and oilseeds are milled. The plateau is a region of low population density; the only major road is the National Highway through Katni. The other important towns are Damoh, Maihar, and Hatta.

bhāngṛā, most popular folk dance of the Punjab (India and Pakistan), performed on all festive occasions, particularly at sowing and harvest celebrations. The brightly dressed villagers dance vigorously in a large circle, accompanied by powerful drumming and also by clapping and singing.

Dancers in pairs give spontaneous solo displays that include virile jumps and even acrobatics. Though at one time danced primarily by men, it is now performed by the entire community.

Bharat: *see* India.

bhārata-nāṭya, also spelled BHĀRATA-NĀṬYAM, principal of the five classical dance styles of India, the others being *kathak, kathākali, manipuri,* and *orissi.* It is indigenous to the Tamil Nadu (Madras) region and prevalent in southern India. *Bhārata-nāṭya* serves the expression of Hindu religious themes and devotions, and its techniques and terminology have been traced back to ancient treatises such as the *Nāṭya-śāstra* (*q.v.*), by the Brahman sage and priest Bharata. *Bhārata-nāṭya,* originally performed exclusively by female temple dancers, was not brought to the stage for public performance until about 1930.

A program of *bhārata-nāṭya* usually lasts two hours without interruption and includes a specific list of procedures, all performed by one dancer, who does not leave the stage or change costume. The accompanying orchestra—composed of drums, drone, and singer—occupies the back of the stage, led by the guru, or teacher, of the dancer.

In pure style, *bhārata-nāṭya* is classically clear in technique. The feet beat out complicated counter rhythms; the legs are bent in a characteristic low squat; arms, neck, and shoulders are part of the movement. In the pantomime sections, the hands tell the story through conventional gesture language, while the face expresses the mood. In the pure dance the hands are restricted to 11 hand poses.

Bhārata Nāṭya-śāstra: *see* Nāṭya-śāstra.

Bharati, Subrahmaṇya C. (b. Dec. 11, 1882, Ettaiyapuram, Madras Presidency, India—d. Sept. 12, 1921, Madras), outstanding Indian writer of the Nationalist period who is regarded as the father of the modern Tamil style.

The son of a learned Brahman, Bharata became a Tamil scholar at an early age. He received little formal education, however, and in 1904 moved to Madras. There he translated English into Tamil for several magazines and later joined the Tamil daily newspaper *Swadesamitran.* This exposure to political affairs led to his involvement in the extremist wing of the Indian National Congress party, and, as a result, he was forced to flee to Pondicherry, a French colony, where he lived in exile from 1910 to 1919. During this time Bharati's nationalistic poems and essays were popular successes. Upon his return to India in 1919 he was briefly imprisoned and later rejoined the *Swadesamitran.* He was killed by a temple elephant in Madras.

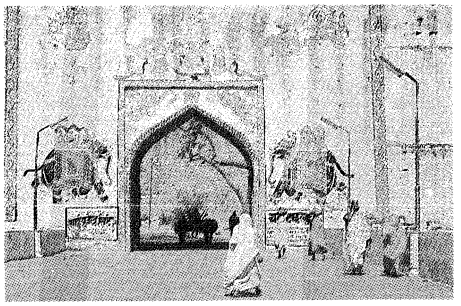
Bharati's best known works include *Kaṇṇan Pāṭṭu* (1917; *Songs to Krishna,* 1973), *Panchali Sapatham* (1912; *Panchali's Vow,* 1977), and *Kuyil Pāṭṭu* (1912; *Kuyil's Song,* 1977). Many of his English works were collected in *Agni and Other Poems and Translations and Essays and Other Prose Fragments* (1937).

Bharatpur, former state of India ruled by Hindu princes of the Jāṭ clan, or caste, situated in east Rājputāna, India, to the south of Delhi and bordering on the Mathura and Āgra districts of British India. In the 19th and 20th centuries its area was nearly 2,000 square miles (5,200 square kilometres), and its population was something less than 1,000,000. The dominant castes were the Jāṭs, who were sturdy cultivators, and Brahmans, and the country was agricultural.

In pre-Muslim times the area was divided between the two Rājput clans, the Tomaras of Delhi and the Jadons of Bayānā. Thereafter it was directly under Delhi. Jāṭ independence began toward the end of the Mughal emperor Aurangzeb's reign (1659–1707), with plundering raids and the establishment of robber forts. In 1722 Bharatpur was recognized by the Mughals as autonomous. Its greatest ruler, Sūraj Mal, plundered Delhi (1753) and took Āgra (1761–74). Soon after his death (1763) the state declined, undergoing two sieges by the British. In 1804 the Jāṭs sided with the Marāthā chief Holkar and successfully resisted a siege from January to February 1805. In 1825 a claimant to the throne, Durjan Sal, seized Bharatpur and defied the British again. This time it was captured by Lord Combermere (1826). After Indian independence (1947) Bharatpur was absorbed into the state of Rājasthān.

Bharatpur, also called BHURTPORE, town, administrative headquarters of Bharatpur district, Rājasthān state, northwestern India. The town, which was the capital of the former

princely state of Bharatpur, was founded *c.* 1733. A communications centre connected by road and rail with Jaipur, Āgra, and Mathura, Bharatpur is an important industrial and agri-



Entrance to the fort at Bharatpur, Rājasthān, India
Baldev—Shostal Assoc./EB Inc.

cultural market centre. Major industries include oil mills, metal fabricating factories, railway workshops, and small-car factories. Bharatpur's handcrafted chowries (fly whisks), which have handles made of ivory, silver, or sandalwood, are famous. It has several hospitals and two colleges affiliated with the University of Rājasthān.

Bharatpur district (3,125 sq mi [8,093 sq km]) comprises an immense alluvial plain with isolated hilly areas in the north and south. Beginning in the 1970s, the irrigated area was increased by the Kota barrage system from the Chambal River. The district has several fisheries. Bajra (pearl millet), gram (chick-pea), barley, wheat, and oilseeds are the chief crops; barytes and iron-ore deposits are worked. Bharatpur district comprises most of the former princely state of Bharatpur, established in the 18th century. In 1949 it became part of the state of Rājasthān. Pop. (1981) town, 105,274; district, 1,884,132.

Bhārhut, village, 120 mi (190 km) southwest of Allāhābād, in the Satna district of Madhya Pradesh, India. Bhārhut is famous for the ruins of a Buddhist *stūpa* discovered there by Maj. Gen. Alexander Cunningham in 1873; the *stūpa*'s sculptural remains are now mainly preserved in the Indian Museum, Calcutta, and in the Municipal Museum (Allāhābād).

The *stūpa* (shrine) was probably begun in the time of Aśoka (*c.* 250 BC); it was originally built of brick, and it was enlarged during the 2nd century BC, when a surrounding stone railing with entrances on the four cardinal points was constructed. This railing bears a wealth of fine relief carving on its inner face. Around the beginning of the 1st century BC four stone gateways (*toraṇas*), each elaborately carved, were added to the entrances. An inscription on these gateways assigns the work to King Dhanabhūti in the rule of the Śuṅgas (*i.e.,* before 72 BC). The sculptures adorning the shrine are among the earliest and finest examples of the developing style of Buddhist art in India.

Bhārhut sculpture, early Indian sculpture of the Śuṅga period (mid-2nd century BC) that decorated the great *stūpa,* or relic mound, of Bhārhut, in Madhya Pradesh state, now largely destroyed. Most of the existing remains—railings and entrance gateways—are now in the Indian Museum, Calcutta.

The Bhārhut style, though at times archaic and primitive in its conception, marks the beginnings of a tradition of Buddhist narrative relief and decoration of sacred buildings that continued for several centuries. Sculptures closely similar to the Bhārhut remains are located throughout northern India, suggesting that the Bhārhut site is the only survival of a once widespread style.

The flat planes, rather stiffly posed figures, and precise, elegant detailing of the ornamentation suggest continuance in stone of an earlier tradition in wood. Some of the uprights bear in relief standing figures of *yakṣa*s and *yakṣī*s (male and female nature deities) that have been pressed into the service of the Buddhist religion; a frequent motif is the woman embracing a tree.

The stone railing, which imitates wooden post-and-rail construction, is decorated with medallions and lunates, most of them filled with the lotus ornament, some of them centred by the head of a man or woman. Other railing medallions and the coping also depict *Jātaka* stories (legends of the Buddha's previous births) and events of the Buddha's life. Since these are labelled, Bhārhut sculpture is indispensable for an understanding of Buddhist iconography. As in all early Indian sculpture before the 1st century AD, the Buddha is represented by a symbol such as a wheel, empty throne, or umbrella, never in human form. The composition is simple, even naïve,

Standard-bearer on horseback, relief sculpture from the *stūpa* of Bhārhut, Madhya Pradesh, mid-2nd century BC; in the Indian Museum, Calcutta
SCALA—Art Resource/EB Inc.

with overlapping figures used in an attempt to distinguish planes. Animals appearing in the sculptures are treated with the sympathetic understanding characteristic of Indian art at all periods.

Bhartendu (Indian author): *see* Harishchandra.

Bhartṛhari (b. AD 570?, Ujjain, Mālwa, India—d. 651?, Ujjain), Hindu philosopher and poet-grammarian, author of the *Vākyapadīya* ("Words in a Sentence"), regarded as one of the most significant works on the philosophy of language, earning for him a place for all time in the *śabdādvaita* (word monistic) school of Indian thought.

Of noble birth, Bhartṛhari was attached for a time to the court of the Maitraka king of Valabhī (modern Vala, Gujarāt), where most likely his taste for sensuous living and material possessions was formed. Following the example of Indian sages, he believed he must renounce the world for a higher life. Seven times he attempted monastic living, but his attraction to women caused him to fail each time. Though intellectually he presumably understood the transitory nature of worldly pleasures and felt a call to yoga and ascetic living, he was unable to control his desires. After a long self-struggle, Bhartṛhari became a yogi and lived a life of dispassion in a cave in the vicinity of Ujjain until his death.

Bhartṛhari entitled three of his works *śataka* ("century"): The *Śṛṅgāra* (love) *-śataka, Nīti* (ethical and polity) *-śataka,* and *Vairāgya* (dispassion) *-śataka.* Although all three are attributed to him, only the first is regarded as his with certainty by most scholars. In another work sometimes attributed to Bhartṛhari, the *Bhaṭṭi kāvya* ("Poem of Bhaṭṭi"), he performs linguistic gymnastics to demonstrate the subtleties of Sanskrit.

Bharūch, also called BROACH, historically BHARUKACCHA, or BHṚGUKACCHA, town, administrative headquarters of Bharūch district, southeastern Gujarāt state, west central India, on the Narmada River near the Gulf of Cambay of the Arabian Sea. Bharūch was one of the most celebrated harbours in ancient India, being mentioned in the *Periplus Maris Erythraei* (*c.* AD 80) and by Ptolemy as Barygaza. It also occurs in the Hindu epic poem *Mahābhārata.* Ruled in the 2nd century by Kṣatrapas and in the 7th century by the Gurjaras, the town was incorporated into the Muslim state of Gujarāt and then annexed to the Mughal Empire in 1572. The Marāṭhās ruled it in 1685, and the British captured it in 1782. After changing hands again several times, it was ceded to the East India Company in 1803.

Bharūch is a commercial and industrial centre, with a substantial cotton industry, as well as handloom weaving and ink and glass manufacturing. The town exports cotton, wheat, tiles, dal (pigeon peas), and firewood. It is served by railroads and is on a national highway.

Bharūch district, bounded by Mahārāshtra state (east) and the Gulf of Cambay (west), occupies 3,492 sq mi (9,045 sq km). Agriculture (cotton, millet, rice, and wheat) is the major economic activity, although there are forests in the east and salt pans along the coast. The major towns are served by national and state highways and railroads. Pop. (1981) town, 110,070; metropolitan area, 120,524; district, 1,296,451.

Bhāsa (b. 2nd or 3rd century AD, India), the earliest known Sanskrit dramatist, many of whose complete plays have been found.

In 1912 an Indian scholar discovered and published the texts of 13 of Bhāsa's dramas, previously known only by the allusions of ancient Sanskrit dramatists. His best work, *Svapnavāsavadattā* ("The Dream of Vāsavadattā"), depicts a king losing and then regaining his kingdom from a usurper. The majority of his dramas are ingenious adaptations on themes of heroism and romantic love borrowed from India's two great epics, the *Rāmāyaṇa* and the *Mahābhārata.* Bhāsa deviated from the accepted dramaturgy of the time by portraying battle scenes and killings on the stage. His influence is seen in the works of the great 5th-century dramatist Kālidāsa, who consciously imitated and improved upon some of Bhāsa's literary motifs.

Bhāskara II, also called BHĀSKARĀCĀRYA, or BHASKARA THE LEARNED (b. 1114, Biddur, India—d. *c.* 1185, probably Ujjain), the leading mathematician of the 12th century, who wrote the first work with full and systematic use of the decimal number system.

Bhāskara II was the lineal successor of the noted Indian mathematician Brahmagupta (598–*c.* 665) as head of an astronomical observatory at Ujjain, the leading mathematical centre of ancient India.

In his mathematical works, particularly *Līlāvatī* ("The Beautiful") and *Bījagaṇita* ("Seed Counting"), he not only used the decimal system but also compiled problems from Brahmagupta and others. He filled many of the gaps in Brahmagupta's work, especially in ob-

taining a general solution to the Pell equation ($x^2 = 1 + py^2$) and in giving many particular solutions. Bhāskara II anticipated modern convention of signs (minus by minus makes plus, minus by plus makes minus) and evidently was the first to gain some understanding of the meaning of division by zero, for he specifically states that the value of $\frac{a}{0}$ is an infinite quantity, though his understanding seems to have been limited, for he also stated wrongly that $\frac{a}{0} \times 0 = a$. Bhāskara II used letters to represent unknown quantities, much as in modern algebra, and solved indeterminate equations of 1st and 2nd degrees. He reduced quadratic equations to a single type and solved them and investigated regular polygons up to those having 384 sides, thus obtaining a good approximate value of $\pi = 3.141666$.

In other of his works, notably *Siddhānta-śiromaṇi* ("Head Jewel of Accuracy") and *Karaṇakutūhala* ("Calculation of Astronomical Wonders"), he wrote on his astronomical observations of planetary positions, conjunctions, eclipses, cosmography, geography, and the mathematical techniques and astronomical equipment used in these studies. Bhāskara II was also a noted astrologer, and tradition has it that he named his first work, *Līlāvatī*, after his daughter in order to console her. His astrological meddling coupled with an unfortunate twist of fate is said to have deprived her of her only chance for marriage and happiness.

Bhatgaon, also spelled BHĀDGAON (Nepal): *see* Bhaktapur.

Bhatinda, also spelled BATHINDA, city, administrative headquarters of Bhatinda district, Punjab state, northwestern India. The city is a major rail hub, with lines converging on it from other Indian states and from nearby Pakistan. It is a trade centre for the area's agricultural products; industries include flour milling and handloom weaving. Rajindra College is located in Bhatinda, as is a huge fort, Govindgarh, built in the 16th century, with walls 118 ft (36 m) high. There is also the shrine of a Muslim saint, Bābā Ratan.

Bhatinda district is 2,148 sq mi (5,564 sq km) in area and forms part of the generally flat alluvial plain south of the Sutlej River. The light rainfall is augmented by irrigation canals; wheat, cotton, sugarcane, and gram (chick-pea) are among the crops grown. Other important towns are Mānsa and Talwandi Sābo. Pop. (1981) city, 124,453; metropolitan area, 127,363; district, 1,304,606.

Bhātpāra, town, Twenty-four Parganas district, West Bengal state, northeastern India, just east of the Hooghly River. Connected by road and rail with Calcutta, it is a major jute-, cotton-, and paper-milling centre. Bhātpāra is an ancient seat of Sanskrit learning, with several schools called *ṭols*. It was constituted a municipality in 1899, when it was separated from Naihāti (*q.v.*) municipality. Pop. (1981) 265,419.

Bhaunagar (India): *see* Bhavnagar.

bhava (Sanskrit), in the Buddhist chain of dependent origination, the "becoming" that immediately precedes birth. *See* pratītya-samutpāda.

bhava-cakra (from Sanskrit: "wheel [*cakra*] of becoming [*bhava*]"), also called WHEEL OF LIFE, in Buddhism, a representation of the endless cycle of rebirths governed by the law of dependent origination (*pratītya-samutpāda*), shown as a wheel clutched by a monster, symbolizing impermanence.

In the centre of the wheel are shown the three basic evils, symbolized by a red dove (passion), a green snake (anger), and a black pig (ignorance). The intermediate space between the centre and the rim is divided by spokes into five (later, six) sections, depicting the possible states into which a man can be reborn: the realm of gods, titans (if six states are shown), men, animals, ghosts, and demons. Around the rim of the wheel the 12 *nidānas*, or interrelated phases in the cycle of existence, are shown in an allegorical or symbolical manner—ignorance, *karman* formations, rebirth consciousness, mind and body, sense organs, contact, sensation, craving, grasping, becoming, birth, and old age and death.

Bhavabhūti (fl. AD 700), Sanskrit dramatist and poet, whose dramas, noted for their suspense and vivid characterization, rival the outstanding plays of Kālidāsa.

A Brahman of Vidarbha (the part of central India later called Berār), Bhavabhūti passed his literary life chiefly at the court of Yaśovarman of Kanauj. He is best known as the author of three plays: *Mahāvīracarita* ("Exploits of the Great Hero"), which gives in seven acts the main incidents in the *Rāmāyaṇa* up to the defeat of Rāvaṇa and the coronation of Rāma; *Mālatī Mādhava,* a domestic drama in 10 acts abounding in stirring, though sometimes improbable, incidents; and *Uttararāmacarita* ("The Later Deeds of Rāma"), which continues the story of Rāma from his coronation to the banishment of Sītā and their final reunion. This last play, though containing far less action than the other two, shows Bhavabhūti at the height of his power in characterization and in presenting suspense and climax.

Bhave, Vinoba, byname of VINAYAK NARAHARI BHAVE (b. Sept. 11, 1895, Gagode, Gujarāt, India—d. Nov. 15, 1982, Wardha, Mahārāshtra), widely venerated disciple of Mahatma Gandhi and one of India's best known social reformers, founder of the Bhudan Yajna, or land-gift movement.

Born of a high-caste Brahman family, he abandoned his high school studies in 1916 to join Gandhi's ashram (ascetic community). Gandhi's teachings led Bhave to a life of austerity, concentrating upon ways of improving Indian village life.

Bhave was interned several times during the 1920s and '30s and served a five-year prison sentence in the '40s for leading nonviolent resistance to British rule. He was given the honorific *acharya* (teacher).

Bhave's idea of the land-gift movement was conceived in 1951, when, while he was touring villages in the province of Andhra Pradesh, a landholder offered him an acreage in response to his appeal on behalf of a group of landless Harijans (untouchable, low-caste Hindus). He then walked from village to village, appealing for gifts of land to be distributed among the landless and relating the act of giving to Gandhi's doctrine of *ahiṃsā* (nonviolence). According to Bhave, land reform should be secured by a change of heart and not by enforced government action. His critics maintained that Bhudan Yajna encouraged the fragmentation of land and would thus obstruct a rational approach to large-scale agriculture, but Bhave declared that he preferred fragmented land to fragmented hearts. Later, however, he encouraged Gramdan, *i.e.,* the system whereby villagers pooled their land, after which the land was reorganized under a cooperative system.

Throughout 1975 Vinoba maintained a vow of silence over the issue of the involvement of his followers in political agitation. As a result of a fast in 1979, he secured the government's promise to enforce the law prohibiting the killing of cows (animals sacred to Hinduism) throughout India.

Bhave's original project and his philosophy of life are explained in a series of articles collected and published as *Bhoodan Yajna* (1953, reprinted 1957).

Bhavnagar, also called BHAUNAGAR, town, administrative headquarters of Bhavnagar district, south central Gujarāt state, west central India, on the western shore of the Gulf of Cambay of the Arabian Sea. Founded in 1723, it has become an important commercial and industrial centre, with spinning and weaving mills, metalworks, tile and brick factories, sawmills, an iron foundry, and a chemical plant. It is connected with the main Western Railway system and has a port for small vessels to the north. The town is the site of the Gandhi Museum.

Bhavnagar district occupies 4,307 sq mi (11,155 sq km) of the eastern Kāthiāwār Peninsula and is bounded by the Gulf of Cambay (east). Chief agricultural products are cotton and grains; salt is processed. Among its many manufactured goods are oil, copper and brass vessels, and cloth. It comprises the former princely state of Bhavnagar and was part of the Western India States agency (1944–47). After Indian independence in 1947, Bhavnagar was merged into the new state of Saurāshtra, which now forms part of Gujarāt state. Pop. (1981) town, 307,121; metropolitan area, 308,642; district, 1,879,340.

Bhawani (India): *see* Bhiwāni.

BHC: *see* benzene hexachloride.

Bhedābheda (Sanskrit: Dualism–Nondualism), an important school of Vedānta, an orthodox system of Hindu philosophy. Its principal author was Bhāskara, who was probably a younger contemporary of the great thinker Śaṅkara of the Advaita (Nondualist) school. The mainstay of Bhāskara's philosophy is the conviction that acts and knowledge are not mutually exclusive but, rather, mutually reinforcing. In contrast, Śaṅkara held that ultimately only total resignation and withdrawal from acts are necessary to attain release. Against this view, Bhāskara upheld the doctrine of the "cumulative effect of acts and knowledge" (*jñāna-karma-samuccaya*) and declared that a person should only withdraw after an active life in which he fulfilled his obligations. On the important issue of the relationship between Brahman (the absolute) and the world, Bhāskara teaches that the two are identical; if, he says, Brahman is the substantial cause of the world, then the world itself is real. Difference occurs when certain limiting conditions (*upādhi*s) are imposed on Brahman.

Bhāskara's doctrine never became widely accepted, for Śaṅkara had already expounded his own view, which soon gained great influence. Nevertheless his work remains important, for it documents the typical Brahman (priestly class) concern with the implementation of the *dharma*—that is, those caste and individual obligations that keep the world in balance and produce the good society. In Bhāskara's opinion, the tenet that the world is in the end illusory attacks the validity of this *dharma,* and the commandment of renunciation of the world prevents the fulfillment of it.

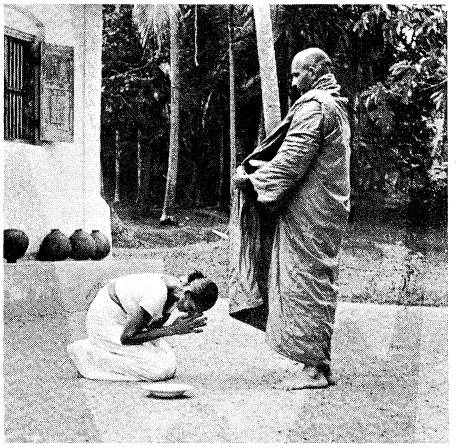
Bhêly-Quénum, Olympe (b. Sept. 26, 1928, Donukpa, Dahomey), African French-language novelist, journalist, and short-story writer.

Bhêly-Quénum was educated at home (in what is now Cotonou, Benin); at Achimota College, Ghana; at the Sorbonne in France; and at the Academy of International Law in The Netherlands. He taught school (1958–61); served at the Ministry of Foreign Affairs in Paris and at the International Court of Justice in The Hague; worked for the French consular service in Florence, Genoa, Milan, and Rome (1962); and became a journalist for UNESCO (from 1968). He also edited the journals *La Vie Africaine* (1962–65) and *L'Afrique Actuelle* (1965–68).

Bhêly-Quénum's major works include the novels *Un Piège sans fin* (1960; "An Endless Trap") and *Le Chant du lac* (1965; "The Song of the Lake"), which received the Grand Prix

de l'Afrique Noir in 1966, and a short-story collection, *Liaison d'une été* (1968; "Summer Affair"), that was actually written before the earlier published novels. He also wrote a school reader for African children, *Un enfant d'Afrique* (1970; "A Child of Africa"). His novels and stories have been praised for their elegant and aristocratic prose—which is poetic with rich metaphorical and symbolic overtones—and their narrative flow. They are, for the most part, powerful, violent, and pessimistic.

bhikku (Pāli), feminine BHIKKUNĪ, Sanskrit BHIKṢU, or (feminine) BHIKṢUṆI, in Buddhism, one who has renounced worldly life and joined the mendicant and comtemplative



Woman worshipping at the feet of a *bhikkhu* after offering him alms, while he blesses her

By courtesy of the Ceylon Tourist Board; photograph, Gamini Jayasinghe

community. While individuals may enter the monastic life at an early age—some renunciate communities include children in their pre-teens—a candidate for ordination must be 21 years of age, have parental permission, and be physically healthy, free of debt, and possessed of a sound mind.

The term *bhikku* comes from a verbal root meaning "to beg." Thus, a Buddhist monk or nun is marked primarily by his or her practice of poverty and non-attachment to the material world. Originally, *bhikkus* were the mendicant followers of the Buddha (6th century BC) who had left their families and worldly pursuits in order to meditate and to apply the Buddha's teachings to their everyday life. *Bhikkus* tended to live as a group in forest retreats near villages and towns; in exchange for food, the monks taught the townspeople the ways of religious righteousness (*dhamma;* Sanskrit, *dharma*). Buddhist texts indicate that in the beginning the Buddha allowed only men to enter the monastic community (the *Saṅgha*) but later permitted women to take vows as well. However, the female monastic order has never been as large as the male one.

A *bhikku* must observe all of the rules (227 to 250, depending upon the sect) of the monastic code that regulate all details of daily life; *bhikkunīs* observe an even greater number of rules. Violations of the code must be confessed in twice-monthly meetings of the monks (the *uposatha*). Four monastic rules, if broken, result in lifelong expulsion from the order. These prohibit (1) having sexual relations; (2) taking or ordering the taking of life; (3) taking something as one's own that has not been freely given; and (4) making claims regarding one's spiritual attainments, powers, or degree or enlightenment.

The *bhikku*'s head and face are kept shaven. He wears three garments—an upper and lower robe and a stole—originally made of cast-off rags dyed with saffron, now more likely the gift of a lay person. He is allowed to retain only a minimum of possessions—his robes and stole, a girdle, an alms bowl, a razor, a needle and thread for mending, and a strainer to prevent his harming the small insects that might otherwise enter his drinking water.

The *bhikku* begs daily for his food; the donation of food by the laity is viewed as meritorious. The *bhikku* may eat no solid food between noon and the following morning. Except on holy days, which are vegetarian, meat may be eaten but only if it has not been cooked especially for a monk.

In the Theravāda countries of Southeast Asia, the monk commonly is prohibited from handling money and from doing physical labour. This is not the case in China and Japan, where Ch'an (Zen) Buddhism early established the rule, "A day without work, a day without food."

Bhīl, ethnic group of nearly 2,500,000 people of western India. Many of them are tribal, and they have been known for rugged independence, sometimes associated with banditry.

The Bhīl are distributed widely in upland areas from Ajmer in Rājasthān on the north to Thāna district in Mahārāshtra on the south, and eastward as far as Indore in Madhya Pradesh. Nearly all of them engage in agriculture, some of them using the primitive slash-and-burn (*jhum*) method, but most employing the plow. The highland Bhīl generally live in scattered houses made of wattle and thatch.

The relationship between the Bhīl and neighbouring peoples is not clear. The Bhīl follow Rajasthani kinship usages in Rājasthān and Maharashtrian usages in Mahārāshtra, but with easier marriage and divorce procedures. Most Bhīl worship local deities in varied pantheons only slightly touching the practices of higher Hinduism; a few aristocratic segments such as the Bhīlāla and some plains groups employ Brahman priests; others are converts to Islām. Their dialects are akin to Gujarati or to other Indo-Aryan languages rather than to the Munda or Dravidian tongues of most tribal peoples. The Bhīl have evidently received many genetic contributions from the higher Hindu castes, whom many Bhīl now resemble more closely than they do the more isolated aboriginal peoples.

Bhilai Nagar, town and major industrial centre, Durg district, Madhya Pradesh state, central India, in the Chhattisgarh region. It was part of the Haihaivanśi Rājputs Kingdom until 1740, when it passed to Marāṭhā rule. It was administered by the British from 1853 until its merger with the Indian Union in 1947. Located on the South Eastern Railway about 4 mi (13 km) east of Durg town, Bhilai Nagar is a planned town, divided into 10 sectors with low-density, mostly single-story housing. A major government-operated steel plant, southeast of the town, was built in collaboration with the U.S.S.R. during India's Second Five-Year Plan (1956–61). Iron ore from Dalli-Rājhara, limestone from Nandini, coal from Jharia, manganese from Bālāghāt, electric power from the Kosa thermal power plant, and water from the Tandula Canal, all nearby, are used in the Bhilai Nagar plant to manufacture rails and structural steel. Pig iron and billets are supplied to foundries and rolling mills located at Kumhari and other sites in central India. Other industries in Bhilai Nagar include a cement plant, a sulfuric acid plant, an ammonium sulfate plant, and sawmills. The Maitri Bāgh (Garden of Friendship) is located near the Maroda water tanks (at the steel plant) and symbolizes Indian–Russian cooperation. Pop. (1981) 319,450.

Bhīlwāra, town, administrative headquarters of Bhīlwāra district, Rājasthān state, northwestern India. A rail and road communications centre, as well as a market town, Bhīlwāra's industries include cotton milling, handloom weaving, and the manufacture of hosiery and metalware (especially tinned utensils). It has a hospital and three colleges affiliated with the University of Rājasthān.

Bhīlwāra district (area 4,035 sq mi [10,450 sq km]) consists of an elevated plateau sloping toward the hilly, forested northeastern region. Wheat, corn (maize), barley, and cotton are the chief crops. Fuel and charcoal are marketable products; beryllium, mica, and iron-ore deposits are worked. Formerly a part of Udaipur princely state, it became part of the state of Rājasthān in 1948. Pop. (1981) town, 122,625; district, 1,310,379.

Bhīma River, major tributary of the Krishna River, flowing through Mahārāshtra and Karnātaka states, western India. It rises in the Bhīmashankar heights of the Western Ghāts and flows southeastward for 450 mi (725 km) in Mahārāshtra to join the Krishna in Karnātaka. Major tributaries are the Sīna and Nīra rivers. The Bhīma drainage area is defined by the Western Ghāts (west), the Bālāghāt Range (north), and the Mahadeo Range (south).

The Bhīma runs in a well-entrenched valley, and its banks are heavily populated. Its water level is marked by monsoonal changes; it is flooded in August following the rains and is practically stagnant in March and April. Receding floodwaters leave rich alluvial terraces that form fertile farming belts. Local irrigation works augment the scant supply of rainfall; major crops are jowar (sorghum), bajra (pearl millet), and oilseeds. Sugarcane is an important irrigated cash crop.

Bhind, also called BHIND-BHANWARA, town, administrative headquarters of Bhind district, Madhya Pradesh state, central India. The town is connected by road and rail with Gwalior. It is an agricultural market centre; cotton processing and brassware manufacture are the major industries. It was the seat of the Bhadwriyā Cauhān Rājputs until it fell in the 18th century. The town has an old fort on a lake, Gaurī Tal, in which stands the Vyankateshwar temple. Constituted a municipality in 1902, Bhind has eight colleges affiliated with Jiwaji University.

Bhind district (1,725 sq mi, or 4,467 sq km), constituted in 1948, marks the beginning of the Ganga–Yamuna plains. In the Yamuna–Chambal badlands, it comprises semi-fertile plains cut by numerous deep ravines along the Chambal, Kunwāri, and Sind rivers, tributaries of the Yamuna. Legumes, wheat, cotton, and millet are the chief crops. Pop. (1981) town, 74,515; district, 973,816.

Bhir, also spelled BĪR, town, administrative headquarters of Bhir district, Mahārāshtra state, western India, on a tributary of the Krishna River near a gap in a range of low hills. Known earlier as Champāvatinagar, its modern name probably derives from the Persian *bhir* ("water"). In its early history it belonged to the Cālukya and Yādava Hindu dynasties. Conquered by the Tughluq Muslim dynasty in the 14th century, it remained part of the Muslim states until 1947. Bhir is known for its leatherwork and its beautiful Kaṅkāleśvar temple, where a poor Brahman is said to have received 1,000 pots of gold as a reward for his intense devotion. The town has three colleges affiliated with Marāṭhwādā University.

Bhir district occupies 4,269 sq mi (11,227 sq km), primarily in the Godāvari River Basin, the river forming its northern boundary. The Bālāghāt Range traverses its southern portion. Rivers of the Bālāghāt drain into the Mānjra River, a tributary of the Godāvari. The Godāvari is considered sacred by the people of Bhir, and its banks are dotted with shrines.

The district is highly dependent on agriculture. About one-fourth of the people, however, are landless labourers who make seasonal migrations to the sugar factories of Ahmadnagar

district. Irrigation projects along the Godāvari have been planned to augment the scanty annual rainfall and to strengthen agricultural production, which is dominated by cotton and jowar (sorghum). Bhir district is one of the sparsely populated districts of Mahārāshtra state. Pop. (1981) town, 80,287; district, 1,486,030.

Bhiwāni, also called BHAWANI, city, administrative headquarters of Bhiwāni district, Haryāna state, northwestern India. The city is located on a tributary of the Ganges River, northeast of the Great Indian (Thar) Desert. Selected by the British in 1817 as a free market site, it was incorporated as a municipality in 1867. A road and rail junction, it is a major centre for trade with Rājasthān state. Industries include cotton milling, ginning, and pressing and light manufacturing. Five colleges and one technological institute are affiliated with Kurukshetra University.

Bhiwāni district has an area of 1,965 sq mi (5,090 sq km). It lies at the edge of the Great Indian Desert and includes outlying hills of the Arāvalli Range. Products include grain, cotton, sugarcane, and oilseed, but agriculture has been hindered by poor water resources. Pop. (1981) city, 101,277; district, 920,052.

Bhojpur, district, Bihār state, northeastern India, in the southern Middle Ganges Plain, with an area of about 1,600 sq mi (4,100 sq km). Located in the western part of the state, it is bounded by Saran district on the north, Patna and Gayā districts on the east, Rohtās district on the south, and Uttar Pradesh state on the west. The district is named after Bhojpur village, historically the capital of the Ujjain Rājput kings, descendants of King Bhoj of the Paramāra dynasty. The Ujjain Rājputs invaded the area and, after defeating the aboriginal Chero people, established a small state named Bhojpur. Subsequently, the local language, Bhojpurī (a dialect of Bihārī), became known for its folk literature, written in Bhojpurī. The Ganges River, laden with detritus, flows sluggishly west to east across the district and has been canalized for irrigation. Forests of sal (*Shorea*), teak, Java plum, mahua, and jujube are widespread. The economy is based on agriculture; rice (the main crop), wheat, barley, corn (maize), pulse (legumes), and vegetables are grown. Cottage industries process foodstuffs, including rice, flour, pulse, vegetable oil, fruits, and dairy products and produce textiles and woven carpets. Transportation consists of paved roads and railways. The only important town is Arrah, the district headquarters. Pop. (1981) 2,407,600.

Bhojpur, historic village, Raisen district, Madhya Pradesh state, central India, just east of the Betwa River. The village includes the remains of a richly carved Śaivite temple, traditionally said to have been erected by Raja Bhoj, a Paramāra Rājput (member of the warrior caste) in the 11th century; more probably, however, it dates to the 12th or 13th century. The temple is rectangular in plan, its four massive pillars supporting an incomplete dome decorated with excellent carvings; it houses a 7.5-ft (2.3-m) Śiva *liṅga,* or phallic symbol. Nearby lies an unfinished Jaina temple of the same period, with a 20-ft statue of Ādinātha, a Jaina saint. Just west are the ruins of two dams, destroyed in the 15th century, that once retained a great lake.

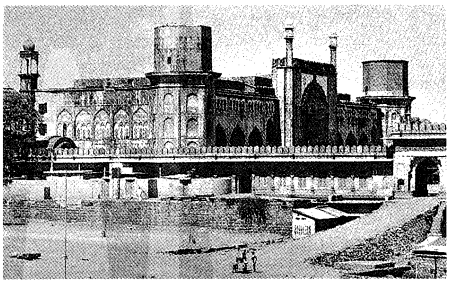
Bhonsle DYNASTY, also spelled BHONSLA, Indian dynasty of the family of the great Marāṭhā king Śivājī. They ruled at Nāgpur in present Mahārāshtra state and were a leading power in the 18th-century Marāṭhā confederacy and were British clients from 1818 to 1853.

Raghuji Bhonsle of Berār founded the dynasty in 1730. There were eight rulers in the line.

Bhopāl, city, administrative headquarters of Bhopāl district and capital of Madhya Pradesh state, central India. The city, lying along the slopes of a sandstone ridge, is a major rail junction and has an airport. Industries include cotton and flour milling, cloth weaving and painting, and the manufacture of transformers, switchgears, traction motors, and other heavy electrical equipment, as well as matches, sealing wax, and sporting goods. Just south lie two large lakes, around which are several palaces and a fort from *c.* AD 1728. Bhopāl has several mosques, including the 19th-century Tāj-ul-Masjid, the largest mosque in India. Constituted a municipality in 1903, the city has several hospitals and a musical academy and is the seat of Bhopāl University (founded 1970), which has 15 affiliated colleges in the city.

In 1984 Bhopāl was the site of the worst industrial accident in history. On December 3 of that year, in the early hours of the morning, about 45 tons of the dangerous gas methyl isocyanate escaped from an insecticide plant in Bhopāl that was owned by the Indian subsidiary of the U.S. firm Union Carbide Corp. The gas drifted over the densely populated neighbourhoods around the plant, killing many of their inhabitants immediately and creating a panic as tens of thousands of others attempted to flee the city. The final death toll was estimated at as high as 2,500 lives, and local medical facilities were overwhelmed by about 50,000 other people who were temporarily disabled by respiratory problems and eye irritation resulting from exposure to the toxic gas. Investigations later established that substandard operating and safety procedures at the understaffed plant had led to the occurrence of the catastrophic accident.

Bhopāl district has an area of 1,067 sq mi (2,763 sq km). It is an agricultural area in the fertile plain of the Mālwa Plateau. The district was formerly a part of the Bhopāl princely state.



Mosque of Tāj-ul-Masjid in Bhopāl, Madhya Pradesh, India

Baldev—Shostal Assoc./EB Inc.

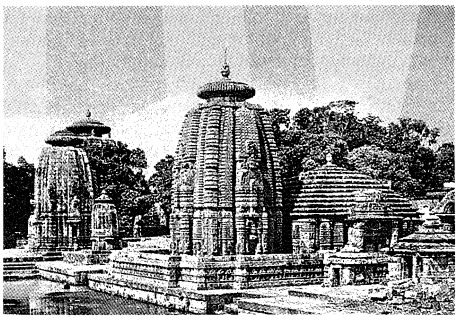
Bhopāl princely state was founded in 1723 by Dōst Moḥammad Khān, an Afghan adventurer, and was the second largest Muslim principality of the British Empire. In its struggles with the Marāṭhās, Bhopāl was itself friendly to the British and concluded a treaty with them at the outbreak of the Pindari War in 1817. The Bhopāl Agency, created in 1818, was a subdivision of the British Central India Agency and comprised the former princely states of Bhopāl, Rājgarh, Narsinghgarh, and several others. The headquarters was at Sehore.

At India's independence, Bhopāl remained a separate province of India, to which it acceded in 1949. In 1952 the nawab's absolute rule was abolished, and a chief commissioner's state was established. In 1956 it merged with Madhya Pradesh, and Bhopāl city replaced Nāgpur as state capital. Pop. (1981) city, 671,018; district, 894,739.

Bhote, also spelled BHOTIA (people): *see* Bhutia.

BHP: *see* Broken Hill Proprietary Company Limited.

Bhubaneswar, historically BHUVANEŚVARA, town, capital of Orissa state, eastern India. Bhubaneswar's history from the 3rd century BC is represented in nearby archaeological remains. Between the 5th and 10th centuries AD, it was the provincial capital of many Hindu dynasties and a centre of the Śaivite faith. Its many temples (such as the Mukteshwara and Parashurāmeshwar) displaying every phase of Orissan architecture were built between the 7th and 16th centuries.



Kedāreśvara and Gaurī temples at Bhubaneswar, Orissa, India

Picturepoint, London

Located in Puri district, the town consists of the old city, containing about 30 ancient temples, and a planned township built after 1948, when the capital was moved there from Cuttack. In the latter are the state government buildings, the state museum, Utkal University (established 1944 in Cuttack), and the Orissa University of Agriculture and Technology. The Gandhi Memorial Park lies at the town's centre. Bhubaneswar is on the national highway between Calcutta and Madras and on the South-Eastern Railway and has an airport. Pop. (1981) 219,211.

Bhuj, town, administrative headquarters of Kutch district, northwestern Gujarāt state, west central India, situated in the lowlands between the Rann (marsh) and the Gulf of Kutch. It is a commercial centre for wheat, barley, cattle, cotton, and salt produced in the hinterland. Handicrafts include the manufacture of cotton cloth and silver items. Bhuj is the junction of several state highways and the terminus of a railroad, and has an airport. Pop. (1981) town, 69,693; metropolitan area, 70,211.

bhūmi, in Mahāyāna Buddhism, the stages of spiritual progress of the *bodhisattva,* or one who, though capable of Enlightenment, delays his Buddhahood in order to work for the salvation of others. The stages (also termed *vihāras,* "stations") appear as 7, 10, and 13 in various texts; but the scheme most commonly agreed upon is that given in the *Daśabhūmika-sūtra* ("The Sūtra on the Ten Spiritual Levels"). It lists the progressively superior stages as: (1) *pramuditā* ("joyful," with the thought that, having begun the career of a *bodhisattva* he will attain Enlightenment and will help others); (2) *vimalā* ("free from impurities"); (3) *prabhākarī* ("luminous" with the noble doctrine); (4) *arciṣmatī* ("brilliant," the rays of his virtue consuming evil passions and ignorance); (5) *sudurjayā* ("hard to conquer"); (6) *abhimukhī* ("turning toward" both transmigration and Nirvāṇa); (7) *dūraṅgamā* ("far-going"); (8) *acalā* ("immovable"); (9) *sādhumatī* ("good-minded"); and (10) *dharmameghā* (showered with "clouds of *dharma*").

Bhumibol Adulyadej, also called PHUMIPHON ADUNLAYADET, or RAMA IX (b. Dec. 5, 1927, Cambridge, Mass., U.S.), ninth king of the Chakkri dynasty, which has ruled or reigned in Thailand from 1782.

He was a grandson of King Chulalongkorn

and was born while his father, Prince Mahidol of Songkhla, was studying at Harvard University. He succeeded to the throne after his older brother Ananda Mahidol, who had been king since 1935, was found dead of a bullet wound on June 9, 1946. He was married to Princess Sirikit Kitiyakara in April 1950 and was formally crowned on May 5, 1950.

The absolute monarchy was abolished in Thailand during the reign of King Prajadhipok as a result of the revolution of 1932. King Bhumibol, therefore, wielded little real political power although the constitution named him as head of state and commander of the armed forces. His most important function was to serve as a living symbol of and a focus of unity for the Thai nation. After the government of Sarit Thanarat in the late 1950s, the King led an active ceremonial life, frequently appearing in public and moderating between extreme parties in Thai politics. Bhumibol's designated heir to the throne was his only son, Crown Prince Vajiralongkorn.

Bhusāwal, town, Jālgaon district, Mahārāshtra state, western India, on the Tāpti River between the Sātpura Range and Ajanta Hills of the Deccan Plateau. Major rail and road routes pass through the town from Bombay to Calcutta and Allahābād. An important commercial centre for the surrounding cotton-growing region, Bhusāwal also trades in bananas, millet, and peanuts (groundnuts) and has a large-scale oil-processing industry. A large locomotive workshop is located there, as is an arts college affiliated with the University of Poona. Pop. (1981) town, 145,335; metropolitan area, 2,618,274.

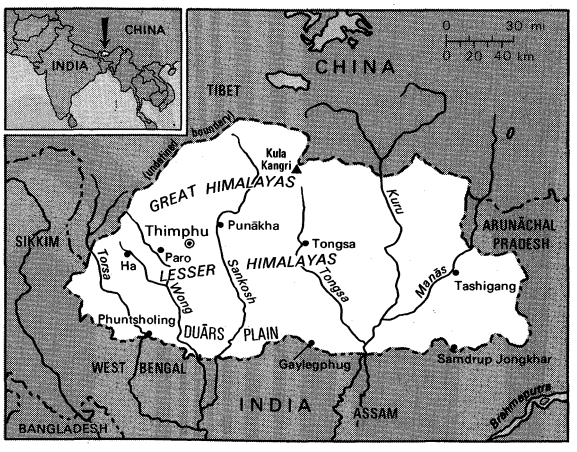
Bhutan, sovereign kingdom in the Himalayas, bounded by the Tibetan Plateau of China (north and west) and by India (south and east). From 1865 to 1949 Bhutan was under the "guidance" of the British government in external affairs and received a British subsidy. In 1949 it concluded a treaty with India in which the British role in this relationship was transferred in essence to the Indian government. The population was estimated in 1984 to be 1,417,000.

The land. Bhutan may be divided into three quite distinct physical regions: the Great Himalayas, the Lesser Himalayas, and the Duārs Plain.

The northern part of Bhutan lies within the Great Himalayas; the snow-capped peaks in this region attain a height of more than 24,000 ft (7,300 m). High valleys occur at elevations of 12,000 to 18,000 ft, running down from the great northern glaciers. The alpine pastures on the high ranges are used for grazing yaks in the summer months. North of the Great Himalayas are several "marginal" mountains of the Tibetan Plateau, forming the principal watershed between the rivers respectively southward and northward. Dry climate is characteristic of the Great Himalayan region. Until about 1960, the tempo of life continued in the Great Himalayas much as it had for centuries. Long undisturbed in their ways, Bhutanese traders carried cloth, spices, and grains across the mountain passes into Tibet and brought back salt, wool, and sometimes herds of yaks. The absorption of Tibet by China, however, broke the tranquil isolation and disturbed the traditional way of living in these high regions, where military precautions have been taken to guard against the potential danger of a Chinese incursion from Tibet. Many Tibetan refugees have settled in the Great Himalayan region.

Spurs from the Great Himalayas radiate southward, forming the ranges of the Lesser (or Inner) Himalayan region. The north–south ranges of the Lesser Himalayas comprise watersheds between the principal rivers of Bhutan. Among these, the Black Mountain Range forms the watershed between the Sankosh and Manas rivers. Differences in elevation and the degree of exposure to moist southwest monsoon winds encourage vegetation ranging from dense forest on the rain-swept windward slopes to alpine vegetation at higher elevations. Several fertile valleys of central Bhutan are in the Lesser Himalayas at elevations varying from 5,000 to 9,000 ft. These valleys are relatively broad and flat, receiving moderate rainfall (estimated at from 40 to 50 in. or less a year), and are fairly well populated and cultivated.

South of the Inner Himalayas and the foothills lies the narrow Duārs Plain, which forms a strip 8 to 10 mi wide along the southern borders of Bhutan. The Himalayan ranges rise sharply and abruptly from the narrow Duārs Plain, which controls access to the strategic passes (known as doors, or *dooars*) through the mountains leading into the fertile valleys of the Inner Himalayas. Subject to excessive rainfall (estimated to amount to between 200 and 300 in. a year), the entire Duār tract is unhealthy, hot, and steamy and is covered with dense semitropical forest as well as undergrowth. The northern part of the Duārs immediately bordering the mountains consists of a rugged, irregular, and sloping surface. At the foot of the mountains, small villages are found in forest clearings, but most of the area is covered with dense vegetation inhabited by elephants, deer, tigers, and other wild animals. The southern part of the Duārs bordering India is mostly covered with savanna and bamboo jungle. In many areas the savanna grasslands are being cleared for rice cultivation. Several market centres and towns, such as Phuntsholing, situated along the India–Bhutan border, are rapidly growing in size. The principal trade routes between central Bhutan and India pass through these centres, following the valleys of the main rivers.



Bhutan

History. The historical origin of Bhutan is obscure. Old manuscripts found in various monasteries contain historical records, but these have not been sufficiently researched to provide an authentic account of Bhutan's early history. It is reported that more than three centuries ago an influential lama from Tibet, Sheptoon La-Pha, became the king of Bhutan and acquired the title of Dharma Raja. It seems probable that Bhutan became a distinct political entity about this period. La-Pha was succeeded by Doopgein Sheptoon, who consolidated Bhutan's administrative organization through the appointment of *penlops* (governors of territories) and *jungpens* (governors of forts). Doopgein Sheptoon exercised both temporal and spiritual authority, but his successor confined himself only to the spiritual role and appointed a minister to exercise the temporal power. The minister became the temporal ruler and acquired the title of Deb Raja. This institution of two supreme authorities—a Dharma Raja for spiritual affairs and a Deb Raja for temporal matters—existed until the death of the last Dharma Raja in the early 20th century. Succession to the spiritual office of Dharma Raja was dependent upon what was considered a verifiable reincarnation of the deceased Dharma Raja. When the last Dharma Raja died, no reincarnation was found, and the practice and the office ceased to exist.

In the 19th century, Bhutan was plagued by a series of civil wars as the *penlops* of the various territories contended for power and influence. The office of the Deb Raja, in theory filled by election by a council composed of *penlops* and *jungpens*, was in practice held by the strongest of the governors, usually either the *penlop* of Paro or the *penlop* of Tongsa. Similarly, the *penlops*, who were to be appointed by the Deb Raja, in practice fought their way into office. Over the course of Bhutanese history, a continuous series of skirmishes and intrigues took place throughout the land as superseded *jungpens* and *penlops* awaited an opportunity to return to power.

In 1907 the *penlop* of Tongsa—the most powerful of the *penlops* to appear for many years—became the hereditary king (Druk Gyalpo) of Bhutan and was recognized by the British as the sole ruler of Bhutan. His successors have ruled since. Druk Gyalpo's grandson, Jigme Dorji Wangchuk, an enlightened ruler who sought the economic, political, and social development of his country while at the same time seeking to minimize as much as possible the destruction of traditional values, died in 1972 and was succeeded by his son, Jigme Singye Wangchuk, who sought to continue the progressive policies.

In the late 20th century, Bhutan continued to be unsettled by the presence of more than 4,000 Tibetan refugees who persisted in ignoring appeals to become citizens. After the discovery of a plot by Tibetan refugees to assassinate the King in 1974, the Tibetans were regarded as a major security problem. Of an estimated 7,000 refugees who had fled their homeland in the wake of the Chinese occupation of 1949, 3,000 had accepted citizenship. A move by the Bhutanese National Assembly to extradite the rest of the refugees to China was stalled by the King, who vainly believed in the possibility of their being accepted by other countries.

Following repeated requests from Bhutan, the Indian government agreed in April to allow the kingdom more trade and transit routes through third countries, especially Nepal and Bangladesh. Rumours that Bhutan was also insisting on a revision of the 1949 treaty with India to obtain more autonomy were repeatedly denied by the King.

The people. Most of the Bhutanese—more than one-half—consist of people of Tibetan extraction known as Bhutia, or Bhote, who share a common heritage of Tibetan culture,

language, and religion. They are dominant in northern and central Bhutan and speak a variety of Tibetan dialects with a high degree of mutual intelligibility. Their written language is identical with Tibetan, and they practice lamaistic Buddhism. In southern and southwestern Bhutan an ethnically mixed population with a predominance of Nepalese settlers is found. The Nepalese speak Nepali and practice Hinduism. In eastern Bhutan the majority of the people are similar to those living in Arunachal Pradesh. They are known by various group names, such as Bhutia, Monpa, and Sherdukpen. Although Buddhists, they are less strict in their observance of religious customs, so that fewer monasteries and lamas are to be found in eastern Bhutan.

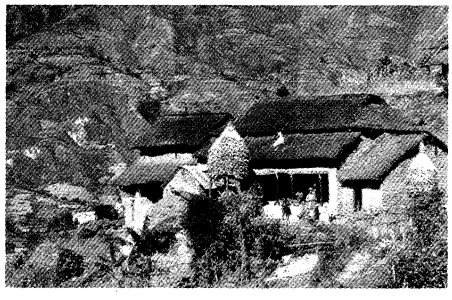
Despite centuries of living together, different ethnic groups retain their distinguishing characteristics. Differences in language, religion, and ethnic origin affect the political life of the kingdom. The people of Bhutan generally think of themselves in terms of their respective tribes or of their ethnic origins.

The economy. The natural resources of Bhutan have not been surveyed, and the precise extent of agricultural, forest, mineral, and power resources is not yet known. The Bhutanese economy is nevertheless mainly agrarian; most of the population is engaged in agriculture and livestock raising.

The government. The king, though enjoying supreme authority, has a council of ministers and shares administrative responsibility. The 140-member national assembly (Tsongdu) can at times be quite critical of the administration, and its deliberations are not disregarded by the government. Half of the members of the national assembly are nominated, and the rest are indirectly elected. There are no political parties.

A recent development that has carried Bhutan further on the road to modernity is the establishment of a high court. Bhutan has codified law but no separate judiciary. Judicial duties are vested in the executive, and lawyers are unknown. The high court functions as an appellate authority above the executive. Four judges have already been appointed. The king, however, remains the supreme tribunal.

Bhutia, also spelled BHOTIA, or BHOTE, Himalayan people who are believed to have emigrated from Tibet in the 9th century or later. They are a majority of the population of Bhutan (about 500,000) and minorities in the



Bhutia village in the Himalayan foothills, Nepal
Harrison Forman

Indian state of Sikkim (23,000), elsewhere in India (25,000), and Nepal (80,000). Their language, Den-jon-ke, is a dialect of Tibetan. The Bhutia are mountain dwellers, living in small villages and isolated homesteads separated by almost impassable terrain. They practice a terraced agriculture on the mountain slopes, their main crops being rice, barley, and wheat. Some of them are animal breeders, known for their cattle and yaks.

Their religion is Tibetan Buddhism, with an admixture of the pre-Buddhist shamanism known as Bon. They recognize the Dalai Lama as their spiritual leader and support many lamas in monasteries.

Their traditional society was feudalistic in structure, with most of the population working as tenants of a landowning nobility, although there were no marked differences in ways of life. There were also slaves, most of them descended from captives taken in raids on Indian territory. In the 1960s the government formally abolished slavery and sought to break up the large estates; the nobility were also deprived of their hereditary titles.

The Bhutia trace their descent patrilineally. They are predominantly monogamous, but traditionally some women might have several husbands, and occasionally a man might have more than one wife.

Bhutto, Zulfikar Ali (b. Jan. 5, 1928, near Lārkāna, Sind, India—d. April 4, 1979, Rāwalpindi, Pak.), Pakistani statesman, president (1971–73), and prime minister (1973–77), a popular leader who was overthrown and executed by the military.

Born into a noble Rājput family that had accepted Islām, Bhutto was the son of a prominent political figure in the Indian colonial government. He was educated in Bombay and at the University of California, Berkeley (B.A., 1950). Bhutto studied law at Oxford and then practiced and lectured (University of Southampton, 1952–53) in England. Upon his return to Pakistan (1953), he set up a practice in Karāchi, where he became acquainted with several high Pakistani officials and was appointed a member of Pakistan's delegation to the UN in 1957.

After Mohammad Ayub Khan seized the government in 1958, Bhutto was appointed commerce minister, which was the first of numerous and sometimes overlapping Cabinet appointments, often acting as the spokesman for Pakistan in the international arena. After his appointment as foreign minister (1963–66), he began working for greater independence from Western powers and for closer ties with China. His opposition to the peace with India after the 1965 war over Kashmir caused him to resign from the government, and in December 1967 he founded the Pakistan People's Party. Bhutto denounced the Ayub Khan regime as a dictatorship and was subsequently imprisoned (1968–69).

After the overthrow of the Ayub Khan regime by Gen. Agha Muhammad Yahya Khan, national elections were held in 1970. Although Bhutto and his party won a sweeping electoral victory in West Pakistan, the biggest election winner was the Awami League, an East Pakistan-based party that had campaigned for full autonomy for the East. Bhutto refused to form a government with this separatist party, causing a nullification of the election. The widespread rioting that followed degenerated into civil war, after which East Pakistan, with the help of India, emerged as the independent state of Bangladesh. After West Pakistan's humiliating defeats by Bangladesh and India, Yayha Khan turned the government over to Bhutto on Dec. 20, 1971. Bhutto placed his predecessor under house arrest, nationalized several key industries, and undertook the taxation of the landed families in his first acts as president. After the new constitution (1973) made the presidency largely ceremonial, Bhutto became prime minister; in both capacities, he had also filled the cabinet posts of foreign affairs, defense, and interior. His government, retaining martial law, began a process of Islāmization.

Sensing that the public was turning against his rule by decree, Bhutto ordered new elections in 1977 to obtain a popular mandate. His party won by a large majority, but the opposition charged him with electoral fraud. The government was seized by Gen. Mohammad Zia ul-Haq, the army chief of staff, on July 5, 1977. Soon afterward Bhutto was imprisoned. He was sentenced to death (March 18, 1978) on the charge of having ordered the assassination of a political opponent in 1974; after an appeal to a higher court, Bhutto was hanged, despite appeals for clemency from several world leaders. He was the author of *The Myth of Independence* (1969) and *The Great Tragedy* (1971).

Bhuvaneśvara (India): *see* Bhubaneswar.

bi (Chinese jade): *see* pi.

Bia, Phou, highest peak (9,252 ft [2,820 m]) in Laos, located among the western spurs of the Chaîne Annamitique (Annamite Chain) immediately south of the Plateau de Xiang Khoang (Plateau du Tranninh). The northwest–southeast-trending massif is isolated from its 8,050–8,500-ft (2,455–2,590-m) sister peaks by the Nam (river) Ngum on the west and the Nam Ngiap (Nhiêp) on the east.

Bia River, river in West Africa, rising 25 mi (40 km) west of Sunyani in western Ghana and, after entering Ivory Coast, flowing in a southerly direction to the Aby Lagoon, an inlet of the Atlantic, after a course of 160 mi. On the river near Ayamé are two hydroelectric plants (1959, 1965), 2½ mi apart, which supply power to Abidjan and southeastern Ivory Coast. From Aboisso, the head of navigation (10 mi from the entrance to the lagoon), logs and agricultural produce are sent downstream to Assini, site of the first French landing on the coast, for transshipment.

Biafra, secessionist West African state that unilaterally declared its independence from Nigeria in May 1967. It constituted the former Eastern Region of Nigeria and was inhabited principally by Ibo people. It ceased to exist as an independent state in January 1970.

In the mid-1960s economic and political instability, coups, riots, and ethnic friction characterized Nigerian public life. In the predominantly Hausa north, resentment against the more prosperous, educated Ibo minority erupted into violence. In September 1966, some 10,000 to 30,000 Ibo people were massacred in the Northern Region, and perhaps 1,000,000 fled as refugees to the Ibo-dominated east. Non-Ibos were then expelled from the Eastern Region.

Attempts by representatives of all regions to come to an agreement were unsuccessful. On May 30, 1967, the head of the Eastern Region, Lieut. Col. (later Gen.) Odumegwu Ojukwu (*q.v.*), with the authorization of a consultative assembly, declared the region a sovereign and independent republic under the name of Biafra. Gen. Yakubu Gowon (*q.v.*), the leader of the federal government, refused to recognize Biafra's secession. In the hostilities that broke out the following July, Biafran troops were at first successful, but soon the numerically superior federal forces began to press Biafran boundaries inward from the south, west, and north. Biafra shrank to one-tenth its original area in the course of the war. By 1968 it had lost its seaports and become landlocked; supplies could be brought in only by air. Starvation and disease followed; estimates of mortality range from 500,000 to several million.

The Organization of African Unity, the papacy, and others tried to reconcile the combatants. Most countries continued to recognize Gowon's regime as the government of all Nigeria, and the United Kingdom and the Soviet Union supplied it with arms. On the other hand, international sympathy for the plight of starving Biafran children brought airlifts of food and medicine from many countries. The Ivory Coast, Gabon, Tanzania, and Zambia recognized Biafra as an independent state; and France sent Biafra weapons.

Biafran forces were finally routed in a series of engagements in late December 1969 and early January 1970. Ojukwu fled to the Ivory

Coast, and the remaining Biafran officers surrendered to the federal government on Jan. 15, 1970. Biafra, on the point of total collapse, thereupon ceased to exist.

Biafra, Bight of, inlet of the Atlantic Ocean on the West African coast, extending east, then south, for 370 mi (600 km) from the Nun outlet of the Niger River (Nigeria) to Cape Lopez (Gabon). The innermost bay of the Gulf of Guinea, it is bounded by southeastern Nigeria, Cameroon, Equatorial Guinea, and northwestern Gabon and receives portions of the Niger and Ogooué river discharges and also the Cross, Sanaga, and many other rivers. Within the bight are several islands, the largest of which is Bioko, belonging to Equatorial Guinea. Major ports on the bay are Malabo (on Bioko), Port Harcourt and Calabar (Nigeria), Douala (Cameroon), Bata (Equatorial Guinea), and Libreville and Port-Gentil (Gabon).

Between the 16th and the 19th centuries the Bight of Biafra was the scene of extensive slave-dealing operations, based mainly on the ports of Brass, Bonny, Opobo, and Old Calabar (now Calabar) in Nigeria. By the 1830s the palm-oil trade had surpassed slave trading, and it has maintained its importance to the present. Petroleum, discovered in the late 1950s in the Niger Delta, is a major economic resource.

Biago, Bernardino di Betto di: *see* Pinturicchio.

Biak Island, also spelled WIAK ISLAND, Bahasa Indonesia PULAU BIAK, largest of the Schouten Islands (*q.v.*), off the northern coast of Irian Jaya (the Indonesian part of New Guinea) at the entrance to Teluk Cenderawasih (Geelvink Bay). It is 45 mi (72 km) long and 23 mi wide and has an area of 948 sq mi (2,455 sq km). Biak was seized by the Japanese in 1942 during World War II; it was retaken May 24–June 20, 1944, by Allied forces.

Biak town, where the airport is located, is the chief urban centre. It is also the transportation centre for Irian Jaya, with flights to other towns in Irian Jaya, as well as to Surabaya and Ujung Pandang in Indonesia and to Port Moresby, the capital of Papua New Guinea. It has now become an oil boomtown, as well.

Biała Podlaska, *województwo* (province), eastern Poland, established in 1975 and comprising an area of 2,065 sq mi (5,348 sq km). It is bordered by the U.S.S.R. on the east and northeast (along the Bug River) and by the provinces of Białystok on the north, Siedlce on the west, Lublin on the southwest, and Chełm on the south. The economy of Biała Podlaska is based on farming (wheat, rye, and potatoes) and food processing, along with the manufacture of electrical-generating machinery and textiles. Biała Podlaska is one of the least densely populated provinces. Its capital is Biała Podlaska (*q.v.*) city. Numerous health spas and rest homes dot the western bank of the Bug River in the wooded eastern sector of the province. Pop. (1982 est.) 288,200.

Biała Podlaska, city, capital of Biała Podlaska *województwo* (province), on the Krzna River and the railroad linking Warsaw and Moscow. It was an important village *c.* the 15th century, belonging then to the Radziwiłł princes. The city is noted for its pottery, carpet, and linen manufacturing. An important aircraft industry was destroyed with most of the town in World War II. Historic buildings remaining include the Church of St. Anne, built in 1524, and the Church of the Basilians, built between 1747 and 1759. Pop. (1982 est.) 41,000.

Bialik, Ḥayyim Naḥman (b. Jan. 9, 1873, Rädi, Volhynia, Russia—d. July 4, 1934, Vienna), a leading Hebrew poet, esteemed for crystallizing in his verse the yearnings of the Jewish people, for making the modern Hebrew language a flexible medium of poetic expression, and for exploring in his work a wide range of profound themes.

Born into poverty, Bialik was left fatherless when he was five or six and was brought up by his rigidly pious, learned grandfather. After an intensive education in the Jewish

Bialik
By courtesy of Bialik House, Tel Aviv-Yafo, Israel

classics, he attended for a short time the Jewish academy in Volozhin (now in Belorussian S.S.R.). These three influences—his poverty, his being an orphan, and his study of Jewish religious classics—were the wellsprings of much of Bialik's poetry. In 1891 he went to Odessa, then the centre of Jewish modernism, where he struck up a lifelong friendship with the Jewish author Aḥad Ha'am, who encouraged Bialik in his creative writing.

The following year, Bialik moved to Zhitomir, now in the Ukrainian S.S.R., married, and for the next few years worked unsuccessfully as a lumber merchant. For three years he taught in a Hebrew school in a small town in Poland. The publication of his first long poem "ha-Matmid" ("The Talmud Student") in the periodical *ha-Shiloaḥ* (edited by Aḥad Ha'am) established his reputation as the outstanding Hebrew poet of his time. The poem is a sympathetic portrait of a student whose single-minded dedication to Talmudic study is awe-inspiring, even saintly; the modern world, however, does not provide sustenance for such spirits. Bialik may be implying that this situation is the plight of the Jewish people itself.

His writing career assured, Bialik returned to Odessa as a teacher in a Hebrew school, at the same time publishing poems and some of the most highly regarded stories in modern Hebrew literature. His poems inspired by the pogrom that took place in 1903 in the city of Kishinyov contain some of the fiercest and most anguished verse in Hebrew poetry. In such poems as "be-'Ir he-Harega" ("In the City of Slaughter") Bialik lashes out at both the cruelty of the oppressors and the passivity of the Jewish populace.

Other poems include a fragment of an epic, "Metey Midbar" ("The Dead of the Desert"), and "ha-Berekha" ("The Pool"). "Metey Midbar" imaginatively builds on a Talmudic legend about the Jewish host (in Exodus) who perished in the desert. "Ha-Berekha" is a visionary nature poem in which the body of water reveals to the poet the wordless language of the universe itself.

Bialik translated such European classics as *Don Quixote, Wilhelm Tell,* and the Yiddish play *Der Dybbuk* into Hebrew. An indefatigable editor and literary organizer, he was a cofounder of the publishing firm Devir (with his lifelong associate, the author and editor Y.H. Ravnitzky) and edited *Sefer ha-Aggada* (1907/08–1910/11; "Book of the Aggada"), a collection of traditional Jewish homilies and legends. He also edited the poems of the great medieval poet and philosopher Ibn Gabirol and began a popular modern commentary on the Mishna.

In 1921 Bialik left Soviet Russia for Germany, where Jewish writers had established a short-lived Hebrew centre, and then settled in Palestine (1924). There he devoted himself to public affairs, producing only a few poems, the most important of which was "Yatmut" ("Orphanhood"), a long poem about his childhood, written shortly before his death.

Białowieża Forest (Poland): *see* Belovezhskaya Pushcha.

Białystok, *województwo* (province), northeastern Poland, established in 1975 and bordered by the provinces of Suwałki to the north, Łomża to the west, Siedlce to the southwest, and Biała Podlaska to the south and by the U.S.S.R. to the east. Białystok has an area of 3,882 sq mi (10,055 sq km); the capital is Białystok (*q.v.*) city. The province is mainly a lake-dotted lowland drained by the Narew, Biebrza, and Bug rivers. More than half of its area is forests, meadows, swamplands, and marshes. The forest of Białowieża (Russian Belovezhskaya Pushcha) covers an area of about 500 sq mi stretching across the border between Poland and the U.S.S.R. The Polish section amounts to some 154,500 ac (62,500 ha), nearly 13,000 ac of which constitute a nature preserve embracing the only virgin forest remaining on the European plains. Some of the conifers and hardwoods have attained ages of 350 to 600 or more years, heights in excess of 150 ft (45 m), and diameters greater than 6 ft. The forest's animal life includes elk, deer, wild pig, wolf, lynx, and bison, for which it is especially noted. The breeding stock of the bison in all European zoos originated in the Białowieża herd, which was at the verge of extinction after World Wars I and II but which survived both times only precariously, as a result of herculean efforts at preservation. Pop. (1982 est.) 646,600.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Białystok, city, capital of Białystok *województwo* (province), northeastern Poland. Thought to have been founded by Gediminas, grand duke of Lithuania, about 1320, it was first chronicled in 1426 and received town rights in 1749. During the 18th century it prospered under the wealthy Branicki family, who erected a magnificent residence known as the Podlasie Versailles. The Branickis invited many renowned artists and theoreticians to Białystok, developing a creative and educational centre known throughout Europe. By 1863 the town was a major textile community with some 230 factories and 3,000 workers.

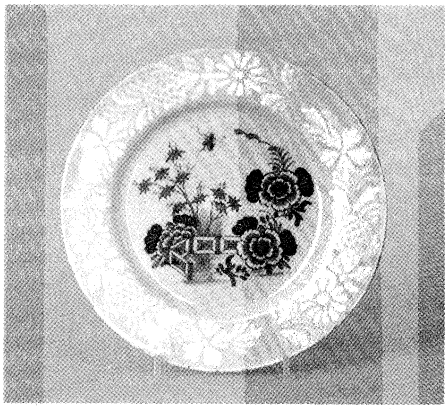
Białystok was a major centre of Polish Jewry. At the onset of World War II, it had a population of 100,000, of whom about 40,000 were Jews; but in 1941–44 the Germans killed half of the inhabitants, including all the Jews in the ghetto, and destroyed three-quarters of the industry and buildings.

After the war, Białystok was rebuilt and became an industrial and cultural centre and a major rail junction. Linen is the chief product; other industry includes meat processing and metallurgical works. The Branicki mansion, restored in 1944, houses an academy of medicine; there is also a technical college and a regional museum. Pop. (1982 est.) 229,700.

Bian He (China): *see* Pien Canal.

Bianco, Monte (France–Italy): *see* Mont Blanc.

bianco sopra bianco (Italian: "white on white"), mode of decoration originally practiced on 16th-century Urbino and Faenza maiolica, or tin-glazed earthenware. It consisted of designs in an opaque, cool-white colour executed on a warmer, milk-white tin



Floral *bianco sopra bianco* decoration on the rim of a Bristol delft plate, *c.* 1750; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

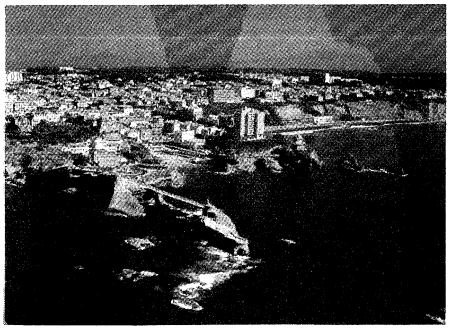
glaze. The technique was broadly revived at the Swedish factory at Rörstrand about 1745, where it was used on grayish grounds. Within five years it was further imitated at Delft, at Lambeth, and at Bristol, where a popular rim decoration of leaf sprays and flowers in *bianco sopra bianco* was used. In France, too, it appeared at Nevers and at Saint-Amand-les-Eaux, known for ware with floral decoration in white on a bluish-white ground, and, again, at Scandinavian factories, including Strålsund and Herrebøe.

Biandrata, Giorgio: *see* Blandrata, Georgius.

Biankouma, town, administrative headquarters (since 1969) of Biankouma *département*, western Ivory Coast. It is a trade centre (rice, manioc, coffee, and cattle) among the Dan (Yafuba, Yacouba) and Tura (Toura) peoples in the mountainous, savanna plateau region on the eastern edge of the Nimba Range. Biankouma is renowned for the calibre of its dancers and weavers. Pop. (1975) town, 4,533; (1979 est.) *département*, 74,916.

Bianzonglun (Buddhist treatise): *see* Pien-tsung-lun.

Biarritz, town, Pyrénées-Atlantique *département*, Aquitaine region, southwestern France, on the Bay of Biscay, adjacent to Bayonne and 11 mi (18 km) from the Spanish border. Once a small fishing village, Biarritz was made fashionable after 1854 by Napoleon III and his



Small rocky peninsulas and part of the seafront, Biarritz, Fr.

Club Iris

Spanish empress, Eugénie. Visited by Queen Victoria, Edward VII, and Alfonso XIII of Spain, Biarritz began to call itself "the queen of resorts and the resort of kings." A mild climate, a variety of beaches and scenery, and the luxurious tourist installations continue to draw an international clientele that sustains the town's prosperity. A promenade runs from the sandy Grand Plage, facing northwest, to the Côte des Basques. The folklore and traditions of the Basques of the district are an added attraction. Pop. (1982) 26,579 (quadrupled in the summer season).

Biās River (India): *see* Beās River.

biathlon, winter sports event combining cross-country skiing with rifle marksmanship, probably developed from European military skiing competitions. The Union Internationale de Pentathlon Moderne et Biathlon (founded 1948) worked for the development of both sports in Olympic competition and instituted annual world championships for the modern pentathlon in 1949 and for the biathlon in 1957. The biathlon was first included in the Winter Olympics program in 1960.

Olympic competitors cover a 20-kilometre (about 12.5-mile) cross-country course, carrying a single-shot rifle and ammunition and stopping at four points at or near the 4-, 8-, 12-, and 16-kilometre marks to fire five shots at small targets 100–250 metres (110–275 yards) away. For the longer range, the shots are fired prone. Contestants are penalized for each miss, and the athlete with the lowest adjusted time for the race wins. In 1968 a four-man biathlon relay event was added to the Olympic program, each man firing twice during each of two 7.5-kilometre laps. The first targets, five of 30 centimetres (11.8 inches), are shot standing. The second targets, five of 10 centimetres, are shot prone. Each has eight bullets for each set of targets. Each target missed requires a 200-metre penalty lap. In the 1980 Olympic Games a 10-kilometre individual race, inaugurated in the 1974 World Championship, was introduced. In both Olympic and world championship competition the Soviets dominate.

Biathlon competitor

By courtesy of the French Government Tourist Office

A combined running and swimming event called the biathlon was instituted in 1968 by the Modern Pentathlon Association of Great Britain, mainly to produce modern pentathlon performers.

For world individual and team champions, *see* Sporting Record: *Skiing: Biathlon competition. See also* Olympic Games.

bib, also called POUT (*Trisopterus*, or *Gadus, luscus*), common fish of the cod family, Gadidae, found in the sea along European coastlines. The bib is a rather deep-bodied fish with a chin barbel, three close-set dorsal fins, and two close-set anal fins. It usually grows no longer than about 30 centimetres (12 inches) and is copper red with darker bars. Though abundant, it is not sought as food.

Bibai, city, Hokkaido, Japan, located between Asahigawa (northeast) and Sapporo (southwest). It was settled in 1891 by Japanese farmer-soldiers (*tondenhei*) and has been the main rice-producing centre of the Sorachi region since 1901. Development was spurred by the opening of a national road (1890) and a railway line (1891). Exploitation of the Ishikari Coalfield on nearby Bibai-yama (Mt. Bibai) began in 1913, but a decline in yield and the introduction of petroleum brought a decrease in population in the 1960s and 1970s. The city's industry produces electrical appliances and concrete. Pop. (1980) 38,552.

Bībān al-Ḥarīm (Egypt): *see* Queens, Valley of the.

Bībān al-Mulūk (Egypt): *see* Kings, Valley of the.

Bibaud, Michel (b. Jan. 19, 1782, Côte des Neiges, near Montreal—d. Aug. 3, 1857,

Bibaud, engraving

By courtesy of the Public Archives of Canada

Montreal), author of French Canada's first volume of poetry and the first substantial history of Canada.

Educated at the Collège Saint-Raphael, he became a schoolteacher and journalist. Bibaud wrote an arithmetic textbook and edited periodicals, of which *La Bibliothèque canadienne,* containing his own historical writing, was the best known. His first historical work, *Histoire du Canada, sous la domination française* (1837), covers the period from the founding of Canada to 1731; a second volume (1844) brings the story to 1830. (A third volume, treating events from 1830 to 1837, was written by his son.) The history was poorly received in his time, for it was unimaginative and reflected pro-British sympathies. Though some of his sources were undigested, Bibaud's observations provide a good record of the period. Bibaud's volume of didactic poetry, *Epîtres, satires, chansons, épigrammes, et autres pièces de vers* (1830), contains four satires on ignorance, avarice, laziness, and envy.

Biber, Heinrich (Ignaz Franz von) (b. Aug. 12, 1644, Wartenberg, Bohemia—d. May 3, 1704, Salzburg, Archbishopric of Salzburg), composer and one of the outstanding violin virtuosos of the Baroque era.

He spent most of his life at the court of the Archbishop of Salzburg, rising from a humble position to that of high steward and musical director (1676). He travelled widely as a virtuoso.

Biber composed mainly for his own instrument. His sonatas for violin and clavier and his solo sonatas with continuo are well constructed and of some technical difficulty. They show development of the violin's resources, especially the use of *scordatura* (abnormal tuning for special effects). His most famous works are the 15 *Mystery Sonatas* on events in the life of Mary, and his *Passacaglia in G Minor* for unaccompanied violin. He also composed chamber works, concerti, and a few stage works, including an opera, *Chi la dura, la vince* (1687).

Bibiena, Galli da, FAMILY, Bibiena also spelled BIBBIENA, a family of Italian artists of the 17th and 18th centuries, who took their name from the birthplace of their progenitor, Giovanni Maria Galli (1625–65), born at Bibbiena near Florence. He studied painting under Francesco Albani and first laid the foundations of an artistry that was carried on by his descendants, who devoted themselves to scenic work for the theatre.

Employing freely the highly ornate style

of the Italian late Baroque architecture and sculpture, the various members of the family produced a series of designs that are amazing for their splendour and spacious proportions achieved by intricate perspective. From about 1690 to 1787, eight Bibienas enchanted most of the courts of Europe with dazzling settings for operas, funerals, and weddings. The Habsburgs were their most lavish patrons.

Ferdinando Galli Bibiena (1657–1743), born at Bologna, was the son of Giovanni Maria. He studied painting under Carlo Cignani and architecture under Giulio Troili, called Paradosso. On Cignani's recommendation he entered the service of the Duke of Parma. His chief work at this period was the villa and garden of Colorno, but he soon established a reputation for scenic designs and worked for the theatre. In 1708 he was called to Barcelona to arrange the decorations in connection with the wedding festivities of the future emperor, Charles VI; when this prince ascended the imperial throne, Ferdinando went to Vienna and was there employed on designs of scenery and decorations for festivities at the court and at the opera. On his return to Bologna in 1717 he was elected a member of the Academia Clementina. In 1731 he built the royal theatre of Mantua (burned in 1781). He produced several books: *L'Architettura civile* (1711; "Civil Architecture"), reissued under various titles, and *Varie opere di prospettiva* (1703–08; "Various Works of Perspective").

Francesco Galli Bibiena (1659–1739), born at Bologna, was the second son of Giovanni Maria. He studied under Lorenzo Pasinelli and Cignani, worked at Piacenza, Parma, and Rome, and then became ducal architect at Mantua. After a stay in Genoa and Naples he was called to Vienna, where he built a large theatre. He was architect of the great theatre at Nancy; of the Teatro Filarmonico at Verona, which Milizia calls the finest theatre in Italy; and of the Teatro Alibert in Rome. In1726 he returned to Bologna and directed the Academia Clementina.

Alessandro Galli Bibiena (1687–1769), eldest son of Ferdinando, was born at Parma. In 1719 he became architect and painter at the court of the elector of the Palatinate. Among his works were the right wing of the *Schloss* (castle) and the opera house (both burned in 1795) and the Jesuit church at Mannheim.

Giuseppe Galli Bibiena (1696–1757), second son of Ferdinando, was the most distinguished artist of the family. He was born at Parma and, as a youth, accompanied his father to Barcelona and afterward to Vienna. Staying on, when his father left, he there became the chief organizer of splendid court festivities and functions. He designed catafalques for the funerals of more than 30 nobles and sovereigns, as well as scenery for plays and dances. In 1722 he worked in Munich and in 1723 in Prague. In 1742 he designed the decorations for the Vienna opera; in 1747 he was employed at the opera in Dresden; in 1748 he designed the interior of the theatre at Bayreuth; and in 1750 he renovated the Dresden opera (burned in 1849). He died in Berlin. He published his stage sets in three series of engravings: *Alcina* (1716); *Costanza e Fortezza* (1723; "Constancy and Fortitude"); *Architetture e prospettive* (1740–44; "Architecture and Perspective").

Antonio Galli Bibiena (1700–74), third son of Ferdinando, was the architect of the Academia Virgiliana at Mantua and of the Teatro Communale at Bologna. He was also employed at the court of Vienna.

Carlo Galli Bibiena (1728–87), son of Giuseppe, was born in Vienna. This last of the theatrical Bibienas travelled farther than any. He worked in Germany, France, and the Netherlands (1746–60); London (1763); Naples (1772), where he published five opera sets; Stockholm (1774); and St. Petersburg until 1778. He died in Florence.

Because the Bibienas' works in theatrical scenery were not executed in durable material and because their decorations for court functions were necessarily of a temporary character, little has survived, and their richness and splendour can be judged only from drawings, which have been preserved in great numbers and are found chiefly at Vienna, Munich, and Dresden.

Bible, the sacred writings of Judaism and Christianity and probably the most influential collection of books in human history. *See* apocrypha; New Testament; Old Testament; Torah.

Bible, Hebrew: *see* Old Testament.

Bible Belt, U.S. region embracing central and southern states, derisively named by H.L. Mencken in the 1920s to characterize an area largely rural and populated by fundamentalist and evangelical Protestants, among whom literal interpretation of the Bible, rigid morality, and anti-intellectualism were rampant. The region is generally identified with the deep South, the border states, and the lower Midwest, whose residents Mencken saw as "yokels" responsible for such things as Prohibition, censorship, and laws against teaching evolution in schools. In his view most residents of the Bible Belt were Baptists or Methodists and members of such organizations as the Anti-Saloon League and the Ku Klux Klan.

As a regional identifier, the term was never precise. Exponents of Biblical literalism and strict morality, as well as anti-intellectuals, can be found in all parts of the United States and Canada and in most religious denominations. A preponderance of Baptists and Methodists can be found in the southern states and parts of the lower Midwest, and that region has contributed importantly to a recent increase in evangelical and fundamentalist Protestant congregations noted by scholars in all parts of the United States. The term Bible Belt has more appropriate usage historically (*e.g.* as the setting of the Scopes Trial [*q.v.*]), and theologically (*e.g.* in examining increasing Protestant fundamentalism) than regionally.

Bible Communist (utopian religious group): *see* Oneida Community.

bible leaf (herb): *see* costmary.

biblical criticism, discipline that studies textual, compositional, and historical questions surrounding the Old and New Testaments. Biblical criticism lays the groundwork for meaningful interpretation of Scripture (*see* MACROPAEDIA: Biblical Literature: *Biblical exegesis and hermeneutics*).

The major types of biblical criticism are: textual criticism, which is concerned with establishing the original or most authoritative text; philological criticism, which is the study of the biblical languages for an accurate knowledge of vocabulary, grammar, and style of the period; literary criticism, which focusses on the various literary genres embedded in Scripture in order to uncover evidence concerning date of composition, authorship, and original function of the various types of writing that constitute the Bible; tradition criticism, which attempts to trace the development of the oral traditions that preceded written texts; and form criticism, which classifies the written material according to the preliterary forms, such as parable, hymn, or poem, from which biblical writings were derived.

Other schools of biblical criticism that are more exegetical in intent—that is, concerned with recovering original meanings of texts—include redaction criticism, which studies how the documents were assembled by their final authors and editors, and historical criticism, which seeks to interpret biblical writings in the context of their historical settings.

The scientific principles on which modern criticism is based depend in part upon viewing the Bible as a suitable object for literary study, rather than as an exclusively sacred text. Evaluation of the Scriptures to uncover evidence about historical matters was formerly called "higher criticism," a term first used with reference to writings of the German biblical scholar J.G. Eichhorn, who applied the method to his study of the Pentateuch. In the 20th century, Rudolf Bultmann and Martin Dibelius initiated form criticism as a different approach to the study of historical circumstances surrounding biblical texts. The rapid development of philology in the 19th century together with archaeological discoveries of the 20th century revolutionized biblical criticism from without, and the rise of the ecumenical movement led to increased cooperation among scholars of all faiths.

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biblical source, any of the original documents that, in compilation, constitute the Bible. Most of the writings in the Old Testament are of anonymous authorship, and in many cases it is not known whether they were compiled by individuals or by groups. Nevertheless, by careful evaluation of internal evidence and with the aid of various schools of biblical criticism (*q.v.*), scholars have been able to identify certain sources and to arrange them chronologically in order of composition.

The means by which the basic sources of the Pentateuch (first five books of the Bible) were distinguished and their chronology established provided the first clear picture of Israel's literary and religious development. The names by which these sources are now known, in chronological order, are: the Yahwist, or J, source, so called because it employed as the Lord's name a Hebrew word transliterated into English as YHWH (called J from the German: JHVH) and spoken as Yahweh; the Elohist, or E, source, distinguished by its reference to the Lord as Elohim; the Deuteronomist, or D, source, marked by distinctive vocabulary and style; and the Priestly code, or P, source, which contains detailed ritual instructions.

Numerous other sources for the Old Testament have subsequently been identified, including two of the earliest books of Hebrew literature, not now extant, parts of which are embedded in the early narratives. These, the "Book of the Wars of Yahweh" and the "Book of Yashar" (the Upright), were probably poetic in form.

The New Testament sources consist of the original writings that comprise the Christian Scriptures, together with the oral tradition that preceded them. The first three Gospels are referred to as synoptic, *i.e.*, they have a common source. Contemporary opinion holds that Mark served as a source for Matthew and Luke and that the latter two also share another common source, called Q (after the German word *Quelle,* "source"), consisting mainly of Jesus' sayings. The Gospel of John apparently represents an independent line of transmission.

Whereas most of the Old Testament authors are anonymous, the major New Testament sources are known, and the essential task in their study is to restore the texts as closely as possible to the original autographs. The main sources of evidence are: manuscripts of the New Testament in Greek dating from the 2nd to the 15th century AD (some 5,000 are known); early versions in other languages, such as Syriac, Coptic, Latin, Armenian, and

Georgian; and quotations fron the New Testament by early Christian writers.

These sources are collectively referred to as "witnesses." Authoritative Bibles in contemporary translation are usually based on an eclectic text in which the witnesses show variant readings. In such cases, the reading that best suits the context and the author's known style is preferred.

Attempts to go beyond the original writings to reconstruct the oral tradition behind them are the province of the form of biblical criticism known as tradition criticism. Recent scholars have attempted with this method to recover the actual words (*ipsissima verba*) of Jesus by removing the accretions attached to them in the course of transmission.

biblical translation, the art and practice of rendering Holy Scriptures into languages other than those in which they have been handed down, for purposes of study, worship, interpretation and criticism, and evangelism. This article addresses the translation of the Jewish Bible and the New Testament, together comprising the Christian Bible.

The tradition of biblical translation is more than 2,000 years old. About AD 1450, the time of the invention of printing, the number of translations was 33; by about 1800 the number had risen to 71. By the late 20th century, portions of the Bible had been translated into well over 1,000 languages, including the entire Bible into several hundred languages.

The Jewish Bible, the Old Testament, was originally written almost entirely in Hebrew, with a few short elements in Aramaic. Many of the New Testament books were first written or recorded in Greek, others in Aramaic. When the Persian Empire controlled the Mediterranean basin, Aramaic became the lingua franca of the area, and for liturgical reasons it became necessary for the Jewish community in Diaspora to have the Torah, or Pentateuch (the Law, or the first five books of the Bible), translated into the common language from the traditional Hebrew. The resulting *targums* (from *meturgeman,* Aramaic: "translator") survived after original Hebrew scrolls had been lost.

Later, in the mid-3rd century BC, Greek was the ruling language, and Jewish scholars began the enormous task of translating the Hebrew canon into that language. The Torah was completed first, but the entire enormous undertaking was not completed for more than a century. Because tradition had it that each of the 12 tribes of Israel contributed six scholars to the project, the Greek version of the Jewish Bible came to be known later (in Latin) as the Septuagint (*septuaginta:* "70").

The Hebrew Scriptures were the only Bible the early Christian Church knew, and as that young religion spread out through the Greek-speaking world, Christians adopted the Septuagint—a development which Jews watched with suspicion and apprehension.

Meanwhile the spread of Christianity necessitated further translations into Coptic, Ethiopian, Gothic, and Latin. St. Jerome in 405 completed translating a Latin version begun and based in part on the Septuagint, and this version, the Vulgate, despite corruption introduced by copyists, became the standard of Christianity for a thousand years and more.

Hebrew scholars at Talmudic schools in Palestine and Babylonia around the 6th century AD began trying to retrieve and codify Hebrew scriptures, restoring them authoritatively and in the Hebrew language. Over centuries they laboured to complete the traditional or Masoretic text (*q.v.*), which since the work was completed in the 10th century has come to be universally accepted. The Masoretic version was transmitted by scribes with amazing fidelity down to the time of movable type (15th century).

Other translations were made by Jews and Christians into Syriac, Arabic, and Spanish. Jerome's Latin Vulgate, which included the entire New Testament and a number of works found apocryphal by Jews (and later by Protestants), was the basis for many of those and other translations. These include the Douai-Reims Version (N.T. 1582; O.T. 1609–10), which remained the only authorized Bible in English for Roman Catholics until the 20th century.

The new learning in the 15th and 16th centuries revived the study of Greek and led to new translations. Very important was the work of Erasmus, whose first edition of the New Testament, containing the Greek text, his own translation into Latin, and his commentary, was published in 1516; further editions followed.

The first complete English version of the Bible dates from 1382 and was credited to John Wycliffe and his followers. A revision was completed in 1388. But it was the work of William Tyndale, a Reformer and scholar, that was the model for a series of subsequent English translations. From 1525 to 1535 he translated the New Testament and part of the Old Testament. Subsequent English translations, including the Coverdale Version (1535), the Matthew's (1537), the Great (1539), the Geneva (1560), and the Bishops' (1568, revised 1572) Bibles, were to some degree dependent on Tyndale's work.

Meanwhile, in Germany, Martin Luther was completing the outstanding European translation (N.T. 1522, complete Bible 1534), the first complete translation from the original Hebrew and Greek into a modern European language. It remained the official Bible for German Protestants, and it was the basis for Danish, Icelandic, Swedish, and other translations.

All previous English translations culminated in the King James Version (1611; known in England as the Authorized Version), prepared by 54 scholars appointed by King James I. Avoiding strict literalism in favour of extensive use of synonym, it was a masterpiece of Jacobean English prose and the principal Bible used by English-speaking Protestants for 270 years.

Jews in English-speaking countries often used the King James Version of the Old Testament, and a 19th-century revision of it, but at a disadvantage; because of departures from traditional Hebrew text, headings and interpretations often were doctrinally objectionable, and even the order of the books differed sharply from the Jewish canon. In 1917 the Jewish Publication Society of America brought forth an English translation that retained the Elizabethan diction of the King James. In 1955 the Society undertook a wholly new translation, based on the Masoretic text, one body of scholars working on the Torah (published 1962, revised 1967), the Megillot and Jonah (1969), Isaiah (1973), and the entire Nevi'im (Prophets; 1978). The other worked on translating the remainder of the Ketuvim (Writings or Hagiographa; the third section, the Megillot, already having appeared), producing Psalms in 1972 and Job in 1980.

In the 19th century a British committee produced the Revised Version (N.T. 1881; O.T. 1885; the Apocrypha 1895), a revision of the King James Version. In the U.S. a committee working closely with the British revision committee produced the American Standard Version (1901). These versions were used for academic study but rarely replaced the King James Version in Protestant worship services or in home use.

In the 20th century many translations appeared. The Revised Standard Version (N.T. 1946; O.T. 1952; Apocrypha 1957) was widely accepted by Protestants in the United States. The Interpreter's Bible, 12 vol. (1952–57), placed King James and Revised Standard texts side by side, accompanied by extensive exegetical, theological, and historical commentary. The New English Bible (N.T., 1st edition 1961, 2nd edition 1970; O.T. and Apocrypha 1970) was prepared by an interdenominational committee of British and Irish Anglican and Protestant scholars.

Several private versions in modern English have been prepared by individuals or by a few scholars. These include James Moffatt's version (N.T. 1913, O.T. 1924; revisions 1935); a translation by Ronald Knox (N.T. 1945; O.T. 1949), which is officially approved by the Roman Catholic Church; and The New Testament in Modern English (1958) by J.B. Phillips.

Under the sponsorship of the American Bishops' Committee of the Confraternity of Christian Doctrine, Roman Catholics published the Confraternity Version (N.T. only, 1941), based on the Vulgate. After Pope Pius XII approved translation from the original languages, a completely new start was made by a committee of 51 scholars, four of them Protestants. The result was the New American Bible (1970), approved for use in the mass and also highly regarded by non-Catholic scholars. Another widely acclaimed modern translation was prepared by Dominican scholars working in Jerusalem with ecumenical cooperation: the French-language La Bible de Jerusalem (1956). English scholars used the same materials to prepare an English-language version, The Jerusalem Bible (1966).

A bible was produced in contemporary American English by the American Bible Society: the Good News Bible, also called Today's English Version (N.T. 1966, O.T. 1976). Another translation in a slightly less conspicuously modern idiom was produced by the New York Bible Society as the New International Version (N.T. 1973, O.T. 1978).

Biblical translation generally after the discovery of the first Dead Sea Scrolls (1947; *q.v.*) profited greatly from the confirmations, corrections, explanations, and insights made possible by those finds and enhanced by an ecumenical spirit then spreading among exegetes of various faiths.

Bibliographic Classification: *see* Bliss Classification.

bibliography, the systematic study and description of books.

A brief treatment of bibliography follows. For full treatment, *see* MACROPAEDIA: History, The Study of.

Bibliography is either (1) the listing of books according to some system (enumerative, or descriptive, bibliography) or (2) the study of books as tangible objects (analytical or critical bibliography). The word is also used to describe the product of those activities: bibliographies may take the form of organized information about a particular author's works, about all the works on a given subject, or about a particular nation or period. A bibliography may also consist of meticulous descriptions of the physical features of a number of books, including the paper used, the binding, printing, typography, and production processes. These bibliographies are then used by students and scholars to gain access to information about material for study in a given area and to help establish such facts about a book as printing date, authenticity, and its value for textual study.

Descriptive, or enumerative, bibliography. The primary purpose of descriptive bibliography is to organize detailed information, item by item, culled from a mass of materials in a systematic way so that others can have access to useful information. In the earliest bibliographies, the organizing principle was simply that of compiling all the works of a given

writer, either a writer's list of his own works (autobibliography) or a biographer's lists of his subjects' writings.

Early autobibliographies are those by the 2nd-century Greek physician Galen and the Venerable Bede (included in his *Ecclesiastical History of the English People,* 731). One of the first biographers to include bibliographies in his lives of church writers was St. Jerome in his *De viris illustribus* ("Concerning Famous Men"), in the 4th century. This practice is continued in the entries of the British *Dictionary of National Biography.*

Bibliography was manageable when books were still manuscripts copied out in the scriptoria of the medieval monasteries. After the invention of printing in the 15th century, however, books proliferated, and organizing information about them became both more necessary and more practical. As early as 1545 the idea of a universal bibliography aroused the German-Swiss naturalist and writer Conrad Gesner to compile his *Bibliotheca universalis* of all past and present writers. Part of his plan, completed in 1555, was to divide entries into categories of knowledge. His attempts at both universality and classification earned him the title "father of bibliography."

The vast numbers of books published as part of the modern knowledge explosion means that elaborate methods of classification are necessary. Widely used systems are the Dewey Decimal classification; the Library of Congress classification, based on its collection; and the Universal Decimal classification. The widespread use in the last quarter of the 20th century of computers in processing information classified by one of these systems has revived the possibility of creating a universal bibliography, including articles in periodicals. The problems threatening its successful implementation, besides those of worldwide standardization of cataloging entries and programming multilanguage materials, are the usual modern ones of cost, labour, and storage. What is meeting the need for comprehensive banks of recorded bibliographic data are the published catalogs of the great comprehensive libraries such as the British Museum and Bibliothèque Nationale and the practice of producing and distributing information about newly published materials in machine-readable form, notably by the Library of Congress. Large amounts of extant bibliographical materials in collections before machine generation of data began remain to be computerized, however.

Critical bibliography. Critical or analytical bibliography began early in the 20th century when scholars developed the techniques to study the physical features of books. They were first successful at dating, identifying, and authenticating books printed in the 16th century, known as incunabula. Methods demonstrated by Robert Proctor at the British Museum and Oxford's Bodleian Library were accurate in assigning early hand-printed books not only to countries and towns but to specific printers, and such methods have been extended to the study of physical features of machine-printed books of the 19th and 20th centuries.

The application of the techniques of critical bibliography to rare editions and questionable chronologies or even false editions has had important results for textual criticism. For example, C.J.K. Hinman studied the typesetting of the Shakespeare First Folio to show that it was composed and printed out of normal order by five different compositors; and W.W. Greg proved that the Pavier Shakespeare Quartos were printed in 1619, not before 1610 as previously supposed. Through chemical analysis of the paper and demonstration of inappropriately used typefaces, the Thomas J. Wise forgeries of more than 50 "first editions," which sold at high prices in the 1890s, were exposed in 1934 by John Carter and Graham Pollard.

Biblioteca Apostolica Vaticana (Italian), English VATICAN APOSTOLIC LIBRARY, official library of the Vatican, especially notable as one of the world's richest manuscript depositories. The library is the direct heir of the first library of the Roman pontiffs. Very little is known of the library up to the 13th century, although there is an inventory of the time of Pope Boniface VIII (1294–1303). The present institution derives from the one founded at Rome during the 15th century under the special patronage of Nicholas V (1447–55). At the end of the 16th century, Domenico Fontana erected the present building. The two chief collections, Vatican Latin and Greek, were then formed. By the 1980s the library possessed over 900,000 printed volumes and 65,000 manuscripts.

Biblioteca Medicea-Laurenziana, English MEDICEAN-LAURENTIAN LIBRARY, collection of books and manuscripts gathered during the 15th century in Florence by Cosimo the Elder, Piero, and Lorenzo the Magnificent, all members of the Medici family. Part of the collection was open to the public before 1494, but in that year the Medici were overthrown and their palace was sacked. What remained of the library was taken to Rome, where it was kept by Lorenzo's son Giovanni, who was elected pope (Leo X) in 1513. When Lorenzo's nephew Giulio was elected pope (Clement VII) in 1523, he returned the library to Florence and commissioned Michelangelo to construct a suitable building. The first drawings were made in 1523. The carved ceiling was designed in the same year but finished ten years later by two indifferent craftsmen. The mosaic floor, which repeats the design of the ceiling, and the carved benches were made by various assistants from sketches of the master. Michelangelo also made designs for the staircase of the library; his model for this was finished by Bartolomeo Ammanati and Giorgio Vasari in 1559.

Though unfinished, the library was opened in 1571. Its chief importance lies in its 10,500 manuscripts, more than 700 earlier than the 11th century. Some are among the most valuable codices in the world—a famous Virgil of the 4th or 5th century, the Justinian Pandects of the 6th, a Horace of the 10th, and many very early classical and biblical texts, about 100 codices of Dante, a *Decameron* copied by a contemporary from Boccaccio's own manuscript, and Benvenuto Cellini's manuscript of his autobiography.

Bibliothèque Nationale (French: National Library), most important library in France and one of the oldest in the world, now located in Paris. The first royal library, the Bibliothèque du Roi, dates from the reign of Charles V (1364–80), who installed 1,200 manuscripts in the Louvre. This library was dispersed, but under Louis XI (reigned 1461–83) another was created. In 1544 Francis I moved the library to Fontainebleau, and from 1537 it received a copy of every French publication. The library was moved to Paris between 1567 and 1593. The first real catalog was made in 1622. First opened to the public in 1692, the library was renamed the Bibliothèque Nationale in 1795. During the 19th century, the administrator, Léopold-Victor Delisle, organized the collection of manuscripts. In 1926 a consortium was established consisting of the Bibliothèque Nationale, the Mazarine (established 1643, later part of the Nationale and, from 1945, attached to the Institut de France), the Arsenal (national and public in 1797), the Sainte-Geneviève (1624, a constituent library of Paris University Library), and the library of the Musée de la Grande Guerre (1917, attached to the Bibliothèque de Documentation Internationale Contemporaine). In the 1980s the Bibliothèque Nationale administered the Arsenal Library and the libraries of the Opéra and of the Conservatoire National de Musique.

The Bibliothèque Nationale acquires a copy of every publication printed in France (copyright deposit) and publishes the *Bibliographie de la France.* Its foreign acquisitions emphasize the humanities. Printed books number 9,000,000; there are 180,000 bound manuscripts and more than 5,000,000 prints.

Bibracte, ancient Gallic town (modern Mont Beuvray, in Saône-et-Loire, France), capital of the Aedui in the time of Julius Caesar and the site of his defeat of the Helvetii tribe, the climax of his first campaign in Gaul (58 BC). To destroy native traditions, Augustus moved the inhabitants to his new town Augustodunum (Autun) in 12 BC.

Bibulus, Marcus Calpurnius (d. 48 BC), Roman politician who, as consul with Julius Caesar in 59, worked with the senatorial conservatives against Caesar's agrarian legislation. During their consulship Bibulus was prevented by mob violence from vetoing Caesar's agrarian proposals in the Senate. He thereupon attempted to prevent the measures from becoming law by announcing that he was looking for omens. According to the constitution, this should have brought all public business to a standstill, but Caesar disregarded the move. Retiring to his house, Bibulus did not emerge for the remaining eight months of his consulship; his only public acts were the issuance of edicts against Caesar's proceedings.

When Caesar and Pompey (Gnaeus Pompeius) quarrelled, Bibulus supported Pompey. In 51, he went to Syria as proconsul. During the Civil War between Pompey and Caesar, Pompey gave Bibulus the command of a fleet in the Ionian Sea, but Bibulus failed in his strenuous efforts to prevent Caesar from crossing from Italy to Epirus with his army in 49. Exhausted, Bibulus died shortly afterward.

bicameral system, a system of government in which the legislature comprises two houses. The modern bicameral system dates back to the beginnings of constitutional government in 17th-century England and to the later 18th century on the continent of Europe and in the United States.

The English Parliament became bicameral in recognition of the distinction between the nobility and clergy and the common people. When the British colonies were established in America, the colonial assemblies were likewise bicameral because there were two interests to be represented: the mother country, by the governor in council, and the colonists, by their chosen deputies. After the Declaration of Independence in 1776, bicameral systems were established in all the states but Georgia, Pennsylvania, and Vermont. In those three states, single-chamber legislatures were set up, but they were replaced by bicameral legislatures in 1789, 1790, and 1830, respectively. All the new states subsequently admitted into the Union entered with two-house legislatures.

Although the Continental Congresses and the Congress of the Confederation had been unicameral, the Constitutional Convention of 1787 decided that the new national legislature should consist of two branches in order to preserve the identity of the separate states, safeguard the influence of the smaller states, and protect the interests of property.

With the extension of constitutional government throughout the world, most countries set up bicameral legislatures on the English or U.S. models, with large first chambers chosen by popular vote and smaller second chambers whose members were either elected or appointed (or, in some cases, determined by inheritance) and often represented political subdivisions, such as the Swiss cantons. The bicameral plan is usually found in federal

governments, such as those of the United States, Australia, Brazil, and Canada, and in quasi-federal governments, such as those of the Federal Republic of Germany and India.

Theoretically, this dualism in the bicameral system is justified as an application of the principle of checks and balances. A bicameral system is desirable, it has been argued, to avoid hasty and harsh legislation, limit democracy, and secure deliberation. Although the bicameral system remained prevalent in the 20th century, there were reactions against it. Unicameral councils or commissions came to predominate in U.S. cities, which were often organized along bicameral patterns in the 19th century. Widespread dissatisfaction with U.S. state legislatures led to numerous proposals for a single-chamber system during the second decade of the century, but the adoption in 1934 of a unicameral legislature by Nebraska (effective from 1937) marked the only departure from the bicameral system among the U.S. states.

Constitutional trends after World War II reflected a growing preference for the unicameral system in nonfederal states of the world. Unicameral national legislative bodies were set up in many European countries, China, and several Latin American countries.

In Britain, where the House of Lords had been weakened, and in France, where the Council of the Republic (renamed Senate in 1958 on the foundation of the Fifth Republic) was practically impotent, the governments operated, in effect, on the unicameral principle. A unitary system of government does not imply a unicameral legislature. Modern constitutional states often retain two chambers even though bicameralism has declined.

bicarbonate of soda, sodium bicarbonate, a white crystalline, weakly alkaline sodium salt (*see* sodium).

Bicaz, town, Neamţ *judeţ* (district), northeastern Romania, at the confluence of the Bicaz and Bistriţa rivers. The town is situated at the southern end of Lake Bicaz, formed by a dam on the Bistriţa.

The fast-flowing Bistriţa (called "the river of light"), which rises in the Rodna Mountains to the northwest, has 13 hydroelectric power stations between Bicaz and Buzău; the largest is at Bicaz. The town manufactures cement and asbestos panels. It is a tourist base for the Bicaz Gorges, an impressive region of heavily eroded limestone constructions that have been designated a natural reservation. Pop. (1982 est.) 9,884.

Where the same name may denote a person, place, or thing, the articles will be found in that order

biceps muscle, any muscle with two heads, or points of origin (from Latin *bis,* "two," and *caput,* "head"). In human beings, there are the biceps brachii and biceps femoris.

For a depiction of the biceps brachii in human anatomy, shown in relation to other parts of the body, *see* the colour Trans-Vision in the PROPAEDIA: Part Four, Section 421.

The biceps brachii is a prominent muscle on the front side of the upper arm. It originates in two places: the coracoid process, a protrusion of the scapula (shoulder blade); and the upper glenoid cavity, the hollow for the shoulder joint. The tendon of this muscle is attached to the inner protrusion near the head of the radius, a bone of the forearm. The action of the biceps brachii flexes the arm at the elbow and shoulder and supinates the forearm (turns the palm forward or upward).

The biceps femoris is one of the hamstring muscles at the back of the thigh. It originates in two places: the ischium (lower, rear portion of the pelvis, or hipbone) and the back of the femur (thighbone). The fibres of these two origins join and are attached at the head of the fibula and tibia, the bones of the lower leg. This muscle extends the thigh, rotates it outward, and flexes the leg at the knee.

Bicester, parish (town), Cherwell district, county of Oxfordshire, England, in farming country on the northern edge of the reclaimed marsh of Ot Moor. An Augustinian priory (1182) was dissolved there in 1538 and is now in ruins. Richard II granted a fair and a market, and in 1440 an additional market was granted. In the 16th century a cattle market was also established. The church contains examples of Saxon, Norman, and later architectural styles.

Bicester is the centre of a fox hunt dating from the 18th century, now known as the Bicester and Warden Hill Hunt. A nearby large army ordnance depot has brought many employees into the area, and industry has expanded. Pop. (1981 prelim.) 14,436.

Bichat, Marie-François-Xavier (b. Nov. 11/14, 1771, Thoirette, Fr.—d. July 22, 1802, Lyon), anatomist and physiologist whose systematic study of human tissues helped found the science of histology. Without knowledge of the cell as the functional unit of living things, Bichat was among the first to visualize the organs of the body as being formed through differentiation of simple, functional units, or

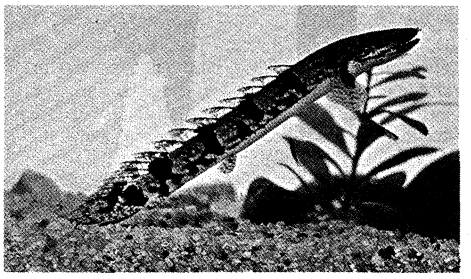
Bichat, detail of an engraving
H. Roger-Viollet

organ precursors. This view he developed in *Traité des membranes* (1800; "Treatise on Membranes"). Although Bichat did not use the microscope, he distinguished 21 kinds of tissues that enter into different combinations in forming the organs of the body.

Bichat studied anatomy and surgery under Marc-Antoine Petit, chief surgeon at the Hôtel Dieu, Lyon. In 1793 he became a pupil, then assistant, of Pierre-Joseph Desault, surgeon and anatomist in Paris. After his teacher's death in 1795, Bichat completed the fourth volume of Desault's *Journal de chirurgie,* adding a biographical memoir of its author. In addition to observations at the bedsides of his patients, as physician at the Hôtel Dieu he studied the postmortem changes induced in various organs by disease. His *Recherches physiologiques sur la vie et la mort* (1800; "Physiological Researches on Life and Death") was followed by *Anatomie générale* (1801). He published the first two volumes of *Anatomie descriptive* (1801–03). The third was completed by his pupils after his death. By order of Napoleon his bust, along with that of Desault, was placed in the Hôtel Dieu.

bichir, also called LOBEFIN, any of about 10 species of tropical African fishes of the genus *Polypterus.* Bichirs and the eel-like reedfish, *Calamoichthys* (sometime called *Erpetoichthys calabaricus*), are of the family Polypteridae, order Polypteriformes; like the sturgeons and paddlefishes, they are thought to be members of the superorder Chondrostei, although this classification is questioned by some authorities.

About 0.6 to 0.9 metre (2 to 3 feet) long, bichirs prey on worms, small fishes, and other animals. They apparently spawn in swamps during floods. They have fleshy lobes in the pectoral fins, thick ganoid (hard, rhombic,



Bichir (*Polypterus delhezi*)
Gene Wolfsheimer

enamelled) scales, and functional lungs. The dorsal fin is a series of sharp spines, each with a flaglike end cluster of fin rays. The bichir is eaten in some areas.

Bichitr (fl. 17th century, India), Mughal court painter active during the reigns of the emperors Jahāngīr, Shāh Jahān, and (probably) Aurangzēb. It seems likely that he was raised at the court. The earliest work known to be by him dates from *c.* 1615 and shows a fully mature style. He may still have been painting around 1660. He included a self-portrait in a picture of Jahāngīr painted around 1616, where he appears as a man of about 30 in Hindu court costume. He may have had the most brilliant court style of all the Mughal painters. As a portraitist and commemorator of great occasions he is superb, painting with faultless technique and majestic formality. While his earlier painting shows some soft and romantic qualities, his later work is characterized by clear, hard line and brilliant colour that barely manage to avoid cold perfectionism. His interest in European paintings and prints, some of which he studied in careful copies, leads him to model his figures with shadows and to include European cherubs or *putti* hovering among the great. Like other court painters he uses Indian landscapes in European perspective, and this too is probably influenced by European works, yet his painting is a magnificent reflection of his own place and time.

bichloride of mercury, mercury(II) chloride, an odourless, colourless, water-soluble compound of mercury (*q.v.*).

Bickel, Frederick McIntyre: *see* March, Fredric.

Bickerdyke, Mary Ann, *née* BALL (b. July 19, 1817, Knox County, Ohio, U.S.—d. Nov. 8, 1901, Bunker Hill, Kan.), organizer and

Mary Ann Bickerdyke
By courtesy of the Library of Congress, Washington, D.C.

chief of nursing, hospital, and welfare services for the western armies under the command of Gen. Ulysses S. Grant during the U.S. Civil War.

She attended Oberlin College and later stud-

ied nursing. Early in the war Mrs. Bickerdyke, then a widow, set herself up as a "botanic physician" in Galesburg, Ill., and then attracted the attention of General Grant by her unofficial efforts at the Cairo, Ill., military installations. Thereafter she received Grant's sanction for her efforts and served throughout the war. She followed his army down the Mississippi, setting up hospitals as they were needed, and later accompanied the forces of Gen. W.T. Sherman on their march through Georgia to the sea. Through her efforts, provisions were made for frequent medical examinations and for transporting men who could no longer walk. Under Mrs. Bickerdyke's supervision, about 300 field hospitals were built with the help of U.S. Sanitary Commission agents.

After the war she became a pension attorney for veterans and also organized veterans' homestead plans. An account of her work is given in Marjorie Barstow Greenbie's *Lincoln's Daughter of Mercy* (1944).

Bickerstaffe, Isaac (b. *c.* 1735, Ireland—d. *c.* 1812), Irish playwright whose farces and comic operas were popular in the late 18th century. There is no apparent connection between his name and the pseudonym earlier adopted by Swift and also used by Addison and Steele for *The Tatler.*

The real Isaac Bickerstaffe's first theatrical success, *Love in a Village* (1762), was followed by many others, including *The Maid of the Mill* (based on Richardson's *Pamela*), *The Padlock,* and *The Hypocrite.* A frank plagiarist, he depended for his success on his lively lyrics and his sparkling dialogue.

Bickerstaffe's future appeared bright until 1772, when he was forced into exile by allegations of sodomy, then a capital offense. He lived in great poverty for many years, probably in France. The exact date and place of his death are unknown.

Bicol, also spelled BIKOL, Spanish BICOLANO, fifth largest cultural-linguistic group in the Philippines, numbering about 2,900,000 in the mid-1970s. Its indigenous region is commonly considered to be all of "Bicolandia," a region comprising six provinces in the Bicol Peninsula and neighbouring islands of southeast Luzon.

The Bicol are largely an agricultural and rural people, producing rice, coconuts, and hemp. Nearly all of them are Roman Catholics. Their language is closely related to others of the central Philippines, all of which belong to the Austronesian (Malayo-Polynesian) family of languages.

Bicol Peninsula, peninsula, southeastern Luzon, Philippines; it is irregular in form, with several deep coastal bays, large subpeninsulas, and a lengthy coastline. The peninsula has an area of about 4,660 sq mi (12,070 sq km). It comprises the Bicol Plain, a large lowland area important in the production of rice, and volcanic highlands; it includes Albay, Camarines Sur, Camarines Norte, and Sorsogon provinces. A well-watered area, it is densely populated although largely rural and agricultural. The peninsula is the homeland of the Bicol, the fifth largest ethnolinguistic group in the Philippines, whose educational and commercial centre is Naga in Camarines Sur province. Bicol National Park occupies an area of 12,855 ac (5,201 ha) in Camarines Sur and Camarines Norte provinces. The peninsula has been a stronghold of Philippine Communists.

bicuspid: *see* premolar.

bicycle, lightweight, two-wheeled, steerable machine propelled by its rider; the bicycle is said to be the most efficient means yet devised to convert human energy into propulsion. First made in the early 19th century, it developed as an important means of transportation and as the basis for a worldwide sport and industry. Bicycles are the most numerous road machines in many countries. Bicycle "touring"—travelling or sightseeing—is most widely practiced in England but has a large and increasing number of followers in Germany, France, and other European countries; the oldest touring club is the Pickwick Bicycle Club of London, founded in 1870. Bicycles are also widely used for racing in France, Germany, Belgium, and to a lesser extent in England and the United States. A bicycle rider can quite easily maintain a pace of 10–12 miles (16–19 kilometres) per hour; *i.e.,* about four times a walking pace. Cycle touring is popular in many countries and is often organized in large clubs.

Early bicycles. The first known patent of a machine that could have resembled a bicycle was held by Jean Theson, who at Fontainebleau on Feb. 4, 1645, was given a 30-year privilege to "put into use a small body on four wheels driven without horses but by two seated men." A similar four-wheeled machine was seen in Paris in 1779. Built by François Blanchard and M. Masurier, it was evidently large and ponderous.

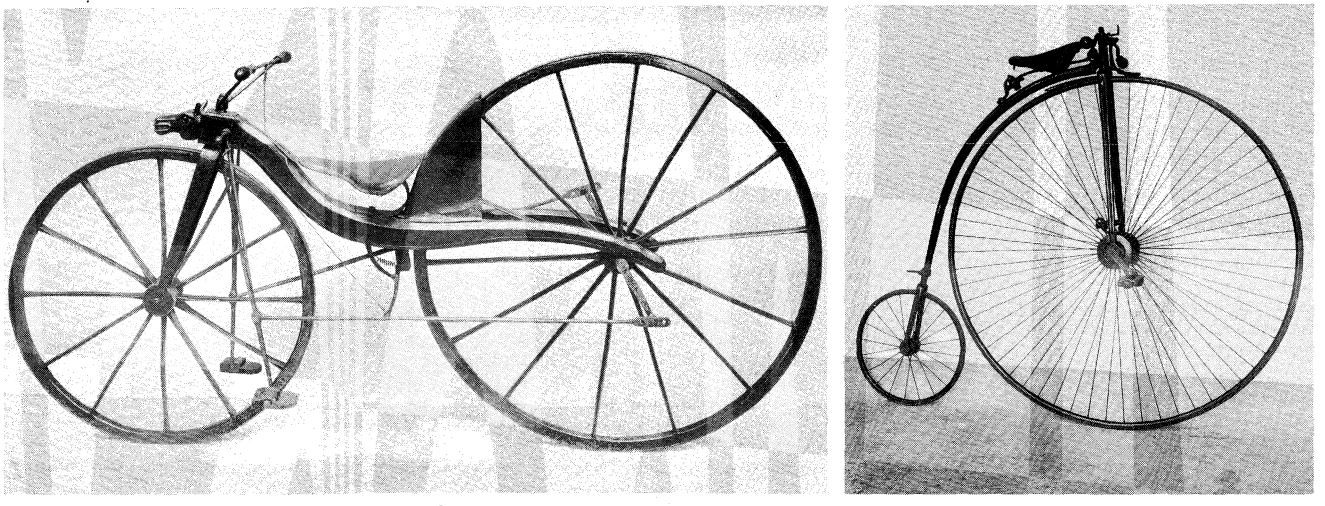
The first two-wheeled machine of which there is evidence was the *draisienne,* invented by Baron Karl de Drais de Sauerbrun and exhibited in Paris, April 6, 1818. It was made of wood, and the seated rider propelled himself simply by paddling his feet against the ground. Steerable, crude, and clumsy, it worked after a fashion. Copies of the machine were made in Britain by Denis Johnson and in America, where it enjoyed a brief vogue. Not until Kirkpatrick Macmillan, a blacksmith of Dumfriesshire, Scotland, completed four years of experiments in 1839 did a self-propelled bicycle appear.

Macmillan's machine had wheels rimmed with iron and, though lighter in appearance than the *draisienne,* it was still heavy. With a steerable front wheel about 30 inches (75 centimetres) in diameter and a driven rear wheel of about 40 inches (100 centimetres) in diameter, it could move at a brisk pace. In 1842 Macmillan successfully challenged a post carriage.

Instead of pedals attached directly to the rear wheel, Macmillan's vehicle had two swinging cranks mounted at the front. The rider rested his feet on the cranks and swung them back and forth, moving a pair of rods that were linked to two levers, located on either side of the rear wheel. Pressing down on one crank pulled the rod forward, which in turn drew the uppermost of the levers forward in an arc, thus turning the wheel and bringing the opposing lever uppermost for the cycle to be repeated with the other foot.

The machine never became popular and, though copied, passed out of fashion. Thus while Macmillan may fairly be claimed as the inventor of the bicycle, the first usable mechanism that survived in principle was the work of two Frenchmen, Pierre Michaux and his son Ernest. In Paris in 1861 the Michaux family built a machine on which they attached two cranks to the front wheel. The cranks could be rotated by the rider's feet, an arrangement that, according to Henry Michaux in 1893, was an adaptation of the crank handles of a vertical grindstone the inventors had seen. Their machine immediately caught on, though its wood and iron frame gave it the sobriquet of "Bone-shaker." That year they made only two machines. In 1862, when it had already been copied in Munich (the machine is preserved in the Deutsches Museum there), they made 142 of the *vélocipèdes,* as they had come to be known. By 1865 the Michaux family was making 400 a year. In 1866 their mechanic, Pierre Lallement, emigrated to the U.S., where with James Carroll of Ansonia, Conn., he took out the first U.S. patent.

On May 31, 1868, the first recorded bicycle race was won in the Parc de Saint-Cloud by James Moore, an Englishman, who also won the first road race (Paris to Rouen) in November 1869. Reportedly, he rode a 160-pound machine that had solid rubber tires and ball bearings, and he covered the 83 miles in 10 hours 25 minutes, some 45 minutes faster



(Left) Macmillan's Hobbyhorse, *c.* 1839 and (right) Starley's "penny-farthing" bicycle, 1883

Science Museum, London, Crown copyright

than the second-place racer. Some 200 bicycles started the race. At the first cycle show in Paris that year, primitive freewheels and variable gears were shown.

Rowley B. Turner of the Coventry Sewing Machine Company, England, rode one of the Michaux bicycles from Coventry station to the factory and persuaded the management to make 400 of them. Originally intended to be sold in France, where capacity was not enough for export, the outbreak of the Franco-German War left Turner to sell them in England. James Starley, an inventive young foreman of the Coventry Company who immediately began development work on the primitive machines, became known in England as the father of the bicycle industry. A statue of him is standing today in Coventry.

Starley set out to reduce the weight of the clumsy *vélocipèdes.* In 1870 he made a bicycle with a large front wheel and a small rear wheel, derisively nicknamed "penny-farthing" after the largest and smallest English copper coins of the period. He developed a gear that allowed the wheel to be turned twice for each revolution of the pedals. He lightened the wheels by making them of iron with wire spokes under tension. His spokes were a single reel of wire looped through holes in the rim and the hub to which he applied tension by screwing up the threads, an arrangement improved further by the introduction in 1874 of eyed and threaded nipples to hold the spokes individually. Later that year Starley thought of tangential spoking—as distinct from radial—to ease the sideway stresses on the spokes. A party of riders rode these high bicycles from London to John O'Groats, some 690 miles, in 15 days. These machines typically weighed about 50 pounds but could be built as light as 21 pounds for track racing, with a driving wheel varying from 40 to 60 inches in diameter, according to the owner's leg length.

Also in 1874 H.J. Lawson built a rear-drive machine with an endless chain between the driving sprocket and the rear wheel. It had two medium-sized wheels of equal diameter. Called the safety bicycle, it had decisive advantages in stability, braking, and mounting over the high front-wheeled "ordinary," which, however, survived for some years. Solid rubber tires improved its stability, but safety machines like Lawson's became more common. In 1888 John Boyd Dunlop, a Belfast veterinarian studying and working with James Moore, introduced a pneumatic tire. The "safety" and Dunlop's pneumatic tire made the bicycle the success it became and killed manufacture of the "ordinary." By 1893 the diamond-pattern frame had been established as the cheapest and most common. The newer models could freewheel and were easily braked.

The next improvement was the introduction of gears. Patents based on the epicyclic principle, using sun and planet wheels inside an annulus ring, were taken out by H. Sturmey and J. Archer between 1901 and 1906. Sturmey-Archer gears, first two speed, then three, were located inside the rear hub of a bicycle and weighed about two pounds. Devices of this type also were made in other countries, all using the same principle.

Dérailleur gears—*i.e.,* gears that moved or derailed the chain from one sprocket to another—were less successful at first because mud from the road interfered with their operation, but eventually they proved highly reliable and convenient. Another important innovation came from an offshoot of the bicycle, the tricycle: the differential, a device permitting two driven rear wheels to maintain way while rotating at differing speeds, as in rounding a corner. Bicycle design from 1893 to 1962 was more or less static: only refinements to existing designs were made until 1962, when the cross frame was introduced.

Modern bicycles. Except for the so-called looped frame, designed to provide clearance for women's skirts, bicycles are produced in two basic types, the diamond frame and the cross frame. They differ widely in principle.

The diamond frame, the only type made in volume until 1962, consists of three triangles and a pair of forks. The rider straddles the main triangle. The other two triangles hold the rear wheel, one on either side. The forks, which can be turned from side to side, hold the front wheel.

The rider sits on a saddle at the top of the seat tube. Besides holding the down tube at the front and the chain stays at the back, the lug at the bottom of the seat tube also contains the bearings for the cranks and driving sprocket.

Early patterns had straight inclined forks, but it became apparent that curved forks would furnish two advantages: they would absorb some road shock through natural springiness and, under the weight of the rider, would tend to return to the straight-ahead position after being turned.

In 1962 Alexander Moulton, an English engineer, used the cross frame to construct the first really new bicycle since the safety bicycle. It had one large tube of oval cross section as its main horizontal member. From this main member projected two parallel tubes: the seat tube and the head tube. The latter held the bearings for the steering forks. Parallel with the main tube at the rear were two tapered forks to hold the rear wheel so arranged as to pivot on each side of the tube about a point approximately three inches forward of the end of the main tube. A small block of rubber was bonded to the end of the tube and to a crosspiece between the tapered forks. Vertical movement of the fork ends subjected the rubber block to compression and shear stress. The front forks were mounted so the rider could turn them while the forks moved vertically. The vertical movement was controlled by a column of rubber mounted inside a coil spring, which provided a form of damping (checking of vibration or oscillation).

Moulton originally wished to reduce inertia by using very high pressure (about 120 pounds per square inch [8 atmospheres]) tires on small wheels. He adopted 16-inch wheels, as against the more normal 26- or 27-inch and included the rubber suspension to reduce the jolting resulting from small wheels and hard tires. The drive was conventional. The suspension, helped by the open frame with no top tube, was a success. Moulton designed it so that the saddle could swiftly be adjusted for riders of varying heights. Behind the seat tube and integral with the frame, he mounted a baggage carrier that, because of the small wheels, was nearer the ground than on an orthodox bicycle and was more stable with heavy loads.

A later development of the design replaced the block of rubber at the end of the main tube by a small metal triangle, free to move slightly up and down, separated from the seat tube by a hard rubber ball, an arrangement that gave a smoother ride.

Within a few years every manufacturer was producing a small-wheeled bicycle, but none enjoyed the Moulton's success, due primarily to its patented suspension.

A bicycle wheel consists of a rim to hold the tire, wire spokes under tension, and a ball-bearing hub. Spokes are laced tangentially and maintained under tension by nipples in the rims that can be adjusted to keep the rim true.

The hubs may be held in the frame either by nuts screwed onto a spindle or by a cam-action lever utilizing a hollow spindle. The spindle also holds the cones of the ball races, which are used for adjustment and to take up wear in the races that are integral with the hub barrel.

Rims come in a variety of sizes, from 14 to 28 inches in diameter, and in three basic types: Westwood, Endrick, and tubular. Westwood rims are simple in form, broad with a depression for the spoke nipples in the centre of the section. Rolled sides contain the wired edges of the tires. Endrick rims are flat sided for use with caliper brakes, which grip the rims. Tubular rims are made in the shape of a flat U with a hollow section formed by extrusion. They are used with tubular racing tires, which are attached to the rim with an adhesive rather than wired on. Occasionally racing rims are made from a light wood.

Tires have an outer cover of canvas and rubber and an inner inflatable tube. The outer cover may either be stitched together to contain the inner tube, as in a racing tire, or have circles of light, springy wire in the edges to keep the cover circular. While outer covers normally contain a large proportion of natural rubber, inner tubes most frequently are made from butyl.

In specialized racing tires the inner tubes are normally of ultrathin natural rubber, and in the interests of lightness and strength, the canvas may be of finer cotton or silk. These tires are usually run at pressures up to 150 pounds per square inch. The most common type of tire valve utilizes a restricting cone actuated by the pressure in the tire.

Although experiments have been made with shaft transmission and bevel gears, as well as with belt transmission, bicycles generally are driven by chains. Roller chains are assembled from pin links and roller links. A pin link consists of two side plates connected by two tightly fitted pins. A roller link consists of two side plates connected by two tightly fitted bushings on which hardened steel rollers are free to rotate. When assembled the pins are a free fit in the bushings. The chains require liberal quantities of oil or grease to protect them from rust and to keep them lubricated, but experiments with plated chains seem to indicate that a dry chain, capable of taking great loads, may not be far off.

Devices to improve the speed of the bicycle for a given pedalling rate are of two types: the *dérailleur,* which requires movement of the chain from sprocket to sprocket, and the epicyclic, which alters the speed of the driver sprocket relative to the rim of the wheel.

A *dérailleur* gear consists of a mechanism to move the chain from one sprocket wheel to another of different size. By varying the size of the driving sprockets, the rear wheel can be made to pass through more or fewer revolutions for each turn of the crank. Cyclists can use up to six sprocket wheels on the rear freewheel and three on the cranks, providing 18 different ratios. The mechanism is spring loaded to absorb chain slack and is controlled by a cable from the frame or handlebars.

Epicyclic gears are made in England, Germany, Japan, and the U.S., in two-, three-, four-, and five-speed models incorporated in the rear hub. They are controlled by levers or twist-grip mechanisms, utilizing cables mounted on the handlebars or on the frame tubes. A two-speed hub gear is also made in brake-hub form, controlled by rotating the sprocket in the reverse direction.

The Sturmey-Archer Company in the 1920s patented a combination three-speed gear and coaster hub brake. Back-pedalling causes a phosphor-bronze split sleeve to expand against the hub shell, resulting in smooth, weatherproof braking action. In this form the hub gear still had to be changed by lever and cable.

The most common brake is the coaster brake. It operates on the rear wheel and leaves the rider's hands free. The coaster brake can be installed with a two-speed gear, also free from the handlebars. It is the only brake unaffected by oil or water and in normal use lasts the life of the bicycle with no more than occasional adjustment. Besides the internal coaster, bicy-

cle brakes are made in three principal types: caliper, rod, and drum.

Caliper brakes function by squeezing two blocks of high-friction material against the sides of the wheel rim. Rod brakes consist of two similar pads of friction material that are pulled against the rim from the inside by rods connected to handlebar levers. Drum brakes may be operated by cable or rod connected to a lever that, when rotated, opens two arcs of friction material mounted on shoes inside a steel drum on the hub.

Saddles are commonly made of plastic and felt, with or without extra spring loading. Leather, the original saddle material, is still desirable because it absorbs perspiration. The simplest form of saddle uses spring wire made from high-tensile steel, with a curved cantle (upward projecting rear) plate at the rear and a bolt at the front peak. A saddle in this form, of good quality leather and reasonably used (*i.e.,* not allowed to be soaked continually with water) assumes the shape of the rider's bottom and should last his riding lifetime. About 90 percent of all saddles are built up with a girder steel frame of similar shape on which is mounted a hammock of small steel springs and padding of various sorts, covered by polyvinyl chloride sheet. This type of saddle is easily cleaned, waterproof, inexpensive, and easily mass-produced. A third form, which became popular in the 1970s, is the plastic saddle made by injection molding. It is the least expensive of all but has the disadvantage of resisting changes in shape because of its tough, formed nature. Careful design has made it very popular for racing, in which its resistance to deformation through rain is appreciated.

Battery lamps, employing tungsten-filament bulbs and dry cell batteries, have long been used. The most common form of lighting is that provided by a small, portable dynamo (generator) mounted on the stays or forks of the bicycle and driven by being forced against the side of the tire. As the tire revolves, a milled wheel on the head of the dynamo turns at a speed sufficient to generate about half an ampere of six-volt power when the bicycle is travelling about 10 miles per hour. Many such devices incorporate the front lamp or the rear lamp in the dynamo itself, running one lamp through a single wire and using the frame as a ground return.

Tools, luggage, and small children are commonly carried in baskets or panniers frequently bolted to lugs that are brazed onto the frame. The rider is protected from spray from the wheels by simple sheet metal or plastic guards bolted to the frame and held off the wheel by wire stays.

See also cycling.

Bida, town and traditional emirate, Niger State, west central Nigeria. The town is on the Bako River, a minor tributary of the Niger, and lies at the intersection of roads from Jebba and Raba, Zungeru, and Agaie. Originally a small settlement of the Beni (Bini), a subgroup of the Nupe, it was captured *c.* 1531 by Tsoede (Edegi), the founder of the Nupe kingdom and the first *etsu Nupe* ("king of the Nupe people"). When the kingdom was conquered *c.* 1806 by Fulani warriors led by Malam Dendo, its central region was incorporated as the Nupe emirate under the Emir of Gwandu (Gando), the Fulani Empire's overlord of the western emirates. Emir Usman Zaki proclaimed himself *etsu Nupe* in 1835; and, after defeating Umar Bahaushe, a rival Fulani emir, in the Nupe civil war (1847–56) at Bida, he named Bida to replace the emirate's old capital at Raba (Rabba), 67 mi (110 km) west.

The town wall, which now encloses 5 sq mi (13 sq km), was begun in the 1850s. During Emir Masaba's second reign (1859–73), when Nupe became the most powerful kingdom in central Nigeria, Bida's three royal palaces, the night market, and the central mosque were constructed. Trade relations with the British Royal Niger Company were established in 1871—guns proving a favourite commodity—through the post at Eggan, 30 mi southeast, on the Niger. Later disputes over both trade and slave dealing led to a British campaign against Nupe and the defeat of the Fulani army at Bida in 1897. The reinstatement by Nupe of the Fulani emir ousted by the company led to British occupation of the town in 1901.

Under British rule, Nupe emirate became known as Bida emirate; and in 1908 it was incorporated into the newly created Niger province. Bida's emir resides in a palace (in traditional northern architectural style, completed 1935) outside the west gate. The ruins of Gbara, a Nupe *ezi'tsu* ("king's town") dating from the 16th century, are near Jimanli, 15 mi southwest, on the Kaduna River.

Modern Bida is well known for its crafts, notably brass and copper goblets, other metal products, glass beads and bangles, raffia hats and mats, and locally dyed cotton and silk cloth. The craftsmen work by hand on their own premises in distinctive wards and are organized into close-knit guilds that originated in the emir's military requirements. Most of the town's predominantly Nupe population live in mud houses that are grouped into customary compounds. The town itself is well shaded by trees and is divided roughly into four parts by two main streets. Bida is the chief collecting point for the swamp rice cultivated in the *fadamas* ("floodplains") of the Niger and Kaduna rivers. Rice is grown both on peasant farms in the vicinity and at the government's major irrigated rice projects at Edozhigi (10 mi west) and Badeggi (10 mi east). A rice research institute is at Badeggi, a collecting point on the Baro-Minna railway, and an agricultural research station at Mokwa, 65 mi west-northwest. Bida also trades in yams, sorghum, millet, shea nuts, tobacco, cotton, peanuts (groundnuts), palm oil and kernels, onions, indigo, sugarcane, fruits, goats, sheep, and pottery.

Bida is the site of a federal polytechnic, a college of advanced studies, a government women's college, other secondary schools, a teacher-training college, a craft centre, and farm institute. It also has a hospital. Pop. (1972 est.) town, 68,186.

bid'ah, in Islām, any innovation that has no roots in the traditional practice (*sunnah*) of the Muslim community. The most fundamentalist legal school in Islām, the Ḥanābilah (and its modern survivor, the Wahhābīyah sect of Saudi Arabia) rejected *bid'ah* completely, arguing that the duty of a Muslim was to follow the example set by the Prophet (*sunnah*) and not try to improve on it.

Most Muslims, however, agreed that it was impossible to adapt to changing conditions without introducing some types of innovations. As a safeguard against any excesses, *bid'ah*s were classified as good (*ḥasan*) or praiseworthy (*maḥmūdah*), or bad (*sayy'ah*) or blameworthy (*madhmūmah*). They were further grouped under the five categories of Muslim law as follows: (1) among *bid'ah*s required of the Muslim community (*farḍ kifāyah*) are the study of Arabic grammar and philology as tools for the proper understanding of the Qur'ān, evaluation of Ḥadith (traditions or sayings of the Prophet Muḥammad) to determine their validity, the refutation of heretics, and the codification of law; (2) strictly forbidden (*muḥarramah*) are *bid'ah*s that undermine the principles of orthodoxy and thus constitute unbelief (*kufr*); (3) recommended (*mandūb*) is the founding of schools and religious houses; (4) disapproved (*makrūh*) are the ornamentation of mosques and the decoration of the Qur'ān; (5) finally, the law is indifferent (*mubāḥah*) to the *bid'ah*s of fine clothing and good food.

Bīdar, town, administrative headquarters of Bīdar district, northeastern Karnātaka (formerly Mysore) state, southern India. At 2,300 ft (700 m) above sea level, the town is reached by the Hyderābād–Bombay road and railway. Bīdar was important under the medieval Hindu dynasties, when it became the Bahmanī capital (*c.* 1425); it was later an independent sultanate under the Barīd Shāhī dynasty (1531). After annexation by Bijāpur (1619–20), it fell to the Mughals (1657) and to Hyderābād (1724). When Hyderābād was partitioned in 1956, the town and district were transferred to Mysore (now Karnātaka). Architectural relics include Aḥmad Shāh Bahmanī's triple-moat fortress (1428), containing the Rangīn Mahal (meaning "painted palace") and the Takht Mahal, or throne room. Another Bahmanī monument is the ruined *madrasah,* or college (built 1472–81). The domed tombs of 12 Bahmanī kings and the royal necropolis of the Barīd sultans are nearby. Since the 14th century, it has been noted for its Bīdrī ware—metal articles damascened (ornamented with wavy lines) in floral and geometric designs with silver wire. Several colleges, including schools of law and commerce, are affiliated with Gulbarga University, which was established in 1980.

Bīdar district (2,105 sq mi [5,451 sq km]) is a lowland area drained by the Karanja River; it produces millet, wheat, and oilseeds. Soapstone, laterite, and black basalt building stone are extracted. Kalyāni, 42 mi (68 km) west of Bīdar town, was capital of the second Cālukya dynasty (10th–12th century). Apart from Bīdar town, the main population centres are Santpur, Bhālki, and Homnābād. Pop. (1981) town, 78,856; district, 995,691.

Bidault, Georges (-Augustin) (b. Oct. 5, 1899, Moulins, Fr.—d. Jan. 27, 1983, Camboles-Bains, near Bayonne), French Resistance leader during World War II and three times minister of foreign affairs, who late in his career vigorously opposed Gen. Charles de Gaulle's Algerian policy and was forced into exile.

Bidault attended an Italian Jesuit school, served briefly with the French Army of Occupation in the Ruhr in 1919, and returned to the Sorbonne, receiving a degree in history and geography in 1925. He founded the leftist Catholic daily *L'Aube* ("The Dawn") in 1932, for which he wrote a foreign affairs column until 1939. Imprisoned in Germany (1940), he returned to France in 1941 and began working with the National Council of Resistance, which he headed in 1943. He was discovered by the Gestapo in 1944 but managed to avoid arrest, meanwhile founding the Mouvement Républicain Populaire, a Christian-Democratic Party. Bidault supported de Gaulle's wartime government.

As foreign minister in de Gaulle's provisional government in 1944, Bidault signed

Bidault

Harlingue—H. Roger-Viollet

the Franco-Soviet alliance in December and in the following year supported the Yalta plan, concluded economic agreements with the Benelux countries, and signed the United Nations Charter. After heading the provisional government in 1946, he again became foreign minister in 1947–48. His policy consistently favoured containment of Germany and European union, including Communist participation in the U.S. Marshall Plan for European redevelopment. After the 1948 Communist takeover in Czechoslovakia, however, he began negotiations for a strong western European customs union and an Atlantic defense alliance, which ultimately became the North Atlantic Treaty Organization (NATO).

As defense minister (1951–52) and foreign minister (1953–54), Bidault, fearful of Arab nationalism and Communism, supported French dominance in Indochina and Algeria. With the collapse of the Fourth Republic and the return of de Gaulle to power (1958), Bidault broke with his wartime friend over the issue of Algerian independence. Bidault founded (1958) a new, right-wing Christian-Democratic Party. When de Gaulle put down a coup and negotiated Algerian independence in 1961, Bidault, still a member of the National Assembly, created a national council of resistance that advocated terrorism in France and Algeria to prevent Algerian independence, and went underground, claiming the illegality of de Gaulle's government. Charged with conspiracy and stripped of his parliamentary immunity from arrest, Bidault fled France in 1962, living in neighbouring countries and Brazil (1963–67). He returned in 1968 to live in Paris after the warrant for his arrest was suspended. In that year he founded the right-wing Mouvement pour le justice et la liberté, but he was thereafter never actively effective in politics, becoming honorary president of the Christian-Democratic Party in 1977.

Biddeford, city, York County, southwestern Maine, U.S., at the falls of the Saco River, opposite Saco, on the Atlantic coast, 16 mi (26 km) southwest of Portland. Englishmen led by Richard Vines settled the area in 1630. Named for the settlers' home in Bideford, Devon, Eng., the communities on the two sides of the river separated in 1762. Industrial growth was spurred by the availability of waterpower; lumber and cotton textiles remain important manufactures. The University of New England (formerly St. Francis College, founded in 1953), now incorporates the New England College of Osteopathic Medicine. Biddeford Pool, Fortunes Rocks, and Hills Beach are nearby resorts. Inc. town, 1718; city, 1855. Pop. (1980) 19,638.

Biddle, James (b. Feb. 18, 1783, Philadelphia—d. Oct. 1, 1848, Philadelphia), career U.S. naval officer who negotiated the first treaty between the United States and China.

Biddle attended the University of Pennsylvania, Philadelphia, before entering the navy as a midshipman in 1800. Retained despite a severe cutback in naval manpower, Biddle served in the war against the Barbary pirates. During that conflict he was captured (Oct. 31, 1803) and imprisoned for more than a year and a half in Tripoli.

Upon his release, Biddle was given command of a gunboat and assigned to protect the South Atlantic coast from pirates. He took a leave of absence in 1807 to serve as first officer on a merchant ship to China. On his return he helped to enforce Pres. Thomas Jefferson's embargo on American trade, and in the years immediately preceding the War of 1812, he served on a number of naval vessels.

During the war, Biddle was first lieutenant on the "Wasp" when it captured the British ship "Frolic." He was later taken by the British and imprisoned in Bermuda. He was released before the end of the war and was promoted to master commandant. Biddle took command of the "Hornet," and his ship conquered the "Penguin," then made a heroic escape from a much larger British vessel in the final naval engagement of the war.

In 1817 Biddle was sent to the Columbia River to claim the Oregon Territory for the United States. He subsequently served in the West Indies, off the coast of South America, and in the Mediterranean. He was serving as commodore of the East India Squadron when he became responsible for negotiating the first treaty between the United States and China (1846), for which he is perhaps best remembered. His last command took him to the Pacific Coast during the Mexican War.

Biddle, John (b. 1615, Wotton-under-Edge, Gloucestershire, Eng.—d. Sept. 22, 1662, London), controversial lay theologian who was repeatedly imprisoned for his anti-Trinitarian views and who became known as the father of English Unitarianism.

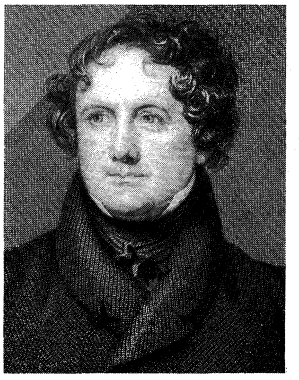
Biddle was educated at the grammar school of his native town in Gloucestershire and at Magdalen Hall, Oxford, being subsequently appointed to the mastership of the free school in Gloucester. His reputation as a heretic in Anglican eyes originated with his manuscript of about 1644, *Twelve Arguments Drawn out of Scripture, Wherein the Commonly Received Opinion Touching the Deity of the Holy Spirit Is Clearly and Fully Refuted,* which was given to magistrates by a treacherous friend.

In 1645 Biddle was summoned before the parliamentary committee, then sitting at Gloucester, and committed to prison. He was released on bail in 1647, but the publication of his manuscript the same year brought another parliamentary inquiry. Biddle was once again taken into custody, and his *Twelve Arguments* was seized and burned. Two additional tracts were subsequently suppressed for attacking the doctrine that the three Persons of the Trinity—Father, Son, and Holy Ghost—were coequal. Biddle chose to elevate the Father and to consider the other two Persons as subordinate to him. Under pressure from the Westminster Assembly, originally convened to reform the Church of England, Parliament in 1648 made this heresy a cause for the death penalty, but influential friends made it possible for Biddle to live in Staffordshire under surveillance until 1652, when he was again imprisoned.

Freed in the same year under the protectorate of Oliver Cromwell, Biddle and his adherents, called Biddellians, or Unitarians, began to meet regularly for Sunday worship. For the resemblance of their views to those of the Italian anti-Trinitarian Faustus Socinus (1539–1604), they were also known as Socinians. Soon after Biddle's translation of a biography by S. Przypkowski (*Life of Socinus,* 1653) and publication of his own *Two-Fold Catechism* (1654), Biddle was summoned before Parliament in December 1654 and imprisoned; his *Catechism* was burned by the common hangman. When Parliament was dissolved the next month, Biddle was free briefly but was then rearrested and tried for his heresy. Reluctant to see him executed, Cromwell rescued Biddle and sent him to one of the Scilly Isles in October 1655. In 1658 some of Biddle's friends sought and obtained his release, and he retired to the country to teach. On his return to London as a preacher in 1662 he was again arrested and fined £100. Unable to pay, he was immediately confined to prison, where he died.

Biddle, Nicholas (b. Jan. 8, 1786, Philadelphia—d. Feb. 27, 1844, Philadelphia), financier who as president of the Second Bank of the United States (1823–36) made it the first effective central bank in U.S. history. He was Pres. Andrew Jackson's chief antagonist in a conflict (1832–36) that resulted in termination of the bank.

Biddle was a contributor to and later (1812) editor of *Port Folio,* the first U.S. literary journal. He served as secretary to Pres. James Monroe (1806–07), then minister to England, and, afterward, while practicing law in the United States, he wrote *History of the Expedition of Captains Lewis and Clark* (1814)



Nicholas Biddle

By courtesy of the Library of Congress, Washington, D.C.

from the explorers' notes. In 1815, while a member (1814–18) of the state senate, Biddle drafted and wrote Pennsylvania's rejection of the Hartford Convention's proposed constitutional amendments to limit the powers of Congress and of the executive. In 1819 President Monroe commissioned him to compile a digest of foreign legislation affecting U.S. trade and appointed him one of the directors of the Second Bank of the United States.

As president of the bank, Biddle sponsored policies that restrained the supply of credit to the country's banks; stabilized the investment, money, and discount markets; regulated the money supply; and safeguarded government deposits. Between 1832 and 1836 the bank came under the attack of Jackson's Democratic Party, which sought to eliminate it, while the Whigs supported it. After Jackson won termination of the bank's national charter in 1836, Biddle became president of the rechartered Bank of the United States of Pennsylvania. After retiring in 1839, Biddle helped to establish Girard College in Philadelphia and held celebrated literary salons at Andalusia, his country estate.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bideford, small port, Torridge district, county of Devon, England, at the lowest bridging point of the Torridge River Estuary, which empties into Bideford, or Barnstable, Bay and the Atlantic Ocean. The medieval community grew mainly as a result of the wool trade, and Bideford received its market charter in 1573 and was incorporated soon after.

The coming of the railway (1856) increased Bideford's importance as a resort. Boatbuilding and the manufacturing of concrete products and leather goods are main industries. The town and the surrounding district were used by Charles Kingsley as locations in his novel *Westward Ho!* (1855). Pop. (1981 prelim.) 12,211.

Bidens, genus of weedy herbs in the family Asteraceae, consisting of about 230 species, variously known as bur-marigold, sticktights, beggar-ticks, and tickseed-sunflowers, distributed throughout the world. Some have divided leaves with toothed segments and long ray flowers; others have undivided, lance-shaped leaves and short ray flowers or none at all.

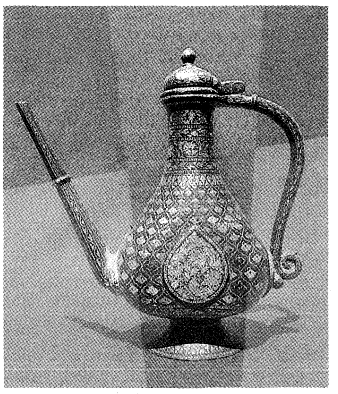
All species have yellow disk flowers and fruits with two to four barbed bristles that become attached to animal coats or to human clothing. One species, *B. ferulaefolia,* is cultivated as a garden ornamental.

Bidens cernua
Dorothea W. Woodruff—EB Inc.

Bidlack Treaty, also called NEW GRANADA TREATY (Dec. 12, 1846), pact signed by New Granada (now Colombia and Panama) and the United States, which granted the U.S. a right-of-way across the Isthmus of Panama in exchange for a U.S. guarantee of neutrality for the isthmus and the sovereignty of New Granada thereafter. The treaty was named for the U.S. chargé d'affaires in New Granada, Benjamin Alden Bidlack. The threat of British intrusion on the coast of Central America had shown the need for such a pact.

After gold was discovered in California in 1848, a U.S. company began to construct a transisthmian railroad, which was completed in 1855. Thereafter, U.S. influence in the region increased because the Colombian government often called upon the United States to prevent closing of the isthmus route during civil wars. In 1902 the U.S. Congress authorized the president to spend $40,000,000 to obtain rights held by the French New Panama Canal Co. for building a canal. The act stipulated that Colombia concede a strip of territory across the isthmus "within a reasonable time"; in the event that Colombia refused to make such a concession, the president was permitted to negotiate with Nicaragua for a right-of-way across its territory. Accordingly, Pres. Theodore Roosevelt bought the French company's rights, and in 1903 the Hay–Herrán Treaty was concluded between the United States and Colombia. The Colombian senate, however, withheld ratification to secure better terms. Thereupon the U.S. government engineered the secession of Panama from Colombia and then reached an agreement (Hay–Bunau-Varilla Treaty) with the new Republic of Panama, by which Panama became a U.S. protectorate and the U.S. government gained exclusive control of the Panama Canal Zone and permission to construct a canal. *See also* Hay–Bunau-Varilla Treaty.

Bidpai, The Fables of, European title for the collection of Indian animal fables known in Sanskrit as *Pañca-tantra* (*q.v.*).



Bīdrī ware from Andhra Pradesh, 19th century; in the Prince of Wales Museum of Western India, Bombay
P. Chandra

Bīdrī ware, metal decorative objects ornamented with a type of Indian inlay work. The ware derives its name from the town of Bīdar, in Andhra Pradesh, though it is not made exclusively in that town; Lucknow and Murshidābād are also very important centres of Bīdrī manufacture.

The metal commonly used is an alloy composed mostly of zinc with a small amount of copper, darkened to achieve a black colour that does not fade. There are two main types of Bīdrī work. In the first type, the pattern is deeply incised, then silver or gold is cut to the exact size, the shape of the incised pattern is embedded in the incision, and the surface is finally smoothed and polished. In the second, encrusted type, the outline of the design is engraved and shaped gold or silver leaf affixed after the cavities have been filled with lead.

Bīdrī ware generally consists of hookah bases, dishes, cups, vases, jars, and spice boxes. The commonest patterns are diapers (overall diamond patterns) and a variety of floral sprays, leaves, fishes, and lozenges. Ambitious large works are no longer attempted, modern production chiefly consisting of cigarette cases, ashtrays, and jewelry.

Bidwell, John (b. Aug. 5, 1819, Chautauqua County, N.Y., U.S.—d. April 4, 1900, near Sacramento, Calif.), California civic and political leader who ran unsuccessfully for U.S. president in 1892 as the candidate of the Prohibition Party.

The Bidwell family moved from New York to Pennsylvania in 1829 and to Ohio in 1831. In 1836 Bidwell walked 300 miles from the family home in Ashtabula to enroll at Kingsville Academy—of which he was made principal the following year at the age of 17.

After returning to Ashtabula to accept a teaching position, Bidwell moved west, settling temporarily in Missouri before joining the first emigrant group to travel by wagon train from the town of Independence to California. On arrival there, Bidwell went to work at Sutter's Fort and, after a few years, became a naturalized Mexican citizen. Reluctant to join the Bear Flag revolt of Americans in California against Mexico, he nonetheless helped draw up the Bear Flag Republic's resolution of independence in July 1846.

Bidwell fought in the Mexican War, marching to Monterey (California) with Colonel John C. Frémont, serving as civil magistrate in Los Angeles, and finally assisting Commodore Robert F. Stockton in the recapture of Los Angeles in 1847. At the end of the war he returned to Sutter's Fort and became the first to find gold on the Feather River.

With his newly discovered wealth Bidwell purchased a 22,000-acre ranch, Rancho Chico, north of Sacramento. There he became the state's leading agriculturalist while simultaneously taking a prominent role in California politics. He served in the state senate and was a delegate to several Democratic Party national conventions. With the advent of the Civil War, Bidwell, a staunch Unionist, became a supporter of Lincoln.

Elected to the House of Representatives in 1864, Bidwell declined renomination in order to run for governor of California on the Republican ticket in 1867; his bid was unsuccessful, as were his two others, one in 1875 as an anti-monopolist independent and another in 1890 as a candidate of the Prohibition Party, which nominated him for president in 1892.

Bidyasagar, Isvarcandra (1820–91): *see* Vidyasagar, Isvar Chandra.

Bié, province, central Angola, on the elevated Bié Plateau, drained by northward-flowing branches of the Kwanza River. Its area is 27,150 sq mi (70,300 sq km). It is largely upland savanna. The climate is tempered by altitude. Crops, grown chiefly in the central section, include corn (maize), rice, sisal, coffee, and sugarcane. The capital and largest settlement is Kuito. Bié province is bisected from east to west by the Benguela Railway. Pop. (1970 prelim.) 650,337.

Bieber, Owen (Frederick) (b. Dec. 28, 1929, North Dorr, Mich., U.S.), U.S. labour leader and president, since 1983, of the United Automobile Workers (UAW; formally the United Automobile, Aerospace and Agricultural Implement Workers of America).

Bieber, after graduating from high school, took a factory job at a company making seats for Hudson and Chevrolet cars. Within a year, at age 19, he was a union shop steward; and by 1956, at age 26, he was president of Local 687 in the Grand Rapids area. In 1980 he was elected a vice president of the entire UAW and became chief of the General Motors department, which traditionally has been a springboard to the presidency. In 1982 he was nominated and in 1983 elected president of the union, succeeding Douglas A. Fraser.

Biedermeier style, in art, transitional period between Neoclassicism and Romanticism as it was interpreted by the bourgeoisie, particularly in Germany, Austria, northern Italy, and the Scandinavian countries. Following the Napoleonic sieges, the Biedermeier style grew during a period of economic impoverishment from 1825 to 1835. The name Biedermeier was derogatory because it was based on the caricature "Papa Biedermeier," a comic symbol of middle-class comfort. Such comfort

"Girl Embroidering," Biedermeier-style painting by Georg Friedrich Kersting, oil on canvas, *c.* 1814; in the Kunstsammlungen, Weimar, E.Ger.

By courtesy of the Kunstsammlungen, Weimar, E.Ger.; photograph, Klaus G. Beyer, Weimar, E.Ger.

emphasized family life and private activities, especially letter writing (giving prominence to the secretary desk) and the pursuit of hobbies. No Biedermeier household was complete without a piano as an indispensable part of the popularized soiree. Soirees perpetuated the rising middle class's cultural interests in books, writing, dance, and poetry readings—all subject matter for Biedermeier painting, which was either genre or historical and most often sentimentally treated. The best representative painters include Franz Krüger, Georg Friedrich Kersting, Julius Oldach, Carl Spitzweg, and Ferdinand Georg Waldmüller.

Biedermeier furniture derives essentially from the Empire and Directoire styles; while plump and naively grotesque at its worst, it did often reach remarkable simplicity, sophistication, and functionality. Stylistically, Biedermeier furniture softened the rigidity of Empire style and added weight to Directoire; it made the elevation of Empire realistic and the delicacy of Directoire durable. While Empire was grandiose and usually of dark woods with ormolu mounts, Biedermeier—identifying more closely with Directoire in this sense—was executed in light, native woods and avoided the use of metal ornamentation. Surfaces were modulated with natural grains, knotholes, or ebonized accents for contrast; though modest, inlay was occasionally used. An identifying feature is the extremely restrained geometric appearance that later influenced art nouveau and modern Scandinavian furniture designs. Some furniture took on new roles; for example, the table *à milieu,* rather than an isolated centrepiece, became the family table, around which chairs were set for evening activities.

In general, the Biedermeier style offered visual evidence of the conflict of ideas between Classicism and Romanticism that continued during the first half of the 19th century. With time the Biedermeier style was romanticized: straight lines became curved and serpentine; simple surfaces became more and more embellished beyond the natural materials; humanistic form became more fantastic; and textures became experimental. Yet the original focus on lightness, utilitarianism, and individuality characterized the revival of the Biedermeier style during the mid-1960s.

Biel (German), French BIENNE, town, Bern canton, northwestern Switzerland, at the northeastern end of Lake Biel (Bieler See), northwest of Bern city. Of Celtic origin (Belenus) and inhabited in Roman times, the town dates from the 11th century and was chartered in 1275. It was for centuries under the jurisdiction of the prince-bishops of Basel. In 1279 (permanently in 1352) it made alliance with Bern. Seized by the French in 1798, it became part of Bern canton in 1815. Situated on the language boundary, Biel's population is two-thirds German speaking and one-third French speaking. It is the only officially bilingual town in Switzerland.

Medieval landmarks include the late Gothic town church of St. Benedict (1451; restored 1775), with fine 15th-century stained glass, and the town hall (1534). The Museum Schwab has a collection of artifacts from the lake pile dwellings of the La Tène (Iron Age) period. The chief industries are watchmaking and the manufacture of chains and machinery. Pop. (1983 est.) 53,354.

Biel, Gabriel (b. *c.* 1420, Speyer—d. Dec. 7, 1495, Tübingen, Württemberg), German philosopher, economist, and one of the most distinguished Scholastic theologians of the late Middle Ages.

Having studied at various German universities, he became vicar and cathedral preacher at Mainz *c.* 1460. In 1468 he entered the Order of the Brothers of the Common Life, a religious community devoted to education and the care of the poor, and was made prior of the brotherhouse at Butzbach (1470) and then at Urach (1479). He became professor of philosophy and theology at Tübingen in 1484, where he served as rector in 1485 and 1489. He was named prior of Schönbuch in 1492.

Biel's *Collectorium circa IV libros sententiarum,* a classical commentary on the celebrated *Sentences* by Bishop Peter Lombard of Paris, gives a clear and methodical exposition of the teaching of the great English philosopher William of Ockham, whose doctrine Biel supported. The work was so influential that Ockhamists at the universities of Erfurt and Wittenberg were known as Gabrielistae. Left unfinished by Biel, *Collectorium* was completed by one of his followers, Wendelin Steinbach, at Tübingen in 1520; the complete work was printed at Brixen in 1574.

A notable political economist, Biel wrote, in addition to theological treatises, a progressive work on economic theory, *De potestate et utilitate monetarum* (printed 1516; *Treatise on the Power and Utility of Moneys,* 1930), in which, among several other issues, he favours fair taxation and price control. He has been called *ultimus scholasticorum* ("the last of the Scholastics"). H.A. Oberman's *The Harvest of Medieval Theology: Gabriel Biel and Late Medieval Nominalism* appeared in 1963.

Biela's Comet, comet discovered (1826) by and named for the Austrian astronomer Wilhelm, Freiherr von Biela (1782–1856). It was identified by Biela as a periodic comet that returned every 6.6 years.

Biela's Comet underwent remarkable transformations; it was observed in 1846 to break in two, and in 1852 the fragments returned as twin comets that were never seen thereafter. In 1872 and 1885, however, when the Earth crossed the path of the comet's known orbit, bright meteor showers (known as Andromedids, or Bielids) were observed, lending strength to astronomers' postulation that some meteors are composed of fragments of disintegrated comets.

Bielefeld, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, on the northern edge of the hilly Teutoburger Wald (forest). First mentioned as Bilifelde in the biography of Bishop Meinwerk of Paderborn between 1015 and 1036, the old town was probably founded and chartered in 1214 by Count Hermann of Ravensberg; the "new town" arose from a religious settlement around the Marienkirche (St. Mary's Church, still standing) in the late 13th century. It joined the Hanseatic League in the 14th century and, with the county of Ravensberg, passed to Jülich in 1346 and to Brandenburg in 1647. Heavily damaged in World War II, it has been rebuilt.

Sparrenburg Castle, dating from 1250, was rebuilt after a fire in 1877. Other notable medieval buildings include the Altstädter Nicolaikirche, the Jodokuskirche, and the Gothic Crüwell House (1530). The city has a concert hall, opera, and playhouse, farmhouse and playing-card museums, a gallery of modern art, and a university (founded in 1966).

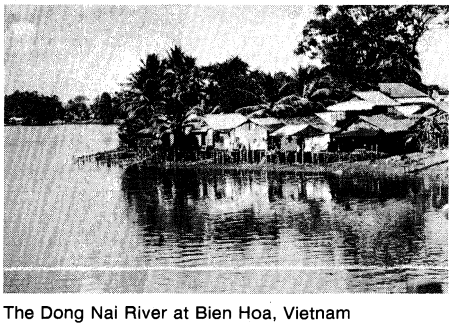
Bielefeld is the centre of the Ravensberg linen industry, which became important in the 16th century; the first mechanized mills in Germany were established there in 1851. It also has silk and plush weaving mills. Other products include clothing, sewing machines, bicycles, cash registers, machine tools, pharmaceuticals, paper, and, most recently, electronic equipment. Annexation of several neighbouring cities in 1973 doubled the size of the city. Pop. (1983 est.) 309,964.

Biella, city, Vercelli province, Piemonte (Piedmont) region, northwestern Italy below the Alps on the Torrente Cervo (river), northeast of Turin. A Gallic and Roman centre, it was a medieval possession of the counts of Vercelli before passing to the House of Savoy in 1379. Biella is divided into Biella Piazzo (upper) and Biella Piano (lower) towns, joined by a cable railway. There are many medieval and Renaissance mansions in the upper town, while the lower is distinguished by a cathedral (1402; remodelled), 10th-century baptistery, and the Renaissance churches of S. Sebastiano (1504) and S. Girolamo (1512–17). Biella has an archaeological museum and an art gallery. On Alpine slopes above the city is the famous pilgrimage resort of Santuario di Oropa, believed to have been founded in 369 by St. Eusebius. A major centre of the Italian woollen industry, Biella also manufactures cotton, silk, and linen textiles. Pop. (1981 prelim.) mun., 53,228.

Bielsko-Biała, *województwo* (province), southern Poland, established 1975, westernmost of three provinces (together with Nowy Sącz and Krosno) located in the foothills of the Carpathian Mountains. It is bounded by the provinces of Katowice on the northwest, Kraków on the northeast, and Nowy Sącz on the southeast and by Czechoslovakia on the south and west. It has an area of 1,430 sq mi (3,703 sq km), and its capital is Bielsko-Biała (*q.v.*). The province is the centre of Poland's textile industry and produces machinery for the mining and chemical industries. One of the oldest communities in the country is Cieszyn (German Teschen), a principal city of the Piast duchy during the Middle Ages. It is located on the Olza River, which also forms part of the frontier with Czechoslovakia. Pop. (1982 est.) 840,400.

Bielsko-Biała, city, capital of Bielsko-Biała *województwo* (province), southwestern Poland, in the foothills of the Carpathian Mountains. Incorporated in 1951, the city existed previously as two separate towns on either side of the Biała River. Bielsko originated as a 13th-century settlement around a stronghold and developed during the 16th century through its textile industry. It received town rights in the 18th century, as did Biała. The city is now a major textile centre and tourist resort amid picturesque surroundings. It has a rail line and road connections to Kraków and Czechoslovakia. Pop. (1982 est.) 167,800.

Bien Hoa, city and provincial seat of Dong Nai *tinh* (province), northeast of the Mekong delta, southern Vietnam. Located 19 mi (30 km) northeast of Ho Chi Minh City (formerly Saigon), on the left bank of the Dong Nai River, it is one of the oldest cities of southern Vietnam. The French conquered it in 1861 after prolonged Vietnamese resistance. It has four hospitals and a ceramics school. A 1,263-ac (511-ha) industrial park district had industries including steel making, metal products,



The Dong Nai River at Bien Hoa, Vietnam
P. V. Butler—Shostal/EB Inc.

refrigeration equipment, motorbikes, batteries, paper products, knitting mills, chlorine, caustic soda, and radio–TV assembly. The industrial park underwent heavy damage during the fighting in 1975; many factories, however, have been restored to operation, and new factories have been constructed. Paper pulp,

pressed wood, rolled steel, tools, refined sugar, condensed and powdered milk, and tractors are some of the manufactured products. Power is provided by the Dai Nham hydroelectric plant. Older industries include brick, tile, and pottery making, and the production of construction stone. Granite quarries are worked, and there is a large airfield nearby. Pop. (1979) 190,086.

Biencourt, Charles de, BARON DE SAINT-JUST (b. 1591/92, Champagne, Fr.—d. 1623/24, Port Royal, Acadia, New France), French colonizer and trader in New France, who commanded the French colony of Port Royal.

In 1606 Biencourt sailed with his father, Jean de Biencourt de Poutrincourt, baron de Saint-Just, to New France (Canada). In 1607 they abandoned their establishment and fort at Port Royal, Acadia, because of insufficient funds. Failing to obtain a Canadian fur-trade monopoly while in France, father and son returned to Acadia and to Port Royal in 1610. In 1611 Jean de Biencourt was appointed vice admiral of the seas of New France; he placed Port Royal under his son's administration.

Charles was not effective in exerting authority, especially over the Jesuits. In 1613–14 the English, under Sir Samuel Argall, attacked Port Royal. The elder Biencourt returned to the devastated settlement and made over his holdings to his son, who stayed on with a few colonists. Charles and his colleagues built up the fishing and fur trading business there and established a new company. In 1618 Charles appealed unsuccessfully to Paris for fortification against the English. The settlement did not prosper, and Biencourt lived with Indians during his last years.

Bienerth, Richard, Freiherr von (baron of), also called (after 1915) GRAF (count) VON BIENERTH-SCHMERLING (b. March 2, 1863, Verona, Italy—d. June 3, 1918, Vienna), Austrian prime minister (1908–11).

After service under the governor of Steiermark, or Styria, Bienerth was transferred to the Austrian Ministry of Education (1886), of which in 1905 he was named director and elevated to the Privy Council. Appointed minister of the interior for Austria (June 1906), he became a supporter of the ministerial program of suffrage reform. In November 1908, upon the resignation of Max, Freiherr von Beck, and with the patronage of the Austro-Hungarian foreign minister, Graf Lexa von Aehrenthal, he succeeded Beck as Austrian prime minister. In the manner of his predecessor, Bienerth planned Czech–German reconciliation in Bohemia through a program of territorial autonomy, but, lacking Beck's competence, he accomplished little toward this end. Unable to command a parliamentary majority after the elections of 1911, he resigned; subsequently he served as *Statthalter* (governor) of lower Austria (1911–15).

Bienne (Switzerland): *see* Biel.

Bienville, Jean-Baptiste Le Moyne, sieur de (sire of) (baptized Feb. 23, 1680, Montreal—d. March 7, 1768?, Paris), French explorer, colonial governor of Louisiana, and founder of New Orleans and Mobile.

Jean-Baptiste was the eighth son of Canadian pioneer Charles Le Moyne. He entered the French Navy at age 12 and served with his noted elder brother, Pierre, sieur d'Iberville, in naval engagements (1696–97) in Hudson's Bay and the North Atlantic during King William's War (War of the Grand Alliance).

When the conflict with England ended in 1697, he accompanied his brother on an expedition from France to explore the mouth of the Mississippi River and to plant a colony there. A settlement was founded at Old Biloxi in early 1699, and Bienville was made second in command of the colony when his brother departed in the spring. He explored the lower Mississippi and the Red River (1699–1700), and when the colony's leader, Sauvole de la Villantry, died in 1701, Bienville was commissioned as king's lieutenant (governor). In 1702 he moved the colony to Ft. Louis on Mobile Bay, and in 1711 it was established at the present site of Mobile, Ala.

Bienville remained as governor of the French colony until 1712 despite numerous complaints against his rule. He was replaced by Antoine de la Mothe Cadillac, under whom he served as deputy for three years. In 1716 he led a campaign against the Natchez Indians, and two years later, after Cadillac's recall, Bienville was restored to the governorship. At that time he founded the settlement of New Orleans on the Mississippi River, and four years later he made that city the new capital of the colony.

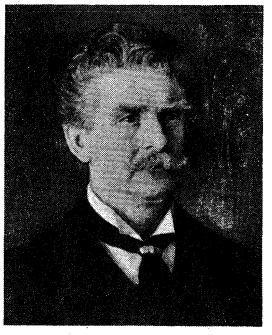
During his second term as Louisiana governor, he captured Pensacola from the Spanish and instituted a strict "Black Code" regulating the conduct of black slaves. When the Company of the Indies, which had been financing Louisiana, became unable to continue its support, Bienville's enemies succeeded in having him recalled to France and dismissed as governor. He returned as governor in 1733, however, after the colony came under royal control. His final term, which lasted for a decade, was marked by intermittent Indian wars. He voluntarily resigned the governorship in May 1743 and retired to Paris.

Bierce, Ambrose (Gwinnett) (b. June 24, 1842, Meigs County, Ohio, U.S.—d. 1914, Mexico?), U.S. newspaperman, misanthrope, wit, satirist, and author of sardonic short stories based on themes of death and horror, whose life ended in an unsolved mystery.

Reared in Kosciusko County, Ind., he became printer's devil on a Warsaw paper after about a year in high school. In 1861 he enlisted in the 9th Indiana Volunteers and fought in a number of Civil War battles, including Shiloh and Chickamauga. Seriously wounded on Kenesaw Mountain in 1864, he served until January 1865; he received a merit promotion to major in 1867.

In San Francisco, which was experiencing an artistic renaissance, he began contributing to periodicals, particularly the *News Letter*, of which he became editor in 1868. Bierce was soon the literary arbiter of the West Coast. "The Haunted Valley" (1871) was his first story. In December 1871 he married Mary Ellen Day, and from 1872 to 1875 the Bierces lived in England, where he wrote for the London magazines *Fun* and *Figaro*, edited the *Lantern* for the exiled French empress Eugénie, and published three books, *The Fiend's Delight* and *Nuggets and Dust Panned Out in California* (both 1872) and *Cobwebs from an Empty Skull* (1874).

In 1877 he became associate editor of the San Francisco *Argonaut* but left it in 1879–80 for an unsuccessful try at placer mining in Rockerville in the Dakota Territory. Thereafter he was editor of the *San Francisco Wasp* for five years. In 1887 he joined the staff of Hearst's *San Francisco Examiner*, for which he wrote the "Prattler" column. In 1896 Bierce moved to Washington, D.C., where he continued newspaper and magazine writing. In 1913, tired of American life, he went to Mexico, then in the middle of a revolution led by Pancho Villa. His end is a mystery, but a reasonable conjecture is that he was killed in the siege of Ojinaga in January 1914.

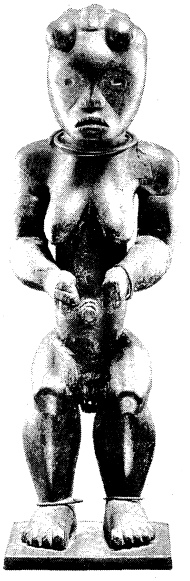


Bierce

By courtesy of the Library of Congress, Washington, D.C.

Bierce separated from his wife, lost his two sons, and broke many friendships. As a newspaper columnist, he specialized in critical attacks on amateur poets, clergymen, bores, dishonest politicians, money grabbers, pretenders, and frauds of all sorts. His principal books are *In the Midst of Life* (1891), which included some of his finest stories, such as "An Occurrence at Owl Creek Bridge," "A Horseman in the Sky," "The Eyes of the Panther," and "The Boarded Window"; *Can Such Things Be?* (1893), which included "The Damned Thing" and "Moxon's Master"; and *The Devil's Dictionary* (1906), a volume of ironic definitions, which has been often reprinted. His *Collected Works* was published in 12 volumes, 1909–12. *The Enlarged Devil's Dictionary*, edited by E.J. Hopkins, appeared in 1967.

bieri, wooden mortuary figure of the Fang tribe of Gabon, Africa, that traditionally guarded the skulls of deceased ancestors. These figures were somewhat naturalistic, representing the ancestor whose skull was kept in a small, barrel-shaped bark container to which the figure was traditionally attached.



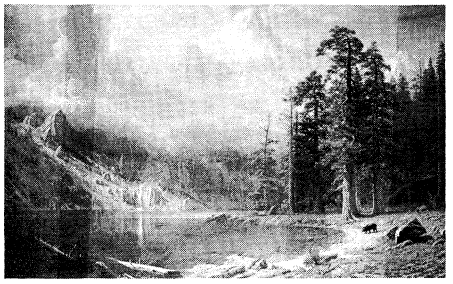
Bieri, Fang tribe, Gabon; in the Metropolitan Museum of Art, New York City

By courtesy of the Metropolitan Museum of Art, New York City, The Michael C. Rockefeller Memorial Collection of Primitive Art, gift of Nelson A. Rockefeller, 1965; photograph, Charles Unt

Because of the spiritual powers attributed to deceased ancestors, these mortuary figures were originally carved to protect the ancestor's bones from possession by evil spirits and to shield the tribesmen from unwittingly coming into contact with the skull's potentially dangerous powers. Through the aesthetic refinement of generations of sculptors, the *bieri* became figures of symbolic rather than spiritual significance. The somewhat representational features of the *bieri* were abstracted into a more conventionalized figure of greater tension, as the spiritual motivation was replaced by a more aesthetic one.

Bierstadt, Albert (b. Jan. 7, 1830, near Düsseldorf, Prussia—d. Feb. 19, 1902, New York City), U.S. landscape painter whose tremen-

dous popularity was based on his panoramic scenes of the American West. Among the last generation of painters associated with the Hudson River school, Bierstadt, like Frederick Church and Thomas Moran, covered vast distances in search of more exotic subject matter. His reputation was made by the huge canvases that resulted from his several trips to the Far West—*e.g.*, "The Rocky Mountains" (1863; Metropolitan Museum of Art, New York City) and "Mount Corcoran" (*c.* 1875–77; Corcoran Gallery of Art, Washington, D.C.). Executed in his studio in New York, the large works do not have the freshness and spontaneity of the small on-the-spot paintings from which they were produced. They are, however, immense in scale and grandiose in effect. Bierstadt freely altered details of landscape to create the effect of awe and grandeur. His colours were applied more according to a formula than from observation: luscious, green vegetation, ice-blue water, and pale, atmospheric blue-green mountains. The progression from foreground to background was often a dramatic one without the softness and subtlety of a middle distance.



"Mount Corcoran," oil painting by Bierstadt, 1875–77; in the Corcoran Gallery of Art, Washington, D.C.

By courtesy of the Corcoran Gallery of Art, Washington, D.C.

Bierut, Bolesław (b. April 18, 1892, Rury Jezuickie, near Lublin, Poland—d. March 12, 1956, Moscow), statesman and Communist Party official who came to be called the Stalin of Poland after playing a major role in his party's takeover of the Polish government after World War II.

Influenced by leftist-socialist ideas, Bierut joined the Polish Communist Party in 1918 and spent the rest of his life organizing and publicizing communist ideas in Poland as well as in Bulgaria, Czechoslovakia, and Austria. Arrested and imprisoned several times in the 1920s and 1930s for his activities in Poland, he went to Russia after his release in 1938 and remained there during most of World War II. He returned to Poland at the end of 1943. With the backing of Stalin and the Soviet Army, Bierut and his fellow Communists were able to dispose of all effective opposition by 1947, and he began his efforts to Sovietize all aspects of Polish life. Always a loyal follower of party directives from Moscow, Bierut, who had been president of the Polish republic from 1945, was instrumental in the 1948 deposition of Władysław Gomułka, the secretary of the Polish Workers' Party, who had attempted to bend the Soviet party line to Polish circumstances. Bierut replaced him and reorganized the party to form the Polish United Workers Party (PZPR) in 1948. In 1952 he left the presidency to become premier, but resigned that post also in 1954. He was attending the Soviet Communist party's 20th Congress in Moscow, at which Khruschev presented his famous "Crimes of the Stalin Era" report, when he died.

big apple, 1930s square-dance version of the jitterbug that was named for the Columbia, S.C., club where it originated. Assembled in a large circle, dancers did a basic shuffling step or other jitterbug step like the lindy hop. Directions such as "right foot forward" or "get your girl and take a twirl" were given by a caller, but more enterprising dancers, singly or in couples, frequently improvised.

Big apple

By courtesy of the Dance Collection, the New York Public Library at Lincoln Center, Astor, Lenox and Tilden Foundations

big-bang model, widely held theory of the evolution of the universe. Its essential feature is the emergence of the universe from a state of extremely high temperature and density—the so-called big bang that occurred at least 10,000,000,000 years ago. Although this type of universe was proposed by Alexander Friedmann and Abbé Georges Lemaître in the 1920s, the modern version was developed by George Gamow and colleagues in the 1940s.

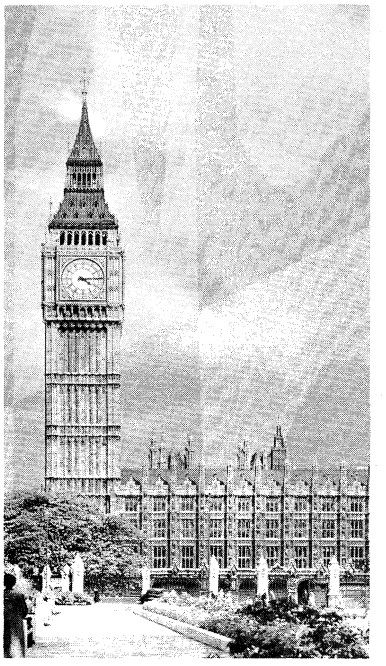
The big-bang model is based on two assumptions. The first is that Einstein's general theory of relativity correctly describes the gravitational interaction of all matter. The second assumption, called the cosmological principle, states that an observer's view of the universe depends neither on the direction in which he looks nor on his location. This principle applies only to the large-scale properties of the universe, but it does imply that the universe has no edge, so that the big-bang origin occurred not at a particular point in space but rather throughout space at the same time. These two assumptions make it possible to calculate the history of the cosmos after a certain epoch called the Planck time. Scientists have yet to determine what prevailed before Planck time.

According to the big-bang model, the universe expanded rapidly from a highly compressed primordial state, which resulted in a significant decrease in density and temperature. Soon afterwards, the dominance of matter over antimatter (as observed today) may have been established by processes that also predict proton decay. During this stage many types of elementary particles may have been present. After a few seconds, the universe cooled enough to allow the formation of certain nuclei. The theory predicts that definite amounts of hydrogen, helium, and lithium were produced. Their abundances agree with what is observed today. About 1,000,000 years later the universe was sufficiently cool for atoms to form. The radiation that also filled the universe was then free to travel through space. This remnant of the early universe is the microwave background radiation (three degree background radiation) discovered in 1965 by Arno A. Penzias and Robert W. Wilson.

In addition to accounting for the presence of ordinary matter and radiation, the model predicts that the present universe should also be filled with neutrinos, fundamental particles with no mass or electric charge. The possibility exists that other relics from the early universe may eventually be discovered.

Big Belt Mountains, segment of the northern Rocky Mountains, paralleling the eastern bank of the Missouri River for about 80 mi (129 km) in west central Montana, U.S. Mt. Edith (9,504 ft [2,897 m]) is the highest point. Lying within a division of the Helena National Forest, the area was the scene of much gold prospecting in the late 1860s. A prominent limestone belt encircles the mountains, hence their name.

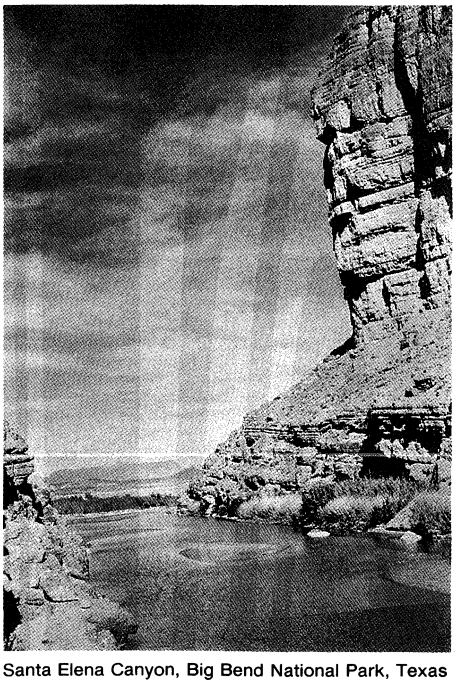
Big Ben, tower clock famous for its accuracy and for its 13-ton bell, designed by Edmund Beckett, Baron Grimthorpe, and housed in the tower at the eastern end of the Houses of Parliament, Westminster, Greater London. The name, for Sir Benjamin Hall, commissioner of works at the time of its installation in 1859, originally applied only to the bell, but eventually came to indicate the clock itself.



Big Ben, London, designed by Edmund Beckett

A.F. Kersting

Big Bend National Park, remote region, southwestern Texas, U.S., 250 mi (400 km) southeast of El Paso, along the Rio Grande opposite Mexico. Established in 1944, it oc-



Santa Elena Canyon, Big Bend National Park, Texas

Donahue—Candida

cupies 708,118 ac (286,565 ha). Named for a wide bend in the Rio Grande, which skirts its southern edge, it has magnificent mountain and desert scenery, deep canyons carved by the river, and spectacular geological formations. There are more than 1,000 species of plants, including stunted oak, piñon pine, yucca, strawberry cactus, and creosote bushes. Wildlife includes coyotes, puma, kit foxes, mule deer, cardinals, and roadrunners. Boating, horseback riding, and hiking are the major recreational activities.

Big Bertha, any gun from either of two different sets of long-range cannon produced by the Krupp works in Germany in World War I. The first were 16.5-inch (42-centimetre) howitzers used by advancing German forces to batter the Belgian forts at Liège and Namur in August 1914.

The second were guns specially built in 1918 by Krupp that shelled Paris at a range, never before attained, of approximately 76 miles (122 kilometres). The guns were fabricated by adding a tube to the barrel of a 15-inch naval gun. The barrel was thus elongated to about 110 feet (33.5 metres), weighed about 200 tons, and needed supports to hold it straight. After modification, the guns were initially 8.26 in. in calibre, but successive firings eroded the inner linings of the gun barrels until their calibre was about 9.5 in. The "Paris guns" were moved to their emplacements near the German front lines on railway tracks and successively carried out an intermittent bombardment of Paris over a period of about 140 days, beginning in March 1918. The extremely long range of the guns (22 miles had been the previous range limit for shellfire) was achieved by sending the shells on a trajectory 12 miles up in the stratosphere, where atmospheric drag was almost nonexistent.

According to some sources, the nickname for the guns was bestowed by the Krupps in honour of Frau Bertha von Bohlen, head of the family; according to others, it was an unflattering reference to her originated by the French.

Big Black River, Battle of (May 17, 1863), U.S. Civil War victory of Union forces under Gen. Ulysses S. Grant, who were pursuing Confederate troops under Gen. John C. Pemberton toward Vicksburg, Miss. Following his defeat at Champion's Hill (May 16), Pemberton left 5,000 troops to make a stand on both sides of the Big Black River, while he withdrew with his main command to nearby Vicksburg. Ten thousand attacking Union troops led by Grant routed the demoralized Confederate defenders, inflicting heavy losses and capturing over 1,700 prisoners. The survivors began a disorderly flight and retreated within the entrenched lines of Vicksburg—which was soon besieged by Grant's army.

Big Boy, largest and most powerful type of steam locomotive ever built. Designed primarily to handle the heavy freight traffic in the United States during World War II, 25 Big Boys were produced from 1941 to 1944 exclusively for the Union Pacific Railroad. They were gradually replaced by the diesel locomotive; the last one was taken out of regular service in 1959. The Big Boy along with its tender weighed about 604 tons (547 metric tons) and measured more than 132 feet (40 metres) in length. It had a maximum power capacity of 7,000 horsepower and could haul up to 4,000 tons at a speed of 70 miles (112 kilometres) per hour. The Big Boy had an articulated design; the frame of the front engine was hinge-connected to the rear engine under a single boiler. Its wheel arrangement was designated 4-8-8-4, *i.e.*, a set of 4 pilot wheels led a set of 8 coupled driving wheels, which were compounded by another set of 8 coupled drivers, with 4 trailing wheels.

Big Cypress Swamp, large forest morass lying mainly in Collier County, southern Florida, U.S., and covering 2,400 sq mi (6,200 sq km). The region merges into the swampy Everglades on the east. It is dominated by cypress trees, and wildlife is abundant. Sunniland, a village in the swamp 40 mi (64 km) southeast of Fort Myers, was the site of the first oil wells in Florida. The Seminole Indians have reservations in the area, which is crossed west to east by the Everglades Parkway.

Big Dipper, The: *see* Ursa Major.

big-eared bat: *see* long-eared bat.

big-eared fox: *see* bat-eared fox.

Big Eight Conference, original name BIG SIX CONFERENCE, formally MISSOURI VALLEY INTERCOLLEGIATE ATHLETIC ASSOCIATION, U.S. Midwestern collegiate athletic organization, composed of the universities of Kansas, Nebraska, Oklahoma, Colorado, and Missouri, as well as Kansas State, Oklahoma State, and Iowa State universities. All but Colorado (joined 1948) and Oklahoma State (joined 1957) had been members of the Missouri Valley Conference, formed in 1907, which split in 1928. The six schools seceding formed the Missouri Valley Intercollegiate Athletic Association, while the remaining schools stayed in the Missouri Valley Conference.

Big-Game Hunting culture, any of several ancient North American cultures based on hunting herd animals such as mammoth and bison; remains of these cultures have been found mainly in the North American Plains as well as in the eastern and southwestern regions of North America. The big-game hunting tradition may date from about 13,000 or 14,000 BC; it began to decline or change after 8000 BC. *See also* Clovis complex; Folsom complex.

Big Rapids, city, seat (1859) of Mecosta County, central Michigan, U.S., on the Muskegon River, 57 mi (92 km) north of Grand Rapids. Once the chief rest stop on the Mackinaw Trail, it was first settled in 1853 and was known as Leonard, after an early settler, until renamed for its location at the rapids of the river. Big Rapids, which survived a lumber boom and bust, is now an agricultural shipping point (fruit, grain, and potatoes) and has some light manufacturing. Natural gas wells, discovered in the 1930s, supply a wide area. Rogers Dam, 7 mi south, tamed the rapids and has impounded a large backwater popular with anglers and canoeists. The city is the seat of Ferris State College (1884). Inc. city, 1869. Pop. (1982 est.) 14,072.

Big Sandy River, river formed by the confluence of Levisa and Tug forks at Louisa, Lawrence County, eastern Kentucky, U.S. The river, made navigable by a series of locks and dams, flows generally north for 27 mi (43 km) along the Kentucky–West Virginia border to the Ohio River near Catlettsburg, Ky., where the three states, Kentucky, West Virginia, and Ohio, meet. The Breaks of Sandy—5 mi of gorge and rapids—are on Russell Fork, a tributary of Big Sandy.

Big Sioux River, river rising in Grant County, north of Watertown, S.D., U.S. It flows south and southeast past Sioux Falls, where its 20-ft (6-m) drop is utilized by a hydroelectric power station, and enters the Missouri River near Sioux City, Iowa, after a course of 420 mi (676 km). Between Sioux Falls and Sioux City the river forms the boundary for about 80 mi between Iowa and South Dakota and between the corn-growing region to the east and the cattle-raising region to the west. It is not navigable. Its main tributaries are the Rock and Floyd rivers.

Big Spring, city, seat (1882) of Howard County, western Texas, U.S., at the foot of the Cap Rock Escarpment, 111 mi (179 km) west of Abilene. It was named for the "big spring" in nearby Sulphur Draw, a frontier watering place and an area that was disputed between Comanche and Shawnee Indians. White settlement, based on cattle and homesteading, developed after the arrival of the Texas and Pacific Railway in May 1881, and Big Spring became a railroad divisional point. Its growth was accelerated after the discovery of oil in 1925. Refining and the production of petrochemicals and carbon black are basic to the economy, which was considerably boosted by the establishment during World War II of Webb Air Force Base (now an industrial park). The city has well-known medical facilities centring on the Veterans Administration Hospital and Rehabilitation Center, and is the site of Howard College at Big Spring (1945). Annual events include a rodeo (June) and a junior rodeo (August). Inc. 1907. Pop. (1980) 24,804.

Big Stick Policy, in U.S. history, reference to a phrase popularized by Pres. Theodore Roosevelt, particularly in advocating before Congress increased naval preparation to support the nation's diplomatic objectives. Taken from an African proverb, "Speak softly and carry a big stick, you will go far," the phrase was also used by Roosevelt to explain his relations with other political leaders and his approach to such issues as the regulation of monopolies and demands of trade unions. When used by the press, especially in cartoons, the "big stick" usually referred to Roosevelt's foreign policy, particularly in Central America and the Caribbean, where he established the supremacy of the U.S. beyond challenge.

Big Stone Lake, source of the Minnesota River in the U.S., on the Minnesota–South Dakota boundary, 300 mi (480 km) west-northwest of Minneapolis. Once part of the southern outlet of the extinct glacial Lake Agassiz, its name comes from red granite outcrops in the vicinity. Its waters are impounded in a narrow spillway by the delta of the Whetstone River. The lake is 26 mi long and ¾ to 1¼ mi wide, has an area of 17 sq mi (44 sq km), and at 962 ft (293 m) is the lowest point in South Dakota. Its level is raised by water diversion from the Whetstone River and regulated by a dam at its outlet near Ortonville. The lake is used as a storage reservoir for spring floodwaters, which otherwise might inundate the Minnesota Valley.

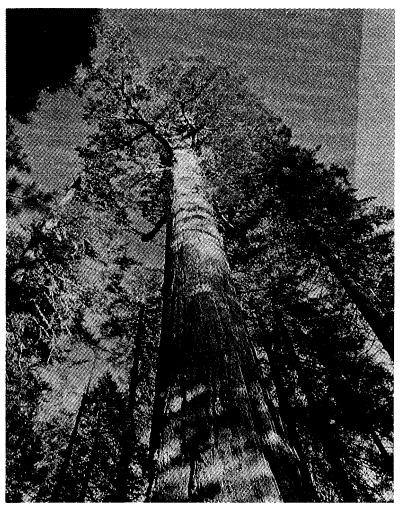
Big Sur, scenic region in western California, U.S., Big Sur comprises a 100-mi- (160-km-) long, ruggedly beautiful stretch of seacoast extending southward from Carmel just south of Monterey (whence the name El Sur: "The South") to the Hearst Castle at San Simeon. A winding, narrow, mountainous coastal road affords some spectacular views of the Pacific and the wayside wilderness areas of the Los Padres National Forest. The Pfeiffer-Big Sur State Park (801 ac [324 ha] of coastal redwood and chaparral) contains the village of Big Sur (30 mi south of Monterey) and borders the Big Sur River, a short stream in the Santa Lucia Range. The area, now popular with tourists and naturalists, was once a bleak wilderness. The splendour of its scenery and the loneliness of its 19th-century homesteaders have been interpreted by Robinson Jeffers in such poems as *Women at Point Sur* (1927). The poet's home (which he built of local rock and stone) is one of the area's landmarks. In 1986 a comprehensive zoning plan was adopted by Monterey County authorities that severely limited commercial development along a 68-mi stretch of Big Sur's twisting and mountainous shoreline.

Big Ten Conference, also called WESTERN CONFERENCE, one of the oldest college foot-

ball conferences in the United States, formed in 1896 by the universities of Chicago, Illinois, Michigan, Minnesota, Northwestern, Purdue, and Wisconsin. Iowa and Indiana were added in 1899 and Ohio State in 1912. Chicago terminated its football program in 1939 and officially withdrew from the conference in 1946, and the conference did not again include 10 teams until Michigan State was added in 1949. The Big Ten traditionally has been one of the strongest football conferences in the nation and since 1947 has sent a representative team, usually its conference champion, to the Rose Bowl, oldest of the postseason invitational events. Competition among the member schools later was extended to many other sports.

big tree (*Sequoiadendron giganteum*), also called GIANT SEQUOIA, or SIERRA REDWOOD (as distinct from the redwood of coastal areas, genus *Sequoia*), coniferous evergreen of the deciduous cypress family (Taxodiaceae), found in scattered groves on the western slopes of the Sierra Nevada Range of California, at elevations between 3,000 and 8,500 feet (900 and 2,600 metres). The big tree is the largest of all trees in bulk; formerly reputed to be the oldest living thing, the largest stumps examined in tree-ring studies were found to be less than 4,000 years old (bristlecone pines are older).

The big tree is distinguished from the coastal redwood by having uniformly scalelike, or awl-shaped, leaves that lie close against the branches, scaleless winter buds, and cones requiring two seasons to mature. The pyramidal tree shape, reddish-brown, furrowed bark, and drooping branches are common to both genera. The largest specimen is the General Sherman tree in Sequoia National Park. This tree measures 101.5 ft (31 m) in circumference at its base, is 272.4 ft (83 m) tall, and has a total estimated weight of 6,167 tons. A few specimens are more than 300 ft (91 m) high but have less bulk than the General Sherman tree. Although several groves of big trees were cut, the big tree's lumber is more brittle than that of the redwood; since the lumber is less



Big tree (*Sequoiadendron giganteum*)
Grant Heilman—EB Inc.

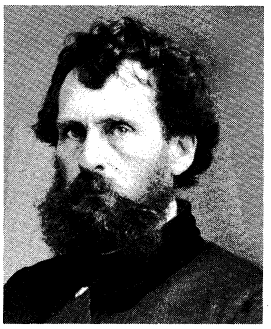
desirable, it has been easier to save the big trees from destruction. Most of the 70 distinct groves are now under the protection of state or national forests or parks.

Bigelow, Erastus Brigham (b. April 2, 1814, West Boylston, Mass., U.S.—d. Dec. 6, 1879, Boston), American industrialist, noted as the developer of the power carpet loom and as a founder of the Massachusetts Institute of Technology (MIT).

From age 10, Bigelow was obliged to work and to forgo a formal education. At the age of 23 he invented his first loom for lace manufacture. Bigelow followed this with other power looms for weaving a variety of figured fabrics, tapestry carpeting, and ingrain carpeting. In 1843 he and his brother Horatio established a gingham mill, around which the town of Clinton, Mass., grew. Several years later, he founded the Bigelow carpet mills there. From 1845 to 1851 Bigelow developed his greatest invention, a power loom for the manufacture of Brussels and Wilton carpets. His inventions provided a large impetus to carpet manufacture in Europe as well as in the United States.

In two authoritative works on economics (1862 and 1877), Bigelow defended protective tariffs. He was a leading member of a committee appointed in 1861 to implement proposals that led to the establishment of MIT in that year.

Bigelow, John (b. Nov. 25, 1817, Bristol, N.Y., U.S.—d. Dec. 19, 1911, New York City), American author, journalist, and diplomat who was the discoverer and first editor of Benjamin Franklin's long-lost *Autobiography.* As U.S. consul in Paris during the American



John Bigelow
By courtesy of the Library of Congress, Washington, D.C.

Civil War, he also prevented the delivery of warships constructed in France for the Confederacy.

Called to the New York bar in 1838, Bigelow was managing editor and, with the poet William Cullen Bryant, part owner of the *New York Evening Post* (1849–61). In the election campaign of 1856 he was a principal adviser of the Republican Party's first presidential candidate, John Charles Frémont.

Appointed consul in Paris (1861), Bigelow adroitly gained support for the Union cause, emphasizing ideological considerations to the French liberal press and the trading potential of the Northern industrial states to French businessmen. In *France and the Confederate Navy, 1862–1868* (1888), he recounted the episode of the French-built warships, which, if manned by Confederate crews, might have broken the Union blockade of the South. As U.S. minister to France (April 1865–September 1866), he dealt tactfully with the problem of the French-backed Mexican empire of Maximilian.

While living in Paris, Bigelow found and edited (1868) a manuscript of Franklin's *Autobiography;* he later edited Franklin's complete works, 10 vol. (1887–88). He also wrote a biography of U.S. presidential candidate Samuel Jones Tilden (1895) and several works on the theology of Emanuel Swedenborg.

bigeye, any of about 18 species of marine fishes comprising the family Priacanthidae (order Perciformes). Some members of the family are also known as catalufas. Most bigeyes are bright red in colour, but many species can change from a pale hue to a deep, mottled shade. Most have large round eyes. Representatives of the family are found in tropical and subtropical marine environments in all of the major oceans. Most species are carnivorous and nocturnal. In the Atlantic the common bigeye (*Priacanthus arenatus*) attains a length of about 41 centimetres (16 inches). The glasseye snapper (*P. cruentatus*), also called the catalufa, about 30 cm long, is found in both the Atlantic and Pacific. The popeye catalufa (*Pristigenys serrula*) is a Pacific ocean species.

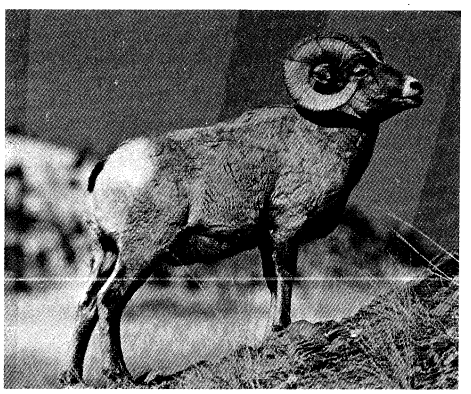
Biggs, E(dward George) Power (b. March 29, 1906, Westcliff-on-Sea, Essex, Eng.—d. March 10, 1977, Boston), organist who brought to many listeners their first acquaintance with the distinctive, incisive colours of the Baroque organ and with the monumental Baroque organ repertory.

Biggs, after training at the Royal Academy of Music in London, settled in the United States in 1930. Through appearances with major orchestras and weekly radio broadcasts (1942–58), he established the organ as a concert instrument. Refusing to perform on electronic organs, he sought out and recorded on organs surviving from the era of Johann Sebastian Bach and George Frideric Handel. He also commissioned organ works by Walter Piston, Roy Harris, and other 20th-century composers. After arthritis forced him to retire, he published editions of early organ music. His playing was marked by a classical clarity and severity.

bighorn, also called MOUNTAIN SHEEP, either of two similar North American sheep: the Canadian bighorn (*Ovis canadensis*) and the Dall sheep (*O. dalli*), both belonging to the family Bovidae (order Artiodactyla). The bighorn's body is compact and muscular; the muzzle, narrow and pointed; the ears, short and pointed; the tail, very short. Both sexes have transversely ribbed horns that, in the male, may curve in a spiral more than 1 metre (39 inches) long on the outer curvature. The fur is deerlike and usually a shade of brown with a whitish rump patch; in the Dall sheep it varies from white to almost black. Height at the shoulder is about 1 m; the weight of rams reaches about 90 kilograms (200 pounds) in the Dall sheep, 155 kg in the Canadian bighorn.

Bighorn live in the remote crags and cliffs of mountainous areas. Formerly the Canadian bighorn ranged from northern Mexico to Canada, but it is now reduced to small bands protected by inaccessible habitat or by refuges. Dall sheep range from Alaska to British Columbia.

Bighorn feed mainly on grasses, but in the desert mountains of the Southwest they eat shrubs and even cacti. Surefooted, they leap easily from rock to rock and climb seemingly sheer cliffs. The cloven hooves are sharp edged, elastic, and concave. Bighorn breed in November and December, the rams battling

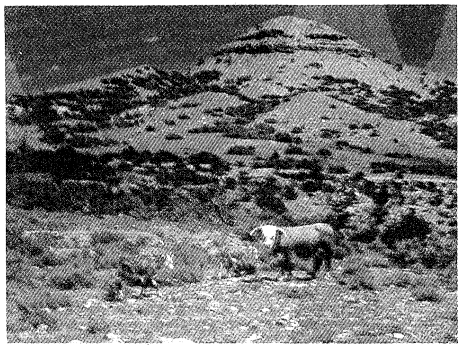


Bighorn sheep (*Ovis canadensis*)
Harry Engels—The National Audubon Society Collection/Photo Researchers

for possession of the ewes. One or sometimes two lambs are born after six months' gesta-

tion. Bighorn are gregarious, but in summer the rams live apart from the ewes and lambs.

Bighorn Mountains, range of the northern Rocky Mountains in southern Montana, U.S., extending southeastward in an anticlinal arch across north central Wyoming for 120 mi (193 km). Varying in width between 30 and 50 mi, the mountains rise abruptly 4,000 to 5,000 ft (1,200 to 1,500 m) above the surrounding Great Plains and Bighorn Basin. Their average height is 8,000 to 13,000 ft, with the highest point being Cloud Peak (13,165 ft) in Wyoming. In addition to the unique geologic formations, the scenic beauty of the mountain slopes is enhanced by the pine, fir, and spruce of the Bighorn National Forest. Hunting, camping, and fishing are popular in the area. The Powder River rises in several headstreams in the southern foothills. On Medicine Mountain is the "Medicine Wheel," a prehistoric relic constructed of rough stones laid



Yellowtail Reservoir area in the Bighorn Mountains, southern Montana

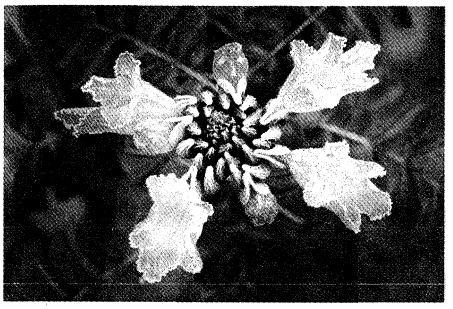
Roger and Joy Spurr—Bruce Coleman Inc.

side by side, forming a circle 70 ft in diameter with 28 spokes leading from the centre hub, which is about 12 ft in diameter.

Bighorn River, largest tributary of the Yellowstone, draining west central Wyoming and a small area of south central Montana, U.S. Topographically, it includes three sub-basins, known in downstream order as the Wind River in Wyoming, the Big Horn in Wyoming and Montana, and the Lower Big Horn in Montana.

Wind River, master stream of the upper basin, originates in the high areas of the Wind River and Absaroka Mountains in northwestern Wyoming. Flowing southeastward to a lowland area in west central Wyoming, it is joined by the Popo Agie River and Little Wind rivers near Riverton. Turning north, it passes out of the upper basin through Wind River Canyon, a deep, spectacular gorge through the Owl Creek Mountains. Boysen Dam is located in the southern section of the canyon. North of the canyon the stream becomes the Bighorn River. Continuing northward it flows through the Big Horn Basin—collecting its two principal tributaries, the Greybull and Shoshone rivers—to the Wyoming–Montana boundary, where it turns northeastward through Bighorn Canyon to cross the Lower Big Horn Basin and empty into the Yellowstone at Bighorn, Mont., after a course of 461 mi (742 km). There are major irrigation projects on the river at Riverton and Bighorn. The Little Bighorn River, site of the Custer Battlefield National Monument, joins the main stream at Hardin, Mont. The Bighorn Canyon National Recreation Area stretches along Bighorn Canyon on both sides of the border.

Bignoniaceae, the trumpet creeper or catalpa family of the figwort order of flowering plants (Scrophulariales). It contains about 120 genera and more than 650 species of trees, shrubs, and, most commonly, vines, mostly of tropical America, tropical Africa, and the Indo-Malayan region. They form an important part



African tulip tree (*Spathodea campanulata*)

W.H. Hodge

of the tropical forest vegetation because of the numerous climbing vines. A few are found in temperate regions, notably the catalpa tree (*Catalpa*), the trumpet-creeper (*Campsis*), and the cross-vine (*Bignonia*).

The family is characterized by oppositely paired, usually compound leaves and bell- or funnel-shaped, bisexual flowers having a five-lobed calyx and corolla; two long and two short stamens arising from the corolla tube; and a pistil positioned above the attachment point of the other flower parts, on a disk, and consisting of two fused, ovule-bearing carpels enclosing two, or rarely one, chambers that contain many ovules attached along the central axis. The seeds are usually flat and winged.

Among the important ornamental and useful members are the African tulip tree (*Spathodea*), calabash tree (*Crescentia cujete*), sausage tree (*Kigelia pinnata*), trumpet vine (*Campsis*), trumpet flower (*Bignonia capreolata*), cat's claw (*Doxantha unguis-cati*), the timber-producing West Indian boxwood (*Tabebuia*), jacaranda (*Jacaranda*), empress tree (*Paulownia*), flowering willow (*Chilopsis*), and the Cape honeysuckle (*Tecomaria capensis*).

Bigordi, Domenico di Tommaso: *see* Ghirlandajo, Domenico.

Bigot, François (b. Jan. 30, 1703, Bordeaux, Fr.—d. *c.* 1777), French civil servant, lawyer, and the last intendant of New France (1748–60), whose corrupt administration aided the British conquest of Canada.

After entering the civil service, Bigot was appointed naval commissary at Rochefort, Fr., in 1731. He became commissary at Louisbourg, on Cape Breton Island (now in Nova Scotia), in 1739 and may have been responsible for failing to fortify it properly, thus aiding its capture by the British in 1744. In 1745 he returned to France and supervised an unsuccessful expedition against Nova Scotia (1746).

On assuming the powers of the intendant of New France in 1746, Bigot set up partnerships with several companies and individuals in order to control the colony's economy. Arriving in Quebec in 1748 with more power than the governor, he perpetrated enormous frauds: he used a false name to retail goods to the public and the government while making a vast profit; and he appropriated military and Indian supplies. He went to France in 1755 but, reassured of his safety, returned to New France to impose an unjust corn and flour trade policy for his own enrichment. The colony's growing economic chaos seriously weakened its resistance to British attack and led to its surrender in 1760. Bigot returned that year to France, where he was arrested and imprisoned in the Bastille for 11 months, fined, and compelled to make restitution. He was then banished from France and died, probably elsewhere in Europe.

Bigsby, John Jeremiah (b. Aug. 14, 1792, Nottingham, Eng.—d. Feb. 10, 1881, London), English physician and geologist whose extensive geological studies of Canada and New York revealed much of the structure of the underlying rock strata and uncovered many new species of prehistoric life.

Having moved to Canada in 1818, he was appointed to report on the geology of Upper Canada the following year. He served as British secretary and medical officer to the Canadian International Boundary Commission from 1822 until he returned to England in 1827. He then practiced medicine in Newark, Essex, until 1846 and in London until 1881. His works include *Thesaurus Siluricus* (1868) and *Thesaurus Devonico-Carboniferus* (1878). In 1877 he established the Bigsby Medal of the Geological Society of London to be awarded biennially to geologists under 46 years of age.

Bihać, town, northwestern Bosnia and Hercegovina, Yugoslavia, located on the banks of the Una River. First mentioned in 1260 as the site of an abbey, it was occupied by the Turks, and became part of Bosnia in 1878. In 1942 the Bihać Republic became briefly a free territory. During World War II Bihać was also the headquarters of the general staff of the National Army of Liberation and the site of the first session of the war parliament of Yugoslavia (AVNOJ, or Anti-Fascist Council of National Liberation of Yugoslavia) in November 1942. The town remained an important meeting place throughout the war.

The modern economic activities of Bihać revolve around the timber and textile industries. It is a rail and market centre, has a hydroelectric plant, and is the hub of a tourist and resort area. Pop. (1981 prelim.) mun., 65,544.

Bihār, constituent state of the Republic of India, lying on the northeastern part of the country. It is bounded on the north by Nepal and, in India, on the east by West Bengal, on the south by Orissa, and on the west by Madhya Pradesh and Uttar Pradesh.

The following article summarizes the administrative history, geography, demographic patterns, economy, and culture of modern Bihār; for additional treatment of its geography and history, *see* MACROPAEDIA: India.

From early times, Bihār occupied an important place in Indian history. Kingdoms existed there in the early Vedic period (beginning about 1500 BC), and for centuries the area was the principal seat of imperial power and the main focus of Indian civilization. Under the British it formed a part of the Bengal presidency until the creation of the province of Bihār and Orissa in 1912. In 1936 Bihār became a separate province, and it became a state upon India's independence in 1947.

In 1857 and in 1859, Bihār was an important centre of the Indian Mutiny against British political authority, and it subsequently played an active role in the successive phases of Indian nationalism. Mahatma Gandhi launched the *satyāgraha* (passive resistance) movement against European indigo planters in the Champāran region of northern Bihār.

Physiographically, Bihār consists of the Gangetic Plains in the north and the Chota Nāgpur Plateau in the south. The plains form part of the middle Gangetic Plains and are in turn divided into north and south plains by the Ganges River. Except for the Himalayan foothills in the extreme northwest, the north Ganges Plain forms a flat alluvial country, less than 250 ft (76 m) above sea level and liable to flooding. The south Ganges Plain is more diversified than the north, and many hills rise from the level alluvium. The Chota Nāgpur Plateau—a series of plateaus, hills, and valleys—covers the southern half of Bihār.

The state has three well-defined seasons: the hot season from March to mid-June, the rainy season from mid-June to October, and a cold season from November to February. May is the hottest month, with the mean temperature exceeding 90° F (32° C), except in the extreme north and on the plateaus. The normal

annual rainfall varies from 40 in. (1,000 mm) in the west central part to more than 60 in. in the far north and in the southwest. The rainfall on the plateau—more than 50 in.—is heavier than on the plains.

Bihār contains a mixture of language groups. Hindī—along with the dialects of Bhojpurī, Maithilī, and Magadhī—and Urdu are spoken by almost 90 percent of the population. Hindī is used by about 44 percent of the people. Hindus constitute about 85 percent and Muslims 12 percent of Bihār's total population.

Around 90 percent of Bihār's people live in villages of from 1,000 to 5,000. Little more than 12 percent of the population can be classified as urban, making Bihār one of the most rural states in India. Cultivated land, about half of all the land in the state, amounts to less than half an acre per capita. Rice is the dominant crop in Bihār; others include corn (maize), wheat, barley, gram, oilseeds, and leguminous plants. Some jute is grown, along with various fruits and vegetables. Chilies, sugarcane, and tobacco are important cash crops on the banks of the Ganges.

Bihār, accounting for about 40 percent of the total mineral production in India, contains good deposits of copper, kyanite, phosphate, mica, bauxite, iron ore, manganese, and coal, along with other minerals. Rānchi, Bokāro, and Jamshedpur rank among the largest industrial complexes in India. Bihār's industrial workers are primarily employed in iron and steel, fertilizer and cement manufacturing, sheet glass production, and in heavy-machine tool factories. Other industries include rice and paper milling, silk manufacturing, jute processing, and sugar refining, and there is a petrochemical complex around the oil refinery at Barauni that depends on petroleum from Assam. Small-scale handicrafts industries are widespread. Most of the state suffers from inadequate road and rail transportation systems.

Bihār's cultural regions are closely connected with its linguistic regions. Tribal festivals (such as Sarhūl), a spring festival (Sohrai), and a winter festival (Mage Parab) are occasions for celebration. Tribal culture is changing fast under the impact of new communication links, tribal welfare programs, and community development projects. Places of religious and cultural interest abound in the plains region. Nālandā is the seat of the ancient and celebrated Nālandā Buddhist monastic university. Rājgīr's temples and shrines are visited by people of many faiths. Pāvāpurī is a centre of Jainism, and Gayā is an important place of Hindu pilgrimage. Buddh Gayā, where Buddha attained Englightenment, is Buddhism's most holy place. The holy town of Deoghar is well known for its Baidyanāth (Śiva) temple.

There has been a remarkable expansion of elementary and secondary schools in Bihār since the early 1950s, and the state has universities at Patna (Bihār's capital city), Rānchi, Muzaffarpur, Bhāgalpur, Buddh Gayā, Pusā, and Darbhanga (devoted to Sanskrit learning). Area 67,134 sq mi (173,876 sq km). Pop. (1981) 69,914,734.

Bihārī languages, eastern Indo-Aryan languages spoken in the state of Bihār, India, and in the Tarai districts of Nepal. There are three main languages: Maithilī (Tirhutia) and Magahī in the east and Bhojpurī in the west, extending into the southern half of Chota Nāgpur. Maithilī, spoken in the old country of Mithilā (Tirhut), was famous from ancient times for its learned use and still retains many antiquated linguistic forms. It is the only Biharī dialect with any real literature and has been the object of increasing interest since 1947. Magahī is considered the modern representative of the Māgadhī Prākrit. The Biharī languages are linguistically related to Bengalī but are culturally identified with Hindī. Most educated Biharī speakers also know Bengalī and Hindī.

Bihārsharif, also called BIHĀR, town, administrative headquarters of Nālanda district, Bihār state, northeastern India, east of the Paimār River, a tributary of the Ganges. It served as the capital of the Pāla dynasty (10th century AD) and contains a 5th-century-AD Gupta pillar and several Muslim mosques and tombs. Nearby lie the remains of Odantapurī (*q.v.*), a great *vihāra,* or college of Buddhist learning, from which the name Bihār was derived. In 1869 it was constituted a municipality. The town is now a road and rail hub, as well as an agricultural trade centre. It has a college affiliated with Magadh University at Buddh Gayā. Pop. (1981) 151,343.

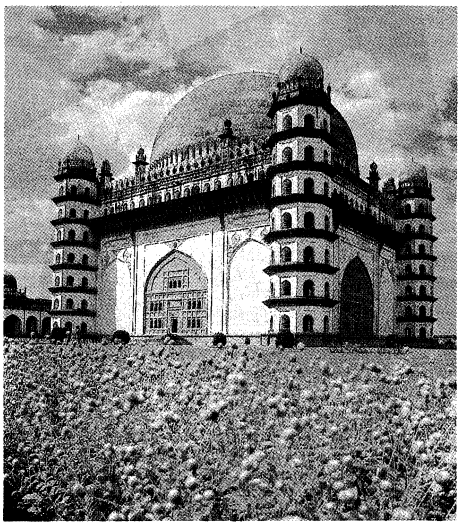
Bihor, *judeţ* (district), western Romania, occupying an area of 2,909 sq mi (7,535 sq km), bounded on the west by Hungary. It was formerly included in feudal Transylvania. The oak- and beech-covered Western Carpathians, including the Apuseni range, rise above settlement areas in intermontane valleys and lowlands. The Crişu Negra River and its tributaries flow westward, draining the area of the district. Neolithic utensils, Roman ceramics and money, and vestiges of the Visigoths and Huns have been found in the area. Oradea (*q.v.*), the district capital, has industries that produce machinery, chemicals, textiles, and footwear. Wood products are manufactured in Tileagd and Ioaniş towns, and bricks are produced in Aleşd town. A hydroelectric plant operates on the Crisu Repede River near Aleşd. Bauxite mines are worked near Roşia and Zece Hotare, and silver and iron were mined in the area during the Roman occupation. Beiuş, a textile centre, is known for its red and black pottery. Băile Întăi Mai and Băile Victoria are thermal resorts. A rare type of water lily, (*Castalea thermalis*), is found in the Peţa River near Băile Întăi Mai. Karst formations in the Apuseni Mountains include underground streams and caverns. Oradea is a centre for air, highway, and rail connections. Pop. (1982 est.) 649,009.

Bihor Massif, Romanian MUNŢII BIHORULUI, mountain massif, the highest part of the Apuseni Mountains, part of the Western Carpathians, western Romania. It is roughly 16 mi (25 km) long from northwest to southeast and 9 mi wide. The summit is almost smooth, broken by a few peaks of harder rock. Curcubăta Mare, at 6,063 ft (1,848 m), is the highest point. A northern extension, Vlădeasa, is a volcanic range reaching 5,949 ft. These mountains are the source of several important rivers. The Vlădeasa spawns the Crişul Repede and the Someşul Cald in a striking gorge.

Biisk (Russian S.F.S.R.): *see* Biysk.

Bijagós Islands, also called BISSAGOS ISLANDS, Portuguese ARQUIPÉLAGO DOS BIJAGÓS, islands of Guinea-Bissau, 30 mi (48 km) off the Guinea coast of West Africa. They compose an archipelago of 15 main islands, among which are Caravela, Carache, Formosa, Uno, Orango, Orangozinho, Bubaque, and Roxa. They are clothed with a lush vegetation and have sandy beaches, and their principal cash crops are palm products. Pop. (1979) 25,713.

Bijāpur, town, administrative headquarters of Bijāpur district, northern Karnātaka (formerly Mysore) state, southern India. An important site of medieval Indian Islāmic architecture, it was formerly called Vijayapura (meaning "city of victory") and was an important town under the Yādava dynasty for more than a century until 1294, when it became a provincial capital of the Bahmanī. In 1489 with the advent of Yūsuf ʿĀdil Shāh, the first ʿĀdil Shāhī sultan, its dominions grew to include Goa, where a navy was maintained. Although defeated (1686) by the Mughal emperor Aurangzeb, the ʿĀdil Shāhī dynasty left a legacy of outstanding Islāmic buildings, aesthetically the most satisfactory of the Deccan styles, including the domed tomb of Gōl Gumbaz and the mausoleum of Ibrāhīm Rawza.



Tomb of Gōl Gumbaz, Bijāpur, Karnātaka, India
Milt and Joan Mann—CAMERAMANN INTERNATIONAL

The modern town has major road and rail facilities and an expanding tourist economy. Industries include cotton ginning, oilseed milling, and the related manufacture of soap, chemicals, and dyes. Bijāpur's colleges of commerce, science, and arts are affiliated with Karnātak University in Dhārwār.

Bijāpur district (6,585 sq mi [17,056 sq km]), formed in 1864, is drained by the Don, Krishna, and Malprabha rivers. Limestone is quarried, and there is some trade in grain and cattle. Cotton, millet, and wheat are the chief crops. Apart from the district headquarters, the main towns are Bāgevādi, Bāgalkot, and Bādāmi. Pop. (1981) town, 147,313; district, 2,401,782.

Bījār carpet, floor covering handwoven by Kurds in the vicinity of the village of Bījār in

Bijār carpet from Iran, 20th century; in the possession of Neshan G. Hintlian, Washington, D.C.
In possession of Neshan G. Hintlian, Washington, D.C.; photograph, Otto E. Nelson—EB Inc.

western Iran. The carpets are known for their weight, sturdiness, and remarkable stiffness and resistance to folding. Woven on a woollen foundation, in the Ghiordes knot, these carpets are said to be double warped. This refers to the way the warps are strung closely together, and alternate weft shoots are pulled so tight that the warp lies on two levels, one almost precisely behind the other. This is also a Kerman characteristic and may have been borrowed from that centre.

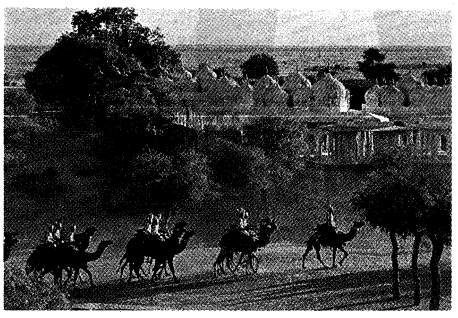
Many Bījār carpets have clumsy medallion decorative schemes in which the medallion and corners are ornamented but the balance of the field remains a solid red. Other examples show repeat patterns, including the ubiquitous *herāti,* in which a diamond lattice peeps through a tangle of roses. From Bījār come a remarkable number of *vāgīrehs*, weavers' samples, used as models for large carpets, that show portions of several patterns and borders.

Bijnor, town, administrative headquarters of Bijnor district, Uttar Pradesh state, northern India, near the Ganges River, northeast of Delhi, with which it is linked by road and rail. A trade centre for agricultural products, Bijnor is also noted for thread manufacturing. The town was ceded to the British East India Company in 1801.

Bijnor district, 1,873 sq mi (4,852 sq km) in area, lies between the Ganges River and the Himalayan foothills. Drained by the Rāmganga and Khoh rivers, it is generally level except for foothills in the northeast. Sal forest covers parts of the north. Grains, sugarcane, and other crops are grown, in some places under irrigation. Bijnor district is a major sugar producer. The largest towns are Bijnor, Nagīna, and Najībābād. Pop. (1981) town, 56,713; district, 1,939,261.

Bijsk (Russian S.F.S.R.): *see* Biysk.

Bīkaner, town, administrative headquarters of Bīkaner district, Rājasthān state, northwestern India. Founded in 1488 by Bīka, a Rājput chieftain (belonging to the warrior caste that ruled the historic region of Rājputāna), Bīkaner (meaning "the settlement of Bīka") was the capital of the former princely state of Bīkaner. The state adhered loyally to the Mughal



Camel Corps passing by the royal tombs at Bīkaner, Rājasthān, India

John Lewis Stage—Photo Researchers

emperors who ruled in Delhi from 1526 to 1857. Wars between Bīkaner and the princely state of Jodhpur raged intermittently in the 18th century. A treaty establishing British paramountcy was concluded in 1818. In 1949 Bīkaner became part of the state of Rājasthān.

The present-day town of Bīkaner is a trade centre for wool, hides, building stone, salt, and grain; Bīkaneri woollen shawls, blankets, carpets, and sugar candy are famous. There are electrical and mechanical engineering works, and plants manufacture glass, pottery, felts, chemicals, shoes, and cigarettes. The town also has ivory and lacquer ware handicrafts, as well as railway workshops. The town, surrounded by a wall with five gates and overlooked by a fort, has numerous buildings of bright red and yellow sandstone. Within the fort are several palaces of different periods, a museum housing Rājput miniature paintings, and a library of Sanskrit and Persian manuscripts. The town's seven colleges (including a medical school and a teachers' training institute) are affiliated with the University of Rājasthān.

Bīkaner district (10,514 sq mi [27,231 sq km]), formerly the princely state of Bīkaner, comprises an arid tract of undulating sand hills, where the breeding of camels, horses, and sheep is the principal occupation. Because there are no rivers, irrigation is chiefly by means of deep tube wells, although the district's extreme northern portion is partially watered by the Bīkaner (Gaṅgā) Canal system, which is supplied by the Sutlej River. Bajra (pearl millet), jowar (sorghum), and pulses are the chief crops; lignite, fuller's earth, glass sand, and gypsum deposits are worked. Industries include sugar and bone milling, ivory carving, and gold, brass, copper, and ironwork. Pop. (1981) town, 253,174; metropolitan area, 287,712; district, 848,749.

bike wagon, also called RUNABOUT, or DRIVING WAGON, a lightweight, one-horse, open carriage, having four wheels, almost invariably with pneumatic or solid rubber tires of the same type used on bicycles, and axles with ball bearings. It was designed in the 1890s, one of the last horse-drawn vehicles manufactured, and it included such innovations as tubular steel running gear.

Bikini, an atoll in the Ralik (western) chain of the Marshall Islands in the central Pacific Ocean. Lying north of the equator, it is 225 mi (360 km) northwest of Kwajalein (the world's largest coral atoll) and 190 mi (305 km) east of Enewetak Atoll. It consists of a small group of islands of which the average elevation is only some 7 ft above low tide level. The land area of the group amounts to little more than 2 sq mi of dry land, distributed about the edges of an oval lagoon 25 mi long and 15 mi wide, with a water area of 243 sq mi and a maximum depth of about 200 ft. The largest islands are Bikini, which forms a narrow arc to the northeast, and Enyu (or Eneu), a slightly smaller island situated at the southeast curve of the reef circling the lagoon. The principal entrance to the lagoon, near Enyu Island, is Enyu Passage, which is 9 mi wide. Bikini stands in the path of the westward-flowing North Equatorial Current and in the region of the northeast trade winds. Storms occur infrequently, and the average mean monthly temperature varies only from 80° to 83° F (27° to 28° C). Bikini was a site for peacetime atomic explosions conducted for experimental purposes by the United States between 1946 and 1958.

Bikini, before World War II known as Escholtz Atoll, was placed on Pacific charts by Otto von Kotzebue, the Russian circumnavigator, who in 1825 sailed past it without landing. Kotzebue noted no inhabitants, but even then Bikini almost certainly had been inhabited for many generations by people of Malayo-Polynesian origin. The Bikinians, together with other Micronesians, were subjected to western and other influences that entered the Pacific in the 19th and 20th centuries, but their small island community was only lightly touched by change until after World War II.

When Japan was driven from the Marshall Islands in 1944, the islands and atolls, Bikini among them, came under the administration of the United States Navy. Soon after World War II, and before the United States had been confirmed in 1947 in its United Nations strategic trusteeship of the Pacific Islands, Bikini in 1946 became the theatre for Operation Crossroads, a vast military-scientific experiment to determine the impact of atomic bombs on naval vessels. Further tests, some of them thermonuclear, were conducted from 1954 to 1958, when Bikini, together with Enewetak Atoll (190 mi to the west), constituted the Pacific Proving Ground of the United States Atomic Energy Commission.

The native population, numbering less than 200 persons, was removed to other islands before the first atomic tests began. In 1969 the U.S. government began work on a long-range project to reclaim the land and, ultimately, to repatriate the Bikinian population.

Biko, (Bantu) Stephen (b. Dec. 18, 1946, King William's Town, S. Afr.—d. Sept. 12, 1977, Pretoria), founder of South Africa's Black Consciousness movement. His death from head injuries suffered while in police custody made him an international martyr for South African black nationalism.

The son of a clerk and a housemaid, he first revealed his political awareness in 1963, when his brother was arrested in a nationwide police crackdown on political activists and when he himself was expelled from Lovedale High School. He nevertheless managed to enroll in and graduate (in 1966) from St. Francis College, a liberal boarding school in Natal, and then entered the University of Natal Medical School. There he became involved in the multiracial National Union of South African Students (NUSAS), a moderate organization that had long espoused the rights of blacks. Growing disenchanted with NUSAS, in which he claimed that "the whites [were] doing all the talking and the blacks listening," he became in 1968 the co-founder and first president of the all-black South African Students' Organization (SASO), whose aim was to raise "Black Consciousness" and black self-esteem and "to overcome the psychological oppression of blacks by whites." He also helped found the South African Students' Movement for high-school students and became honorary president of the Black Peoples' Convention (BPC), an umbrella group that drew in large numbers of young professionals and intellectuals. He defended his emphasis on youth organizations by saying that "it was a waste of time to try and change the mind of anybody over 40, as they have already made up their minds."

Biko's participation in black community programs and the publication of the *Black Review*, a political journal, eventually drew official censure when he and other SASO and BPC members were served with "banning" orders in February 1973, tightly restricting their associations, movements, and public statements. Biko then operated covertly, establishing the Zimele Trust Fund in 1975 to help political prisoners and their families. In that year he was arrested and held 137 days without charge or trial; and he was again arrested in August 1976 (and held for 101 days), as well as in March and July 1977. Finally, on Aug. 18, 1977, he and a fellow activist were seized at a roadblock and jailed in Port Elizabeth. There, during the next 24 days, held naked and manacled, he evidently suffered three brain lesions that, according to the postmortem, were caused by "application of force to his head." He died after being trucked in an unconscious state 740 miles (1,190 kilometres) to Pretoria on September 11. An inquest absolved the police of any wrongdoing.

Bikol (people): *see* Bicol.

Bilāspur, also called KAHLUR, city, administrative headquarters of Bilāspur district, Himāchal Pradesh state, northwestern India. The city lies on the edge of Govind Sāgar, an artificial lake northwest of Simla, the state capital. Bilāspur was the capital of an independent Punjab Hill State until 1814, when the Gurkhas overran it; the British drove them out the following year. It is a local trade centre for agricultural products.

Bilāspur district (451 sq mi [1,167 sq km])

lies in southwestern Himāchal Pradesh, at the southern margin of the Himalayan foothills. Much of its area is taken up by Govind Sāgar, created by the Bhākra Dam across the Sutlej River. The principal crops of the district are wheat, corn (maize), and rice; timber is cut from the forests. Some weaving is done by hand. Pop. (1981) city, 8,063; district, 247,368.

Bilāspur, town, administrative headquarters of Bilāspur district, Madhya Pradesh state, central India, lying just west of the Arpa River. It was the capital of a Gonḍ kingdom until captured by the Marāṭhās in the 18th century. Just north lies Ratanpur, an ancient Hindu capital of the Haihaya dynasty of Chhattīsgaṛh; its ruins date from the 8th century AD. A major rail junction with extensive workshops, Bilāspur has agricultural trade and is a centre of rice and flour milling, sawmilling, and the manufacture of shellac. Bilāspur was constituted a municipality in 1867 and has a musical academy and seven colleges affiliated with Ravishankar University.

Bilāspur district (7,685 sq mi [19,905 sq km]), constituted in 1861, comprises the northern part of a wide plain delineated by a semicircle of hills and forms a portion of the Chhattīsgaṛh Plain (*q.v.*), or upper Mahānadi Basin. On the north the Maikala Range rises to 3,700 ft (1,130 m) at Amarkantak and contains the sources of the Narmada and Son rivers. The Mahānadi and its tributaries drain the area. Rice, wheat, corn (maize), cotton, and sugarcane are the chief crops; there are extensive forest preserves; and coal, dolomite, and iron-ore deposits are worked. The district contains most of Madhya Pradesh's lac (shellac) factories, and *tasar* (tussah) silk is produced by cottage industry. In the south, Seorīnārāyan and Kharod temples date from the 12th century. Pop. (1981) town, 147,218; metropolitan area, 187,104; district, 2,953,366.

Bilbao, port city, capital of Vizcaya (Biscay) province, in the autonomous Basque Country, northern Spain, located along the mouth of the Río Nervión, near the Cantabrian coast. It is the largest city in the Basque Country. Bilbao originated as a settlement of seafaring people on the banks of the Nervión's estuary. The inhabitants began to export both the iron ore found in large quantities along the river's eastern bank and the products of their ironworks. The latter were well known, and Shakespeare refers to the excellent swords of Bilbos made from the steel of Bilbao. To this settlement of mariners and ironworkers, Don Diego López de Haro, lord of Biscay, in 1300 gave the charter and privilege of self-government in an independent municipality. Bilbao was also a centre for the export of wool from Burgos, in the interior of Castile, to Flanders. In 1511 the city obtained the right, like Burgos, to its own commercial tribunal that could issue laws in the form of ordinances. The last of these, promulgated in 1737, formed the basis of the first Spanish commercial code in 1829. In the 18th century Bilbao derived great prosperity from intensive trade with the American colonies of Spain. The city was sacked by French troops in the Peninsular War (1808) and besieged four times during the Carlist Wars. These struggles produced a strong communal spirit that after 1874 directed itself toward industrialization. Several towns on the left bank of the river were annexed to the municipality after 1890, forming the modern extension of the city.

Bilbao is the most important port in Spain. It is also significant as one of the nation's largest concentrations of metallurgical and chemical industries and as a financial centre. Maritime activities include the fishing industry and shipbuilding and ship repairing. Notable landmarks include the Gothic cathedral of Santiago (14th century), the Plaza Nueva (early 19th century), and the Baroque town hall, found in the old section of the city on the western (right) bank of the Río Nervión. There are numerous museums, an engineering school, a Catholic university, and the University of Bilbao (1968). Pop. (1982 est.) 450,024.

Bilbays, also spelled BILBEIS, or BILBĪS, town, southeastern ash-Sharqīyah *muḥāfaẓah* (governorate) in the eastern Nile Delta, Lower Egypt. Bilbays lies northeast of Cairo, on the main road from Ismailia and Port Said and on the Tur'at (canal) al-Ismā'īlīyah. Its name is an Arabic corruption of the Coptic Phelbes. Situated on a caravan and natural invasion route from the east, Bilbays was conquered in AD 640 by the Arabs, who in 727 resettled some of the Qays tribe there and later built a chain of fortresses to protect Cairo. In 1163 the Frankish crusaders under Amalric I occupied the town, which had often served as a camping place for Arab armies moving east. In 1517 the Ottoman army passed through on its way to Cairo. The modern town has textile manufacturing and is served by a railway station at Mīt Ḥamal, just northwest. Bilbays military base with an airfield is 3 mi (5 km) southeast. Pop. (1983 est.) 83,600.

bilberry, also called WHORTLEBERRY (*Vaccinium myrtillus,* family Ericaceae), low-growing shrub found in woods and on heaths, chiefly in hilly districts of Great Britain and northern Europe and Asia. The stiff stems, from 15 to 45 centimetres (6 to 18 inches) high, bear small egg-shaped leaves with serrated margins and small, globose, rosy flowers tinged with green.

The dark-blue berries, ripening in July and August, have a waxy bloom and are about 1 cm in diameter. They are a principal food of the grouse and are used for tarts and preserves. The berries are borne singly, in contrast to those of the much more productive, cultivated blueberries of the United States (*V. australe*), which are borne in racemes (long clusters). *V. myrtillus* is frost-susceptible and partly self-sterile and has been hybridized with the foxberry, *V. vitis-idaeus. See also* blueberry.

Bilbo, Theodore G(ilmore) (b. Oct. 13, 1877, near Poplarville, Miss., U.S.—d. Aug. 21, 1947, New Orleans), U.S. politician and Democratic senator from Mississippi (1935–47), best known for his racist and demagogic rhetoric.

Bilbo managed despite poverty to attend Peabody College and the University of Nashville (Tennessee) for a time and later studied law at Vanderbilt University in Nashville. In 1907 he won a seat in the Mississippi Senate, running as an anti-railroad populist and supporter of white supremacy. In 1911 he was elected lieutenant governor and then became governor in 1916. He lost a bid for Congress in 1920 and was defeated once again when he ran for governor in 1924.

Leaning heavily on racist invective, Bilbo regained the governorship in 1928. He fired many faculty members of Mississippi's colleges and universities and brought the state almost to bankruptcy. In 1934, after a campaign in which he made more than a thousand speeches—characterized by biblical phraseology and highly imaginative language—Bilbo won a seat in the U.S. Senate. There he remained for almost the rest of his life, blocking any attempt at ameliorating racial injustice and advocating the deportation of blacks to Africa in order to preserve "racial purity."

After evidence of influence peddling was uncovered and during further investigation of his unethical practices, several senators recommended that Bilbo be barred from the Senate chambers, a suggestion that met with firm opposition from Bilbo's Southern supporters in the Senate. Before the issue was resolved, Bilbo, who was ill, left Washington, D.C., for medical treatment and never recovered.

Bildad, also spelled BALDAD, in the Old Testament, one of the three principal comforters of Job. Bildad is introduced (Job 2:11) as a Shuhite, probably a member of a nomadic tribe dwelling in southeastern Palestine. Bildad's arguments with Job reveal him to be a sage who looks to the authority of tradition. His wounded orthodoxy provokes the lack of courtesy in his initial reply.

In his first speech (chapter 8), he begins abruptly by asking Job how long he will make speeches full of wind. He then implies that Job's children died deservedly because of transgressions. He states that the wisdom of the patriarchs teaches that wicked men will perish as surely as reeds without water, but that it is not too late for Job to repent and be returned to God's favour.

In his second speech, Bildad, rankled by Job's denunciation of the three comforters as being more stupid than beasts, compares Job to a beast in his angry tearing of himself. He then describes the terrifying fate of the wicked man, who, although he may enjoy what appear to be happiness and prosperity for a time, must in the end face "the king of terrors." His memory will vanish from the earth and he will have neither "offspring or descendant."

In his third speech, which some scholars believe to be an edited fragment of the original one (possibly parts of the original were given to Job to soften the force of his heresies), Bildad does not answer Job directly but instead praises the transcendence of God, before whom man is infinitely imperfect, "a maggot, and the son of man, who is a worm."

In Job 42:7 God reprimands Bildad and the two other comforters for not having spoken rightly of him and requires them to make a sacrifice to appease his anger.

Bilderberg Conference, annual three-day conference attended by about 100 of Europe's and North America's most influential bankers, economists, politicians, and government officials. The conference, held in a different Western country each year, is conducted in an atmosphere of rigid security, with each delegate pledged to secrecy regarding the discussions that take place during the conference. The meeting's purpose has been described as providing a private, informal environment in which those who influence national policies and international affairs can get to know each other and discuss without commitment their common problems. After each conference a private report of the meeting is circulated only to past and present participants, and in the report speakers are identified only by their country.

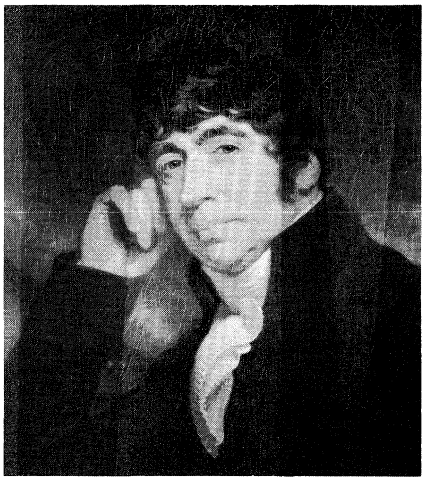
The conferences were initiated by Prince Bernhard of The Netherlands and took their name from the hotel at Oosterbeek, Neth., where the first conference was held in 1954. An international steering committee generally selects different delegates each year; the conference's small secretariat is located in The Hague.

Bilderdijk, Willem (b. Sept. 7, 1756, Amsterdam—d. Dec. 18, 1831, Haarlem, Neth.), Dutch poet who had considerable influence not only on the poetry but also on the intellectual and social life of the Netherlands.

Born of a strongly Calvinist and monarchist family, he had a crippled foot and spent a precocious childhood among books. After studying law at Leiden, Bilderdijk practiced as an advocate at The Hague until 1795, when, as an Orangeist, he was forced into exile for his refusal to take the oath of allegiance to the republic established by the French. He went to Germany and then to London, where he met Katherina Schweickhardt, also a poet, whom he married in 1802 after divorcing his first wife. In 1806 he returned to the Netherlands.

After the restoration he hoped in vain for a professorship at Amsterdam.

Although much of his prolific output was in the dry, rhetorical style of previous gen-



Bilderdijk, detail of an oil painting by C.H. Hodges; in the Rijksmuseum, Amsterdam

By courtesy of the Rijksmuseum, Amsterdam

erations, he occasionally produced a poetic diction and ideas on poetry that were totally new to the Netherlands. With his passionate Gothic-style verse rendering (1803) of the 18th-century ballads of Ossian, Bilderdijk set the scene in the Netherlands for early-19th-century Romantic nostalgia. In his poem *De kunst der poëzij* (1809; "The Art of Poetry") he maintained the importance of feeling in the writing of poetry, a principle that he introduced to the Netherlands but rarely lived up to himself. Bilderdijk's profusely religious poems, the most sensitive of which is *Gebed* (1796; "Prayer"), inspired theologian poets throughout the 19th century. The work for which he is best remembered is the unfinished epic poem *De ondergang der eerste wareld* (1810; "The Destruction of the First World"), which dramatically portrays the primordial struggle between Cain's son and the progeny of his daughters.

Bildungsroman (German: "novel of formative education"), class of novel in German literature that deals with the formative years of an individual. It is sometimes called an *Entwicklungsroman* ("novel of character development").

The folklore tale of the dunce who goes out into the world seeking adventure and learns wisdom the hard way was raised to literary heights in Wolfram von Eschenbach's medieval epic *Parzival* and in Hans Grimmelshausen's picaresque tale *Simplicissimus* (1669). The first novelistic development of this theme was Goethe's *Wilhelm Meisters Lehrjahre* (1795–96; *Wilhelm Meister's Apprenticeship*), and it remains the classic example of the type. Other examples are Adalbert Stifter's *Nachsommer* (1857; "Indian Summer") and Gottfried Keller's *Grüne Heinrich* (1854–55; *Green Henry*). The Bildungsroman ends on a positive note, though it may be tempered by resignation and nostalgia. If the grandiose dreams of the hero's youth are over, so are many foolish mistakes and painful disappointments, and a life of usefulness lies ahead. A common variation of the Bildungsroman is the *Künstlerroman* (*q.v.*), a novel that deals with the formative years of an artist.

bile, also called GALL, golden-yellow secretion produced in the liver and passed to the gallbladder for concentration, storage, or transport into the first region of the small intestine, the duodenum. Its function is to aid in the digestion of fats in the duodenum. Bile is composed of bile acids and salts, cholesterol, pigments, water, and electrolyte chemicals that keep the total solution slightly acidic (with a pH of about 5 to 6). Bile is continually secreted from the cells of the liver into the common bile duct and gallbladder; once in the gallbladder it is concentrated to about 20 times the strength of the original secretion. The amount of bile secreted into the duodenum is controlled by the hormones secretin, gastrin, and cholecystokinin and also by the vagus nerve. About 250 to 1,000 millilitres of bile (before concentration) are produced daily by the liver.

Bile salts are composed of the salts of four different kinds of free bile acids (cholic, deoxycholic, chenodeoxycholic, and lithocholic acids); each of these acids may in turn combine (conjugate) with glycine or taurine to form more complex acids and salts. Bile salts and acids can be synthesized from cholesterol or extracted from the bloodstream by the liver. They pass from the liver into the intestine, where they emulsify fat and reduce the surface tension on fat droplets to prepare them for the action of pancreatic and intestinal fat-splitting enzymes. The salts are large, negatively charged ions that are not readily absorbed by the upper region of the small intestine; consequently, they remain in the intestine until most of the fat is digested. In the lower intestine, the salts and acids are absorbed and passed back into the bloodstream until they are once again extracted by the liver; this cycle, from the liver to the intestine and blood and then back to the liver, is called enterohepatic circulation. Some salts and acids are lost during this process; these are replaced in the liver by continual synthesis from cholesterol. The rate of synthesis is directly related to the amount of acids and salts lost. Bile salts do not normally reach the colon; when they do, however, they inhibit the absorption of water and sodium, causing a watery diarrhea.

Bile salts and acids are transported in a fluid that contains water, sodium, chloride, and bicarbonates. This fluid is produced in the liver, and it serves to neutralize hydrochloric acid passed from the stomach into the small intestine. The major bile pigment is bilirubin (*q.v.*); it has no known function other than that of a colouring agent. Traces of other substances can also be found in bile, but their significance there is not fully understood; a few of these substances are mucus, serum proteins, lecithin, neutral fats, fatty acids, and urea.

Bilecik, city, capital of Bilecik *il* (province), northwestern Turkey, on the Karasu Çayi, a tributary of the Sakarya Nehri (river). It was captured from the Byzantines by the Ottoman ruler Osman I in 1298. The city and its famous silk industry suffered heavily during the Turkish War of Independence (1919–22), when it was occupied by Greek forces. The old town is on the upper slopes of a hill, while the modern quarter lies around the railway station, on the Ankara–Istanbul line.

Bilecik *il,* 1,748 sq mi (4,527 sq km) in area, occupies rough country between the Marmara and central Anatolian regions. Söğüt, southeast of Bilecik city, was the first Ottoman capital. Stock raising and agriculture are the principal occupations; industries include leather, cheese, and silk production. Pop. (1980) city, 15,126; (1983 est.) *il,* 152,700.

Bilfinger, Georg Bernhard (b. Jan. 23, 1693, Cannstatt, Württemberg—d. Feb. 18, 1750, Stuttgart), German philosopher, mathematician, statesman, and author of treatises in astronomy, physics, botany, and theology, best known for his Leibniz–Wolffian philosophy. He coined the term to refer to his own position midway between those of the philosophers Gottfried Wilhelm Leibniz (1646–1716) and Christian Wolff (1679–1754).

At Tübingen, Bilfinger was made court preacher and, in 1721, professor of philosophy at the university there. In 1724 he was appointed professor of moral philosophy and mathematics; but his association with Wolff, who was expelled from Halle in 1723, led to charges of atheism against him, and he was removed from his teaching positions. With Wolff's help, in 1725 he became professor of logic, metaphysics, and moral philosophy at St. Petersburg (now Leningrad). His dissertation *De Causa Gravitatis Physica Generali* (1728; "On the General Physical Cause of Gravity") won the highest award in a contest sponsored by the Paris Academy. His reputation improved, Bilfinger returned to Tübingen as professor of theology in 1731.

Bilfinger was one of the most accomplished and versatile thinkers of his time. Although he was the pupil, friend, and defender of Wolff, it was rather on Leibniz's work that he concentrated his attention. Bilfinger's most original contribution to philosophy—a theory of possibility—is found in *Dilucidationes Philosophicae de Deo, Anima Humana, Mundo, et Generalibus Rerum Affectionibus* (1725), a discussion of God, the human soul, and the physical world in general. In this work he differs from Leibniz's views on two important points, both concerning monads, the infinitesimal psychophysical units of force that comprise the universe (according to Leibniz). Whereas Leibniz had held each monad to be at once physical and spiritual, Bilfinger insisted on the heterogeneity of material and spiritual monads, with the consequence that he could not regard all monads as percipient: some of them rather were endowed only with moving force. His other major deviation from Leibniz was on the question of preestablished harmony, which he held to apply not to the whole universe but only to the relationship between the soul and the body and to consist in a correspondence of inner states in the percipient and in the nonpercipient monads.

Bilge, also spelled BILGÄ, Wade–Giles romanization P'I-CHIA, or MO-CHI-LIEN, Pinyin PIJIA, or MOJILIAN (d. 734), *khagan,* or great khan, of Mongolia from 716 until his death. His name literally translates as "Wise Emperor." He assumed leadership of the T'u-chüeh, a tribe of Turks in control of southern Central Asia, when his brother instigated a palace coup against the old ruler. When the T'ang emperor Hsüan Tsung refused his offer of an alliance, Bilge decimated the Chinese army, forcing them to sue for peace in 721. Bilge is even better known, however, for advising his successors that the power of the T'u-chüeh came from their nomadic life and that to settle in agricultural communities on the Chinese border would weaken them.

bilharziasis (disease): *see* schistosomiasis.

bilin, also called BILICHROME, any biological pigment (biochrome) belonging to a series of yellow, green, red, or brown nonmetallic compounds formed as a metabolic product of certain porphyrins. In addition to being found in the bile pigments of mammals, bilins also occur in invertebrates, lower vertebrates, red algae, and green plants. Bilin pigments not only impart various colours to certain animal parts or products but are also indispensable in a number of photoperiodic processes in green plants and as accessory pigments in the photosynthetic process in red algae.

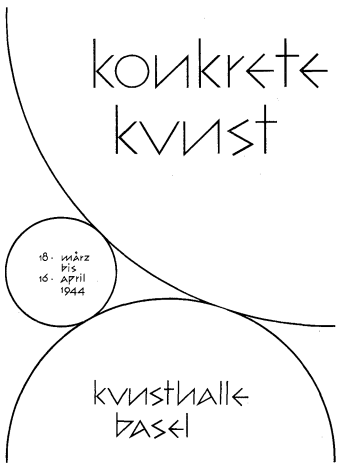
bilirubin, a brownish-yellow pigment of bile, secreted by the liver in vertebrates, which gives to solid waste products (feces) their characteristic colour. It is produced in bone marrow cells and in the liver as the end product of red-blood-cell (hemoglobin) breakdown. The amount of bilirubin manufactured relates directly to the quantity of blood cells destroyed. About 0.5 to 2 grams are produced daily. It has no known function and can be toxic to the fetal brain.

Bilirubin in the bloodstream is usually in a free, or unconjugated, state; it is attached to albumin, a protein, as it is transported. Once in the liver it conjugates with glucuronic acid made from the sugar glucose. It is then concentrated to about 1,000 times the strength found in blood plasma. Much bilirubin leaves the liver and passes to the gallbladder, where it is further concentrated and mixed with the other constituents of bile. Bile stones can originate from bilirubin, and certain bacteria can infect the gallbladder and change the conjugated bilirubin back to free bilirubin and acid. The calcium from the freed bilirubin can settle out as pigment stones, which may eventually block the passageway (common bile duct) between the liver, gallbladder, and small intestine. When blockage occurs, conjugated bilirubin is absorbed into the bloodstream, and the skin becomes yellow in colour (*see* jaundice).

Normally, conjugated bilirubin passes from the gallbladder or liver into the intestine. There, it is reduced by bacteria to mesobilirubinogen and urobilinogen. Some urobilinogen is reabsorbed back into the blood; the rest goes back to the liver or is excreted from the body in urine and fecal matter. In humans, bilirubin is believed to be unconjugated until it reaches the liver. In dogs, sheep, and rats, there is no bilirubin in the blood, though it is present in the liver.

bill (zoology): *see* beak.

Bill, Max (b. Dec. 22, 1908, Winterthur, Switz.), Swiss graphic artist, industrial designer, architect, sculptor, and painter, primarily important for his sophisticated, disciplined advertising designs.



"Konkrete Kunst," poster by Max Bill, 1944

By courtesy of the Bibliotheque Nationale Suisse, Bern

His early ambition was to become a silversmith, but the work of the architect Le Corbusier influenced him to study architecture at the Bauhaus, Germany's foremost school of design. He also studied metalwork, stage design, and painting. In 1930, he set up his own studio in Zürich and concentrated on sculpture, painting, and architecture while earning his living by designing advertisements. After 1944 he became increasingly active as an industrial designer, creating products as diverse as chairs and wall sprockets with the same elegance of line and form that characterized his marble sculpture "Construction from a Circle" (1942).

Later in his career, Bill divided his time between his own work as a designer and graphic artist and teaching, most notably at the Hochschule für Gestaltung (College of Design) in Ulm, W. Ger. He was the school's first rector and acted as director of the department of architecture and product design. He also designed its buildings and planned the curriculum. He exhibited designs and graphic works widely in Europe in the 1960s and '70s.

bill of ——— : *see under* substantive word (*e.g.*, exchange, bill of).

Billaud-Varenne, Jean-Nicolas (b. April 23, 1756, La Rochelle, Fr.—d. June 3, 1819, near Port-au-Prince, Haiti), lawyer and pamphleteer, a member of the Committee of Public Safety that ruled Revolutionary France during the period of the Jacobin dictatorship (1793–94).

Billaud-Varenne was the son of a lawyer of La Rochelle. After studying at the universities of Paris and Poitiers, he taught at the Oratorian college at Juilly. In 1785 he was admitted to the bar at Paris, and by 1787 he was writing anonymous tracts attacking the French church and government. He joined the Club of the Jacobins soon after the outbreak of the Revolution in 1789.

As a member of the "revolutionary Commune," he helped plan the popular insurrection that overthrew the monarchy on Aug. 10, 1792. He was elected a deputy to the revolutionary National Convention, which convened on September 21, and, on his motion, the Republic was declared the next day. Billaud-Varenne then threw himself into the struggle against the deputies of the moderate Girondin faction. The leading Girondins were expelled from the Convention on June 2, 1793, and the Jacobins took control of the Revolution.

By that time Billaud-Varenne had formed close ties with the Parisian sansculottes (wage earners and shopkeepers), who looked for leadership to the left-wing Jacobins under Jacques Hébert. Billaud's *Éléments du républicanisme* (1793) set forth such Hébertist demands as the redistribution of wealth and guaranteed employment for all workers.

Taking advantage of popular unrest in Paris, the Hébertists forced the Convention to appoint Billaud-Varenne and Collot d'Herbois to the Committee of Public Safety on Sept. 6, 1793. On 14 Frimaire (Dec. 4, 1793) Billaud-Varenne secured passage of a law giving the Committee absolute authority over provincial officials. Robespierre, the Committee's chief spokesman, had the leading Hébertists guillotined in March 1794, and in the following month Billaud-Varenne and Collot d'Herbois forced him to eliminate Georges Danton, the leader of the Jacobins' right wing. Soon Billaud-Varenne was challenging Robespierre's leadership. Conspiring with Collot d'Herbois and other dissidents, he helped bring about Robespierre's downfall on 9 Thermidor

Billaud-Varenne, engraving by F. Bonneville, late 18th century

By courtesy of the Bibliotheque Nationale, Paris

(July 27, 1794). In the ensuing Thermidorian reaction against the Jacobin regime, Billaud-Varenne and Collot d'Herbois were deported to French Guiana (April 1795), where Billaud-Varenne married and became a farmer. In 1800 he turned down Napoleon Bonaparte's offer of a pardon. He made his way to New York in 1816 but settled in Haiti the following year.

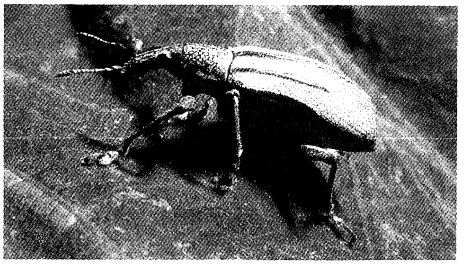
Billbergia, genus of evergreen epiphytes (plants that are supported by other plants and have aerial roots exposed to the humid atmosphere) of the pineapple family (Bromeliaceae), containing more than 50 South American species. Several species are grown indoors as decorative plants for their colourful foliage, flowers, or bracts (leaflike clusters beneath the flowers). The stiff, spiny, often strap-shaped leaves grow in a rosette, sometimes up to 90 centimetres (35 inches) in diameter, directly from the root. The flowers are on a spike or panicle (loose cluster) growing from the centre of the rosette.

Billbergia

Sven Samelius

To make the best use of the Britannica, consult the INDEX *first*

billbug, any of certain beetles of the insect family Curculionidae (order Coleoptera). The billbug, a stout-bodied beetle with a short snout, ranges up to 50 millimetres (2 inches) in length. Some (*e.g., Rhynchophorus*) are found mainly in the tropics, boring through the new growth of palm trees. The larvae of *R. cruentatus* are about 50 mm long and make a clucking sound while boring in cabbage palms. These larvae are eaten, either fried or raw, by natives of tropical America. A similar species (*R. ferrugines*) has threatened copra (dried coconut meat) production in the Pacific because it attacks coconut and wine palms.



Billbug (*Diaprepes*)

Raymond A. Mendez—Animals Animals

Other billbug genera include *Diaprepes, Rhodobaenus,* and *Sitophilus. Sitophilus* species are important pests of stored grain.

Billetdoux, François (b. Sept. 7, 1927, Paris), French playwright whose works, linked with the avant-garde theatre, examine human relationships and find them doomed to failure.

As a youth, Billetdoux studied at the Charles Dullin School of Dramatic Art and the Institut des Hautes Études Cinématographiques; from 1949 to 1950, he was director of the French Radio Department in Martinique.

Tchin-Tchin (1959; *Chin-Chin,* 1963), his first play to win popular acclaim, traces the decline into alcoholism of a couple brought together by the infidelity of their spouses. In *Le Comportement des époux Bredburry* (1960; "The Behaviour of the Bredburry Couple"), a wife attempts to sell her husband in the classified pages of a newspaper. *Va donc chez Törpe* (1961; "Go to the Torpe Establishment"; Eng. trans. *Chez Torpe,* 1964) tallies the suicides in an inn whose owner insists on breaking down her guests' defenses. Other plays include *Il faut passer par les nuages* (1964; "You Must Pass Through the Clouds"), and *Comment va le monde, môssieu? Il tourne, môssieu!* (1964; "How is the World, Mister? It's Turning, Mister!"). Structured around rapid, unexpected variations in mood and emotions, Billetdoux's plays are complex works, emphasizing social and philosophical arguments.

billfish, common name for several long-jawed fishes, including the gar, marlin, needlefish, sailfish, saury, and swordfish (*qq.v.*).

billiards, any of various games played with varying numbers of balls and a long stick called a cue on a rectangular table, traditionally slate-topped, covered with a smooth, tight-fitting cloth. Rubber-cushioned rails bordering the table are covered with the same cloth. Carom billiards, or French billiards (*q.v.*), is played on a table that has no pockets. Games such as English billiards, snooker, and pocket billiards (*qq.v.*) are played on a table that has six pockets, one at each corner and one at the centre of each long side.

The word billiards, applied to the game, is plural but construed as a singular; the true singular form is used only as a modifier, as in billiard ball. Billiard games have been most popular with the upper classes and the lower classes from early days. Players are either amateur or professional.

The origin of billiard games is uncertain but is usually placed in France about the mid-15th century. Analogies with such earlier non-table games as shuffleboard and *paille-maille* (pall-mall) are distant ones, nor does etymology offer much help. The modern word may come from the French word *billard,* diminutive *bille,* meaning a curved stick; but *bille* may also mean ball, deriving from Latin *pila.* The link from either is uncertain. Historical and literary references abound both in French and English during the 16th and 17th centuries. Mary, Queen of Scots, complained in 1576 that her billiard table had been taken from her during her captivity. Louis XIV of France was an avid player. The earliest game was played on a table with pockets; the carom game originated in the 18th century. The first description of the game in English was in Charles Cotton's *Compleat Gamester* (1674), by which time there were public as well as private tables. In the early days there were obstacles on the table, a vestigial remnant of which is the bumper pool table, a favorite in U.S. saloons in the second two-thirds of the 20th century. By the 18th century the cue had assumed its present form. Chalk applied to the end of the cue and the use of rubber in the rails of the table came into use in the 19th century. The traditional green cloth covering the table remained unvaried until the second half of the 20th century when a proliferation of tables in private homes persuaded designers to make decorative changes. Until late in the 19th century, balls were made of ivory, but synthetics later became more common.

Billiards is an internationally played family of games, French, or carom, billiards are played in continental Europe; English billiards and snooker are popular in Great Britain and the countries that were at one time part of the empire; and pocket billiards in its numerous varieties is popular in the United States and Japan. While billiard games have been known for centuries, competitive play arose relatively late. The world governing body for French billiards is the Union Mondiale de Billard, formed in 1959 as a confederation of national associations which conducts world championships. English billiards is governed by the Billiards Association and Control Council, an amalgamation in 1919 of the Billiards Association, formed in 1885 for amateurs and professionals, and the Billiard Control Club, formed in 1908 for amateurs. The Billiards Congress of America, formed in 1948, is one of several U.S. governing bodies, some of them restricted to pocket billiards and to three-cushion billiards.

See also balkline billiards; baseball; continuous pocket billiards; eight ball; fifteen ball; golf; pool; pyramids; rotation; straight-rail billiards; and three-cushion carom.

See also Sporting Record: *Billiards.*

Billingham, locality, Stockton-on-Tees district, county of Cleveland, northeastern England. Its industrial growth began with the building of the Port Clarence railway in 1833 to a deepwater site on the Tees for shipment of Durham coal. After World War I the heavy chemical industry developed as the result of an underlying field of salts, easy access to coal, and North Sea port facilities. From 1966 a large oil refinery on the reclaimed foreshore has added petrochemicals. The giant Imperial Chemical Industries concern employs most of the town's workers. Pop. (latest census) 32,139.

Billings, city, seat (1883) of Yellowstone County, south central Montana, U.S., on the Yellowstone River, 3,119 ft (951 m) above sea level. Established (1882) by the Northern Pacific Railway, it was named for Frederick Billings, the company's president. Prosperity, spurred by the railroad's arrival, collapsed after 1887 but was renewed after 1900 with the growing cattle industry and irrigated agriculture.

Billings is now the metropolis of the "Midland Empire," a rangeland and irrigated river valley region producing sugar beets and varied truck crops, wool, and livestock. Beet sugar and oil refining, meat-packing, and flour milling are important industries, and tourism contributes increasingly to the economy. Eastern Montana College (1927) and Rocky Mountain College (1947) are in the city. Billings is the headquarters for the Custer National Forest, containing Grasshopper Glacier, with millions of grasshoppers embedded in its ice. Pictograph Cave State Monument, 7 mi (11 km) southeast, contains prehistoric artifacts. Inc. 1885. Pop. (1980) city, 66,798; metropolitan area (SMSA), 84,328.

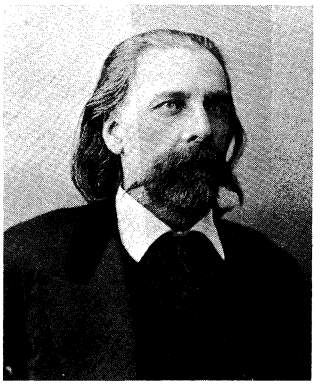
Harvesting sugar beets near Billings, Mont.
J. Mueller—Shostal/EB Inc.

Billings, John Shaw (b. April 12, 1838, Switzerland County, Ind., U.S.—d. March 11, 1913, New York City), surgeon and librarian whose organization of U.S. medical institutions played a central role in modernization of hospital care and maintenance of public health.

While on the staff of the U.S. surgeon general, Washington, D.C. (1864–95), Billings developed the library later known as the Army Medical Library. Under successive directors it grew into the Surgeon General's Library and ultimately the National Library of Medicine, the world's largest medical reference centre. His attempt to construct a logical classification system for the library resulted in his founding of the *Index Medicus* (1879), a monthly guide to current medical literature, and publication of the first edition of the *Index Catalogue,* 16 vol. (1880–95). The first of their kind, both indexes long remained predominant medical references, and the *Index Medicus* is still regarded as one of the primary medical bibliographies in the U.S.

Billings also designed and served as medical adviser to the Johns Hopkins Hospital, Baltimore, and administered national programs for collecting vital statistics. In the field of public health, he led a successful effort to eradicate yellow fever in the U.S. He spent the last 17 years of his life as the first director of the New York Public Library.

Billings, Josh, pseudonym of HENRY WHEELER SHAW (b. April 21, 1818, Lanesboro, Mass., U.S.—d. Oct. 14, 1885, Monterey, Calif.), U.S. humorist whose philosophical comments in plain language were widely popular after the Civil War through his newspaper pieces, books, and comic lectures. He employed the misspellings, hapless grammar, and hopeless logic then current among comic writers who assumed the role of cracker-barrel philosophers. His special contributions were his rustic aphorisms ("The biggest phool in this world haint bin born yet; thare iz plenty ov time yet") and his droll delineations of animal life.



Josh Billings, *c.* 1868
Lightfoot Collection

Expelled from Hamilton College, Clinton, N.Y., in his second year for removing the clapper from the chapel bell, he drifted about for some years in the West and Midwest before settling in Poughkeepsie, N.Y., in 1858 as an auctioneer and land dealer. He began writing when he was 45 but he became successful only when he adopted the misspelling vogue. His "Essa on the Muel" made him suddenly famous, and after joining the *New York Weekly* in 1867 he became a national idol. Some of his best work is in a 10-year series of *Josh Billings' Farmer's Allminax* he started in 1869 as a burlesque on *The Old Farmer's Almanac.* His other books were hasty collections of his newspaper writings, the most comprehensive being *Everybody's Friend* (1874).

Billings, William (b. Oct. 7, 1746, Boston—d. Sept. 26, 1800, Boston), foremost composer of the early U.S. primitive style, whose works have become an integral part of the U.S. folk tradition. A tanner by trade, he was self-taught in music and early declared his independence from all "rules" of composition. Among his friends were many prominent figures of the American Revolution, including Samuel Adams and Paul Revere.

Billings' compositions include hymns, psalms, anthems, and fuguing tunes (choral pieces beginning in chordal style, followed by melodic imitation). His music is noted for its rhythmic vitality, freshness, and straightforward harmonies. The emotions embodied in his music range from the exuberant glory of the anthem "The Lord Is Risen Indeed" and the profound grief of the anthem "David's Lamentation" to the buoyant humour of the secular song "Modern Music" and the austerity of the canon (round) "When Jesus Wept."

Once criticized for never including dissonance in his music, he composed "Jargon," a choral piece consisting entirely of dissonances, prefaced by a tongue in cheek dedication and hilarious performance directions. His patriotic hymn "Chester," to his own inflammatory text, became the unofficial hymn of the American Revolution; and his lyrical hymn "The Rose of Sharon," was one of the most popular of early U.S. hymns.

Billings was active as an itinerant singing master and was influential in furthering the singing school tradition of U.S. folk culture. Many of his hymns and fuguing tunes continue to be printed in the shape-note hymnals of the singing schools. (Shape notes, used in rural southern U.S. hymnbooks, show the pitch by their shape.) His six publications include *The New-England Psalm-Singer* (1770; the first collection entirely by a U.S. composer); *The Singing Master's Assistant* (1778; known as "Billings' Best"); and *The Continental Harmony* (1794).

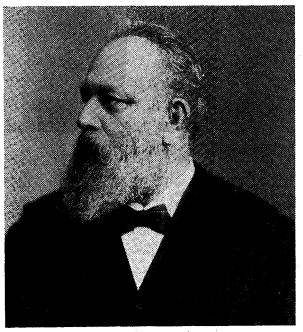
Billingsgate, market, until its closure in 1982 the oldest in London, situated at the north end of London Bridge, under the monument that commemorates the outbreak of the Great Fire of September 1666. Since the 16th century it had been principally a fish market, though most of the fish handled latterly was carried to and from the site by land. The market building now on the site was designed by Horace Jones and opened in 1877. Market activities were moved in 1982 to a large modernized warehouse (built 1915) in the Isle of Dogs (a southward-extending tongue of land in Tower Hamlets inner borough) overlooking the West India Dock near the River Thames. The word "Billingsgate" is derived from the coarse vituperative language for which the old fish market was famous.

Billiton, also spelled BELITUNG, BELITOENG, or BELITONG, island and *kabupaten* (regency), Sumatera Selatan *propinsi* (South Sumatra province), Indonesia. With 135 associated smaller islands, it lies between the South China and Java seas, southwest of Borneo and east of Palau (island) Bangka. The principal town, port, and site of the airport is Tanjungpandan on the western coast. With an area of 1,853 sq mi (4,800 sq km), it resembles Bangka in physical structure and products. Its coasts are sandy and marshy and studded with rocks and coral banks, but the tidal Sungai (river) Cerutuk is navigable for 7 mi (11 km). The highest point is Mt. Tanyem (1,673 ft [510 m]), but most of the land lies less than 130 ft above sea level. Groups of hills rise from flat or slightly undulating country, and in the central parts are treeless plains covered with cogon grass (used for thatching).

The island is important for its tin mines, discovered in 1851. At first exploited by a private Dutch company, later with participation of the government, and now by the Indonesian government, the mines are worked by labourers of Chinese descent. Most ore is taken from alluvial deposits, but there is some lode mining. The island was ceded to the British in 1812 by the Sultan of Palembang, Sumatra, but Britain recognized the Dutch claim in 1824. Pop. (1980) 163,815.

Billroth, (Christian Albert) Theodor (b. April 26, 1829, Bergen, Prussia—d. Feb. 6, 1894, Abbazia, Austria), Viennese surgeon, generally considered the founder of modern abdominal surgery.

While at the University of Zürich (1860–67), he published his classic *Allgemeine chirurgische Pathologie und Therapie* (1863; *General Surgical Pathology and Therapeutics*, 1871). Yet not until Billroth joined the faculty at the University of Vienna (1867–94), founding a surgical clinic in the city, did he begin making major contributions to the practice. He was a pioneer in the study of the bacterial causes of wound fever, as evidenced by *Untersuchungen über die Vegetationsformen von Coccobacteria*



Billroth, 1888
Archiv fur Kunst und Geschichte, West Berlin

septica (1874; "Investigations of the Vegetal Forms of *Coccobacteria septica*"), and was quick to use antiseptic techniques in his surgical practice. With the threat of fatal surgical infections eradicated through his work and others', Billroth proceeded to alter or remove organs that had previously been considered inaccessible. In 1872 he was first to remove a section of the esophagus, joining the remaining parts together; a year later he performed the first complete excision of a larynx.

By 1881 he had made intestinal surgery seem almost commonplace and was ready to attempt what appeared in his time as the most formidable abdominal operation conceivable: excision of a cancerous pylorus (the lower end of the stomach). His successful execution of the operation initiated the modern era of surgery.

He was also a man of strong artistic bent and was a lifelong friend of Johannes Brahms.

Billung DYNASTY, the primary ruling dynasty in Saxony in the 10th and 11th centuries. It was founded by Hermann Billung, who in 936 received from the German king Otto I a march (a border territory) on the lower Elbe River to be held against the pagan Slavic Wends. In 961 Otto granted Hermann the Saxon ducal title, which on his death (973) passed to his son and thereafter to his descendants, who continued the struggle against the Slavs.

Although the family extended its conquests toward the Oder River, thus preparing these territories for Christianization, their lands consisted of only the northeastern part of the former stem duchy of Saxony. Hermann's son Bernard I (died 1011) obtained guarantees of the special privileges and customs of the Saxons from Henry II; Bernard II (died 1059) obtained similar guarantees from Conrad II. Both Bernard II and his son Ordulf (died 1072) had to defend their territories against the encroachments of Adalbert, archbishop of Bremen. The family came to embody the Saxon national resentment to the Salian kings, Henry III and particularly Henry IV, who wished to reestablish royal authority in Saxony. In August 1106, with the death of Magnus Billung, the family died out.

Billy THE KID, byname of WILLIAM H. BONNEY, JR., original name HENRY MCCARTY? (b. Nov. 23, 1859, New York City—d. July 14, 1881, Fort Sumner, N.M., U.S.), one of the most notorious gunfighters of the American West, reputed to have killed at least 27 men before being gunned down at age 21.

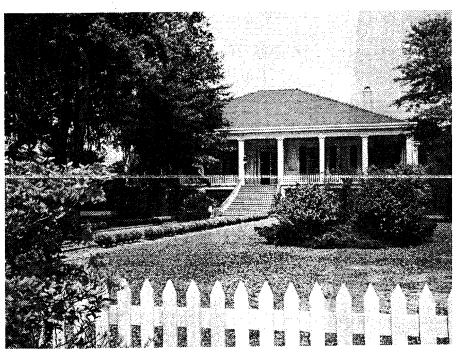
Born on New York City's East Side, Bonney as a child migrated with his parents to Kansas; his father died there, and the mother and her two boys moved to Colorado, where she remarried. The family moved to New Mexico, and, in his early teens, Billy fell into a career of thievery and lawlessness, wandering throughout the Southwest and northern Mexico, often with gangs. In December 1880 he was captured by Sheriff Patrick Floyd Garrett and stood trial for murder in Mesilla, N.M., in April 1881; he was found guilty and sentenced to hang. He escaped jail on April 30, however, killing two deputies, and remained at large until tracked down and ambushed by Garrett, who shot him dead on the evening of July 14 at the ranch home of Pete Maxwell.

As a child, Billy the Kid went under the name of Henry McCarty. Scholarly opinion is divided over whether that or William H. Bonney, Jr. (the name he used later, as in the trial), was his true name.

Billy Direct (foaled 1934), U.S. harness racehorse (Standardbred) who paced 1 mile in 1:55 on Sept. 28, 1938, establishing a world record that endured until 1960. Sired by Napoleon Direct out of Gay Forbes, he early showed exceptional speed despite his small size. During his years of competition (1936–39) he won 47 of 55 starts. After his retirement he became an outstanding studhorse; in 1952 one of his progeny, Direct Rhythm, paced 1 mile in 1:56⅕, the best pacing time since Billy Direct's record performance 14 years earlier.

Bilma, Saharan oasis about 300 mi (480 km) north of Lake Chad, in Agadez *département*, northeastern Niger, West Africa. It is 60 by 10 mi in extent. The evaporation of water in a number of lakes near this oasis yields large quantities of fine salt, the basis of an extensive trade. A small spring provides drinking water, but otherwise the area is surrounded by desert. In the early 1900s the area was claimed by both Turkey and France, but the French succeeded in occupying it, and the oasis became a part of Niger. Pop. (1977) 1,719.

Biloxi, city, coseat (with nearby Gulfport) of Harrison County, southeastern Mississippi, U.S., on a narrow Gulf Coast peninsula. In 1699 Pierre Le Moyne, sieur d'Iberville, planted the French flag across Biloxi Bay at Old Biloxi (now Ocean Springs; *q.v.*). The settlement there, at Ft. Maurepas, was the first capital (1699–1702) of Louisiana Territory. Ft. Louis, site of present-day Biloxi (founded 1719), was the capital (1720–22). The name, meaning "first people," refers to the Biloxi Indians. Since its founding, Biloxi has been under the flags of France, Spain, England, West Florida Republic, the Confederacy, and the U.S. During the Civil War, it submitted



Beauvoir, last home of Jefferson Davis, Biloxi, Miss.
Arthur Griffin—EB Inc.

to Federals from Ft. Massachusetts on Ship Island (12 mi [19 km] offshore and now part of the Gulf Islands National Seashore).

Seafood is Biloxi's chief industry, augmented by tourism and light industry including boatbuilding, fertilizer production, and wire making. The National Soldiers Home and Hospital and nearby Kessler Air Force Base are additional economic factors. Annual festivals include the blessing of the shrimp fleet, Biloxi Mardi Gras, and Spring Garden and Old Home Pilgrimage. Beauvoir, home of Jefferson Davis, where he spent the last 12 years of his life, is 5 mi west. Inc. village, 1872; city, 1896. Pop. (1980) 49,311.

Bilston enamelware, enameled products made in Bilston, Eng., which was one of the most prolific centres of enameling in the 18th century. A large number of enamelers worked in Bilston decorating small objects primarily by the transfer printing process. Bilston enamelware is often technically brilliant, displaying a great range of colours and ornament. It lacks, however, the finesse of Battersea enamelware (*q.v.*), produced in London between 1753 and 1756. It remains impossible to distinguish between the products of the various Bilston enterprises.

bimah, also spelled BIMA, also called ALMEMAR, or ALMEMOR (from Arabic *al-minbar,* "platform"), in Jewish synagogues, a raised platform with a reading desk from which, in the Ashkenazi (German) ritual, the Torah and Haftarah (a reading from the prophets) are read on the sabbath and festivals. In the Sephardic (Spanish) rite, the entire service is conducted from a platform called a *teba* ("box"). At an earlier date, when the bimah was positioned in the centre of the synagogue (as it still is in Sephardic and many Orthodox Ashkenazi synagogues), the attention of the congregation was divided between it and the Ark of the Law. Though Maimonides and others insisted on this location in the Middle Ages, many modern synagogues now place the bimah in front of the Ark. This arrangement conserves space, facilitates listening, and is, some feel, architecturally more pleasing.

bimetallism, monetary standard or system based upon the use of two metals, traditionally gold and silver, rather than one (monometallism). The typical bimetallic system of the 19th century defined the monetary unit of a nation by law in terms of fixed quantities of gold and silver (thus automatically establishing a rate of exchange between the two metals). The system also provided a free and unlimited market for the two metals, imposed no restrictions on the use and coinage of either metal, and made all other money in circulation redeemable in either gold or silver. One of the major problems in the international use of bimetallism arose from the fact that with each nation independently setting its own rate of exchange between the two metals, the resulting rates often differed widely from country to country.

In an attempt to establish the bimetallic system on an international scale, France, Belgium, Italy, and Switzerland formed the Latin Monetary Union in 1865. The union established a mint ratio between the two metals and provided for use of the same standard units and issuance of coins. The system was undermined by the monetary manipulations of Italy and Greece (which had been admitted later) and came to a speedy end with the Franco-German War (1870–71). The future of the bimetallic standard apparently had been sealed at an international monetary conference held in Paris in 1867, when most of the delegates voted for the gold standard.

Supporters of bimetallism offer three arguments for it: (1) the combination of two metals can provide greater monetary reserves; (2) greater price stability will result from the larger monetary base; and (3) greater ease in the determination and stabilization of exchange rates among countries using gold, silver, or bimetallic standards will result.

Arguments advanced against bimetallism are: (1) it is practically impossible for a single nation to use such a standard without having international cooperation; (2) such a system is wasteful in that the mining, handling, and coinage of two metals is more costly; (3) because price stability is dependent on more than the type of monetary base, bimetallism does not provide greater stability of prices; and (4) most importantly, bimetallism in effect freezes the ratio of the prices of the two metals without regard to changes in their demand and supply conditions. Such changes can disrupt attempts to maintain the double standard. *See also* Gresham's law.

binary form, in music, the structural pattern of many songs and instrumental pieces, primarily from the 17th to the 19th century, characterized by two complementary, related sections of more or less equal duration that may be represented schematically as *ab*. In 18th-century compositions, including dance-inspired movements by J.S. Bach and keyboard sonatas by Domenico Scarlatti, the two sections are separated by double bars with repeat signs, so that a proper performance actually yields an *aabb* structure.

The first section of a binary composition in a major key typically modulates to the dominant, thus displacing the center of harmonic gravity to the fifth degree above the tonic: compositions in minor keys similarly modulate to the relative major (*i.e.,* the major key centred on the third degree above the tonic). The second section begins in the new key and, after thriving for a period on the harmonic thus generated, returns to the home key. Binary structures, though not necessarily monothematic, tend to rely on closely linked melodic-rhythmic materials.

In the "rounded" binary form, as exemplified by many of Scarlatti's sonatas, the second section returns rather quickly to both the original key and the melodic-rhythmic features of substantial portions of the first section. By the same token, binary organization of this sort begins to approximate the ternary outline of many later 18th- and 19th-century pieces.

binary number system, in mathematics, positional numeral system employing 2 as the base and requiring only two different symbols, 0 and 1. The importance of the binary system to information theory and computer technology derives mainly from its convenience in representing systems that are of two-state or bistable nature—such as "on-off," "open-closed," "go-no go." *See* number system.

binary star, also called DOUBLE STAR, pair of stars in orbit around their common centre of gravity. A high proportion, perhaps one-half, of all stars in the Earth's Galaxy are binaries or members of more complex multiple systems. Some binaries form an important class of variable stars (*see* eclipsing variable star).

If the images of the two components of a binary star system can be separated by telescope, it is called a visual binary. Stars whose components are too close to each other to be distinguished visually can sometimes be identified as binaries by spectroscopic observation; as the members of these spectroscopic binaries move alternately toward the Earth and away from it, a Doppler effect of frequency change is observed in their spectral lines. Some stellar systems with so-called invisible companions are binaries; these companions can be detected through changes in the proper motion—that is, the rate of motion of the visible stars across the background of more distant stars.

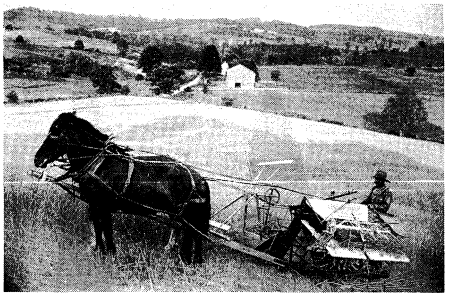
Binche, town, Hainaut province, Belgium, 15 mi (24 km) southwest of Mons. Situated on a hill, Binche remains encircled by fortifications built in the 12th century and flanked by 27 towers. Its town hall was constructed in the second half of the 14th century and restored in the 16th century by Jacques de Broeucq. In 1545 Mary of Hungary, regent of the Netherlands and sister to Charles V (Holy Roman emperor and king of Spain), demolished part of Binche's fortifications to build her palace. It was there in 1549 that she held a great fete to celebrate the Spanish conquest of Peru. The ramparts and the town suffered at the hands of the French in 1554 and 1675.

Now a centre of the confectionary and fashion industries, Binche is most famous for its Shrove Tuesday carnival. The costume of the *Gilles* (clowns), unique in Europe to Binche's carnival, may derive from that of Peruvian Incas. Pop. (1983 est.) mun., 33,298.

Binchois, Gilles (Egidius), Binchois also spelled DE BINCHE (b. *c.* 1400, Mons, Hainaut—d. Sept. 20, 1460, near Mons), Flemish composer of church music and of secular chansons which were among the finest of their genre, being notable for their elegance of line and grave sweetness of expression.

Binchois was in Paris in 1424 serving William de la Pole, earl of Suffolk, and returned with him to Hainaut in 1425. In 1430 Binchois joined the chapel of Philip the Good of Burgundy, where he remained until his death, eventually becoming second chaplain and cantor. By 1437 Binchois had become canon at Mons, Soignies, and Cassel. In both his sacred and secular music Binchois cultivated the gently subtle rhythm, the suavely graceful melody, and the smooth treatment of dissonance of his English contemporaries. Some of Binchois's church music is related to English liturgical use, and his techniques in these works have English affiliations.

binder, machine for cutting grain and binding it into bundles, once widely used to cut small grain such as wheat. The first patent was issued on a self-tie binder in 1850. The horse-drawn twine binder, first marketed in 1880, remained the chief method of harvesting small grain during the early decades of the 20th century. The mechanical twine knotter



Binder in early 1900s

By courtesy of the State Historical Society of Wisconsin

was patented in 1892. Along with the header, which cut off the heads of grain and elevated them into a wagon for later threshing, the binder was standard harvesting equipment in the wheat-producing areas of the United States and Canada until the grain combine was adopted in the 1930s. Binders, using twine, not wire, were still used in the late 20th century to a limited extent on small farms.

binding: *see* bookbinding.

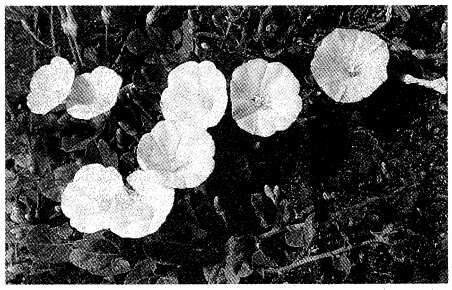
binding energy, amount of energy required to separate a particle from a system of particles or to disperse all the particles of the system. Binding energy is especially applicable to subatomic particles in atomic nuclei, to electrons bound to nuclei in atoms, and to atoms and ions bound together in crystals.

Nuclear binding energy is the energy required

to separate an atomic nucleus completely into its constituent protons and neutrons, or, equivalently, the energy that would be liberated by combining individual protons and neutrons into a single nucleus. The hydrogen-2 nucleus, for example, composed of one proton and one neutron, can be separated completely by supplying 2.23 million electron volts (MeV) of energy. Conversely, when a slowly moving neutron and proton combine to form a hydrogen-2 nucleus, 2.23 MeV are liberated in the form of gamma radiation. The total mass of the bound particles is less than the sum of the masses of the separate particles by an amount equivalent (as expressed in Einstein's mass–energy equation) to the binding energy.

Electron binding energy, also called ionization potential, is the energy required to remove an electron from an atom, a molecule, or an ion. In general, the binding energy of a single proton or neutron in a nucleus is approximately a million times greater than the binding energy of a single electron in an atom.

bindweed, plants of the closely related genera *Convolvulus* and *Calystegia,* mostly twining, often weedy, and producing handsome



Field bindweed (*Convolvulus arvensis*)
Kitty Kohout from Root Resources—EB Inc.

white, pink, or blue, funnel-shaped flowers. Bellbine, or greater bindweed (*Calystegia sepium*), native in Eurasia and North America, bears arrow-shaped leaves and white to pink, 5-centimetre (2-inch) flowers. This twining perennial grows from creeping, underground stems and is common in hedges, woods, and along roadsides. Its range tends to coincide with that of its principal pollinator, the hawkmoth. Sea bindweed (*C. soldanella*), with fleshy, kidney-shaped leaves and deep pink, 5-cm blooms, creeps along European seaside sand and gravel. Several *Convolvulus* species are widespread or conspicuous. The weedy, perennial field bindweed (*C. arvensis*), which is European but widely naturalized in North America, twines around crop plants and along roadsides. It bears long-stalked clusters of fragrant pink, white, or striped blooms, 2 cm across, among arrow-shaped leaves. Scammony, a purgative, is derived from the rhizomes of *C. scammonia,* a trailing perennial with white to pink flowers, native in western Asia. Rosewood oil comes from certain species of *Convolvulus.*

Binet, Alfred (b. July 8, 1857, Nice, Fr.—d. Oct. 18, 1911, Paris), French psychologist who played a dominant role in the development of experimental psychology in France and who made fundamental contributions to the measurement of intelligence.

Fascinated by the work of the French neurologist Jean Charcot on hypnosis at the Salpêtrière Hospital, Paris, Binet abandoned a law career in 1878 to devote himself to medico-scientific studies at the hospital, remaining until 1891. He then became associated with a research laboratory at the Sorbonne (1891) and served as its director from 1895 to 1911. Seeing little value in German laboratory research of sensation and perception, he sought to develop experimental techniques to measure reasoning ability and other higher mental processes, devising techniques using paper, pencil, pictures, and portable objects. In 1895 he founded the journal *L'Année Psychologique,* the first French journal devoted to psychology. About the same time he opened a Paris laboratory for child study and experimental teaching.

Impressed by the attempt of the English psychologist Sir Francis Galton to record individual differences by means of standardized tests, Binet adapted the method to studies of eminent writers, artists, mathematicians, and chess players, often supplementing the more formal tests with observations on body type, handwriting, and other characteristics. A notable work was *L'Étude expérimentale de l'intelligence* (1903; "Experimental Study of Intelligence"), an investigation of the mental characteristics of his two daughters, which he developed into a systematic study of two contrasted types of personalities. Between 1905 and 1911 he and Theodore Simon developed highly influential scales for the measurement of intelligence of children. Binet also published works on suggestibility (1900) and hysteria (1910) and was working on a revision of his scales at the time of his death.

Bing, Sir Rudolph (b. Jan. 9, 1902, Vienna), British operatic impresario who oversaw the Metropolitan Opera in New York City for 22 years (1950–72) as general manager.

The son of an Austrian industrialist, Bing grew up in a musical household and studied at the University of Vienna. He first worked in theatrical agencies casting singers for opera houses. From 1928 to 1935 he assisted Carl Ebert in managing opera companies in Germany and England. In 1935 Bing was appointed general manager of the Glyndebourne Opera Company. In 1947 he helped found the Edinburgh Festival, establishing it as a major European festival.

Three years later Bing was appointed general manager of the Metropolitan Opera Company in New York City. During Bing's tenure he improved standards of performance and production and was especially praised for his attention to scenic design. He shaped the repertoire to ensure success at the box office and was therefore often criticized for his musical taste: Italian Romantic operas became the mainstay, while Baroque and 20th-century works were rarely programmed. He concentrated on attracting singers of international fame but neglected to retain conductors of equal stature, which resulted in some lacklustre performances. Bing's imperious and autocratic manner contributed to the conflicts that flared during his successful and tempestuous career at the Met.

Bing was knighted in 1971 and wrote two memoirs, *5,000 Nights at the Opera* (1972) and *A Knight at the Opera* (1981).

Bing Xin, Wade–Giles romanization PING HSIN (Chinese: "Pure in Heart"), pseudonym of HSIEH WAN-YING (b. Oct. 5, 1900, Minhou, Fukien Province, China), Chinese writer of sentimental stories and poems that enjoyed great popularity in the early 1920s.

Bing Xin studied the Chinese Classics and began writing traditional Chinese stories as a child, but her conversion to Christianity and her attendance at an American school in Peking soon were reflected in a didactic and Western influence in her writing. The short stories and poems that Bing Xin published during her college years at Yen-ching University—lyrical pieces about childhood and nature—won her instant fame and a grant to study at Wellesley College in the United States, where she received an M.A. degree in 1926.

After she returned to China, Bing Xin married Wu Wen-tsao, whom she had met in the United States. She continued to write throughout the 1940s and 1950s, producing such works as *Hsü chi hsiao-tu-che* ("More Letters to Young Readers"), *Kuan-yü nü-jen* (1943; "About Women"), *T'ao Ch'i te shu-ch'i jih-ch'i* ("T'ao Ch'i's Summer Schedule"), and *Shih-sui hsiao-ch'a* ("Miscellaneous Essays"), a volume of essays written between 1959 and 1964. Bing Xin wrote little after the early 1960s, but she became very active in cultural affairs under the Communist government, especially in children's literature.

Bingen, city, Rheinland-Pfalz *Land* (Rhineland-Palatinate state), southwestern West Germany. Bingen is a port at the confluence of the Rhine and Nahe rivers, near the whirlpool known as Binger Loch. It originated as the Roman fortress of Bingium and later became an imperial free city, joining the Hanseatic League in 1254. The archbishop-electors of Mainz held the town from 1281 until it fell to Hessen in 1803, after the secularization of the electorate. The Nahe bridge and Klopp Castle (destroyed 1689, restored 1854) are built on Roman foundations, and the local museum has a display of Roman surgical instruments. Other historic buildings are St. Martin's Church (1403), St. Rochus Chapel (built in thanksgiving for deliverance from the plague of 1666), and the well-known Mäuseturm (Mouse Tower) on a rock in the Rhine where, according to Saxon legend, Archbishop Hatto I of Mainz was gnawed to death by mice in 913 for wrongdoing. Now a rail junction and tourist centre, Bingen is an old-established centre of the wine trade. Pop. (1983 est.) 23,110.

Bingerville, town, Abidjan *département,* southeastern Ivory Coast, on the Ébrié Lagoon. Named for Capt. Louis-Gustave Binger, first governor of the French Ivory Coast colony, the town was the colonial capital from 1900 to 1934. Formerly a trade centre among the Ebrie (Kyama) people, it is now the site of agricultural research stations for oil palm, coffee and cacao, and livestock. Pineapples and avocados are among the crops grown. Bingerville also has two schools of agriculture, an experimental garden, a school of art, a military-technical school, the only centre for orphans in the country, and a psychiatric hospital. Pop. (1975) 12,527.

Bingham, George Caleb (b. March 20, 1811, Augusta County, Va., U.S.—d. July 7, 1879, Kansas City, Mo.), American frontier politician and painter noted for his landscapes, portraits, and especially for his representations of Midwestern river life.

In 1819 Bingham's family moved to Franklin, Mo., on the Lewis and Clark trail, where he grew up and became an itinerant preacher and portrait painter. Except for three months of study at the Pennsylvania Academy of the Fine Arts, Bingham was self-taught.

After his brief stay in Philadelphia, where he studied paintings by Benjamin West, Thomas

"Fur Traders Descending the Missouri," oil on canvas by George Caleb Bingham, 1845; in the Metropolitan Museum of Art, New York City
By courtesy of the Metropolitan Museum of Art, New York, Morris K. Jesup Fund, 1933

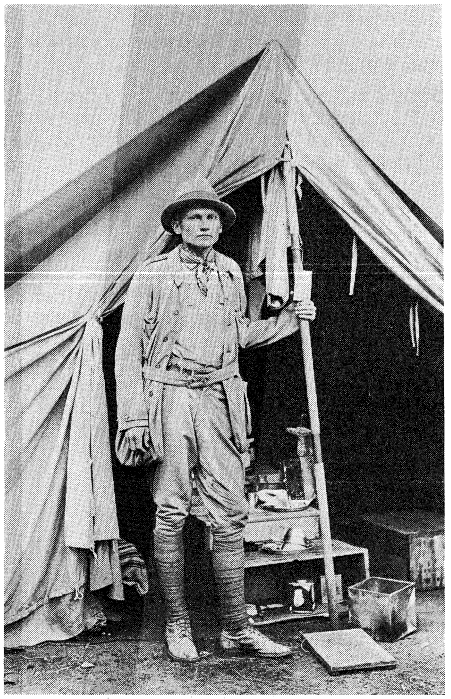
Lawrence, and Thomas Sully, he returned to Missouri and entered politics. He continued to paint, however, and his most mature works date from this period. In such works as the "County Election" (1851–52; St. Louis Art Museum) and the "Verdict of the People" (1855; Boatmen's National Bank, St. Louis), Bingham has left a vivid account of the rough and lively political life of the frontier. These works display his facility for incisive characterization as well as his talent for clearly organizing large, dense compositions.

Among Bingham's most memorable works are scenes of river life. His "Jolly Flatboatmen in Port" (1857; St. Louis Art Museum) shows his continued preference for compositions crowded with lively figures. But, in his "Raftsmen Playing Cards" (1847; St. Louis Art Museum), the number of figures is greatly reduced and the composition is more static; and the sweeping view of the mist-covered river shows his growing ability to manipulate space and light to heighten the mood of the picture, a quality exemplified in the well-known "Fur Traders Descending the Missouri" (*c.* 1845; Metropolitan Museum of Art, New York City).

In 1856 Bingham visited Germany to study the masters of the Düsseldorf school, a group of painters whose work is characterized by sentimentality and careful attention to detail. Influenced by the paintings he saw there, he altered his style and lost the directness and integrity he had achieved in earlier works. In 1875 he was appointed adjutant general of Missouri, and his activity as a painter decreased. During the last two years of his life he taught at the University of Missouri, Columbia.

Bingham, George Charles: *see* Lucan, George Charles Bingham, 3rd earl of.

Bingham, Hiram (b. Nov. 19, 1875, Honolulu—d. June 6, 1956, Washington, D.C.), American archaeologist and politician who



Hiram Bingham at Machu Picchu, 1912
Yale University Peabody Museum of Natural History

in 1911 located the "lost city of the Incas," Machu Picchu, in a nearly inaccessible part of the Peruvian Andes.

As a boy Bingham learned mountaineering from his father, a well-known Pacific missionary. This skill vastly aided his Inca research. In 1906, seeking to enhance his ability to teach Latin-American history, he traveled the Andean route taken in 1819 by Simón Bolívar from Venezuela to Colombia. In 1908 he followed the old Spanish trade route through the Andes from Buenos Aires to Lima, Peru.

Bingham was a member of the history faculty at Yale University from 1909 until 1924. In 1911 he directed the Yale archaeological expedition whose main objective was to find Machu Picchu. Prospects for locating it were poor: not even the Spanish conquistadores had discovered it. It was believed to be situated somewhere near Cuzco, Peru, where the problems of crossing the Andes were formidable. Clues from early chronicles of the Incas were scanty. The expedition owed its success largely to Bingham's steadfastness and courage. He visited several Inca sites, sometimes risking his life to do so.

On July 24 he reached the fortress city of Machu Picchu. There he found well-preserved stonework remains and was particularly struck by the similarity of one of the structures to the Temple of the Sun at Cuzco. In August he found another important Inca site, Vitcos. In 1912 he led the expedition that excavated Machu Picchu. His publications on South America include *Inca Land* (1922), *Machu Picchu* (1930), and *Lost City of the Incas* (1948).

He entered politics and was elected lieutenant governor of Connecticut (1922–24). After winning the governorship in 1924, he almost immediately resigned to fill a vacancy in the U.S. Senate. He was reelected to a full term in 1926, after which he devoted himself to business interests. In 1951 he was appointed to the Civil Service Loyalty Review Board by Pres. Harry S. Truman and helped investigate controversial cases of suspected subversion in the State Department.

Binghamton, city, seat (1806) of Broome County, south central New York, U.S. It lies at the confluence of the Chenango and Susquehanna rivers, near the Pennsylvania border, 75 miles (121 km) south of Syracuse. With Johnson City and Endicott, it forms the Triple Cities. Settled in 1787 at the site of an Iroquois village (Ochenang), it was first known as Chenango Point and was later named for William Bingham, who owned land tracts on both sides of the Susquehanna. Laid out in 1800, the village prospered after the Chenango and Erie canals were linked in 1837 and the Erie Railroad arrived in 1848. Its transportation advantages encouraged industrial development. Leading manufactures of the area include shoes, textiles, photo supplies, machinery, electronic equipment, computers, and cosmetics. Dairy, livestock, and poultry industries and ski resorts augment the economy. In 1946 Broome Community College and the State University of New York at Binghamton were opened. The city's Roberson Center is a museum complex (arts, science, history) and includes a planetarium and civic theatre. Inc. village, 1834; city, 1867. Pop. (1984 est.) 54,501.

bingo, also called LOTTO, game of chance using cards on which there is a grid of numbers, a row of which constitute a win when they have been chosen at random. Bingo is one of the most popular forms of low-priced gambling in the world.

To play bingo, which is a form of lottery, each player purchases one or more cards divided into numbered and blank squares. Randomly chosen numbers, usually up to 75 or 90, are called out by a "banker." The first player to achieve a card (or a line) in which all of the numbers have been called shouts "bingo" or "house" and collects the entire stake money, usually less a specified percentage, if that is permitted by local law. In another popular variation, the central square on the card is free, and the first player on whose card five of the called numbers appear in a row—vertically, horizontally, or diagonally—is the winner. The prize (jackpot) may amount to thousands of dollars. Bingo is legal in most U.S. states that prohibit other forms of gambling. It is permitted in Ireland when the profits are for charity; and it is closely regulated in the United Kingdom, where lotto halls were subjected to a tax in 1966.

Bingo card
By courtesy of the Mar Matic Sales Company, Inc.

Bingo has had many names and variations. The earliest name, lotto (or loto), a children's game, was first recorded in 1778. The original American form, called keno, kino, or po-keno, dates from the early 19th century. The only form of gambling permitted in the British armed services, the game is called in the Royal Navy tombola (1880) and in the Army, house (1900), or housy-housy. Other American names are beano, lucky, radio, and fortune. At the height of its popularity during the Great Depression of the 1930s, a variant (often called screeno) was played in motion-picture theatres, with one night in the week designated bank night, when patrons received free bingo cards with their admission tickets; prizes amounted to hundreds of dollars in cash or merchandise.

Bingo has been played enthusiastically in Japan and has even been introduced at the casino in Monte-Carlo. In Great Britain the game received its greatest impetus when the Betting and Gaming Act of 1960 permitted the formation of a large number of commercial lotto clubs. Within a few years, the game achieved a popularity equaling or exceeding that which it had formerly enjoyed in the United States.

Bingöl, formerly ÇAPAKÇUR, city in eastern Turkey, lying along the Göniksuyu, a tributary of the Murat River. It is a market for grain, livestock, and livestock products of the area. The city takes its name (*bin,* "thousand," *göl,* "lakes") from numerous small lakes that dot the Bingöl Mountains to the northeast. Bingöl suffered heavy damage by earthquake in 1966. The city is linked by main roads with Elâzığ to the east and Muş to the west.

The surrounding area is drained by the Murat River and its tributaries and is largely mountainous. Croplands are scarce, and livestock raising is the main activity. Many of the people are Kurds. Once part of the Assyrian Empire, the region was added to the Ottoman Empire in the early 16th century. Pop. (1980) city, 27,137.

Bini (people): *see* Edo.

Binkis, Kazys (b. Nov. 4, 1893, Gudeliai, Russian Lithuania—d. April 27, 1942, Kaunas, Lithuanian S.S.R.), poet who led the

"Four Winds" literary movement, which introduced Futurism into Lithuania.

From 1920 to 1923 Binkis studied literature and philosophy in Berlin, where he became acquainted with the newest trends in western European literature. The poems he wrote during his connection with the "Four Winds" movement, published in *Simtas pavasarių* (1926; "One Hundred Springs"), caused a sensation because of their break with traditional forms. His best work, however, was done mainly before World War I and is contained in his first collection of verse, *Eilėraščiai* (1920; "Poems"). A poet of rare talents in Lithuanian literature, he wrote lyric poetry with an effortless, soaring quality.

In 1927 Binkis turned from Futuristic poetry to humorous pieces in verse, with themes drawn from Lithuanian country life. They were published in provincial newspapers and became immensely popular. He also wrote a number of successful children's books, edited several anthologies of poetry, and wrote two successful plays: *Atžalynas* (1938; "The Younger Generation") and *Generalinė repeticija* ("General Rehearsal"), first performed in 1948 in Germany, published in 1958 in Lithuania, and first performed there in 1959.

Binney, Horace (b. Jan. 4, 1780, Philadelphia—d. Aug. 12, 1875, Philadelphia), American lawyer and politician who established the legality of charitable trusts in the United States.

Binney graduated from Harvard in 1797 and was admitted to the bar in 1800. He became an expert on marine-insurance and land-title law, and from 1809 to 1814 he published six volumes of authoritative court reports of cases heard in the state Supreme Court of Pennsylvania. By 1820 Binney had become the acknowledged leader of the Pennsylvania bar, but he declined repeated offers of judgeships in the state and federal courts. He served in the U.S. House of Representatives for one term from 1833.

One of Binney's two most important legal cases was *Lyle* v. *Richards* (1823), in which his arguments established the common-law basis of real property in the United States. His second landmark case was *Vidal et al* v. *Philadelphia et al* (1844). In this case he successfully opposed Daniel Webster before the U.S. Supreme Court in arguing the city of Philadelphia's right to carry out a charitable trust created by Stephen Girard for the founding of a school for orphans. Binney gave up his legal practice in 1850 and thereafter spent his time writing. During the American Civil War he wrote three memorable pamphlets defending President Lincoln's suspension of the writ of habeas corpus during that conflict.

Binney, Thomas (b. 1798, Newcastle upon Tyne, Northumberland, Eng.—d. Feb. 24, 1874, London), English Congregational minister who actively sought reunion with the Church of England. He brought his chapel services closer to those of the established church by introducing the chanting of psalms taken from the Authorized Version of the Bible.

Binnig, Gerd (b. July 20, 1947, Frankfurt am Main, W.Ger.), German-born physicist who shared with Heinrich Rohrer (*q.v.*) half of the 1986 Nobel Prize for Physics for their invention of the scanning tunneling microscope. (Ernst Ruska won the other half of the prize.)

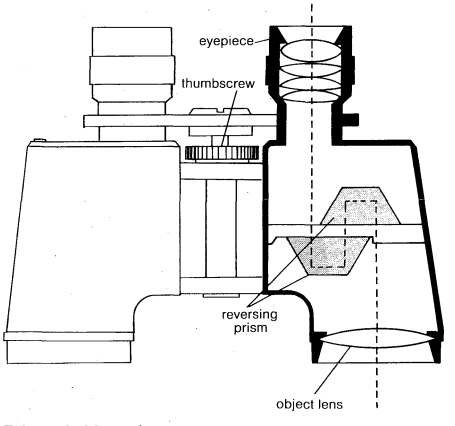
Binnig graduated from Johann Wolfgang Goethe University in Frankfurt and received a Ph.D. from the University of Frankfurt in 1978. He then joined the IBM Research Laboratory in Zurich, where he and Rohrer designed and built the first scanning tunneling microscope (STM). This instrument produces images of the surfaces of conducting or semiconducting materials in such fine detail that individual atoms can be clearly identified. Quantum mechanical effects cause an electric current to pass between the extremely fine tip of the STM's tungsten probe and the surface being studied, and the distance between the probe and the surface is kept constant by measuring the current produced and adjusting the probe's height accordingly. By recording the varying elevations of the probe, a topographical map of the surface is obtained on which the contour intervals are so small that individual atoms are clearly recognizable. The tip of the STM's probe is only about one angstrom wide (one ten-billionth of a metre, or about the width of an atom), and the distance between it and the surface being studied is only about 5 or 10 angstroms.

Binnya Dala (d. 1774), last king (reigned 1747–57) of Pegu in Lower Burma, whose independence from the northern Burmese was revived briefly between 1740 and 1757.

In 1747 Binnya Dala succeeded Smim Htaw Buddhaketi, who had seven years earlier been set up as king of the Mon in the new capital of Pegu after their successful revolt against the Burmese. Binnya Dala, who was his predecessor's chief minister and a more capable military leader, made numerous raids into Upper Burma, penetrating beyond Ava, the capital. In 1751 he raised a large army for the conquest of Upper Burma, capturing Ava in April 1752. Two years later he executed the last king of the Toungoo dynasty, which had been founded in 1486.

Binnya Dala was eventually deposed by Alaungpaya, the founder of the Burmese Alaungpaya dynasty, who captured Pegu in 1757. He was kept captive and was executed by Alaungpaya's son, Hsinbyushin, in 1774.

binocular, optical instrument for providing a magnified view of distant objects, consisting of two similar telescopes, one for each eye, mounted on a single frame. A single thumbscrew may control the focus of both telescopes



Prismatic binoculars
By courtesy of Bausch and Lomb

simultaneously, and provision may be made for focusing each separately to allow for varying characteristics in the two eyes.

In most binoculars, each telescope is provided with two prisms. The prisms reinvert the inverted image provided by the ocular, or eyepiece, of each telescope. They prescribe a folded path for the light rays, allowing a shorter overall length for the instrument. The prisms also provide better stereoscopic effect—that is, depth perception at greater distances—by allowing the two objectives (object lenses) to be set farther apart than the eyepieces. The arrangement of these prisms and the other optical components is shown in the illustration.

Binoculars are commonly designated as 6 × 30, 7 × 50, or 8 × 30. The first number indicates the magnification and the second the diameter of the objective lens in millimetres (one inch is about 25 millimetres). This latter figure is a measure of the light-gathering power of the instrument.

In applications in which depth perception is not essential, a single telescope, called a monocular, may be employed. It is essentially one-half of a pair of binoculars.

Opera glasses are binoculars with simple, inexpensive lens systems and narrow fields of view and are usually made with magnifications of only 2½ to 4. The lenses used in most binoculars are coated to prevent reflections.

binomial nomenclature (biology): *see* nomenclature.

binomial theorem, statement that, for any positive integer n, the nth power of the sum of two numbers a and b may be expressed as the sum of $n + 1$ terms of the form

$$\binom{n}{r} a^{n-r} b^r ;$$

in the sequence of terms, the index r takes on the successive values 0, 1, 2, . . . , n. The coefficients, called the binomial coefficients, are defined by the formula

$$\binom{n}{r} = n!/(n-r)!r! ,$$

in which n! (called n factorial) is the product of the array often called Pascal's triangle:

```
          1
        1   1
      1   2   1
    1   3   3   1
  1   4   6   4   1
```

Isaac Newton stated in 1676, without proof, the general form of the theorem (for arbitrary values of n), although mathematicians had been aware of simple cases long before his time. A proof by Jakob Bernoulli was published in 1713, after Bernoulli's death.

Binswanger, Ludwig (b. April 13, 1881, Kreuzlingen, Switz.—d. Feb. 5, 1966, Kreuzlingen), Swiss psychiatrist and writer who applied the principles of existential Phenomenology, especially as expressed by Martin Heidegger, to psychotherapy. Diagnosing certain psychic abnormalities (*e.g.*, elation fixation, eccentricity, and mannerism) to be the effect of the patient's distorted self-image and his inadequate relation to the world, he developed a form of psychoanalysis to establish the patient's consciousness of self as a total person, uniquely existing in and communicating with the concrete world as it is. Among his important writings are *Grundformen und Erkenntnis menschlichen Daseins* (1962; abridged Eng. trans., *Being-in-the-world*) and *Erinnerung an Sigmund Freud* (1956; *Sigmund Freud: Reminiscences of a Friendship*).

binturong (*Arctictis binturong*), catlike carnivore of the civet family (Viverridae), found in dense forests of southern Asia, Indonesia, and Malaysia. It has long, shaggy hair, tufted ears, and a long, bushy, prehensile tail. The colour generally is black with a sprinkling of whitish

Binturong (*Arctictis binturong*)
Philip Wayre—EB Inc.

hairs. The head and body measure about 60–95 centimetres (24–38 inches) and the tail an additional 55–90 cm (22–35 in.); weight ranges from about 9 to 14 kilograms (20 to 31

pounds). The binturong is principally nocturnal and arboreal in habit, using its prehensile tail as an aid in climbing. It apparently feeds mainly on fruit but also takes eggs and small animals. In some areas it is tamed and is reported to make an affectionate pet.

Binxian (China): *see* Pin-hsien.

Binyon, (Robert) Laurence (b. April 10, 1869, Lancaster, Lancashire, Eng.—d. March 10, 1943, Reading, Berkshire), English poet, dramatist, and art historian, a pioneer in the European study of Far Eastern painting.

The son of a clergyman, Binyon was educated at St. Paul's School, London. At Trinity College, Oxford, he won the Newdigate

Binyon, pencil drawing by William Strang, 1901; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Prize for his poem *Persephone* (1890). He combined his lifelong interests—books and painting—when in 1893 he began work at the British Museum, London, where later he was in charge of Oriental prints and drawings. His first book on Oriental art was *Painting in the Far East* (1908), which is still a classic. His later books on art included *The Flight of the Dragon* (1911) and *The Spirit of Man in Asian Art* (1935), as well as writings on English watercolours.

World War I came as a devastating experience, and Binyon's poem "For the Fallen" (1914) won immediate recognition as the expression of the feelings of a disillusioned generation. The poem was set to music by Sir Edward Elgar. His best poetry, though written after the war, employed the diction traditional in the prewar years. *Collected Poems* appeared in 1931. He was also concerned with the revival of verse drama; his works in that form included *Attila* (1907), *Arthur* (1923), and *The Young King* (1934). His verse translation of Dante's *Divine Comedy* was published in three parts in 1933, 1938, and 1943.

Bío-Bío, *región,* central Chile, bordering Argentina to the east and fronting the Pacific Ocean to the west. It was given its present boundaries in 1974. Its area of 14,262 square miles (36,939 square km) includes the *provincias* of Ñuble, Concepción, Arauco, and Bío-Bío. The islands of Santa María, in the Bay of Arauco, and Mocha, 14 miles (23 km) offshore, are part of Arauco *provincia.* Bío-Bío *región* spans the coastal mountain range, the cool, fertile Central Valley, and the Andean cordillera. Bío-Bío *región* is drained in the north by the northwestward-flowing Itata River and its main tributary, the Ñuble River, and in the south by one of Chile's major rivers, the Bío-Bío, and its principal tributary, the Laja River.

When the Spaniards attempted to conquer the southern half of the *región* (the present *provincias* of Arauco and Bío-Bío), it was skillfully defended by the Araucanian Indians, who fiercely resisted the Spaniards near the town of Cañete in the 16th century. Not until the 1860s, some 50 years after Chile gained its independence from Spain, did the Chilean army pacify the Indians in this part of Araucanía. Only then was this Frontera (Frontier) territory widely settled, primarily by European immigrants but also by Chileans.

Most of the population is in the rural areas, and the *region*'s economy is based upon diversified crops, timber trees, and mineral wealth. The chief crops are wheat, wine grapes, sugar beets, corn (maize), oats, and vegetables, cultivated in the Central Valley. Cattle and sheep are common in the open brush and forest range; pine forests yield lumber and tanning materials, and there are coastal fisheries. Concepción, the capital of the *región,* is economically important because of its mineral resources and industries. Near the coast at Coronel, Lota, and Penco, all served by railroad from Concepción, are coal and copper deposits. There is a large steel plant at Huachipato, near Talcahuano; other important economic activities in the *región* include textile manufacturing, flour milling, fish canning, sugar refining, and brewing. The Pan-American Highway, on which are located Los Angeles and Chillán, and the main north–south railroad pass through the central part of the *región.* Several resorts are on the coast. Pop. (1987 est.) 1,625,840.

Bío-Bío River, Spanish RÍO BÍO-BÍO, river in south-central Chile. It rises in the Andes of eastern Cautín *provincia* and flows generally northwestward through Malleco, Bío-Bío, and Concepción *provincias* to enter the Gulf of Arauco on the Pacific Ocean near Concepción after a course of 240 miles (380 km). The Bío-Bío traverses the fertile Central Valley and then forms the only major transverse valley through the coastal mountain range. Although it is one of Chile's longest rivers, it is navigable only by flat-bottomed boats. The Bío-Bío is commonly referred to as the southern limit of middle Chile, where about three-fourths of the nation's people live.

biocenology: *see* synecology.

biochemical oxygen demand (BOD), the amount of oxygen used by microorganisms in the process of breaking down organic matter in water. The more organic matter there is (*e.g.,* in sewage), the greater the number of microbes. The more microbes there are, the greater the need of oxygen to support them; consequently, less oxygen is available for higher animals such as fishes. The BOD is therefore a reliable gauge of the organic pollution of a body of water. One of the main reasons for treating sewage or waste water prior to its return to a water resource is to lower its BOD—*i.e.,* reduce its need of oxygen and thereby lessen its demand from the streams or rivers into which it is released.

biochemical taxonomy: *see* chemotaxy.

biochemistry, the field of science concerned with the chemical substances and processes that occur in plants, animals, and microorganisms. Specifically, it involves the quantitative determination and structural analysis of the organic compounds that comprise the basic constituents of cells (proteins, carbohydrates, and lipids) and of those that play a key role in chemical reactions vital to life (nucleic acids, vitamins, and hormones). Biochemistry entails the study of all the complexly interrelated chemical changes that occur within the cell—*e.g.,* those relating to protein synthesis, the conversion of food to energy, and the transmission of hereditary characteristics. Both the cell's degradation of substances that release energy and its buildup of complex molecules that store energy or act as substrates or catalysts for biological chemical reactions are studied in detail by biochemists. Biochemists also study the regulatory mechanisms within the body that govern these and other processes.

Biochemistry lies in the border area between the biological and physical sciences. Accordingly, it makes use of many of the techniques common to physiology and those integral to analytical, organic, and physical chemistry. The field of biochemistry has become so large that many subspecialities are recognized, as, for example, clinical chemistry and nutrition. Molecular biology, the study of large molecules—for example, proteins, nucleic acids, and carbohydrates—that are essential to life processes is a field closely allied to biochemistry. Taken as a whole, modern biochemistry has outgrown its earlier status of an applied science and has acquired a place among the pure, or theoretical, sciences.

Biochemistry is treated in a number of articles in the MACROPAEDIA. For the history and principal treatment of the discipline, *see* Biological Sciences, The. For the primary subjects of study, *see* Biochemical Components of Organisms; Chemical Compounds; Cells; Genetics and Heredity, The Principles of: *Genes;* Metabolism; Photosynthesis. For basic methodology and instrumentation, *see* Analysis and Measurement, Physical and Chemical.

For a description of the place of biochemistry in the circle of learning and for a list of both MACROPAEDIA and MICROPAEDIA articles on the subject, *see* PROPAEDIA: Part Ten, Division III.

bioclimatology, branch of climatology that deals with the effects of the physical environment on living organisms over an extended period of time. Although Hippocrates touched on these matters 2,000 years ago in his treatise on *Air, Waters, and Places,* the science of bioclimatology is relatively new. It developed into a significant field of study during the 1960s owing largely to a growing concern over the deteriorating environment.

Because almost every aspect of climate and weather has some effect on living organisms, the scope of bioclimatology is almost limitless. Certain areas are emphasized more than others, however, among them studies of the influence of weather and climate on small plant organisms and insects responsible for the development of plant, animal, and human diseases; the influence of weather and climate on physiological processes in normal healthy humans and their diseases; the influence of microclimate in dwellings and urban centres on human health; and the influence of past climatic conditions on the development and distribution of plants, animals, and humans.

bioecology: *see* ecology.

bioelectricity, electric potentials and currents produced by or occurring within living organisms. Biolectric potentials are generated by a variety of biological processes and generally range in strength from one to a few hundred millivolts. In the electric eel, however, currents of one ampere at 600 to 1,000 volts are generated.

A brief treatment of bioelectricity follows. For full treatment, *see* MACROPAEDIA: Electricity and Magnetism.

Bioelectric effects were known in ancient times from the activity of such electric fishes as the Nile catfish and the electric eel. The experiments of Luigi Galvani and Alessandro Volta in the 18th century on the connection between electricity and muscle contraction in frogs and other animals were of importance in the development of the sciences of physics and physiology. In modern times the measurement of bioelectric potentials has become a routine practice in clinical medicine. Electrical effects originating in active cells of the heart and the brain, for example, are commonly monitored and analyzed for diagnostic purposes.

Bioelectric potentials are identical with the potentials produced by devices such as batteries or generators. In nearly all cases, however, a bioelectric current consists of a flow of ions

(*i.e.*, electrically charged atoms or molecules), whereas the electric current used for lighting, communication, or power is a movement of electrons. If two solutions with different concentrations of an ion are separated by a membrane that blocks the flow of the ions between them, the concentration imbalance gives rise to an electric-potential difference between the solutions. In most solutions, ions of a given electric charge are accompanied by ions of opposite charge, so that the solution itself has no net charge. If two solutions of different concentrations are separated by a membrane that allows one kind of ion to pass but not the other, the concentrations of the ion that can pass will tend to equalize by diffusion, producing equal and opposite net charges in the two solutions. In living cells the two solutions are those found inside and outside the cell. The cell membrane separating inside from outside is semipermeable, allowing certain ions to pass through while blocking others. In particular, nerve and muscle cell membranes are slightly permeable to positive potassium ions, which diffuse outward, leaving a net negative charge in the cell.

The bioelectric potential across a cell membrane is typically about 50 millivolts; this potential is known as the resting potential. All cells use their bioelectric potentials to assist or control metabolic processes, but some cells make specialized use of bioelectric potentials and currents for distinctive physiological functions. Examples of such uses are found in nerve and muscle cells. Information is carried by electric pulses (called action potentials) passing along nerve fibres. Similar pulses in muscle cells accompany muscular contraction. In nerve and muscle cells, chemical or electrochemical stimulation results in temporary changes in the permeability of cell membranes, allowing the electric potential between inside and outside to discharge as a current that is propagated along nerve fibres or that activates the contractile mechanism of muscle fibres. The transport of sodium ions is involved in the production of action potentials. Among other cells in which specialized functions are dependent on the maintenance of bioelectric potentials are the receptor cells sensitive to light, sound, and touch and many of the cells that secrete hormones or other substances.

Various fishes, both marine and freshwater, have developed special organs that are capable of generating substantial electric discharges, while others have tissues that can sense feeble electric fields in water. In more than 200 fish species, the bioelectric organ is involved in self-defense or hunting. The torpedo, or electric ray, and the electric eel have especially powerful electric organs, which they apparently use to immobilize or kill prey. The electric eel has three pairs of electric organs; they constitute most of the mass of the body and about four-fifths of the total length of the fish. This fish is reputed to be able to generate a sufficiently powerful electric shock to stun a man. Electric rays have two large, disk-shaped electric organs, one on each side of the body, that contribute to the disklike shape of the body.

The electric catfish of Africa, the knife fish of Latin America, and the stargazers probably use their bioelectric organs as sense organs in the detection of other fishes.

The basic element of a bioelectric organ is a flattened cell called an electroplaque. Large numbers of electroplaques are arranged in series and in parallel to build up voltage and current-producing capacity of the electric organ. Fishes deliver a sudden discharge of electricity by timing the nervous impulses that activate individual electroplaques, thereby providing simultaneous action of the entire array.

bioengineering, application of engineering principles and equipment to the biological and medical sciences. It includes the development and fabrication of life-support systems for underwater and space missions, machines for medical treatment (*e.g.*, heart–lung machines), and instruments for monitoring biological processes.

A brief treatment of bioengineering follows. For full treatment, *see* MACROPAEDIA: Engineering.

Of relatively recent origin, bioengineering has provided some of the most remarkable breakthroughs in medical science. Prosthetic limbs have been developed that can replace or augment normal functions; such prostheses are equipped with the ability to move and to operate by touch feedback. Development has been particularly rapid in the area of artificial organs, which culminated in the implantation of an artificial heart into a human being (1982).

Two of the most common examples of artificial organs are the artificial kidney and the heart–lung machine. An artificial kidney, or hemodialyzer, is used for those with chronic kidney malfunction, and a heart–lung machine is used to oxygenate the blood when the lung and/or heart muscles cannot. There are other mechanical devices used to aid heartbeat and blood circulation, such as pacemakers.

Bioengineering also has proven pivotal in the development of elaborate life-support systems that enable humans to maintain body functions in hostile environments—*i.e.*, no oxygen, extremes of temperature and pressure, and so on. One such system is the space suit worn by astronauts during extravehicular maneuvers. This type of suit is a self-contained environment that supplies everything needed to sustain life. It provides a pressurized interior, without which an astronaut's blood would boil in the vacuum of space. In addition, the space suit provides oxygen; a means for removing excess products of respiration (*i.e.*, carbon dioxide and water vapour); protection against extreme heat, cold, and ionizing radiation; and facilities for temporarily storing body wastes.

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biofeedback, information supplied instantaneously about an individual's own physiological processes. Data concerning a person's cardiovascular activity (blood pressure and heart rate), temperature, brain waves, or muscle tension is monitored electronically and returned, or "fed back," to that person by a gauge on a meter, a light, or a sound. Though such activity of the autonomic nervous system was once thought to be beyond an individual's control, it has been shown that an individual can be taught to use the biological data to learn how to voluntarily control the body's reactions to stress or "outside-the-skin" events. An individual learns through biofeedback training to detect his physical reactions (inside-the-skin events) and establish control over them.

Biofeedback training is a type of behaviour therapy that attempts to change learned responses to stressors. It can be very successful in alleviating symptoms (*e.g.*, pain and muscle tension) of a disorder, and its effects can be especially lasting if used in combination with psychotherapy to help the patient understand his reactions to stress.

Complaints that have been treated by biofeedback training include migraine headaches, gastrointestinal cramping (*e.g.*, colitis), high blood pressure, tics, and the frequency and severity of epileptic seizures. Theoretically, many psychologists believe it possible to bring under partial control any physiological process that can be continuously monitored and displayed, including electrophysiological activity of the limbic system and other homeostatic processes.

Biofeedback training with brain waves has also been useful in enhancing mental functioning. "Alpha (wave) training" elicits the calming and integrative effects of meditation. Theta wave training has led to more focused attention, the control of "mental blocks" during examinations, and the control of anxiety.

biogenetic law, also called RECAPITULATION THEORY, postulation, by Ernst Haeckel in 1866, that ontogeny recapitulates phylogeny—*i.e.*, the development of the animal embryo and young traces the evolutionary development of the species. The theory was influential and much-popularized earlier but has been of little significance in elucidating either evolution or embryonic growth.

biogeochemical cycle, any of the natural circulation pathways of the essential elements of living matter. These elements in various forms flow from the nonliving (abiotic) to the living (biotic) components of the biosphere and back to the nonliving again. In order for the living components of a major ecosystem (*e.g.*, a lake or forest) to survive, all the chemical elements that make up living cells must be recycled continuously.

Each cycle can be considered as having a reservoir (nutrient) pool—a larger, slow-moving, usually abiotic portion—and an exchange (cycling) pool—a smaller but more active portion concerned with the rapid exchange between the biotic and abiotic aspects of an ecosystem.

Biogeochemical cycles can be classed as gaseous, in which the reservoir is the air or the oceans (via evaporation), and sedimentary, in which the reservoir is the Earth's crust. Gaseous cycles include those of nitrogen, oxygen, carbon, and water; sedimentary cycles include those of iron, calcium, phosphorus, and other more earthbound elements.

Gaseous cycles tend to move more rapidly than do the sedimentary ones and to adjust more readily to changes in the biosphere because of the large atmospheric reservoir. Local accumulations of carbon dioxide, for example, are soon dissipated by winds or taken up by plants. Extraordinary and more frequent local disturbances can, however, seriously affect the capacity for self-adjustment.

Sedimentary cycles vary from one element to another, but basically each consists of a solution phase and a rock (or sediment) phase. Weathering releases minerals from the Earth's crust as salts, some of which dissolve in water, pass through a series of organisms, and ultimately reach the deep seas, where they settle out of circulation indefinitely. Other salts deposit out as sediment and rock in shallow seas, eventually to be weathered and recycled.

Plants and some animals obtain their nutrient needs from solutions in the environment. Other animals acquire the bulk of their needs from the plants and animals that they consume. After the death of an organism, the elements fixed in its body are returned to the environment through the action of decay organisms and become available to other living organisms again.

biogeography, study of the geographic distribution of plants and animals. It is concerned not only with habitation patterns but also with the factors responsible for variations in distribution.

A brief treatment of biogeography follows. For full treatment, *see* MACROPAEDIA: Biosphere, The.

Strictly speaking, biogeography is a branch of biology, but physical geographers have made important contributions, particularly in the study of flora. The classification of vegetation

and the preparation of maps of vegetation have been notably advanced by F. Shreve, H.L. Shantz, H.M. Raup, and others.

Biogeographic studies divide the Earth's surface—primarily the continents and islands—into regions exhibiting differences in the average composition of flora and fauna. It is thought that the present-day distribution patterns of plant and animal forms, as reflected in such biogeographic regions, are the result of many historical and current causes. These causes include present climatic and geographic conditions, the geological history of the landmasses and their climates, and the evolution of the taxon (*e.g.*. genus or species) involved. Investigators have found that rate of dispersal, adaptability to prevailing environmental conditions, and the age of the taxa being studied also have a significant impact on pattern and extent of distribution.

Biograph Company, one of the major American motion-picture studios in the early days of filmmaking. Its most significant contribution to the film comes from the work of D.W. Griffith, the first great director, who developed the art of the cinema during his five years at Biograph. The American Mutoscope and Biograph Company released its first film, *Empire State Express*, in 1896. It quickly became a major producer of short pictures.

From 1908 to 1914 a great many of the Biograph films were directed by Griffith and executed by the cameraman G.W. (Billy) Bitzer. Griffith refined the use of the close-up, experimented with camera angles and film editing, and trained a group of actors that included Mary Pickford, one of the most popular film actresses of all time; Florence Lawrence, the first actual movie star; Mack Sennett, who later achieved fame as the director of the Keystone comedies; and the well-known leading men Lionel Barrymore and Owen Moore. Griffith made his last film for Biograph in 1914, and within five years the company had closed.

biography, form of nonfictional literature, the subject of which is the life of an individual. In general, the form is considered to include autobiography, in which the subject recounts his or her own history. Biography can be seen as a branch of history, since it depends on a selective ordering and interpretation of materials, written and oral, established through research and personal recollection. It can also be seen as a branch of imaginative literature in that it seeks to convey a sense of the individuality and significance of the subject through creative sympathetic insight.

A brief treatment of biographical literature follows. For full treatment, *see* MACROPAEDIA: Literature; The Art of.

The earliest biographical writing probably consisted of funeral speeches and inscriptions, usually praising the life and example of the deceased. From this evolved the laudatory and exemplary biography with its associated problems of uncritical or distorted interpretation of available evidence. Such lives are still found, but they have produced their own antithesis in the denunciatory or debunking biography of which Lytton Strachey's *Eminent Victorians* (1918) is a famous modern example. Both kinds of biography were incorporated in historical writing and oratory from an early period where individual behaviour and character were of significance for the general discussion. Particular philosophical, religious, or political causes were often popularized by biographical means. Plato and Xenophon helped to vindicate Socrates by writing about his life as well as his teaching; the gospels did much the same for Jesus of Nazareth. Stoic biographies of Cato and Brutus served to attack the Roman principate, just as R.R. Madden's *Lives of the United Irishmen* implicitly attacked English rule in 19th-century Ireland.

The origins of modern biography as a distinct genre lie not with eulogy or admiring accounts of great sages and saints but with Plutarch's moralizing lives of prominent Greeks and Romans and Suetonius' gossipy lives of the Caesars, which quote documentary sources. While kings and leaders of men attracted biographical attention as a part of the general historical record of their times, there are few vernacular lives of individuals considered for themselves until the 16th century. In England William Roper's life of Thomas More (1626) is an important example, and in the next century Izaak Walton and John Aubrey produced brief biographies of writers and eminent persons. But the major developments of English biography come in the 18th century with Samuel Johnson's critical *Lives of the English Poets* and James Boswell's massive *Life of Johnson* (1791), which combines detailed records of conversation and behaviour with considerable psychological insight. This provided the model for exhaustive, monumental 19th-century biographies such as A.P. Stanley's *Life of Arnold* and Lord Morley's *Gladstone.* Carlyle's conviction that history was the history of great men demonstrated the general belief of the time that biographical writing was an important method of understanding society and its institutions. In modern times impatience with Victorian reticence and deference and the development of psychoanalysis have sometimes led to a more penetrating and comprehensive understanding of the biographical subject. Leon Edel's massive *Henry James* is a good example. Another modern development has been the group-biography of a family or small body of close associates.

It has been recognized that a biographer is not neutral but discloses aspects of his own personality in the presentation and interpretation of the biographee. This is much more the case with autobiography; indeed the manner may reveal as much about the subject as the matter. Though self-justification may provide the autobiographical impulse, so also may self-contempt, particularly when linked with some intellectual, religious, or emotional crisis that precipitates change. Such crises, beginning perhaps with the conversion of St. Augustine described in his *Confessions,* provide the focal point of many autobiographies but may have the effect of unconsciously distorting antecedent experience since the reader is offered a kind of manifesto that is only secondarily a personal record. But autobiography may recount the experiences, however scandalous, of travellers, lovers, or rascals, more or less for their own sake. Again, autobiography may be undertaken for partly therapeutic ends, seeking to establish an ironic or formal distance from painful or chaotic experience and to trace patterns of coherence in it.

Biographical and autobiographical writing can easily pass into fiction as rational inference or conjecture pass over into imaginative reconstruction or frank invention, or where the biographical subject itself is wholly or partly imaginary.

bioherm, ancient organic reef of mound-like form built by a variety of marine invertebrates, including corals, echinoderms, gastropods, mollusks, and others; fossil calcareous algae are prominent in some bioherms. A structure built by similar organisms that is bedded but not mound-like is called a biostrome. Bioherms and biostromes occur in sedimentary rock strata of all geological ages, providing definitive information on paleoenvironments in the vicinity of their occurrence.

Bioko, also called FERNANDO PO, or FERNANDO PÓO, formerly (1973–79) MACIAS NGUEMA BIYOGO, island in the Bight of Biafra (Gulf of Guinea), lying about 60 mi (100 km) off the coast of southern Nigeria and 100 mi (160 km) northwest of continental Equatorial Guinea, West Africa. The island was named after the first president of the country in 1973, but Bioko became the local official name after he was deposed in 1979. Bioko forms one of the three provinces of the Republic of Equatorial Guinea. Volcanic in origin, it is parallelogram-shaped with a north–south axis, embracing 779 sq mi (2,017 sq km), and rises sharply from the sea with its highest point being Pico de Santa Isabel (9,869 ft [3,008 m]). Malabo (*q.v.*), the republic's capital and chief port, stands near a crater breached by the sea.

The island was first sighted by the Portuguese explorer Fernão do Pó, probably in 1472, and was originally named Formosa (Beautiful). It was claimed by Spain after 1778, although the first attempt at firm Spanish control came only in 1858. For a short time (1827–34) Britain used the island as an anti-slavery base.

The original inhabitants, the Bubi, a Bantu people, now number about 15,000. The so-called Fernandinos are of a later origin, being descendants of liberated slaves, mixed with settlers from former British West Africa. Both these groups have declined in status, as the Fang, who have flocked to the island from continental Equatorial Guinea, came to occupy most of the civil service posts. There was formerly a large transient population of contract plantation workers from Nigeria; most of these returned to Nigeria, however, following repressive acts by the government of Equatorial Guinea in the mid-1970s.

Bioko was one of the first African territories to grow cocoa, but the devastation of the administration of Pres. Nguéma reduced output to almost nothing in the late 1970s. Timber and coffee were the other important products. Pop. (latest census) 63,660.

biolith, any sediment formed from the remains of living organisms or through the physiological activities of organisms. Bioliths are sometimes identifiable as fossil plants or animals. Caustobioliths are combustible and include all sediments used for fuel, such as peat, coal, or petroleum. Acaustobioliths do not burn; they include carbonate, phosphate, and siliceous sediments.

biological community: *see* community.

biological control, the use of living organisms to control pests. A natural enemy such as a parasite, predator, or disease organism is introduced into the environment of a pest, or, if already present, is encouraged to multiply and become more effective in reducing the number of pest organisms. Examples of biological control include the destruction of the citrophilus mealybug in California by two parasitic species of chalcid wasps imported from Australia, *Coccophagus gurneyi* and *Tetracnemus pretiosus;* the effective predation of an Australian ladybird beetle, or vedalia bettle (*Rodolia cardinalis*), on the cottony cushion scale in California; the limiting of the proliferation of the European rabbit in Australia by introduction of myxoma virus (which causes the disease myxomatosis); and the control of Japanese beetles by *Bacillus popilliae,* which causes milky disease.

biological productivity, the rate at which sunlight is stored by green plants in the form of food. It is a measure of the biological richness of a population, community, or ecosystem and is usually expressed as the quantity of heat that would be liberated by complete oxidation of the organic substances formed per unit of time. *See also* biomass.

biological rhythm, periodic biological fluctuation in an organism that corresponds to, and is in response to, periodic environmental change. Examples of such change include cyclical variations in the relative position of the Earth to the Sun and to the Moon and in the immediate effects of such variations; *e.g.,*

day alternating with night, high tide alternating with low tide.

A brief treatment of biological rhythm follows. For full treatment, *see* MACROPAEDIA: Behaviour, Animal.

The internal mechanism by which such a rhythmic phenomenon occurs and is maintained even in the absence of the apparent environmental stimulus is termed a biological clock. When an animal that functions according to such a clock is rapidly translocated to a geographic point where the environmental cycle is no longer synchronous with the animal's cycle, the clock continues for a time to function synchronously with the original environmental cycle. Humans similarly transported over great distances often experience fatigue and lowered efficiency for several days, a phenomenon known as "jet lag," or jet syndrome.

A rhythm with a 24-hour cycle is called a circadian (Latin *circa:* "about," *di:* "day"; *i.e.,* "about a day"), solar day, diel, daily, diurnal, or nychthemeral rhythm. A lunar tidal rhythm—the regular ebb and flow of oceans and very large inland bodies of water—subjects seashore plants and animals to a rhythmic change; typically two high and two low tides occur each day (about 24.8 hours). Many species of shorebirds exhibit this rhythm by seeking food only when beaches are exposed at low tide. Monthly rhythms, averaging about 29.5 days, are reflected in reproductive cycles of many marine plants and in those of many animals. Annual rhythms are reflected in the reproduction and growth of most terrestrial plants and animals in the temperate zones.

biological warfare, military use of disease-producing agents, such as germs and viruses, on humans, animals, or plants and the means for combatting such agents. Though direct use of biological warfare against enemy personnel is very old, it has acquired a stigma in modern times and no country has admitted employing it. In 1972 a treaty was signed by more than 70 countries prohibiting production, stockpiling, or development of biological weapons and requiring destruction of existing stockpiles. Nevertheless, reports, rarely substantiated, persist, alleging such development or, occasionally, disastrous accidents growing out of such experimentation.

One of the grounds for opposition is the possibility of an agent getting out of control, as is said to have happened in the most celebrated recorded case of biological warfare. In the siege of Caffa (now Feodosiya, Ukrainian Soviet Socialist Republic) in the Crimea in 1347, the Mongols hurled bodies of plague victims over the walls of the Genoese defenders. Genoese ships carried the bacillus to Europe, loosing the massive epidemic known as the Black Death. Many later attempts were made to spread infection among enemy armies or populations, but rarely with much success.

In World War I the Germans infected Romanian cavalry horses and livestock in the United States destined for shipment to the Allies, with glanders, a lesion-producing bacterial disease. Charges of germ warfare were made by the Chinese against United Nations forces in the Korean War of 1950–53, but no substantiation was offered.

biology, the study of living organisms and of their vital processes. The two main divisions of biology are zoology, the study of animals, and botany, the study of plants. Other biological disciplines include physiology, the study of the functioning of organs and the chemical and physical processes in living things; cytology, the study of cells; embryology, the study of fetal development; ecology, the study of organisms and their interactions with other organisms and their environment; anatomy, the study of the structures of organisms; morphology, the study of anatomical structures in relationship to their functions; genetics, the study of the mechanism of inheritance; biochemistry, the study of chemical processes in living organisms; and molecular biology, the study of biological processes at the molecular level.

For full treatment of biology as an academic discipline and field of study, *see* MACROPAEDIA: Biological Sciences, The.

The particular subjects of biological study—living organisms, their structures and processes, and the relationships among organisms—are treated in many articles in the encyclopaedia. For lists of these articles in both the MACROPAEDIA and the MICROPAEDIA, and for the place of biology in the circle of learning, *see* PROPAEDIA: Part Three; Part Four, Divisions I and II. For references to a particular biological subject, *see* INDEX.

bioluminescence, emission of light by an organism or by a test-tube biochemical system derived from an organism. It could be the ghostly glow of bacteria on decaying meat or fish, the shimmering phosphorescence of protozoans in tropical seas, or the flickering signals of fireflies. The phenomenon occurs sporadically in a wide range of protists and animals, from bacteria and fungi to insects, marine invertebrates, and fish; but it is not known to exist naturally in true plants or in amphibians, reptiles, birds, or mammals. Bioluminescence results from a chemical reaction (chemiluminescence) in which the conversion of chemical energy to radiant energy is direct and virtually 100 percent efficient; *i.e.,* very little heat is given off in the process. For this reason the emission is called cold light, or luminescence (*q.v.*)

The role of bioluminescence in behaviour. Light production appears to be associated with the protection and survival of a species. This is quite clear in certain squids, who secrete a luminous cloud to confuse an enemy and make an escape, and in many deep-sea fishes who dangle luminous lures to attract food or show light organs that disguise their form from enemies, frighten predators, or simply light the way in the darkness of the ocean deeps. The survival value of bioluminescence is indisputable for many organisms who use their flashes as species-recognition and mating signals. In *Photinus pyralis,* a common North American firefly, the male flashes spontaneously while in flight, emitting on the average a 0.3-second flash every 5.5 seconds if the temperature is 25° C. The females watch from the ground and wait for a male to flash. Upon seeing a flash, a female flashes a response after an interval of about two seconds; it is this response that attracts the male. The female is unable to identify a male by his flashing; thus it is the male that recognizes the correct signal—*i.e.,* interval between flashes—and seeks out the female. The interval between the male's signal and the female's response, therefore, is crucial. Similar specific recognition codes are used by many species of fireflies. Other fireflies possibly rely on colour differences in the light signals between sexes.

Lantern fishes and hatchet fishes, along with many other deep-sea organisms, possess distinct arrangements of light organs on the body, which may serve as species and sex recognition patterns. The light organs, or photophores, of many deep-sea fishes are placed on the ventral and lateral surfaces of the body, and the light is emitted downward and outward. Such an arrangement is believed to allow the light of the photophores to be used to match the intensity of sunlight penetrating from above, thus concealing the fish's own shadow from a predator below. Some lantern fishes possess, in addition, a large nasal organ; others have a patch of luminous tissue in the tail region. In deep-sea angler fishes, the first dorsal spine is turned forward into an elongated rod, from the end of which dangles a luminous organ. When an unsuspecting prey approaches the luminous lure, it is engulfed in the large jaw. Many deep-sea organisms undertake diurnal vertical migration; *i.e.,* they rise to the surface with the setting of the Sun and return to the deep at sunrise. Such migrations are believed to take place for the purpose of feeding on planktonic organisms, which grow in abundance in the photosynthetic zone of the ocean's surface. During the migrations, the concealment mechanism is probably used for protection.

The role of bioluminescence in metabolism. The functional role of bioluminescence in lower organisms such as bacteria, dinoflagellates, and fungi is difficult to discern. Partly because the glow of luminous bacteria is extinguished when oxygen is removed, it has been suggested that the bioluminescent reaction was originally used to remove oxygen toxic to primitive types of bacteria that developed during a time when oxygen was absent or very rare in the Earth's atmosphere. The metabolic reaction that combines the oxygen with a reducing substance (luciferin) liberates sufficient energy to excite a molecule in the organism to emit visible radiation. Most of those luminous primitive organisms have subsequently developed systems of utilizing oxygen, but they have retained the luminescent capability as parts of related metabolic pathways or for some survival value that luminescence may confer on the organism.

The significance of bioluminescence in research. The luminescent reaction of the firefly has been used as an assay method for the determination of adenosine triphosphate (ATP), an important metabolic substance used by all living cells in numerous reactions in which energy is either stored or expended. The glow of a specially blended extract of firefly lanterns eventually dims and disappears as ATP is broken down. The addition of fresh ATP, either as a pure chemical or as a constituent of a tissue extract, immediately restores the luminescence. The intensity of the glow is a direct measure of the amount of ATP present in the extract. This assay method has been widely used in medical and biological research to determine the amount of ATP present in extracts of cells and tissues. The study of reactions involving ATP has led to a detailed understanding of the mechanisms of energy conversion in cells. The firefly reaction is one of the few reactions in which ATP is directly involved with light emission. All other bioluminescent reactions involve compounds that are chemically distinct from ATP.

The range and variety of bioluminescent organisms. Luminous species are widely scattered taxonomically, with no clear-cut pattern discernible. Many luminous shrimps are known but no luminous crab. Many luminous squids are known but only a single luminous octopus (*Callistoctopus arakawai* of Japan). Again, luminous centipedes and millipedes are not uncommon, but luminous scorpions and spiders are apparently nonexistent. Many plantlike protists (bacteria and fungi) exhibit bioluminescence, but no luminous true plant is known.

Almost half the animal phyla contain luminous forms, but the number of representatives is very small compared to the total number of known animal species. The protists are not so rich in luminous species but are greatest in sheer abundance, especially in tropical seas. In fact, the majority of luminous organisms are marine.

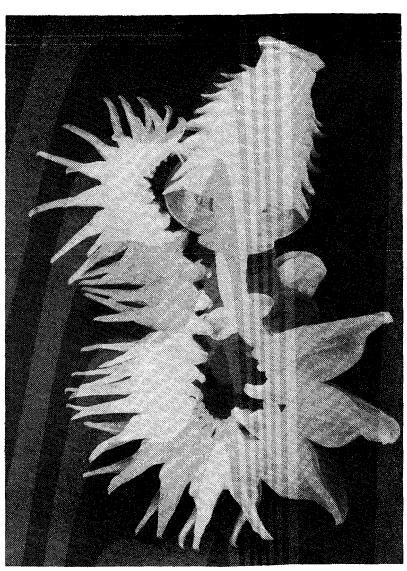
The ocean surface in many parts of the tropics is dense with single-celled luminous planktonic organisms, primarily dinoflagellates, that glow when stimulated mechanically, as by the churning of the waves, or, when washed ashore, by the pressure of a foot. Some organisms exhibit a 24-hour rhythm of light

intensity, highest at night and lowest during the day.

Among crustaceans, luminous species are especially remarkable in the copepods, shrimps, and ostracods. Luminous copepods are widely distributed throughout the world's waters. Some are surface dwellers, while others live in the deep sea. Two famous groups of luminous copepods are *Pleuromma* and *Metridia.* Some shrimps (*Hoplophorus*) emit a luminous secretion from luminous organs, while others possess true light organs (photophores), which consist of a lens, reflector, and light-emitting photogenic cells. Of the three or four species of the ostracod genus *Cypridina* known to be luminous, the most famous is *Cypridina hilgendorfii,* found in the coastal waters and sands of Japan. This tiny, shelled organism, which ejects a blue luminous secretion into the water when disturbed, may be collected and dried for the light-emitting components, which are active indefinitely.

Other organisms responsible for large patches of light in the ocean are jellyfish and other coelenterates and comb jellies (ctenophores). A large proportion of the floating, transparent siphonophores and the feathery, bottom-dwelling sea pens are luminous. Many of the hydroids and jellyfish are also luminous. pens (*Pennatula*), sea cactus (*Cavernularia*), and sea pansy (*Renilla*) are colonies, which upon stimulation generate a wave of luminous light that travels down the organism. The luminescence in these organisms appears to be under nervous control.

Among annelids, marine worms and earthworms both contain luminous forms. *Odontosyllis,* the fire worm of Bermuda, swarms in great numbers a few days after the full moon. Female worms, about two centimetres (almost an inch) in length, rise to the surface shortly after sunset and swim in circles while ejecting a luminous secretion. Smaller male worms swim to where the females are circling and mate. The male is also luminous, but the light is intermittent and of intracellular character. It is not certain whether luminescence has any relationship to mating since nonluminous *Odontosyllis* exhibits similar courtship behaviour. *Chaetopterus* spends its life in a tube of parchment membrane, with openings at both ends. It luminesces when disturbed, but it is doubtful whether the luminescence has any special purpose. *Polynoe* and *Polycirrus* are luminous annelids that usually live in sand or rock. Luminous mollusks include *Pholas* (a bivalve), *Phyllirrhoe* (a floating nudibranch), *Planaxis* (a marine gastropod), *Latia* (a freshwater limpet), and squids (cephalopods).



Luminescent parchment worm (*Chaetopterus*)

George G. Lower

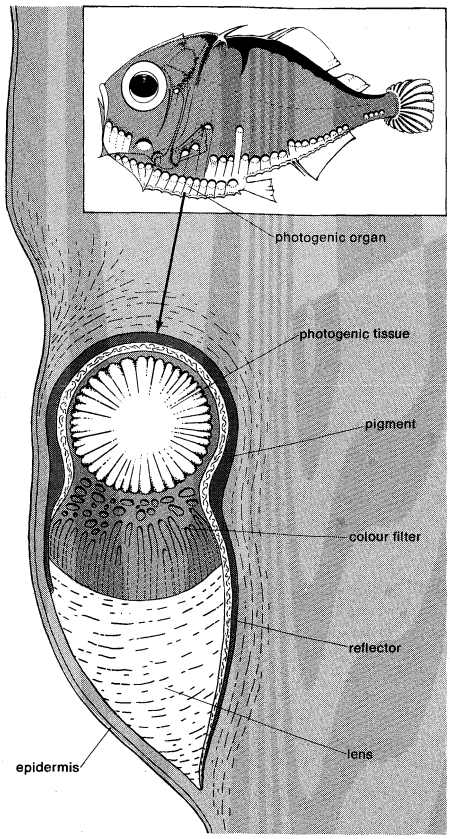
The luminous squids and deep-sea fishes possess the most complicated light organs; they consist of photogenic cells, reflector, lens body, and, in certain cases, colour filters. Of the open-ocean forms (oegopsids) such as *Lycoteuthis, Histioteuthis,* and *Enoploteuthis,* as many as 75 percent are self-luminous; *i.e.,* light results not from symbiotic luminous bacteria but from an internal biochemical reaction. In the shore forms (myopsids) such as *Euprymna, Uroteuthis,* and *Sepiola,* of which only a few percent are luminous, a pair of luminous organs is present on the ink sac, and the light can be obscured by a flow of ink into a space between the light organ and its lens. In deep-sea squids, the light organ is often found on the eyelid or on the eyeball itself. In others—*e.g., Watasenia scintillans*—light organs are present also at the end of the tentacles and over other surfaces of the body.

The anatomical structure of the luminous organs of many fishes is similar to that of squids. Deep-sea fishes have photophores along the body, under the eyes, and often on barbels or antennae. The typical luminous organ consists of a lens, luminous body, colour filter, and reflector (see the Figure). Luminous organs of most deep-sea fishes have no screen of melanophores over them. The light is often under nervous control, and emission takes place when the fish is alive. After death, the ability to luminesce disappears rapidly. Whether the light-producing components are developed by the fish or ingested by the fish is not clear. A distinct possibility exists that a fish feeds on crustaceans such as *Cypridina* organisms and utilizes their light-emitting components for its own light production. A few genera of deep-sea fishes and several families of shallow-water fishes produce light by virtue of harbouring symbiotic luminous bacteria within light organs. This type of organ is endowed with a rich blood supply that nourishes and maintains the luminous bacteria. It appears that each fish species becomes infected with a specific bacterial type. The bacteria-filled organ is continuously luminous, but the light can be controlled either by melanophores scattered over the surface of the organ or by a black membrane that may be mechanically drawn over the organ. Control is brought about by the contraction and expansion of melanophores, or pigment granules. Expansion of the melanophores cuts off the light, whereas contraction allows light to pass through.

An indirect-emission type of luminous organ is present in some fish. The luminous organ is connected to the gut via a short duct and is often embedded in tissue. The light passes to the outside through the translucent keel and ventral muscles, as in *Leiognathus, Acropoma,* and *Archamia.* In fish other than those mentioned above, luminescence is produced intracellularly. The light is emitted by special cells (photocytes).

Among other higher animals, the chordate subphylum Tunicata contains luminous forms. The genus *Pyrosoma* includes several species that account for the brilliant luminescence among macroplanktons of the seas, giving rise to the name "fire body." *Pyrosoma* is a floating colonial form, pelagic and translucent. The colonies usually reach a length of three to 10 centimetres (about one to four inches); and each individual is about five millimetres (0.2 inch) long.

Luminous plantlike protists are represented by only two groups, bacteria and fungi. Luminous bacteria are all marine forms, requiring salt for growth and luminescence, and are widely distributed throughout the oceans of the world. The most common are *Vibrio* and *Photobacterium* species. While luminous bacteria come in various shapes, they do not form clusters or chains, as do many other bacteria. The light of an individual bacterium, of course, cannot be seen with the naked eye, but the light from a liquid or agar culture containing billions of bacteria is readily visible. The light is bluish and continuous. Although these bacteria are not pathogenic to man, some of them do infect sand fleas, shrimps, and insects. Many luminous bacteria live in the light organs of fish and squids, without adversely affecting their hosts.



Tranverse section of a photogenic organ of the (inset) hatchet fish (*Polyipnus spinosus*)

Small, whitish, luminous fungi ("foxfire") commonly grow on dead wood of forests, particularly where the ground is moist and wet; these forms predominate in the tropics. The light of fungi ranges from blue to green and yellow, depending on the species. Among the large luminous forms are *Pleurotus lampas* of Australia and the jack-o'-lantern (*Clitocybe illudens*) of the United States, which reach approximately 13 centimetres (about five inches) in diameter.

Luminosity among land animals is not associated with any particular habitat, but almost all these forms are nocturnal. The centipede *Orphaneus,* widely distributed in tropical Asia, gives off luminous secretions from each segment. The entire body of *Luminodesmus sequoiae,* a millipede found in the Sierra Nevada Mountains of California, glows with a diffuse light. Luminous insects include some true flies (order Diptera), notably *Arachnocampa luminosa,* the larva of which luminesces a greenish blue from a knob at the end of its body. The larvae dangle at the ends of filaments that hang from the ceilings of caves in New Zealand. Luminous beetles include the fireflies and the elaterid *Pyrophorus* (the click beetle, or *cucujo* in South America). The luminescent larvae of fireflies and some luminescent wingless adults are known as glowworms. The female *Diplocladon hasseltii,* called starworm, or diamond worm, gives off a continuous greenish-blue luminescence from three spots on each segment of the body, forming three longitudinal rows of light, the appearance of which inspired the common name night train. *Phrixothrix,*

the railroad worm, possesses two longitudinal rows, with a red luminous spot on the head. The limpet *Latia neritoides,* found in streams around Auckland, N.Z., is the only strictly freshwater luminous form known. The so-called firefly shrimp (*hotaru ebi*) is found in Lake Suwa, Japan, but the light is from luminous bacteria that infect the shrimp and kill it in about 24 hours.

Biochemical events of light emission. The essential light-emitting components are the oxidizable organic molecule luciferin and the enzyme luciferase, which are specific for different organisms. The present custom is to use generic names according to origin; *e.g.,* firefly luciferin and luciferase, *Cypridina* luciferin and luciferase. The luciferin–luciferase reaction is actually an enzyme–substrate reaction in which luciferin, the substrate, is oxidized by molecular oxygen, the reaction being catalyzed by the enzyme luciferase, with the consequent emission of light. The light emission continues until all the luciferin is oxidized. This type of reaction is found in *Cypridina, Latia,* and many fish.

A bioluminescent reaction that does not employ an enzyme and is not analogous to the luciferin–luciferase system involves a luminescent protein, or photoprotein, with varying molecular weights in different organisms. This system is found in two genera of jellyfishes (*Aequorea* and *Halistaura*), in the marine worm *Chaetopterus,* and in the euphausiid shrimp *Meganyctiphanes norvegica.* Light is emitted when the photoprotein of either *Aequorea* or *Halistaura* is mixed with calcium ion. Oxygen is not required in the reaction. In the *Chaetopterus* system light emission occurs when the photoprotein is mixed with molecular oxygen; a hydroperoxide; iron (ferrous ion); and two cofactors, one resembling a nucleoprotein, the other a lipid. In the *Meganyctiphanes* system light is produced when the photoprotein is mixed with an unidentified heat-stable fluorescent compound (molecular weight less than 1,000) and molecular oxygen. In the boring clam (*Pholas dactylus*) luminescence results from the reaction of a photoprotein, another protein, and molecular oxygen.

An additional system is found in the marine dinoflagellate *Gonyaulax polyedra.* A crystalline-like particle called scintillon, which has been isolated from that unicellular organism, emits a flash of light when the surrounding fluid is acidified by lowering the pH from about 8 to 5.7. Soluble luciferin and luciferase, which emit light when mixed in the presence of oxygen and salt, can also be dissociated from the scintillons.

biomass, the weight or total quantity of living organisms of one animal or plant species (species biomass) or of all the species in the community (community biomass), commonly referred to a unit area or volume of the habitat. The number of organisms, or the biomass, in an area at a given moment is the standing crop. The total amount of organic material produced by living organisms of a particular area within a set period of time, called the productivity, is usually measured in units of energy, such as gram calories per square metre per year.

Biombo, region, western Guinea-Bissau, West Africa, bordered by the Atlantic Ocean and the islands of Bolama region to the south, and by the regions of Cacheu to the northwest, Oio to the northeast, and Quinara to the southeast. It has an area of 304 sq mi (780 sq km). Biombo region surrounds, but does not administratively include, Bissau city, the national capital. The Rio Mansôa flows east–west forming the western and northern border of the region, and empties into the Atlantic Ocean. The western half of the region is forested with mangroves. In the east are dispersed grazing land for cattle, sheep, and goats, and scattered farm land used for subsistence agriculture that produces corn (maize), millet, and sorghum. Rice and oil palms are cultivated throughout the region. An agro-industrial complex specializing in the production of vegetable (palm) oil was under construction in the early 1980s at Cumeré near Bissau city. The regional capital is Quinhámel. A road from Quinhámel stretches southwestward to the Atlantic Ocean and southeastward to Bissau city. The Pepel are the main ethnic group; the other groups are the Balante and the Malinke. Pop. (1979) 57,724.

biome, the largest geographical biotic unit, a major community of plants and animals with similar life forms and environmental conditions. It includes various communities and developmental stages of communities and is named for the dominant type of vegetation, such as grassland or coniferous forest. Several similar biomes comprise a biome type—for example, the temperate deciduous forest biome type that includes the deciduous forest biomes of Asia, Europe, and North America. Major life zone is the European phrase for the North American biome concept.

biomechanics, antirealistic system of dramatic production developed in the U.S.S.R. during the 1920s by the avant-garde director Vsevolod Meyerhold. The actor, whose role was subordinated until he was a mere instrument of the director's will, was supposed to eliminate all emotion from his highly stylized portrayal. Coached as gymnasts and acrobats and emphasizing pantomime rather than words, the actors threw themselves about in puppet-like attitudes at the director's discretion. For these productions the stage was exposed to the back wall and was then furnished with sets consisting of scaffoldings, ladders, and ramps that the actors used. The biomechanics system exerted its greatest influence in the area of stage design, opening new avenues to counteract the realism of early 20th-century scenography.

Bion (fl. 100 BC; b. Smyrna, Lydia, Asia Minor), minor Greek bucolic poet. The *Lament for Bion,* written by an Italian pupil of the poet, suggests that he lived in Sicily. The 17 surviving fragments of Bion's *Bucolica,* mostly concerned with love, strike a playful, sometimes sententious note. Since the Renaissance Bion has also been credited with the *Lament for Adonis,* whose overheated and highly coloured emotionalism may reflect the cult of Adonis, which was popular in the poet's homeland. The Greek text is in *Bucolici Graeci* (ed. A.S.F. Gow, 1952), and there is a translation by the same author in *The Greek Bucolic Poets* (1953).

Articles are alphabetized word by word, not letter by letter

Biondo, Flavio, Latin FLAVIUS BLONDUS (b. 1392, Forlì, Romagna—d. June 4, 1463, Rome), Humanist historian of the Renaissance and author of the first history of Italy that developed a chronological scheme providing an embryonic notion of the Middle Ages.

Biondo was well educated and trained as a notary before he moved in 1433 to Rome, where he was appointed apostolic secretary the following year. After serving on diplomatic missions to Venice and to the condottiere Francesco Sforza, he wrote *De Roma instaurata,* 3 vol. (1444–46; "Rome Restored"), a reconstruction of ancient Roman topography. In 1459 he wrote *De Roma triumphante,* a discussion of pagan Rome as a model for new reform in administrative and military institutions. The book was extremely influential, serving both to provide a new conception of the papacy as a modern continuation of the Roman Empire and to awaken Roman patriotism and respect for antiquity.

Biondo's two greatest works were the *Italia illustrata* (written between 1448 and 1458, first published in 1474) and the *Historiarum ab inclinatione Romanorum imperii decades* (written from 1439 to 1453, first published in 1483; "Decades of History from the Deterioration of the Roman Empire"). The first work, based on his extensive travels through Italy, described the geography and history of

Biondo, portrait from Paulus Jovius' "Elogia," 1517

By courtesy of the Accademia Nazionale Dei Lincei, Rome; photograph, Vivarelli e Gulla

18 provinces, beginning with the Roman Republic and Empire, tracing 400 years of barbarian invasion, and analyzing the influence of Charlemagne and subsequent emperors. In this work Biondo gave an acute description both of contemporary internal divisions between secular and papal power in Italy and of the restoration of the classics and revival in letters during the first half of the 15th century.

Biondo's other great work, the 32-book *Historiarum,* was a comprehensive treatment of both Europe and Christendom from the sack of Rome by the Goths in AD 410 to the rise of Italian cities and renewal of Italian dignity and glory up to 1442. A careful and critical work based on the most reliable sources, the *Historiarum* provided a definite chronological scheme between ancient Rome and Biondo's own time and influenced the later notion of a 1,000-year period of the Middle Ages. The work was consulted by Niccolò Machiavelli in his analysis of Italy's disunity.

bionics, science of constructing artificial systems that have some of the characteristics of living systems. Bionics is not a specialized science but an interscience discipline; it may be compared with cybernetics. Bionics and cybernetics have been called the two sides of the same coin. Both use models of living systems, bionics in order to find new ideas for useful artificial machines and systems, cybernetics to seek the explanation of living beings' behaviour.

Bionics is thus distinct from bioengineering (or biotechnology), which is the use of living beings to perform certain industrial tasks, such as the culture of yeasts on petroleum to furnish food proteins, the use of microorganisms capable of concentrating metals from low-grade ores, and the digesting of wastes by bacteria in biochemical batteries to supply electrical energy.

Mimicry of nature is an old idea. Many inventors have modelled machines after animals throughout the centuries. Copying from nature has distinct advantages. Most living creatures now on the Earth are the product

of 2,000,000,000 years of evolution, and the construction of machines to work in an environment resembling that of living creatures can profit from this enormous experience. Although the easiest way may be thought to be direct imitation of nature, this is often difficult if not impossible, among other reasons because of the difference in scale. Bionics researchers have found that it is more advantageous to understand the principles of why things work in nature than to slavishly copy details.

The next step is the generalized search for inspiration from nature. Living beings can be studied from several points of view. Animal muscle is an efficient mechanical motor; solar energy is stored in a chemical form by plants with almost 100 percent efficiency; transmission of information within the nervous system is more complex than the largest telephone exchanges; problem solving by a human brain exceeds by far the capacity of the most powerful computers. These exemplify the two main fields of bionics research—information processing and energy transformation and storage.

The general pattern of the information network of living organisms is the following: environmental sensations are received by the organs of sense and then coded into signals that are transmitted by nerves to the centres of processing and memorization of the brain. Pit vipers of the subfamily Crotalinae (which includes the rattlesnakes), for example, have a heat-sensing mechanism located in a pit between nostrils and eyes. This organ is so sensitive that it can detect a mouse at a few metres' distance. Though much more sensitive man-made infrared detectors exist, bionics can still profit from study of the vipers. First, it would be interesting and of potential value to understand the principle of energy transformation occurring in the rattlesnake's infrared pit, as well as the process by which the nerves are stimulated in the absence of an amplifying mechanism. Another striking example is the odour-sensing organ of the silk moth, *Bombyx mori*. The male can detect the chemical secreted by the female in a quantity as small as a few molecules.

In a conductor such as a telephone wire, the signal is attenuated as it travels along the wire, and amplifiers must be placed at intervals to reinforce it. This is not the case for the animal nerve axon: the neural impulse issued from sense organs does not weaken in travelling along the axon. This impulse can travel in only one direction. These properties make the nerve axon capable of logic operations. In 1960 a semiconductor device called a neuristor was devised, capable of propagating a signal in one direction without attenuation and able to perform numerical and logical operations. The neuristor computer, inspired by a natural model, imitates the dynamic behaviour of natural neural information networks; each circuit can serve sequentially for different operations in a manner similar to that of the nervous system.

Another question of interest to bionics is how a living system makes use of information. In changing circumstances, human beings evaluate alternative courses of action. Every situation somehow resembles a situation experienced before. "Pattern recognition," an important element in human action, has implications for bionics. One way to design an artificial machine capable of pattern-recognition properties is to use learning processes. Experimental versions of such a machine have been developed; they learn by establishing and modifying connections among a large number of possible alternative routes in a net of pathways. This learning, however, is still rudimentary and far from human.

The first essential difference between existing electronic computers and the human brain lies in the way their memories are organized. In either the memory of a living being or that of a machine the main problem lies in retrieving information once it has been stored. The method computers use is called "addressing." A computer memory can be compared to a large rack of pigeonholes, each having a particular number or address (location). It is possible to find a certain piece of information if the address—that is, the number of the pigeonhole—is known. The human memory works in a very different way, using association of data. Information is retrieved according to its content, not according to an external address artificially added. That difference is qualitative as well as quantitative. Man-made memory devices are now constructed using associative principles, and there is a great potential in this field.

The second main difference between electronic computers and the human brain resides in the manner of dealing with the information. A computer processes precise data. Man accepts fuzzy data and carries out operations that are not strictly rigorous. Also, computers perform only very simple elementary operations, producing complex results by performing a vast number of such simple operations at very high speed. In contrast, the human brain performs at low speed but in parallel rather than in sequence, producing several simultaneous results that can be compared (*see also* artificial intelligence).

In the living world, energy is stored in the form of chemical compounds; its use always is accompanied by chemical reactions. Solar energy is stored by plants by means of complex chemical processes. The energy of muscular motion is derived from chemical changes. The light produced by such living organisms as mushrooms, glowworms, and certain fishes is of chemical origin. In every case the energy transformation is remarkably efficient compared with thermal engines.

A beginning is being made in understanding how these transformations take place in living material and the nature of the complex role played by living membranes. Perhaps some of the limitations of molecular complexity and fragility could be overcome in man-made artificial-energy machines and better results achieved than in natural membranes.

bionomics: *see* ecology.

biophysics, discipline concerned with the application of the principles and methods of the physical sciences to biological problems.

A brief treatment of biophysics follows. For full treatment, *see* MACROPAEDIA: Biological Sciences, The.

The major areas of biophysics deal with biological function when the function depends on physical agents such as electricity (in nerves) or mechanical force (in muscles), the interaction of living organisms with physical agents such as light or sound or ionizing radiations (*e.g.,* X-rays), and interactions between living things and their environment as in locomotion (swimming, flying, etc.), navigation, and communication.

Sophisticated methodology and instrumentation are crucial in biophysics. In molecular biophysics, for example, X-ray diffraction and a sedimentation technique carried out with the ultracentrifuge have been among the most productive. These have made possible precise descriptions of the structure and properties of macromolecules found in animals and plants. Moreover, with the aid of electron microscopy and nuclear magnetic resonance, the molecular configuration and bonding of the principal constituents of cell membranes and chromosomes have been determined.

Physicists and physiologists have been aware of the biological effects of electric currents since Luigi Galvani's discovery of bioelectricity in the 18th century, and much work in biophysics has been concerned with the role of electric pulses in the conduction of information by nerves and in initiating muscular contraction. The generation of force by contracting muscle is also studied by biophysicists.

Biophysical studies of the senses have made much progress in the areas of vision and hearing. The use of light by plants is also investigated by biophysicists as the process of photosynthesis starts as a physical interaction even though it later develops through a chemical chain. Study of the effects of ultraviolet light is an extension of the study of the effects of visible light. No form of life is adapted to use ionizing radiations, but these constantly impinge on living organisms in the form of cosmic rays and naturally occurring radiations from uranium, radium, etc. The development of man-made sources of these radiations in the form of X-ray machines, nuclear power reactors, and isotopes used as tracers, as well as nuclear weapons, has been the spur for extensive research into their biophysical effects. There have been studies of the biological effects of lower-energy electromagnetic radiations (radio and radar waves), and of intense beams of infrared and visible light such as may be produced by lasers.

Locomotion presents one of the more complicated biophysical problems. The ways in which birds fly and fish swim involve complex considerations of aerodynamics and hydrodynamics, respectively. Mathematical expression of human and animal locomotion is formidably complex. Animal movement also requires navigation and this has revealed unexpected biophysical patterns, ranging from the use of ultrasonics by bats, to a kind of low-frequency radar used by certain fish, to the use of magnetic fields by pigeons and polarization of sunlight by bees.

biopoiesis, a process by which living organisms are thought to develop from nonliving matter, and the basis of a theory on the origin of life on Earth. According to this theory, conditions were such that, at one time in Earth's history, life was created from nonliving material, probably in the sea, which contained the necessary chemicals. During this process, molecules slowly grouped, then regrouped, forming ever more efficient means for energy transformation and becoming capable of reproduction (*see* eobiont).

Some scientists think that under present biospheric conditions new forms of life are not likely to be created from nonliving matter. Others feel that life is continuously being created but that the new forms are not so well adapted to the environment as existing ones and are thus unable to compete successfully.

biopsy, medical diagnostic procedure in which cells or tissues are removed from a patient and examined visually, usually with a microscope. The material for the biopsy may be obtained by several methods and with various instruments, including aspiration through a needle, swabbing with a sponge, scraping with a curette, trephining a bone, or excision with a forceps or electric snare. The biopsy is a standard step in the diagnosis of malignant and benign tumours and can also provide a wide range of other types of diagnostic information, particularly in connection with such organs as the liver or pancreas.

biopsychology: *see* psychobiology.

Biorra (Ireland): *see* Birr.

Biosatellite, any of a series of three U.S. Earth-orbiting scientific satellites designed to study the biological effects of weightlessness (*i.e.,* zero gravity), cosmic radiation, and the absence of the Earth's 24-hour day–night rhythm on a variety of plants and animals ranging from microorganisms to a primate. Such space laboratories were equipped with telemetering equipment with which to moni-

tor the condition of the specimens. Biosatellite 1 (1966) was not recovered. Biosatellite 2 (1967) was a complete success. It involved an assortment of biological experiments, including one concerned with mutations induced in the offspring of insects exposed to ionizing radiation in space. The flight of Biosatellite 3 (1969), scheduled to last 31 days, had to be cut short when the trained pigtail monkey that was aboard became ill.

biosociology: *see* synecology.

biosphere, relatively thin stratum of the Earth's surface and upper water layer that contains the total mass of living organisms, which process and recycle the energy and nutrients available from the environment.

A brief treatment of the biosphere follows. For full treatment, *see* MACROPAEDIA: Biosphere, The.

The primary source of energy for all life is solar radiation, and the minerals and other substances converted and used by organisms are drawn from the geosphere, or nonliving world, which consists of the atmosphere (the air), the hydrosphere (the water), and the lithosphere (rocks and soil of the terrestrial surface). A relatively recent conception of the Earth views all of these layers, both biotic (living) and abiotic (nonliving or geophysical), as components of an integral complex of interdependent systems known as the ecosphere.

The organisms of the biosphere range from the simplest unicellular microbes to humans. All life forms can be classified according to their function. Green plants are considered productive organisms because their photosynthetic conversion of water and carbon dioxide into carbohydrates supplies the basic nutritive substances for life. A second category consists of the organisms that consume and convert the energy stored in plants, including all species of animals, and a third category consists of microorganisms that decompose organic detritus into simpler forms that can be used again in the productive processes of plant growth. Groups of species in a defined region form biotic communities which, together with the nonliving components of their environment, constitute an ecosystem.

An understanding of the biosphere entails the study not only of its constituent organisms but also of the cycles by which energy and essential substances are transferred among species and between the biotic and abiotic segments of the environment. Photosynthesis, for example, the first stage in the conversion of solar energy into usable nutrients, operates at a maximum efficiency of 3 percent. At each stage in the transfer of this energy through the consumption of plants by animals, efficiency declines. In order for an organism to make the most efficient use of the energy it consumes, it must regulate its activity within an environment that supplies the temperature and the amounts of sunlight, water, and essential elements optimal for its species.

As energy flows in a single direction from solar radiation through plants and animals to humans and is dissipated at each successive stage, the chemical elements essential for life flow through the biogeochemical cycle from the nonliving environment through the biotic community and eventually return to their former state through organic decay. Gaseous elements are generally transferred through the atmosphere or hydrosphere, and the mineral elements such as magnesium, boron, sulfur, calcium, potassium, and phosphorus are absorbed through the soil and transmitted by water to plants and animals. Oxygen, for example, is cycled as an element of water and of mineral compounds, and it is released into the atmosphere in its free form by photosynthesis.

Most important of all, perhaps, is the cycle of water, a substance necessary for all life forms and a principal determinant of the climatic conditions suitable for each species. Water is circulated primarily through evaporation and precipitation and distributed chiefly as a liquid (*e.g.,* ocean currents and river runoff) over much of the Earth's surface, or as atmospheric water vapour. It is absorbed directly by plants and animals in both liquid and gaseous states and is released through respiration, elimination, and, in plants, transpiration. Besides its importance as a component of all organisms, it also serves as a medium for the transference of nutrients and assists in the regulation of internal conditions such as body temperature.

Biot, Jean-Baptiste (b. April 21, 1774, Paris—d. Feb. 3, 1862, Paris), French physicist who helped formulate the Biot–Savart law, which concerns magnetic fields, and laid the basis for saccharimetry, a useful technique of analyzing sugar solutions.

Educated at the École Polytechnique, Biot was appointed professor of mathematics at the University of Beauvais in 1797, became professor of mathematical physics at the Collège de France in 1800, and was elected a member of the French Academy of Sciences in 1803. He accompanied J.-L. Gay-Lussac in 1804 on the first balloon flight undertaken for scientific purposes. The men showed that the Earth's

Biot
H. Roger-Viollet

magnetic field does not vary noticeably with altitude, and they tested upper atmospheric composition. Biot also collaborated with the noted physicist D.F.J. Arago in investigating the refractive properties of gases.

In 1820 he and the physicist Félix Savart discovered that the intensity of the magnetic field set up by a current flowing through a wire is inversely proportional to the distance from the wire. This relationship is now known as the Biot–Savart law and is a fundamental part of modern electromagnetic theory. In 1835, while studying polarized light (light having all its waves in the same plane), Biot found that sugar solutions, among others, rotate the plane of polarization when a polarized light beam passes through. Further research revealed that the angle of rotation is a direct measure of the concentration of the solution. This fact became important in chemical analysis because it provided a simple nondestructive way of determining sugar concentration. For this work Biot was awarded the Rumford Medal of the Royal Society in 1840.

Among his voluminous writings, the most important work was *Traité élémentaire d'astronomie physique* (1805; "Elementary Treatise on Physical Astronomy"). He was made a member of the French Academy in 1856.

Biot–Savart law, in physics, a fundamental quantitative relationship between an electric current and the magnetic field it produces, based on the experiments in 1820 of the French scientists Jean-Baptiste Biot and Félix Savart.

An electric current flowing in a conductor, or a moving electric charge, produces a magnetic field, or a region in the space around the conductor in which magnetic forces may be detected. The value of the magnetic field at a point in the surrounding space may be considered the sum of all the contributions from each small element, or segment, of a current-carrying conductor. The Biot–Savart law states how the value of the magnetic field at a specific point in space from one short segment of current-carrying conductor depends on each factor that influences the field. In the first place, the value of the magnetic field at a point is directly proportional to both the value of the current in the conductor and the length of the current-carrying segment under consideration. The value of the field depends also on the orientation of the particular point with respect to the segment of current. If the line from the point to the short segment of current makes an angle of 90° with the current segment or lies straight out from it, the field is greatest. As this angle gets smaller, the field of the current segment diminishes, becoming zero when the point lies on a line of which the current element itself is a segment. In addition, the magnetic field at a point depends upon how far the point is from the current element. At twice the distance, the magnetic field is four times smaller, or the value of the magnetic field is inversely proportional to the square of the distance from the current element that produces it.

The Biot–Savart law is applied in a specific case by adding up the contributions to the magnetic field at a given point from the whole series of short current segments that constitute a specific conductor of whatever shape. For instance, with a very long straight wire carrying current, the value of the magnetic field at a point nearby is just directly proportional to the value of the current and inversely proportional to the perpendicular distance from the wire to the given point. *Compare* Ampère's law.

biotechnology, the application to industry of advances made in the techniques and instruments of research in the biological sciences.

The growth of the field of biotechnology is closely linked to the development in the 1970s of genetic engineering (the directed alteration of genetic material). Substances that have been produced in this manner include human interferon (a natural virus-fighting substance), human insulin, and human growth hormone. The techniques of genetic engineering—splicing, transplantation, and chemical replantation of repressed, nonfunctional genes—also offer the possibility that a number of heredity disorders may be "corrected" by manipulation. Recombinant DNA techniques in conjunction with the development of a technique for producing monoclonal antibodies (antibodies produced by single clones of antibody-producing cells) have made an evident impact on medical diagnosis and oncology. Another important use of genetic engineering is the production of bacteria used to biodegrade oil spills and toxic wastes.

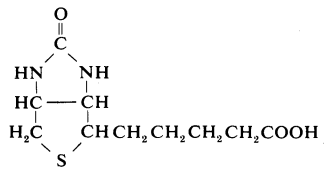
Biotechnology had its origins in a 1980 decision by the U.S. Supreme Court that "a live human-made microorganism is patentable matter." This ruling resulted in the establishment of a number of commercial firms—among them Genentech, Biogen, New England BioLabs, Cetus, and Genex—that manufacture quantities of gene-engineered substances for a variety of mostly medical and ecological uses.

biotic interaction, association among living organisms in a biological community. *See* amensalism; carnivore; commensalism; competition; food chain; herbivore; mutualism; parasitism; predation; symbiosis.

biotic potential, the maximum reproductive capacity of an organism under optimum environmental conditions. Full expression of the biotic potential of an organism is restricted by environmental resistance, any condition that inhibits the increase in number of the population.

Habitat resistance includes unfavourable climatic conditions; lack of space, light, or a suitable substrate; and deficiencies of necessary chemical compounds or minerals. Biotic resistance denotes the inhibiting effects of predators, parasites, disease organisms, or unfavourable genetic changes.

biotin, a water-soluble, nitrogen-containing acid essential for growth and well-being in animals and some microorganisms. Biotin functions in metabolic processes leading to the

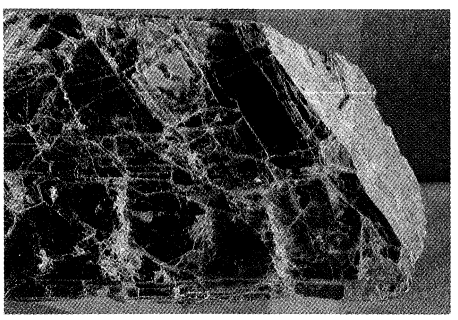


Biotin

formation of fats and the utilization of carbon dioxide. A relatively stable substance, it is widely distributed in nature and is especially abundant in egg yolk, beef liver, and yeast.

Biotin was first identified as a nutritive requirement of yeast. Originally called vitamin H, it was isolated in pure form in 1935; its structure was established in 1942, after it had been shown to be required by animals. Evidence for the necessity of biotin was provided by the discovery in 1927 that the addition of uncooked egg white to a diet that is otherwise adequate produces toxicity and disease. This is because egg white contains a specific protein, avidin, that combines with biotin and thus effectively prevents its action.

biotite, also called BLACK MICA, a silicate mineral in the common mica group. It is abundant in metamorphic rocks (both regional and contact), in pegmatites, and also in granites and other intrusive igneous rocks. For chemical formula and detailed physical properties, *see* mica (table).



Biotite mica from the district of Juchitán, Oaxaca, Mex.

By courtesy of the Field Museum of Natural History, Chicago; photograph, John H. Gerard—EB Inc.

Biotite is regarded as a mixture composed of variable proportions of four basic aluminosilicates of potassium, iron, magnesium, or aluminum: annite, $K_2Fe_6(Si_6Al_2O_{20})(OH)_4$; siderophyllite, $K_2Fe_5Al(Si_5Al_3O_{20})(OH)_4$; phlogopite, $K_2Mg_6(Si_6Al_2O_{20})(OH)_4$; and eastonite, $K_2Mg_5Al(Si_5Al_3O_{20})(OH)_4$. Biotite is arbitrarily designated as having a magnesium-to-iron ratio less than 2:1. Lepidomelane is a biotite very rich in iron.

Bioy Casares, Adolfo (b. Sept. 15, 1914, Buenos Aires), Brazilian novelist and short-story writer, best known for his use of magic realism.

Bioy Casares founded a literary magazine, *Destiempo* (1936), and published two collections of short stories, *Caos* (1934; "Chaos") and *Luis Greve, muerto* (1937; "Luis Greve, Dead"). He did not win wide notice until his first novel, *La invención de Morel* (1940; *The Invention of Morel,* 1964), a carefully constructed and fantastic work in which the protagonist strives to establish a point of contact with a woman whose movements have been captured by a gigantic movie machine. The novel ends with the protagonist incorporating himself into the film. The book formed the basis for Alain Robbe-Grillet's film script for the film *Last Year at Marienbad* (1961). *Plan de evasión* (1945; *A Plan for Escape,* 1975) and *La trama celeste* (1948; "The Celestial Plot," six stories translated in *The Invention of Morel,* 1964) are short-story collections that continue to explore imaginary worlds, tightly constructed to adhere to a fantastic logic.

In the novel *El sueño de los héroes* (1954; "The Sleep of the Heroes"), Bioy Casares employs the colloquial language of the lower classes of Buenos Aires to parody the conflict of civilization and barbarism in Argentine culture. The novel *Diario de la guerra del cerdo* (1969; *Diary of the War of the Pig,* 1972) is a mixture of science fiction and blatant political satire.

With Jorge Luis Borges, under the pseudonym of Honorio Bustos Domecq, he published *Antología de la literatura fantástica* (1940; "Anthology of Fantastic Literature," *i.e.,* magic realism) and *Seis problemas para Don Isidro Parodi* (1942; "Six Problems for Don Isidro Parodi"). These are complicated detective stories as well as satirical visions of Argentine life. With his wife, the poet Silvina Ocampo, and Borges, Bioy Casares edited *Antología poética argentina* (1941) and with Borges *Poesía gauchesca,* 2 vol., (1955; "Gaucho Poetry").

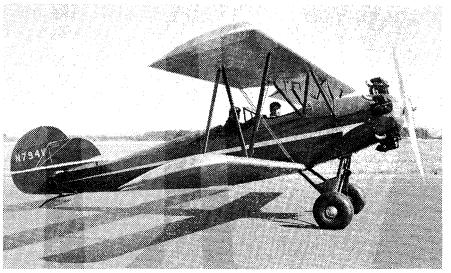
His other works include the collections of short stories *El gran serafín* (1967; "The Great Angel"), *Historias de amor* (1972; "Love Stories"), *Historias fantásticas* (1972; "Fantastic Stories), and *Los mejores cuentos policiales* (1973, with Borges; "The Greatest Detective Stories") and the novel *Dormir al sol* (1973; *Asleep in the Sun,* 1978).

biozone, stratigraphic unit consisting of all the strata containing a particular fossil and, hence, deposited during its existence. The extent of the unit in a particular place, on the local stratigraphic range of the fossil plant or animal involved, is called a teilzone. The geological time units corresponding to biozones and teilzones are biochrons and teilchrons, respectively. Biozone is also used synonymously with the terms zone and range zone in stratigraphy.

biphenyl, also called DIPHENYL, an aromatic hydrocarbon, used alone or with diphenyl ether as a heat-transfer fluid; chemical formula, $C_6H_5C_6H_5$. It may be isolated from coal tar; in the U.S., it is manufactured on a large scale by the thermal dehydrogenation of benzene.

Biphenyl is slightly less reactive chemically than benzene. It is chlorinated industrially to a mixture, polychlorinated biphenyl (*q.v.*), called PCB, formerly used as a heat-transfer fluid. Pure biphenyl is a colourless crystalline solid with a pleasant odour, insoluble in water but soluble in ordinary organic solvents. It freezes at 70°–71° C (158°–160° F) and boils at 254° C (489° F).

biplane, airplane with two wings, one above the other. In the 1890s this configuration was adopted for some successful man-carrying gliders. The Wright brothers' biplanes (1903–09) opened the era of powered flight. Biplanes predominated in military and commercial aviation from World War I through the early 1930s, but the biplane's greater manoeuvrability could not offset the speed advantage of



1930 Fleet, two-seat biplane

Peter M. Bowers

the lighter monoplane. After World War II, biplanes were used only for special purposes: crop dusting and sport (aerobatic) flying.

In the mid-1930s Adolf Busemann proposed the supersonic biplane, having a quite narrow gap (space between wings) in which expansion waves and shock waves would interact to reduce drag (the "shape drag" due to the thickness of the airfoil sections). A biplane having one wing (usually the lower) much smaller than the other is called a sesquiplane. A few triplane designs proved successful during World War I; powered aircraft with four or more main lifting surfaces have never been more than curiosities.

bipolar cell, in zoology, one of the nerve cells in the retina of the eye that make the connection between light-sensitive cells—the rods and cones—and ganglion cells, whose axon fibres make up the optic nerve. Some bipolar cells transmit impulses from the rods and cones to the ganglion cells; others transmit in the opposite direction.

Biqāʿ, al-, also spelled BEKAA, or BEQAA, *muḥāfaẓah* (governorate), eastern Lebanon, with an area of 1,653 sq mi (4,280 sq km). It is bordered by Syria to the east and north, and by the *muḥāfaẓat* (governorates) of al-Janūb to the south, and ash-Shamāl and Jabal Lubnān to the west. Al-Biqāʿ Valley, drained by the Līṭānī and Orontes rivers, constitutes much of the *muḥāfaẓah,* and contains nearly half of Lebanon's arable land. The Lebanon Mountains to the west and the Anti-Lebanon Mountains to the east enclose the al-Biqāʿ Valley. Crops include sugar beets, grains, fruits, and vegetables. Zaḥlah, the administrative centre, is noted for its vineyards and produces *arrack* (an alcoholic beverage made from dates). Baʿlabakk (Baalbek) is the site of several outstanding Roman ruins and is also the agricultural market centre of the governorate. Rīyāq has an airport. Pop. (1970 est.) 204,000.

Biqāʿ, al-, also spelled BEKAA, or BEQAA, classical COELE SYRIA, broad valley of central Lebanon, extending in a north–east–southwest direction for 75 mi (120 km) along the Līṭānī and Orontes rivers, between the Lebanon Mountains to the west and Anti-Lebanon Mountains to the east. The valley, which constitutes much of al-Biqāʿ *muḥāfaẓah* (governorate), contains nearly half of Lebanon's arable land but is not as intensively farmed as the country's coastal plain because of less rainfall and a wider variation in temperature. Crops grown in this mostly dry-farmed area are grains, with fruits and vegetables of secondary importance. Main towns include Zaḥlah, Baʿlabakk (Baalbek), and Rīyāq.

Bīr (India): *see* Bhir.

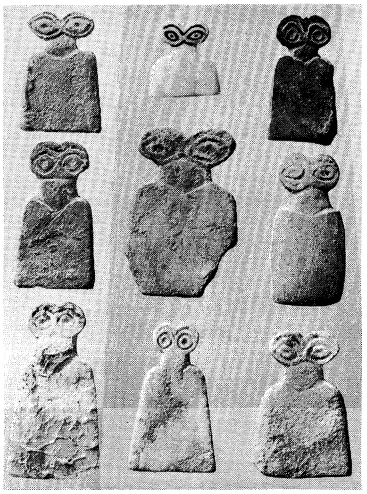
Bīrah, al- (Israeli-occupied Jordan): *see* Rām Allāh.

Birāk, also spelled BRACH, or BRAK, oasis, western Libya, on the southeastern edge of al-Ḥamādah al-Ḥamrāʾ, a stony plateau. One of

the string of oases along the Wādī (seasonal river) ash-Shāṭi', it is isolated from Sabhā, 40 mi (64 km) south, by great sand dunes, but the Adirī-Birāk road, running east, links with the north road from Sabhā to the Mediterranean coast.

Probably the most fertile oasis in the Fezzan (traditional region), it is irrigated by more than 50 artesian wells. The old town of narrow, dark alleyways contrasts with the modern, open settlement in the midst of a palm grove. The fort remains from the Italian occupations in 1914 and 1929. Produce includes dates, barley, vegetables, livestock, and poultry. There is a government experimental farm and air service. Pop. (1972 est.) 9,291.

Birāk, Tall, also spelled TELL BRAK, ancient site located in the fertile Nahr al-Khābūr basin in al-Ḥasakah governorate, Syria; it was inhabited from *c.* 3200 to *c.* 2200 BC. One of the most interesting discoveries at Birāk was the Eye Temple (*c.* 3000), so named because of the thousands of small stone "eye idols"



Eye idols from the temple area at Tall Birāk, late 4th millennium BC; in the British Museum

By courtesy of the trustees of the British Museum

found there. These curious objects have almost square bodies and thin heads carved with two to six large eyes. The temple itself is important for its use of typically southern Mesopotamian decorative motifs.

During the time of the Akkadian king Naram-Sin (reigned *c.* 2254–*c.* 2218), a royal residence was built at Birāk, and the town served as a control point for all the roads of the Jazīrah desert.

Biran, Marie-François-Pierre Maine de: *see* Maine de Biran, Marie-François-Pierre.

Birātnagar, town, southeastern Nepal, in the Terai, a low, fertile plain, north of Jogbani, India. The town is Nepal's principal industrial and foreign trade centre; manufactures include jute, sugar, and cotton. The Birātnagar Jute Mills (1936) was Nepal's first industrial endeavour and remains the country's largest single employer. A fish breeding and distribution centre has been established there with financial and technical assistance from the United States. The Kosi River project (hydroelectric) provides power for eastern Nepal. Pop. (1981) 93,544.

Bīrbhūm, district, West Bengal state, northeastern India. Its area (1,757 sq mi [4,550 sq km]) comprises two distinct regions. To the west lies an undulating, generally barren upland, part of the eastern fringe of the Chota Nāgpur plateau, rising to 3,000 ft (900 m); to the east is a densely populated, alluvial plain of the Gangetic Delta. The Ajay, Mor, Mayurākshi, Bakreswar, and Dwārka are the principal rivers. A project on the Mayurākshi provides irrigation for about 600,000 ac (240,000 ha) and 2,000 kW of electric power. Rice, legumes, wheat, corn (maize), and mangoes are the chief crops in the east; coal, china clay, and iron-ore deposits are worked in the west. The district's principal industries include cotton and silk weaving, rice and oilseed milling, and metalware and pottery manufacture. Sūri (*q.v.*) is the district headquarters. Pop. (1981) 2,095,829.

birch, any of about 40 species of short-lived ornamental and timber trees and shrubs constituting the genus *Betula* (family Betulaceae), distributed throughout cool regions of the Northern Hemisphere. Ivory birch (family Euphorbiaceae) and West Indian birch (family Burseraceae) are not true birches. The name bog birch is applied to a species of buckthorn (*q.v.*), as well as to *B. glandulosa.*

A birch has smooth, resinous, varicoloured or white bark, marked by horizontal pores (lenticels), which usually peels horizontally in thin sheets, especially on young trees. On older trunks the thick, deeply furrowed bark breaks into irregular plates. Short, slender branches rise to a narrow pyramidal crown on a young tree; they become horizontal, often pendulous, on an older tree. The egg-shaped or triangular, usually pointed leaves have toothed margins; they are alternately arranged on the branchlets. They are usually bright green, turning yellow in autumn. The drooping male catkins flower before the leaves emerge; smaller, upright female catkins on the same tree develop in conelike clusters, which disintegrate at maturity, releasing tiny, one-seeded, winged nutlets.

Gray birch, paper birch, river birch, sweet birch, yellow birch, and white birch are the best known; white birch is usually called silver birch in England, but the latter name is also sometimes given to paper birch and to yellow birch. The Japanese monarch birch (*B. maximowicziana*) is a valuable timber tree of Japan, especially in the plywood industry. Usually 30 metres (100 feet) high, with flaking gray or orange-gray bark, it has heart-shaped leaves about 15 centimetres (6 inches) long and is a hardy ornamental. The similar Japanese cherry birch (*B. grossa*) also produces useful timber.

Water birch (*B. occidentalis; B. fontinalis* of some authorities), a shrubby tree native to moist sites along the western coast of North America, has nonpeeling, dark-red bark; it grows in clusters, with all stems rising from a common root system. It is sometimes called red birch, black birch, or mountain birch. Swamp birch (*B. pumila*), a similar but smaller shrub, is found on boggy sites; it may be erect or trailing and matted. Bog birch (*B. glandulosa*) of North America, also called tundra dwarf birch or resin birch, and dwarf birch, or dwarf Arctic birch (*B. nana*), native to most far northern areas of the world, are small alpine and tundra shrubs commonly known as ground birch. Both species have almost circular leaves, are food sources for birds and grazing animals, and may be planted as ornamentals. Several Chinese birches and the Japanese white birch (*B. platyphylla japonica*) are sometimes used ornamentally. A few natural hybrids between trees and shrubs of the genus *Betula* are cultivated as ornamentals in Europe and North America.

Pale- to red-brown birchwood is used for flooring, furniture, cabinetry, interior finishing, vehicle parts, plywood, pulp, and turnery. The thin, water-impervious bark provided roofing, canoes, and shoes for North American Indians and early settlers. Birch oil and birch beer made from sap are obtained from the trees. Woodsmen rely on the ability of yellow and paper birch bark to burn even when wet.

Birches were among the first trees to become established after the glaciers receded. Hardy, quick growing, and relatively immune to disease and insect attack, they are valuable in reforestation, erosion control, and as protective cover, or nurse trees, for development of more permanent plants. Most require moist, sandy, and loamy soil; they are usually propagated by seeding or grafting. Many ornamental varieties are cultivated for their leaf colour, leaf shape, or growth habit.

birch mouse (*Sicista*), any of six species of small, long-tailed, typically mouselike rodents, family Zapodidae (order Rodentia). Birch mice are found in Eurasia, in woods, moors, steppes, and fields. They are about 5–10 centimetres (2–4 inches) long, excluding the tail, and they have brown or yellowish brown fur. Some species have a dark back stripe. Birch mice live in burrows, eat plant material and insects, and hibernate underground from fall until well into spring. They leap, rather than run, and they climb well, supporting themselves with their tails.

bird, warm-blooded vertebrate of the class *Aves*, unique in having feathers and forelimbs modified into wings.

A brief treatment of birds follows. For full treatment, including illustrations, *see* MACROPAEDIA: Birds.

The dispersal of birds is almost universal due to their flight capacity. Generally, the number of species in any area of the world depends proportionately on the space and diversity of habitats.

Mankind has used birds and their eggs for food since the earliest times, and with the beginnings of agricultural society, domestication of some species of wild birds began. The red jungle fowl, the mallard duck, and the greylag goose were the ancestors of the domestic chicken, the duck, and the barnyard goose. Modern culture has changed the need for wild game from food source to sport. Bird feathers are used for decoration as well as insulation and many birds are kept as pets. Despite all their uses, birds can be serious pests due to depredations of grains and fruit.

Behaviour. Birds exhibit much behaviour that is stereotyped for the species. Wing-, leg-, and tail-stretching movements are almost universal in all species. Territories and defended areas are maintained during breeding season. The bird "song," an auditory signal, is used to attract mates, warn off rivals, alert other birds to danger, and, in the case of young birds with their parents, beg for food.

Nests vary widely. They can be deep burrows, woven hanging structures, a mere depression in the sand, a hole in a tree or rock, and others. Materials for lining can consist of sticks, leaves, algae, rootlets, small stones, dirt, mud, and animal materials like horsehair, snakeskin, or feathers. Except for mound builders, all birds incubate their eggs, with incubation varying from 11 to 80 days.

The feeding habit of the earliest birds was insectivorous and many modern members have specialized feeding techniques. Some, who catch insects on the wing, have wide gapes. There are woodpeckers who dig out wood-boring grubs, thrashers who use their bills to dig in the ground, and the raptorial varieties who feed on animals and who have evolved talons and hooked bills.

Form and function. The big flying birds have evolved skeletons that are highly pneumatic, with part of the bone replaced by air spaces, an adaptation for reducing weight. Because of forelimb modification for flight, birds have developed a bipedal gait.

Feathers, unique to birds, are made of a protein called keratin. The contour feathers both streamline and waterproof the body of a bird, with the basal part of the feathers serving as insulation. The contour feathers are shed in a

process called molting. Coloration in birds is caused by pigments, structure, or both.

Structural modifications of birds include feet covered with scales, occasionally vestigial claws on wing tips, a bill covered with keratin, and an oil gland for dressing the plumage.

Strength and lightness of skeleton, necessary for flight, are due to pneumatic features and to the fusion of elements. Birds can move both upper and lower jaws, an ability mammals do not possess. The wing skeleton modifications include feathers, the restricted motion of elbow and wrist joints to one plane, loss of functional claws, and hollow wing bones. In large flying birds the pneumatic bones are strengthened by struts at stress points.

The muscles of the viscera and the heart muscles of birds are similar to those of mammals and reptiles. Feather muscles in the skin can raise or depress the feathers. A pectoralis muscle lowers the wing, opposed by a supracoracoideus, which raises it with a pulley-like action through a tendon.

Like mammals, and unlike reptiles, birds have a circulatory system that separates the lung circulation from that of the body. Birds' hearts are large in proportion to body weight. The lung differs from that of other land vertebrates in having capillaries for passage of air and gas exchange.

The crop, an enlarged part of the esophagus used for temporary food storage, is an adaptation for flight.

As with reptiles, male birds have internal testes. The sexual organs of both sexes enlarge and regress according to season.

The body temperature of birds, which are warm-blooded, is approximately 41° C (106° F). Insulation is provided by feathers, together with layers of subcutaneous fat in some water birds. In cold temperatures, heat loss from the exposed, unfeathered feet is minimized by a reduction of blood flow to that part of the bird and by a network of heat-exchange in the blood vessels of the upper leg. Rapid panting dissipates heat when necessary, since birds do not have sweat glands.

Evolution and paleontology. *Archaeopteryx lithographica*, the earliest known fossil bird, found in Upper Jurassic deposits in Bavaria, was different from recent birds and resembled some reptiles. The jaws had teeth set in sockets, the bones were not pneumatic, and the wing bones contained three movable digits with functional claws. Avian characteristics were present in the structure of the beak, eye, and jaw articulation, and in the presence of feathers.

The skeletal structure indicated that *Archaeopteryx* did not fly, it glided. Features of the limb bones indicate that it was descended from reptiles of the Triassic order Thecodontia.

Small bipedal reptiles, called pseudosuchians, were present in the Triassic Period (225,000,000 years ago). With a skull like that of *Archaeopteryx*, this group probably was arboreal, finding abundant insect food and safety from large terrestrial enemies. Selective evolution would bring forth avian characteristics such as the grasping foot, enlargement of claws and forelimb elongation for climbing, better visual capacity, and, most important of all, internal temperature control. The latter was advantageous in catching insects and in keeping warm in the arboreal breeze.

As the modern bird evolved, muscles for wing movement enlarged, the tail, used as a steering mechanism, became shorter and more easily moved, feathers took on functional specializations, and bird species dispersed to cover the Earth.

Bird, (Cyril) Kenneth, pseudonym FOUGASSE (b. Dec. 17, 1887, London—d. June 11, 1965, London), British cartoonist who, particularly in *Punch*, created warmhearted social comedies, using little stick figures to convey his point.

Originally a civil engineer, Bird was with the Royal Engineers during World War I. He decided on a drawing career after a shell fractured his spine at Gallipoli, Turkey, in 1915, when it appeared that he would not walk again. He contributed his first cartoon to *Punch* in 1916 and became art director for the publication in 1937 and editor in 1949, a position he held until 1953.

Bird decided to use a pseudonym to avoid confusion with another *Punch* artist, later explaining that "fougasse" was an old technical term used by sappers for a rough-and-ready land mine that might or might not go off. He gained widespread fame during World War II for a series of posters in behalf of various national causes. Particularly notable were those captioned "Careless talk costs lives," in which Adolf Hitler was portrayed listening in on conversations in public places. From the 1920s through the 1950s his drawings were collected in a succession of books.

Bird, Robert Montgomery (b. Feb. 5, 1806, New Castle, Del., U.S.—d. Jan. 23, 1854, Philadelphia), novelist and dramatist whose work epitomizes the nascent U.S. literature of the first half of the 19th century. Although immensely popular in his day—one of his tragedies, *The Gladiator*, achieved more than 1,000 performances in Bird's lifetime—his writings are principally of interest in the 20th century to the literary historian.

Bird graduated with a medical degree from the University of Pennsylvania in 1827 but practiced for only a year. He wrote poetry, some of it published in periodicals, and several unproduced plays. His first drama to be staged was *The Gladiator* (1831), produced by the famous tragic actor Edwin Forrest, who became a close friend until they fell out because Bird thought Forrest had paid him too little for his dramas. About a slave revolt in the Rome of 73 BC, *The Gladiator* by implication attacks the institution of slavery in the U.S. The play's indictment of Rome's imperial power was also a thrust against Britain's relationship to the U.S. during the colonial period. Bird employed his close study of Spanish-American history in *Oralloossa* (1832), a romantic tragedy of Peru at the time of the Spanish conquest. Eighteenth-century Colombia was the scene of *The Broker of Bogota* (1834), a domestic drama considered his best by many critics.

After his break with Forrest (who had produced all his plays), Bird turned to the novel, beginning with *Calavar* (1834), a tale of the Spanish conquistadors in Mexico, and its sequel, *The Infidel* (1835). His remaining novels were laid in the United States, generally in the frontier regions he knew from his travels. The most popular was *Nick of the Woods* (1837), in which he attempted to demolish the image of the American Indian as a noble savage by picturing him with the contempt and hatred that the backwoodsman often showed.

Finding it impossible to make a living from his writing, Bird taught at Pennsylvania Medical College in Philadelphia (1841–43) and tried his hand at farming. At the time of his death he was literary editor and part owner of the Philadelphia *North American*.

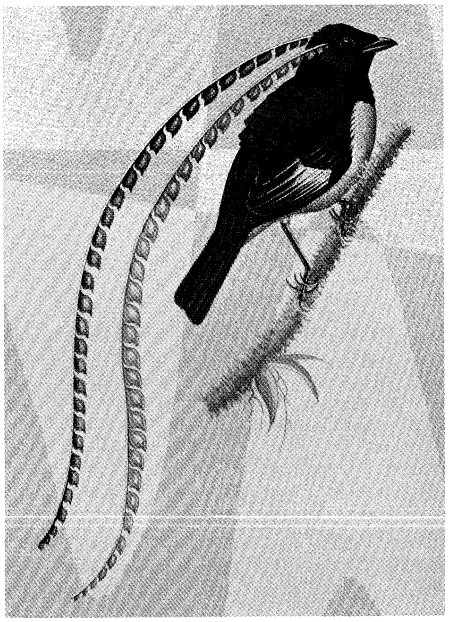
Bird Island, also called AVES ISLAND, Spanish ISLA AVES, or ISLOTE AVES, coral-covered sandbank only 15 ft (4.5 m) high at low tide, located in the Caribbean Sea 350 mi (560 km) north of Venezuela and 70 mi west of Dominica. (The island is not a part of the group of Venezuelan islands of similar name, Islas de Aves, comprising Aves de Barlovento and Aves de Sotavento, located 145 mi north of Caracas, just east of Bonaire.) The uninhabited islet was valued in the past for the economic value of its abundant guano, used as fertilizer, and was claimed or occupied by a number of powers (Spain, Venezuela, the United States, the Netherlands, Great Britain, and Dominica) after its discovery in 1492.

The islet acquired great political significance in the 1970s because of its strategic importance for the control of the Caribbean basin and became the subject of a tense dispute between Venezuela and Dominica. Dominica's claim is based on geographical criteria, since the island rises from a long submarine sandbank, the Aves Ridge, which apparently connects it with Dominica. Venezuela's claim stems from having maintained an armed force there and exercised acts of sovereignty by virtue of which it was awarded to Venezuela in 1865.

bird louse, any chewing louse (Mallophaga) living on birds. Probably all bird species have chewing lice. Bird lice feed on feathers, skin surface, and sometimes blood but normally are not harmful; however, if too numerous, their irritation may cause the bird to damage itself by scratching and may even interfere with egg production and the fattening of poultry.

Birds with damaged bills are often heavily infested because they cannot preen themselves properly. Two important species of chewing lice are the chicken louse, *Menopon pallidum*, and the pigeon louse, *Lipeurus baculus*.

bird-of-paradise, family name PARADISAEIDAE, any of about 40 species of small to medium-sized forest birds (order Passeriformes).



King of Saxony's bird-of-paradise (*Pteridophora alberti*)
Painting by Murrell Butler

They are rivalled only by a few pheasants and hummingbirds in colour and in the bizarre shape of the males' plumage. Courting males perform for hours on a chosen perch or in a cleared space on the forest floor. After mating, the plain females generally make the nest and raise the one or two young unaided.

Birds-of-paradise occur in New Guinea highlands and on nearby islands; species called manucodes and riflebirds are found also in Australia. The largest manucode is the 45-centimetre (17½-inch) curl-crested manucode (*Manucodia comrii*). The trumpetbird (*Phonygammus keraudrenii*) is 25 to 32 cm (10 to 12½ in.) long and has head tufts as well as pointed neck feathers. It is named for the male's loud call. Others having special names include sicklebills and standardwings.

Among the most notable birds-of-paradise

are the plumebirds—the seven species of *Paradisaea,* 29 to 46 cm (11½ to 18 in.) long. Their central tail feathers are elongated as wires or twisted narrow ribbons, and their filmy flank plumes can be raised and brought forward over the back, hiding the wings. The greater bird-of-paradise (*P. apoda*) has been introduced into the island of Little Tobago, in Trinidad and Tobago off the coast of Venezuela.

The 12-wired bird-of-paradise (*Seleucidis melanoleuca,* sometimes *S. ignotus*) is a short-tailed, 33-cm bird with flank plumes elaborated as forward-curving wires.

Grouped as flagbirds are the six-plumed birds-of-paradise—the four species of *Parotia*—and the King of Saxony's bird-of-paradise (*Pteridophora alberti*). The former have elaborate flank plumes as well as six flag-tipped wires projecting back from the head; the latter has a shoulder-cape and a pair of long head-streamers composed of about 40 squarish lobes with an enameled appearance.

The superb bird-of-paradise (*Lophorina superba*) has a spreading breast shield and a broad cape that turns into a head-fan. The magnificent bird-of-paradise (*Diphyllodes magnificus*) and Wilson's bird-of-paradise (*D. respublica*) are caped and have two wirelike tail feathers curving outward; in Wilson's the crown is bare and has a "cross of Christ" pattern. The king bird-of-paradise (*Cicinnurus regius*), only 13 to 17 cm long, has similar but flag-tipped tailwires and fanlike side plumes.

In the five species of long-tailed birds-of-paradise (*Astrapia*), males are shining black, sometimes with iridescent ruffs, and have long graduated tails of broad black or black-and-white feathers; total length may be 80 to 115 cm.

The other "paradise" birds are far less colourful. Among them are the sickle-crested, or mocha-breasted, bird-of-paradise (*Cnemophilus macgregorii*); the wattle-billed, or golden-silky, bird-of-paradise (*Loboparadisea sericea*); and Loria's, or Lady Macgregor's, bird-of-paradise (*Loria loriae*)—three species formerly classified as bowerbirds.

Riflebirds are three species of the genus *Ptiloris,* named perhaps for resemblance of the males' plumage to an early-day British rifleman's uniform. The name has also been attributed to the calls of Queen Victoria's riflebird (*P. victoriae*) and the paradise riflebird (*P. paradiseus*)—prolonged hisses, like the passage of bullets through the air.

bird-of-paradise flower, also called CRANE FLOWER (*Strelitzia reginae*), ornamental plant of the family Strelitziaceae. There are five species of the genus *Strelitzia,* all native to southern Africa. They grow from rhizomes (underground stems) to a height of 1 to 1.5 metres (about 3 to 5 feet) and have stiff, erect, leathery, concave, and oblong leaves. The leaves are bluish green and may have a red midrib.

Bird-of-paradise flower (*Strelitzia reginae*)
Sven Samelius

The *Strelitzia* flower has two erect, pointed petals and five stamens. One main bract, shaped like a boat, is green with red borders. It holds many long-stemmed, orange and bright-blue flowers. *S. reginae* variety *citrina* has yellow flowers.

bird of prey, any bird that pursues other animals for food. Birds of prey are classified in two orders: Falconiformes and Strigiformes. Diurnal birds of prey—hawks, eagles, vultures, and falcons (Falconiformes)—are also called raptors, derived from the Latin *raptare,* "to seize and carry off." (In a broader sense, the name raptor is sometimes synonymous with the designation "bird of prey.") The nocturnal birds of prey are the owls (Strigiformes). The condors (species of vultures) and the eagles are among the largest and strongest of birds. All birds of prey have hook-tipped beaks and sharp curved claws called talons (in nonpredatory vultures the talons are present but atrophied). In spite of the similarities between the two groups, many authorities believe that they are not closely related, but rather that they developed similar methods of living a predatory life.

bird rug, floor covering handwoven in Turkey from the 16th to the 18th century, carrying on a white ground an allover, stylized leaf design commonly thought to resemble a bird. A scarce, comparatively large version in bright colours seems to have been made along the Aegean coast of Turkey, possibly in the city of Uşak.

Small rugs, progressively cruder and more degenerate in treatment with more sombre colouring, have been found in Transylvanian churches and were probably produced either there or in European Turkey. Bird rugs, as well as other white-ground Turkish rugs, have been forged extensively.

bird song, certain vocalizations of birds, characteristic of males during the breeding season, for the attraction of a mate and for territorial defense. Songs tend to be more complex and longer than birdcalls, used for communication within a species. Songs are the vocalizations of birds most pleasing to man.

From the advertising song of a male on its territory, other males learn what species it is, and some species can judge the mood of the singer and even its individual identity. The indigo bunting can learn all of this data from various parts of a conspecific's song, yet the total sequence of notes in the song, so conspicuous to humans, is not known to convey any information to the bird. In some birds the characteristic song is hereditary rather than learned. In others, such as the chaffinch, juveniles must hear the song from adult males in order to learn to sing it.

bird stone, abstract stone carving of a kind thought by many to be the most beautiful of all the artifacts left by the prehistoric Indian cultures inhabiting the area east of the Mississippi River in the United States and some parts of eastern Canada. They resemble birds and rarely exceed six inches (15 centimetres) in length.

The great majority were carved from black, brown, or dark green slate, with a few beautiful examples carved from porphyry. The stone was evidently chipped away to a rough approximation of the finished form and then smoothed to a high polish with sand and other abrasives. A distinctive feature of all bird stones is a pair of conical holes running diagonally through the base.

There have been many theories about the function of the bird stones, but none seems to have gained wide acceptance. Bird stones were probably not invested with ritual or ceremonial significance, for they are not typically found in burial mounds but dispersed in fields. The most credible theory is that the stone was either a weight or a handle for an *atlatl,* a short rod used to hurl spears or arrows, giving them more speed and power than would be possible if they were thrown by hand alone. Most bird stones have been found in New York, Ohio, Indiana, Illinois, Michigan, Wisconsin, and Ontario but they have been discovered in places as far from the Northeast as Georgia, Mississippi, and South Dakota.

Consult the INDEX *first*

bird-watching, the observation of live birds in their natural habitat, a popular pastime and scientific sport that developed almost entirely in the 20th century. In the 19th century almost all students of birds used guns and could identify an unfamiliar species only when its corpse was in their hands. Modern bird-watching was made possible largely by the development of optical aids, particularly binoculars, which enabled people to see and study wild birds, without harming them, better than ever before.

A great surge of interest in wild birds occurred from about the 1880s onward. Bird-watching first became popular in Great Britain, with the United States not far behind. Eventually, it became almost equally popular in Scandinavia, The Netherlands, Germany, Switzerland, and the older countries of the British Commonwealth.

Interest in bird-watching has been stimulated by bird books, stretching as far back as Gilbert White's *Natural History of Selborne* (1788) and John James Audubon's illustrated *Birds of America* (1827–38) and culminating in such essential aids to the bird-watcher in the field as H.F. Witherby's five-volume *Handbook of British Birds* (1938–41) and Roger Tory Peterson's *Field Guide to the Birds* (1947), which gives the field marks of all North American birds found east of the Rocky Mountains. Similar works are available for many other regions.

Journals and magazines, such as the *Audubon Magazine* (United States), *British Birds* (England), and *La Terre et la vie* (France), have also contributed to the growth of interest, as have the broadcasting media.

One of the great appeals of bird-watching is that it is a relatively inexpensive activity. Basic equipment includes binoculars, a field book to aid identification, and a notebook for recording time and place of sightings; it is not necessary to travel. Many bird-watchers set up feeding stations to attract birds. The lists of bird observations compiled by members of local bird-watching societies are very useful to scientists in determining dispersal, habitat, and migration patterns of the various species.

From about 1930 there was a great increase in fieldwork, including photography, by amateur bird-watchers. The British Trust for Ornithology organizes cooperative inquiries, such as sample censuses of herons and great crested grebes and surveys of winter roosts of gulls, in which large numbers of amateurs take part. The wildfowl counts of the International Wildfowl Research Bureau are run as a coordinated international effort throughout western Europe.

Bird Woman (Shoshone Indian): *see* Sacajawea.

Birdman of Alcatraz: *see* Stroud, Robert.

bird's-foot trefoil (*Lotus corniculatus*), perennial, spreading herbaceous plant, of the pea family (Fabaceae), native to Europe and

Asia but introduced to other regions. Often used as forage for cattle, it is occasionally a troublesome weed. The stem grows to about

Bird's-foot trefoil (*Lotus corniculatus*)
C. Foord—EB Inc.

60 centimetres (2 feet) long. The leaves consist of three rather oval leaflets, broadest near the tip. The flowers, about 2 cm (0.8 in.) wide, are yellow, sometimes tinged with red, and grow in clusters of 5 to 10.

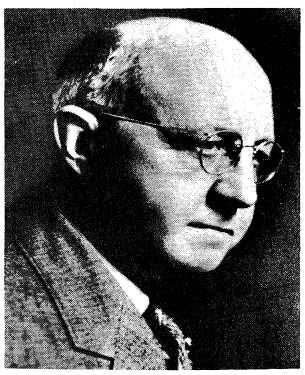
bird's-nest orchid (*Neottia nidus-avis*), European plant of the family Orchidaceae that lacks chlorophyll and obtains its food from decaying organic material. Its numerous pale-brown flowers are borne on a leafless spike. The short, underground stem and the mass of roots that resembles a bird's nest store food until about the ninth year, when the plant first blooms.

bird's-nest soup, delicacy of the Chinese cuisine, made from the teacup-like nests of the swiftlet (*q.v.*)—nests formed chiefly of the bird's saliva. The substance, rich in protein, is clear, whitish, and brittle before it is boiled. It is prepared as a consommé or is blended with floured chicken broth. The most expensive nests are virtually free of plant material.

Birdseye, Clarence (b. Dec. 9, 1886, New York City—d. Oct. 7, 1956, New York City), U.S. businessman and inventor best known for developing a process for freezing foods in small packages suitable for retailing.

After working as a government naturalist, Birdseye went to Labrador as a fur trader in 1912 and again in 1916. There the people often froze food in the winter because of the difficulty of obtaining fresh food; this solution to their problem spurred Birdseye's imagination.

After returning to the U.S., he began to experiment and, in 1924, helped found General Seafoods Company. Five years later he began



Birdseye
By courtesy of General Foods Corporation

selling his quick-frozen foods, a successful line of products that made him wealthy. Birdseye's process consisted of rapid freezing of packaged food between two refrigerated metal plates. Though his were not the first frozen foods, Birdseye's freezing process was a highly efficient one that preserved the original taste of a variety of foods, including fish, fruits, and vegetables. In 1929 Birdseye's company was bought by Postum, Inc., which changed its own name to the General Foods Corporation, retaining Birdseye as a consultant. From 1930 to 1934 Birdseye was president of Birds Eye Frosted Foods and from 1935 to 1938, of Birdseye Electric Company.

Birdseye held nearly 300 patents. Besides his frozen food process, he developed infrared heat lamps, a recoilless harpoon gun for taking whales, and a method of removing water from foods. A few years before his death he perfected a method of converting bagasse (crushed sugarcane residue) into paper pulp.

birefringence: *see* double refraction.

biretta, stiff hat with three rounded peaks worn by Roman Catholic, some Anglican, and some European Lutheran clergy for both

Cardinal de Richelieu wearing a red biretta as a symbol of his rank, oil painting by Philippe de Champaigne, middle of the 17th century; in the Musée Condé, Chantilly, Fr.
By courtesy of the Musee Conde, Chantilly, France; photograph, Eddy van der Veen

liturgical and nonliturgical functions. A tassel is often attached. The colour designates the wearer's rank: red for cardinals, purple for bishops, and black for priests.

The biretta developed from the medieval cap known as a *birettum,* or *pileus.* By the 16th century it had evolved through several forms and had essentially attained its present form.

Bīrganj, town, southern Nepal, in the Terai, a low, fertile plain, near the Indian border. Southwest of Kāthmāndu, it is an important marketing centre (rice, wheat, barley, corn [maize], jute) and a terminus for the narrow-gauge Royal Nepal Government Railway running north to Amlekhganj and connecting with a ropeway leading to Kāthmāndu. The town is also served by the Indian North-Eastern Railway. Industry is limited to sugar processing and the manufacture of cigarettes and matches. A fish breeding and distribution centre has been established there with financial and technical assistance from the United States, which has also sponsored construction of the Tilawe Nadī irrigation dam, 10 mi (16 km) north. Pop. (1981) 43,642.

Birger JARL (d. Oct. 1, 1266, Västergötland, Swed.), the virtual ruler of Sweden from 1248 until his death.

Before 1238 Birger had married Ingeborg (d. 1254), the sister of King Erik Eriksson (1222–50), and was created *jarl* (earl) of Sweden in 1248. When Erik died, leaving no son, Birger obtained the election as king of his own son Valdemar, a minor for whom he acted as regent. He enlisted the support of the church against the magnates (local rulers) and the provincial assemblies and issued the first Swedish national laws developing the concept of the king's peace. He established closer links with Norway and Denmark, confirmed by marriage alliances: his daughter, Rikissa, in 1251 married the Norwegian heir apparent, and in 1261 he himself married Mechthild, widow of the Danish king Abel; extended Swedish influence to southern Finland; and, by granting privileges, encouraged the Baltic city of Lübeck to increase its trade with Sweden. The claim that he founded Stockholm is in dispute, but under his regency Stockholm became the administrative centre of Sweden.

Birger MAGNUSSON (b. 1280—d. May 31, 1321), king of Sweden (1290–1318), son of Magnus I; he was nominally king under a regency during 1290–1302. He was crowned in 1302 and subsequently engaged in civil war with his brothers (1306–10). Later (1317–18), he had them imprisoned and killed but was himself driven into exile in Denmark (1318).

Birgit OF SWEDEN, SAINT, Swedish SANKTA BIRGITTA AV SVERIGE: *see* Bridget of Sweden, Saint.

Biringuccio, Vannoccio (b. Oct. 20, 1480, Siena, Rep. of Siena—d. *c.* 1539), Italian metallurgist and armament maker, chiefly known as the author of *De la pirotechnia* (1540; "Concerning Pyrotechnics"), the first clear, comprehensive work on metallurgy.

As a youth Biringuccio enjoyed the patronage of Pandolfo Petrucci (1450—1511), the dictator of Siena. Sent to Germany by Petrucci to study technology, he returned in 1513 and took a series of posts in Siena, Parma, Ferrara, and Venice as an armourer and metallurgist. He returned to Siena in 1530 and eight years later became director of the papal arsenal under Pope Paul III.

De la pirotechnia contrasts strikingly with the obscure alchemical writings of the time. The book is replete with lavish woodcuts illustrating the equipment and processes then in use and includes clear, practical instructions for mining, smelting, and metalworking. It became a standard reference and remains valuable as a source of information on the state of technology during the 15th and 16th centuries.

Biritch, also called KHEDIVE, card game similar to Bridge Whist and a forerunner of Auction and Contract Bridge. Apparently developed in the eastern Mediterranean region, where it was known as Khedive, it became popular in Greece and Egypt and, under the name of Biritch, on the French Riviera in the last quarter of the 19th century. The name Biritch, of obscure origin, had been corrupted to Bridge by the 1880s. In Bridge Whist, "to biritch (bridge) it" means to pass the choice of trump from the dealer to his partner.

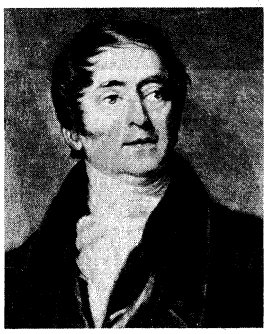
Bīrjand, chief town and county (*shahrestān*) in Khorāsān *ostān* (province), eastern Iran, built on low hills in a barren valley 4,774 ft (1,455 m) above sea level. The town, divided by the Khūsf River (usually dry), was formerly the seat of semi-independent rulers and a caravan centre; it has in part maintained its commercial position. Local wool is excellent, and carpet making remains one of Bīrjand's most important industries. Pop. (1976) 55,925.

Birka, medieval city in southeastern Sweden, on the Lake Mälaren island of Björkö. It was Sweden's first major urban centre and served as a thriving international trade centre between western and eastern Europe.

Founded in the 9th century and thus one of the earliest urban settlements in Scandinavia, Birka was the Baltic link in the river and portage route through Russia to the Byzantine Empire. A major part of the city's commerce involved Russian, Byzantine, and Arabic goods, in addition to western European articles. Birka declined and disappeared after 975 because the Baltic island of Gotland was in a better strategic position for receiving Russian–Byzantine trade and perhaps also because the water level around Björkö had dropped. Birka's activity was taken over by Gotland and by a new Mälaren site, Sigtuna.

Birkarlar, Finnish PIRKKALAISET, group of Swedish and Finnish traders and trappers who, for nearly 300 years, explored, colonized, and governed the forest area extending from the eastern coast of the Gulf of Bothnia to the northern Norwegian hinterland. In 1277 the Swedish kings gave the Birkarlar the right to exploit this wilderness, amassing furs and fish and levying taxes on the Lapp population. In return, the Birkarlar paid a tribute to the royal treasury. These frontiersmen had Norwegian and Russian counterparts (especially the Novgorodian Vatagi) with whom they shared the tasks of subduing pagan tribes and developing the river and portage routes. They brought significant revenues and commerce to the advanced centres of Scandinavia and northeastern Europe. In 1552, Sweden's King Gustav I Vasa (ruled 1523–60) revoked the Birkarlar's taxing rights in the vast area in favour of direct royal control, and the frontier company passed from the historical scene.

Birkbeck, George (b. Jan. 10, 1776, Settle, Yorkshire, Eng.—d. Dec. 1, 1841, London),



Birkbeck, lithograph after an oil painting by S. Lane
BBC Hulton Picture Library

British physician who pioneered the founding of classes for workingmen and was the first president of Birkbeck College.

In 1799 Birkbeck was appointed professor of natural philosophy in a school in Glasgow. There he started a course of lectures on science, to which artisans were admitted for a low fee. In 1823 he helped found the London Mechanic's Institution, of which he was president until his death. In 1907 the institution was renamed Birkbeck College and in 1920 was recognized as a school of the University of London for evening and part-time students. The success of the London institution led to the establishment of similar vocational training schools all over Britain, some of which developed into technical colleges.

Birkenau (German Nazi extermination camp): *see* Auschwitz.

Birkenhead, borough and seaport in the metropolitan county of Merseyside (until 1974 in Cheshire), Eng., on the Wirral Peninsula, facing Liverpool at the mouth of the River Mersey. The community was a hamlet of 106 inhabitants as late as 1810. Its subsequent rapid development began with the establishment of boiler works and a shipyard on Wallasey Pool, a creek of the Mersey, in 1824 by William Laird, a pioneer in the construction of iron ships. Laird also laid out the nucleus of the town on a grid plan.

In 1828 proposals were made for the conversion of Wallasey Pool into an artificial basin. The first docks were built in less than five years and opened in 1847. With nearly 10 mi (16 km) of quay facilities, they have been under the control of the Mersey Docks and Harbour Board since 1857. Besides sharing in the general trade of the Mersey, Birkenhead developed an individual trade in the export of manufactures from the Midlands, the import of cattle from Ireland, and the export and import of goods with the Eastern tropics. The two main basins of the dock system attracted a gigantic flour-milling industry that made Birkenhead the largest milling centre in Europe. A vast cattle and meat trade is carried on at an abattoir on the river front. Shipbuilding and ship repairing continue, and there is also heavy and light engineering, food processing, and clothing manufacture.

The ferry crossing the Mersey to Liverpool dates from 1330. The railway tunnel under the river was completed in 1886, and the vehicular Mersey Tunnel was opened in 1934. Birkenhead Park was laid out in 1847. Birkenhead was incorporated in 1877 and was a county borough until 1974. Pop. (1981 prelim.) 123,907.

Birkenhead, Frederick Edwin Smith, 1st earl of, VISCOUNT FURNEAUX OF CHARLTON, byname (until 1919) F.E. SMITH (b. July 12, 1872, Birkenhead, Cheshire, Eng.—d. Sept. 30, 1930, London), British statesman, lawyer, and noted orator; as lord chancellor (1919–22), he sponsored major legal reforms and helped negotiate the Anglo-Irish Treaty of 1921.

A graduate (1895) of Wadham College, Oxford, Smith taught law at Oxford until 1899, when he was called to the bar and began to practice in Liverpool. Elected to the House of Commons from a Liverpool district in 1906, he attracted attention by the brilliant invective of his first parliamentary speech (March 12) and soon became a leader of the Conservative Party. Sympathizing with his numerous Irish Protestant constituents in Liverpool, he favoured the exclusion of the largely Protestant counties of Ulster from Irish Home Rule. After the formation of H.H. Asquith's World War I coalition government, he became solicitor general (June 2, 1915) and later (Nov. 3, 1915) succeeded his friend, the Ulster leader Sir Edward Carson, as attorney general. In

Birkenhead
Bassano & Vandyk

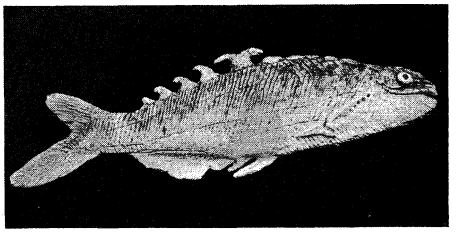
that capacity he secured the conviction and execution (Aug. 3, 1916) of the Irish nationalist Sir Roger Casement for seeking German aid for Irish revolutionaries. In 1917 he visited the United States and Canada, speaking on behalf of the Allied cause.

After the election of 1918, David Lloyd George, prime minister in the second wartime coalition, offered Smith the lord chancellorship, which he, as Baron Birkenhead, assumed Feb. 4, 1919. His greatest accomplishments were the Law of Property Act (1922) and subsequent real-property statutes (1925) that replaced a convoluted, largely medieval system of land law. Although enacted after he had left office (Oct. 24, 1922), the County Courts Act (1924) and the Supreme Court of Judicature (Consolidation) Act (1925), which reformed the judiciary, were also the results of his efforts.

During his tenure as lord chancellor, Birkenhead worked for the treaty (Dec. 6, 1921) granting independence to Ireland apart from Ulster. While gaining the friendship of the Irish nationalist leaders Arthur Griffith and Michael Collins, he enraged some of his formerly close associates in the Conservative Party, notably Sir Edward Carson. In 1924, however, he was reconciled with the orthodox Conservatives, and from then until his retirement in 1928 he served as secretary of state for India in Stanley Baldwin's second ministry.

Birkenhead was created Viscount Birkenhead in 1921 and earl of Birkenhead and Viscount Furneaux in 1922. His *Life*, 2 vol. (1933–35; 2nd ed., 1 vol., 1959) was written by his only son, Frederick Winston Furneaux Smith, 2nd earl.

Birkenia, extinct genus of early fishlike vertebrates found in Late Silurian and Early Devonian rocks in Europe (the Silurian Period, which preceded the Devonian, began



Birkenia
By courtesy of the trustees of the British Museum (Natural History); photograph, Imitor

430,000,000 years ago and lasted 35,000,000 years). *Birkenia* was a primitive jawless vertebrate that attained a length of only about 10 centimetres (4 inches). *Birkenia* was adapted for active swimming, and its sucking mouth was in a terminal rather than a ventral position. The head of *Birkenia* was covered by small scales rather than by the fused bony shield of some of its relatives.

Birkhoff, George David (b. March 21, 1884, Overisel, Mich., U.S.—d. Nov. 12, 1944, Cambridge, Mass.), foremost U.S. mathematician of the early 20th century, who formulated the ergodic theorem, which transformed the Maxwell–Boltzmann ergodic hypothesis of the kinetic theory of gases (to which exceptions are known) into a rigorous principle through use of the Lebesgue measure theory.

Birkhoff taught at the University of Wisconsin, Madison (1907–09); Princeton University (1909–12); and Harvard University (1912–44). He was an extraordinarily stimulating lecturer and director of research. In the mid-20th century, many of the most productive U.S. mathematicians had either written their doctoral dissertations under his direction or had done postdoctoral research with him. He

conducted research mainly in mathematical analysis and analysis applied to dynamics. His dissertation and much of his later work dealt with the solutions of ordinary differen-

Birkhoff

By courtesy of Harvard University Archives

tial equations and the associated expansions of arbitrary functions. Using matrix methods, he also contributed fundamentally to the theory of difference equations.

His proof in 1913 of a geometric theorem of Henri Poincaré in topology (the study of surfaces and spaces) was a striking achievement. Birkhoff's formulation of the ergodic theorem (the so-called strong form), published shortly before the "weak" formulation of John von Neumann appeared, has important applications to modern analysis and is applicable in more cases than the weak form. He developed his own theory of gravitation after Albert Einstein had developed his and constructed a mathematical theory of aesthetics, which he applied to art, music, and poetry. All this internationally renowned creative work stimulated further scientific discoveries.

Birkhoff served as president of the American Mathematical Society (1924–26), as dean of the Harvard faculty of arts and sciences (1935–39), and as president of the American Association for the Advancement of Science (1936–37). His works include *Relativity and Modern Physics* (1923), *Dynamical Systems* (1928), *Aesthetic Measure* (1933), and *Basic Geometry* (1941; with Ralph Beatley).

birling, also called LOGROLLING, outdoor sport of the North American lumberjack. Its origin can be traced to the spring log drives of eastern Canada and the New England states, particularly the state of Maine, during the early lumbering era in the 19th century, from which it moved westward to the Great Lakes region and then to the Pacific Northwest.

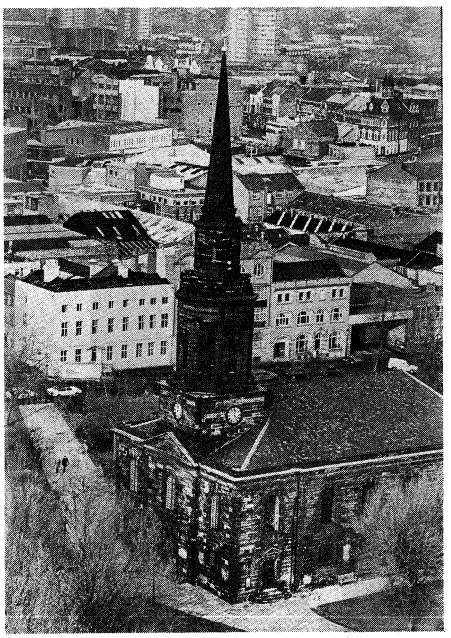
On the spring drives the lumberjacks, turned rivermen, obtained their experience in managing themselves on the moving carpet of logs. From their daily work of leaping from log to log, prying and pulling to keep the logs moving and to prevent jams at bends in the river, on sandbars, rocky narrows, windfalls, and deadheads, the sport of birling developed. It consisted of hopping with an opponent on a log, spinning it rapidly in the water with the feet, stopping ("snubbing") it suddenly, reversing its motion, and in various ways trying to manoeuvre an adversary off balance and into the water. Dislodging an opponent constituted a fall; two falls out of three constituted a match.

Lumberjacks birling

By courtesy of the Timber Carnival Association, Albany, Oregon

Birling rules became standardized, and camp championship contests were held, followed by intercamp and eventually intersectional contests, finally culminating in national championship tournaments, called rodeos. The contests were usually held after the drive reached the sawmills, and the contestants wore their work clothes—shortened overalls or jeans, woollen shirts, and high-topped calked boots. The lumberjacks bet freely on their favourites, and large sums of money changed hands. The first public birling match was sponsored in 1888. The first world's championship tournament was held in 1898 at the Omaha, Neb., exposition. Thomas Fleming of Eau Claire, Wis., won the honour of being the first world's champion. Competition declined in the 20th century, but exhibitions were held at riverside fairs.

Birmingham, second largest city of the United Kingdom and, since 1974, a district of the West Midlands metropolitan county. It



St. Paul's Church in Birmingham

© John Reardon—Aspect Picture Library

is the hub of a principal industrial and commercial area near the geographical centre of England.

Birmingham's lack of river transport impeded its development until the late 18th century, when it became the leading nucleus of the Industrial Revolution in Britain. The engineers James Watt (inventor of the steam engine), Matthew Boulton, and William Murdock (pioneers in steam engine development), the chemist Joseph Priestley, and the printer John Baskerville all lived in the city at that time and greatly contributed to the technological progress of Birmingham and the nation. Boulton's Soho Manufactory, which developed the steam engine for industrial use, became famous throughout Europe. After the Reform Act of 1832 Birmingham elected its own members to Parliament, and the city was incorporated in 1838. In the same year, rail links to Liverpool and London were completed.

Birmingham was a British pioneer in town-planning schemes (1911), one-way-traffic experiments (1933), and municipal airports (1939). The Municipal Bank, still the only one in the country, opened in 1916. Wartime industrial activity and heavy bombing left the city temporarily exhausted in 1945, but it quickly recovered.

One of the main centres in Birmingham is Victoria Square, with the classical Town Hall (1834) and the Renaissance-style Council House (1874–81) and City of Birmingham Museum and Art Gallery. St. Philip's Cathedral (1715), in its green churchyard, forms another focus, while the Georgian area around St. Paul's Church (1779) also has a character of its own. Other centres have formed around St. Chad's Cathedral (Roman Catholic), designed by A.W.N. Pugin (1841), and the elegant *Birmingham Post and Mail* building (1964).

Birmingham is the centre of Britain's light and medium industry, principally concerned with the metal and engineering trades. The largest single industry in terms of employment is the production of motor vehicles. Bicycles and motorcycles are made in the area, though the bicycle trade has somewhat declined. The city is also one of the main centres of the machine-tool industry. Bournville, a suburb, is the site of Cadbury's chocolate factory.

Cultural institutions include the symphony orchestra, the central library, and the art gallery, which is noted for its English watercolours and its pre-Raphaelite paintings. The University of Birmingham and the University of Aston in Birmingham are both located in the city. Pop. (1982 est.) 1,017,300.

Birmingham, largest city in Alabama, U.S., and a leading industrial centre of the South, in the north central part of the state. It is the seat of Jefferson County, a port of entry in the Mobile customs district, and the focus of a large metropolitan area that includes Jefferson, Shelby, and Walker counties, the cities of Bessemer and Fairfield, and other communities. The site, in the narrow Jones Valley near the southern end of the Appalachian Mountain system, was settled in 1813, and Elyton (now part of Birmingham) became the county seat in 1821. In 1870 the east–west and north–south railroads met at this point; the city was founded there in 1871 by a land company backed by railroad officials and simultaneously became the county seat. Named for Birmingham, Eng., it developed as the iron and steel centre of the South. The city's industrialization was based largely on abundant local deposits of coal, limestone, dolomite, and iron ore, essential for making steel. Graphite, marble, barites, bauxite, pyrite, quartz, millstone, cement rock, clays, sand, and gravel are also found. Important products are pig iron and steel and related manufactures (stoves, wire castings, bars, bolts, steel tanks, machinery, cast-iron pipe, freight cars, coke, and pipe fittings). The industrial trend is now toward diversification, and other products include aircraft, acetylene, shellac, waxes, glycerine, wood blocks, cement, chemicals, jeep tops, spices, grits, and cotton textiles. From nearby Port Birmingham a barge canal leads southward to the seaport of Mobile on the Gulf of Mexico.

The city is the seat of several higher educational institutions. The University of Alabama in Birmingham is a unit (designated 1966) of the state university system. Birmingham–Southern College (Methodist) was created in 1918 by the consolidation of Birmingham College (1898) and Southern University, established at Greensboro in 1856. Samford University (chartered in 1841 at Marion) moved to Birmingham in 1887, where it was operated as Howard College (Baptist) until 1965. Daniel Payne College, maintained by the African Methodist Episcopal Church, was established in 1889, and Miles College (Methodist) was founded in 1907. The city's med-

ical centre includes the medical and dental colleges of the University of Alabama, the Southern Research Institute, and a number of specialized hospitals and clinics.

The Birmingham Museum of Art houses the Samuel H. Kress Collection (Renaissance art). The city has an opera company, a symphony orchestra, and theatre and ballet groups. Annual events include the Camellia Show (February), the Festival of Arts in the spring, and the State Fair in the fall. Arlington House is a restored antebellum (1842) home that was used as the headquarters of U.S. Gen. James H. Wilson toward the end of the Civil War. An iron statue of Vulcan, the Roman god of fire, stands 55 ft (17 m) tall atop a 124-ft pedestal on Red Mountain overlooking the city.

Birmingham was the scene of some of the black anti-discrimination and voter registration drives led by the Rev. Martin Luther King, Jr., in the early 1960s. A change in the form of city government (replacement of the commission form of government by a mayor–council form in 1962) helped improve race relations in the civil rights struggle. In 1979 the voters elected Richard Arrington as the city's first black mayor. In 1971 Birmingham became the first U.S. city in which industrial plants were closed under federal law during an air pollution crisis. Inc. 1871. Pop. (1980) city, 284,413; metropolitan area (SMSA), 847,360.

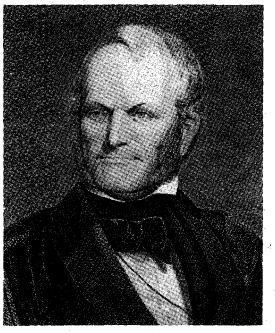
Birmingham enamelware, enamelled objects made in Birmingham, Eng., an important centre for the production of 18th-century European enamelware. The most prominent Birmingham enameller was Matthew Boulton (1728–1809), a leading English engineer and manufacturer. His firm, Boulton and Fothergill, produced some of England's finest gilded bronze and brass or ormolu mounts and ornaments for furniture, and was a major supplier of enamelware to the court of Empress Catherine the Great of Russia. Boulton may have initiated the use of platinum in silver-lustred enamel decoration and the use of tortoiseshell to line enamelled snuffboxes. Little is known of other Birmingham enamellers.

Birney, (Alfred) Earle (b. May 13, 1904, Calgary, Alta., Can.), Canadian poet and novelist whose poetic collections, starting with *David and Other Poems* (1942), contrast the indignities of contemporary Canadian urban life with the majestic promise of Canada's natural beauty.

Birney was educated at several schools and received his Ph.D. at the University of Toronto (1936). He taught there and in 1946 at the University of British Columbia. His other verse collections include *Now Is Time* (1945) and *The Strait of Anian* (1948). His verse drama, *Trial of a City* (1952), is an indictment of modern Vancouver by heroes from Vancouver's past. Birney also wrote two novels: *Turvey* (1949), a picaresque novel of World War II, and *Down the Long Table* (1955), which is semi-autobiographical. Impressions of his travels to Europe, Latin America, and Asia found their way into his work in the 1960s. Also an essayist and critic, he edited *Twentieth Century Canadian Poetry* (1953). His *Collected Poems* appeared in 1975. Later works include a stage play, *The Damnation of Vancouver* (1977), and *The Mammoth Corridors* (1980), a collection of poems. Birney won many awards for his work and in 1970 was made a member of the Order of Canada.

Birney, James Gillespie (b. Feb. 4, 1792, Danville, Ky., U.S.—d. Nov. 25, 1857, Eagleswood, N.J.), prominent opponent of slavery in the United States who was twice the presidential candidate of the Abolitionist Liberty Party. Birney was trained in law and practiced in Danville. He won election to the Kentucky legislature in 1816, and in 1818 he moved to Alabama, where he was elected to the legislature in the following year. There he helped incorporate into the state constitution provisions that empowered the legislature to emancipate slaves and to prohibit selling slaves brought into the state.

In 1837 he was elected executive secretary of the American Anti-Slavery Society, which soon afterward split, one faction advocating the inflammatory approach of such Abolitionists as William Lloyd Garrison and the other, which became the Liberty Party, emphasizing



James Birney, engraving

By courtesy of the Library of Congress, Washington, D.C.

electoral activity. The party nominated Birney as its presidential candidate in 1840 and again in 1844. In 1840 he was a vice president of the World Anti-Slavery Convention in England, where he wrote *The American Churches, the Bulwarks of American Slavery* (1840). Birney's career, which was ended by an injury that invalided him in 1845, was recounted by his son William in *James G. Birney and His Times* (1890).

Birnin Kebbi, town, Sokoto State, northwestern Nigeria, on the Sokoto (Kebbi) River at the intersection of roads from Argungu, Jega, and Bunza. An early settlement of the Kebbawa, a subgroup of the Hausa, it was captured *c.* 1516 by Muhammadu Kanta, founder of the Kebbi kingdom, and incorporated into Kebbi, one of the *banza bakwai* (the seven illegitimate Hausa states), which extended over what is now northwestern Nigeria and southwestern Niger. Internal dissension led Tomo, *sarkin* ("king of") *Kebbi,* to move his capital from Surame, 60 mi (100 km) northeast, to Birnin Kebbi *c.* 1700; but by the mid-18th century both Zamfara and Yauri, two other *banza bakwai,* had extricated themselves from Kebbi domination.

The town remained the capital of Kebbi until 1805, when it was burned in the Fulani *jihād* ("holy war") by Abdullahi dan Fodio, a brother of the *jihād* leader and later *amīr* of Gwandu. After Birnin Kebbi was incorporated into the Fulani emirate of Gwandu, it was eclipsed in political importance by Gwandu (Gando) town, 30 mi east, and as a caravan and riverside market centre by Jega, 20 mi southeast, the head of navigation on the Zamfara River, a tributary of the Sokoto. Ironically, while Argungu (30 mi northeast) became the traditional seat of the *sarkin Kebbi* in 1827, Birnin Kebbi served as the Gwandu emirate headquarters after Amīr Haliru was inaugurated there in 1906. It is now the headquarters of a local government council.

Although Birnin Kebbi has declined as a river port because of silting as well as political conditions, it now serves as a collecting point for tobacco, peanuts (groundnuts), and rice and as a major local market centre in millet, sorghum, rice, fish, goats, cattle, skins, and cotton. The site of Sokoto State polytechnic and a government rice-research station, it also has a teacher-training college, secondary schools, and a hospital. Its Hausa and Fulani inhabitants are Muslims. Pop. (1983 est.) 43,660.

Birnin Kudu, town, Kano State, northern Nigeria, at the intersection of roads from Kano city, Gwaram, and Ningi. It is best known as the site of Dutsen Habude, a cave containing Neolithic paintings of cattle (which bear strong resemblance to some found in the central Sahara) and rock gongs believed to be more than 2,000 years old. It is a collecting point for peanuts (groundnuts), which are sent to Kano city 76 mi (122 km) west-northwest for export by rail, and is a market centre for millet, sorghum, peanuts, cowpeas, cotton, and livestock for Hausa and Fulani peoples. It is the headquarters of a local government council and has a secondary school, a hospital, and a dispensary. Pop. (1972 est.) 8,554.

Birobidzhan (region, Russian S.F.S.R.): *see* Yevreyskaya autonomous oblast.

Birobidzhan, also spelled BIROBIDŽAN, city and administrative centre of Yevreyskaya (Jewish) autonomous *oblast* (region), Khabarovsk *kray* (territory), in the far eastern Russian Soviet Federated Socialist Republic. Situated on the Bira River, a tributary of the Amur, and on the Trans-Siberian Railroad, it was founded in 1928 as a railway station called Tikhonkaya. The *oblast* was formed in 1934, with Birobidzhan as its centre; it became a city in 1937. Industries include sawmilling and woodworking and a variety of light industries, mainly clothing and footwear. Tractor trailers are also produced. The city has an agricultural college. Pop. (1983 est.) 75,000.

Biron, BARONS AND DUKES OF, titled French nobility of the House of Gontaut, grouped below chronologically and indicated by the symbol •.

• **Biron, Armand de Gontaut, baron de** (baron of) (b. *c.* 1524—d. July 26, 1592, Épernay, Fr.), soldier and marshal of France during the 16th-century Wars of Religion.

As a young page of Margaret, queen of Navarre, he attracted the attention of the Marshal de Brissac (Charles de Cossé), who took him to Piedmont. There he commanded the artillery but was lamed by a wound. He brought back to the royal army in France the professional spirit of the Italian soldiers and, in the battles of 1568–69, won the post of grand master of the artillery, held by Brissac before him. He took La Rochelle in 1573, commanded in Guienne, and in 1577 was made marshal of France, with command in the south against Henry of Navarre. In 1581–83 he commanded the Duc d'Anjou's forces in Artois.

Having been a loyal friend of Henry III, he became in 1589 the chief commander of the army under Henry IV. The latter owed much to his sagacity at the battles of Arques and Ivry and in the many sieges, but Biron was believed to be prolonging the war for his private advantage. He was killed at the siege of Épernay.

There is an edition of his correspondence by E. de Barthélemy (1874).

• **Biron, Charles de Gontaut, baron et duc de** (baron and duke of) (b. 1562—d. July 31, 1602, Paris), son of Armand who won the favour of King Henry IV by his courage and enterprise at Arques and Ivry and was made admiral of France and Brittany in 1592 after his father's death. He was relieved of that post and made marshal in 1594 on the recovery of Paris, when he was sent to regain Burgundy; and in 1597 he ended the war in the north by the recapture of Amiens.

Biron was made duke and peer in 1598 but was discontented with the King's handling of his government of Burgundy. His mission to Brussels (1598) entangled him in intrigue with Spain, as his duties in Burgundy had with

Savoy. He commanded the force which gained Bourg in 1600; but his opponent, Charles Emmanuel I, duke of Savoy, was secretly promising him his daughter in marriage. Henry could not decide to take any real action until 1601, when Biron was known to be working with the malcontents led by the Comte d'Auvergne (*see* Angoulême, Charles de Valois, duc d'). Biron was arrested at Fontainebleau, found guilty of treason in sending the Duke of Savoy full particulars of the French army, and he was beheaded in the Bastille.

• **Biron, Armand-Louis de Gontaut, duc de** (duke of), also called DUC DE LAUZUN (b. April 15, 1747, Paris—d. Dec. 31, 1793, Paris), military commander with the French forces in the American Revolution, and one of the peers of France who supported the French Revolution, only to be sacrificed to the guillotine during the Terror.

In his youth, as Duc de Lauzun, he dissipated his fortune, travelling about Europe and earning notoriety for his gallantry and success with women. After inheriting his uncle's duchy of Biron in 1788, he began to realize his military ambitions. He had raised colonial troops and taken Senegal in 1779; he fought in the American Revolution under the Comte de Rochambeau; he put his signature to notes on invading England and other military topics. But he was nephew of the Choiseuls and friend of the Duc d'Orléans (Philippe Égalité), and he had no favour at court. Even after the Revolution of 1789 he was overshadowed by Lafayette.

His chance came with the war in 1792. From Rochambeau's staff he secretly devised with C.F. Dumouriez a plan which gave him the chief role in Belgium. He marched for Mons with 10,000 men who on April 29 fled from a much smaller force at Quiévrain. He was happy to escape from his own men, and this was his only action. Commanding on the Rhine in July, transferred in 1793 to Italy, and sent, after Orléans was arrested, to command in the west, he was never present when there was actual fighting. He had accepted every political change, but after 40 days in this last command he was dismissed on July 11. Robespierre could not risk the countercharge of leniency to a former peer, and Biron was guillotined.

His *Mémoires* were published in 1822 (new ed., 1858).

Biron, Ernst Johann, Reichsgraf von (Imperial count of), Biron also spelled BÜHREN (b. Nov. 23 [Nov. 13, old style], 1690, Kalnciems, Courland—d. Dec. 29 [Dec. 18, O.S.], 1772, Mitau, now Jelgava), German adventurer who became duke of Courland and chief adviser to the Russian empress Anna (ruled 1730–40); he exercised extraordinary influence over Russian affairs during a period that became known as *Bironovshchina*.

The grandson of a German groom who served Duke Jacob III of Courland (1642–82), Biron attended the academy of Königsberg (modern Kaliningrad) and, after being expelled for riotous conduct and unsuccessfully seeking his fortune in Russia (1714), he went to Mitau, in Courland, where he acquired a position in the court of Anna Ivanovna, duchess of Courland. Having become Anna's lover in about 1727, Biron became her chief adviser and, despite his subsequent marriage to Fräulein B.G. Trotta von Treiden, followed Anna to Moscow when she succeeded to the Russian throne (1730). Biron, made a count of the Holy Roman Empire, a chamberlain in the Russian court, and master of an estate at Wenden (Cesis, in modern Latvian S.S.R.), held no official administrative post in Russia. Nevertheless, he soon became the major figure in the Russian government, leading a group of German adventurers who, having gained favour in Anna's court, managed the government, discriminated against the Russian nobility, exploited Russia's resources for their personal benefit, and suppressed their opponents by having them banished to Siberia or executed. As a result, Biron was generally despised by the Russian population.

In 1737 when the Kettler dynasty of Courland became extinct, Biron was elected duke of Courland; in 1740 Anna named him regent for her infant heir Ivan VI, the son of her grandniece Anna Leopoldovna. Three weeks after Anna's death, however, Biron was seized (at midnight Nov. 19–20 [Nov. 8–9, O.S.], 1740) by his rival Burkhard Christoph, Graf von Münnich, who had been in charge of the army during Anna's reign. Biron was exiled to Pelym in Siberia, but in 1742 he was allowed to settle in Yaroslavl, and in 1762 he was granted an amnesty and reinstated at the Russian court. In 1763 Catherine II the Great (ruled 1762–96) used Russian troops to restore Biron to the ducal throne of Courland, which, during his exile, had been ruled by a ducal council and then by Charles of Saxony, the younger son of Augustus III of Poland. Biron abdicated in favour of his son Peter in 1769.

Birr, Irish BIORRA, urban district and market town, County Offaly, Ireland, on the River Camcor. A monastery was founded there by St. Brendan of Birr (d. *c.* 573). In 1620, Birr Castle, the principal stronghold of the O'Carrolls, and the surrounding area were granted to Lawrence Parsons of Leicestershire, Eng., whose descendants became the earls of Rosse. Present-day industrial activities include the production of footwear and plastic coverings. Pop. (1981) 3,679.

Birrell, Augustine (b. Jan. 19, 1850, Wavertree, Lancashire, Eng.—d. Nov. 20, 1933, London), politician and man of letters whose policies, as British chief secretary for Ireland (1907–16), contributed to the Easter Week rising of Irish nationalists in Dublin (1916).

A lawyer from 1875 and a Liberal member of the House of Commons (1889–99, 1906–18), Birrell became well known in British literary circles for two essay collections entitled *Obiter Dicta* (1884–87). After serving as president of the Board of Education (1905–07), he received the secretaryship for Ireland. In 1908 he was successful in getting Parliament to create the National University of Ireland (with constituent colleges in Dublin, Cork, and Galway) and the independent Queen's University, Belfast. Although the new universities were legally nondenominational, under Birrell's plan the Irish Roman Catholic bishops were permitted a considerable degree of supervision.

Birrell; chalk drawing by Randolph Schwabe, 1927; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Birrell's unconcerned attitude was unsuited to the passionate complexities of Irish affairs. In addition, he relied excessively on the advice of the Irish patriot leader John Redmond, who himself had lost touch with Irish problems. Despite the armed parading of nationalist groups in Dublin, as well as their staging of mock attacks as rehearsals, Birrell seemed unable to sense any peril and was shocked when the uprising of April 24–29, 1916, occurred. He resigned amid general condemnation, which was tempered by respect for his frank avowal of responsibility.

Birs, also called BIRS NIMRUD (Iraq): *see* Borsippa.

birth control, the voluntary limiting of human reproduction, using such means as contraception, postponement of marriage, sexual abstinence, surgical sterilization, and induced abortion. The term was coined in 1914–15 by the U.S. feminist Margaret Sanger.

A brief treatment of birth control follows. For full treatment, *see* MACROPAEDIA: Birth Control.

Contraception is used by couples both to limit the total number of offspring and to lengthen the interval between pregnancies. Medically, birth control is often advised in cases in which childbirth might endanger the physical or mental health of the prospective mother or in which a substantial risk exists of bearing a severely disabled child. Socially and economically, limitation of reproduction is frequently motivated by the desire to maintain or improve family living standards. Though these reasons for curbing family size might appear to be distinctly modern, most of them were operative thousands of years ago. Most religious leaders now generally agree that some form of fertility regulation is desirable, though the means is strongly debated.

Beyond these essentially personal and ethical reasons for birth control, there has arisen in recent decades a growing social motivation—the so-called population explosion. After World War II, the dramatic lowering of death rates through the advances of medical science resulted in the doubling of the growth rate of the world's population in about 15 years. The most rapid population increases have occurred mainly in the countries with the lowest per capita economic production and the least ability to keep up with population growth. India, to cite one example, has faced the seemingly insurmountable task of raising the general standard of living, while at the same time providing for at least 35,000 new mouths to feed every day.

Across the broad span of human history, there has been a general tendency in the curbing of family size to shift from deliberate action after birth (infanticide) to action before birth (abortion) or before conception (contraception). This shift has occurred in different parts of the world at different times and is far from complete.

While infanticide is on the wane, as late as the 18th century in European countries unwanted infants were disposed of by abandonment and exposure, a practice that prompted the establishment of the Foundling Hospital of London. Infanticide persists in semidisguised form as traditional practice among some primitive peoples and in more remote areas. Induced abortion, however, was estimated by one authority to be still the world's most widely practiced means of curbing family size.

Japan provides a dramatic example of the shift. In its feudal past, infanticide was common. Abortion was legalized in 1948 and quickly emerged as the primary means of fertility control. In the 1960s, the Japanese in growing numbers began to employ contraception in preference to abortion.

In Europe and North America, the 20th century has seen legal proscription against birth control give way to laws permitting contraception. In most Western nations, induced abortion has been legalized by either legislation or the interpretation of the courts, but there are almost universal restrictions. Much of the liberalization has been encouraged by the women's liberation movement.

Elsewhere, contraception and abortion are sanctioned in the Soviet-bloc nations, and family planning has been adopted as government policy in many of the developing nations of Asia, Africa, and Latin America. This is especially true in China, where the one-child family is officially advocated.

For types of contraception, *see* contraceptive.

birth defect, genetic or accident-induced abnormality that is present at birth. *See* congenital disorder.

birth rate, frequency of births in a given population, conventionally calculated as the annual number of births per 1,000 inhabitants. *See* vital rates; human fertility and fecundity.

birthmark, an unusual mark or blemish on the skin at birth. *See* mole; nevus.

birthroot (plant): *see* Trillium.

birthstone, gemstone associated with the date of one's birth, the wearing of which is commonly thought to bring good luck or health. Supernatural powers have long been attributed by astrologers to certain gemstones.

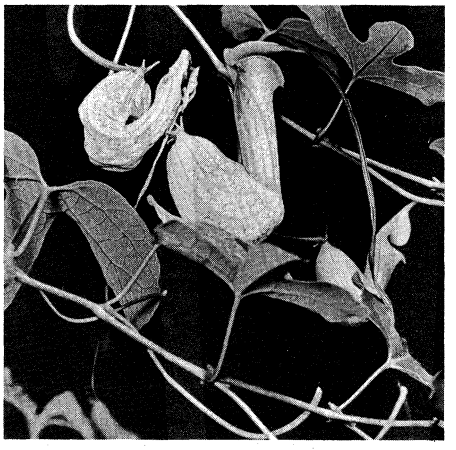
The stones now associated with each month, as listed in the Table, have only slight relationship to the ancient beliefs, for the list is tempered by availability and cost. Before mineralogy had progressed to the point of chemical analysis, colour was of greater importance than some of the other physical characteristics, and little distinction was made between emerald and chrysoprase, for example, or between ruby and garnet, or between citrine and topaz. When it came to the ability to heal or bring good luck, the actual stone and the look-alikes were regarded as equally effective. Even the names used in ancient times do not necessarily refer to the stones that go by those names in the 20th century; the sapphire of the Bible is much more likely to have been lapis lazuli than what is now known as sapphire, and adamas (diamond) was probably white sapphire or white topaz.

Birthstones

month	traditional gemstone	20th-century expansion	synthetic supplement: trade name	material of synthetic stone
January	garnet		garnet	dark-red synthetic corundum
February	amethyst		amethyst	purple synthetic corundum
March	bloodstone	aquamarine	aquamarine	light-blue synthetic spinel
April	diamond		white sapphire	colourless synthetic spinel or corundum
May	emerald		emerald	synthetic emerald or synthetic green spinel
June	pearl	alexandrite	cultured pearl, alexandrite	changeable synthetic corundum, (synthetic spinel is rare)
July	ruby		ruby	red synthetic corundum
August	sardonyx	peridot	peridot	green synthetic spinel
September	sapphire		sapphire	blue synthetic spinel or corundum
October	opal	tourmaline (pink or green)	rozircon	pink synthetic corundum or spinel
November	topaz (precious)	topaz quartz (citrine)	topaz	yellow synthetic corundum
December	turquoise	zircon	zircon	medium blue synthetic spinel

Originally, the stones were considered to be those of the breastplate (*ḥoshen*) of the Jewish high priest. In the 20th century the list was supplemented with a series of synthetic stones that were recommended as alternatives for some of the rarer, less attractive, or less durable natural stones. The natural-stone list was also expanded to make it more acceptable to both sexes. The Table gives the traditional stones and modern variants.

birthwort, order name ARISTOLOCHIALES, any plant of the family Aristolochiaceae, which



Birthwort (*Aristolochia*)
A to Z Botanical Collection—EB Inc.

contains five genera of mostly tropical woody vines and a few temperate-zone species. The calyx (outer part of the flower) is three-lobed. The flowers of some species lack petals; those of others are large and foul smelling.

A brief treatment of birthworts follows. For a full treatment, *see* MACROPAEDIA: Angiosperms.

North American species of the Aristolochiaceae include wild ginger (*q.v.; Asarum canadense*), Virginia snakeroot (*Aristolochia serpentaria*), pelican flower (*Aristolochia grandiflora*), and Dutchman's-pipe (*q.v.; Aristolochia durior*). The European birthwort (*Aristolochia clematitis*) and asarabacca (*Asarum europaeum*), the European wild ginger, are other common members of the family.

European birthwort bears pale-yellow, trumpet-shaped flowers in clusters of two to eight. The plant has heart-shaped leaves with finely toothed edges and pear-shaped hanging fruits. The plant is poisonous, but an extract from it has been used in the past to facilitate childbirth (hence the name) and in the treatment of snakebite.

Birunga Mountains (Africa): *see* Virunga Mountains.

Bīrūnī, al-, in full ABŪ AR-RAYḤĀN MUḤAMMAD IBN AḤMAD AL-BĪRŪNĪ (b. September 973, Khwārezm, Khorāsān—d. Dec. 13, 1048, Ghazna, Ghaznavid Afghanistan), Arab scholar and scientist, one of the most learned men of his age and an outstanding intellectual figure.

Possessing a profound and original mind of encyclopaedic scope, al-Bīrūnī was conversant with Turkish, Persian, Sanskrit, Hebrew, and Syriac in addition to the Arabic in which he wrote. He applied his talents in many fields of knowledge, excelling particularly in astronomy, mathematics, chronology, physics, medicine, and history. He corresponded with the great philosopher Ibn Sīna (Avicenna). Some time after 1017 he went to India and made a comprehensive study of its culture. Later he settled at Ghazna in Afghanistan. In religion he was a Shīʿī Muslim, but with agnostic tendencies.

Al-Bīrūnī's most famous works are *Āthār al-bāqīyah* (*Chronology of Ancient Nations,* 1879); *at-Tafhīm* ("Elements of Astrology"); *al-Qanūn al-Masʿūdī* ("The Masʿūdī Canon"), a major work on astronomy, which he dedicated to Sultan Masʿūd of Ghazna; *Tāʾrīkh al-Hind* ("A History of India"); and *Kitāb as-Saydalah,* a *materia medica.* In his astronomical works he discussed with approval the theory of the Earth's rotation on its axis and made accurate calculations of latitude and longitude. In physics, he explained natural springs by the laws of hydrostatics and determined with a remarkable degree of accuracy the specific weight of 18 precious stones and metals. In geography he advanced the daring view that the valley of the Indus had once been a sea basin.

Birzebbuga, also spelled BIRZEBBUGIA, village, southeastern Malta, on Marsaxlokk Bay, southeast of Valletta. The present village originated as a fishing settlement and is now a summer resort. Several churches and part of the old fortifications remain. Its environs are rich in prehistoric remains, notably the cave of Ghar Dalam and a megalithic temple and a Bronze Age acropolis at Borg-in-Nadur. The modern section of Birzebbuga has oil-storage facilities and a tanker jetty. Pop. (1983 est.) 5,470.

BIS: *see* International Settlements, Bank for.

bis pole (South Pacific religion): *see* bisj pole.

Bisaya, also spelled BISAYAH, indigenous people of northwestern Borneo, in Malaysia, concentrated above the Padas River and below Beaufort in Sabah state, and in northern Sarawak state. They are of Malay stock and possibly related to the Visayan of the Philippines. The Bisaya speak Murut, leading some to believe they were once one of the branches of the Murut peoples. They numbered about 5,000 in the late 1970s. Their villages, comprising houses set on piles, are built along the banks of rivers. Traditionally slash-and-burn cultivators of dry rice, sago palms, vegetables, and rubber, they are increasingly growing wet rice. Bisaya kinship is organized in ranked ambilineal descent groups, in which the form of marriage ceremony determines whether the child is a member of the mother's or father's clan. Their religion is a mixture of traditional beliefs and Islām, and they also practice a form of black magic, primarily to injure enemies.

Bisayan (people): Visayan.

Bisayas (Philippines): *see* Visayas.

Bisbee, city, seat of Cochise County, southeastern Arizona, U.S., 8 mi (13 km) north of the Mexican border. It is built on steep canyon slopes (east of the Mule Mountains) and was for many years a major copper-producing centre. It began as a prospectors' camp after the discovery of copper in 1877 and was named for Judge DeWitt Bisbee, part owner of the Copper Queen Mine. During World War I, more than 1,000 striking miners were forcibly transported to Columbus, N.M. (the Bisbee

Deportation, 1917). The Lavender Open-pit Mine stopped production in 1975 and has since been a tourist attraction. Tombstone, the Coronado National Memorial, and segments of the Coronado National Forest are nearby. Inc. 1900. Pop. (1984 est.) 8,000.

Biscay (Spain): *see* Vizcaya.

Biscay, Bay of, Spanish GOLFO DE VIZCAYA, French GOLFE DE GASCOGNE, wide inlet of the North Atlantic Ocean indenting the coast of western Europe. Forming a roughly triangular body with an area of about 86,000 square miles (223,000 square km), it is bounded on the east by the west coast of France and on the south by the north coast of Spain. Its maximum depth, a little south of its centre, is 15,525 feet (4,735 m). The principal rivers flowing into the bay are the Loire, the Adour, and the Dordogne and Garonne, which form the Gironde Estuary.

The continental shelf is up to about 100 miles (160 km) wide off Brittany but narrows to less than 40 miles (65 km) off the Spanish shore. The edge of the shelf and the continental slope are dissected by numerous submarine canyons of which that of Cap Breton, in the southeastern corner of the bay, is one of the largest. Beyond the continental slope lies the Biscay Abyssal Plain, with depths of about 15,000 feet (4,550 m), which occupies about half the area of the bay. Much of it has a very flat topography.

The surface currents are influenced by the clockwise circulation in the North Atlantic that produces a clockwise circulation in the bay. This pattern is frequently disturbed by wind, so that, on the shipping route across the mouth of the bay, currents in any direction may be encountered. Westerly gales in winter give rise to an eastward-flowing current along the north coast of Spain, which reaches 5 miles per hour (8 km/h). The main outflow of water is believed to be a subsurface current flowing westward off the north coast of Spain.

The range of mean spring tides is about 20 feet (6 m) on the French coast at the northern end of the bay near Ile d'Ouessant, decreasing southward to about 12 feet (3.5 m) in the southeastern angle near Biarritz. The Bay of Biscay is noted among sailors for its rough seas. The frequency of gales is in fact less than in more northerly parts of the eastern Atlantic, but they can be severe and may exceed 70 miles per hour (113 km/h). Squalls are also a hazard to navigation and may occur at any time of year. The north coast of Spain is noteworthy for dangerous squalls and capricious winds. The climate on shore is maritime, with mild winters and cool summers.

The principal ports along the Bay of Biscay are Brest, Nantes, La Rochelle, Bordeaux, and Bayonne in France, and Bilbao, Santander, Gijón, and Avilés in Spain; none are able to take large vessels. Resorts include La Baule, Biarritz, and Saint-Jean-de-Luz, all on the French coast. Fishing is a principal industry. Catches include sardines, tuna, anchovies, hake, cod, bream, and crustaceans, including lobster. Oyster culture is practiced in shallow lagoons and estuaries along the French coast.

Biscayne Bay, shallow inlet of the Atlantic Ocean, along southeastern Florida, U.S. It is about 40 miles (64 km) long and 2–10 miles (3–16 km) wide and forms a part of the Atlantic Intracoastal Waterway. The bay connects with the ocean mainly through Safety Valve Entrance and with Florida Bay (south) through a series of sounds. It is bordered by Miami on the northwest and by Miami Beach and several other islands on the northeast, with the Florida Keys lining the rest of the eastern portion of the bay. Tourism is the main economic activity. The bay was named for an early explorer called El Biscaino, who came from the province of Viscaya (Biscaya), Spain. In 1968 more than half (96,000 acres [39,000 hectares]) of the bay's water and reef, with a rich, varied tropical marine life, was declared a national monument.

Biscayne National Monument, national monument off the southeastern coast of Florida, U.S., 20 miles (32 km) south of Miami. It was authorized in 1968 with a boundary change in 1974. It consists mostly of coral reef and water containing about 25 keys, or islands, that form a north–south chain separating Biscayne Bay from the Atlantic Ocean. The park covers an area of 103,643 acres (41,944 hectares) with a total land area of 4,373 acres (1,770 hectares).

Bisceglie, town and episcopal see, Bari province, Puglia (Apulia) region, southeastern Italy. It lies along the Adriatic Sea and is about 120 miles (190 km) east-northeast of Naples. The Romans called the place Vigiliae, from the watchtowers that were used there in guarding the coast.

The town was conquered by the Normans and was made a countship in the 11th century. After having various feudal rulers, Bisceglie became a free city in 1532 and later passed to the Kingdom of Naples; it was joined to the Kingdom of Italy in 1861. There are remains of the castle, built by the Hohenstaufens (a German dynasty) on the site of a Norman castle and later enlarged and embellished by the Angevins (House of Anjou). Examples of 11th- and 12th-century Romanesque-Apulian architecture include the cathedral and the church of Santa Margherita. There are also several Renaissance and Baroque palaces.

In the surrounding area there is progressive and intensive market gardening; and cherries, dessert grapes, vegetables, almonds, olives, and other fruit are exported. Bisceglie is a fishing port and seaside resort and also produces wine, olive oil, and furniture. Pop. (1984 est.) mun., 46,869.

Bischof, Werner (b. April 26, 1916, Zürich—d. May 16, 1954, Peruvian Andes), Swiss photojournalist whose assignments around the world produced pictures that are notable for their human understanding, strong sense of design, and sensitive use of light.

From 1932 to 1936 Bischof attended the Zürich Kunstgewerbeschule, where among other subjects he studied photography. In 1942 he became associated with the Zürich picture magazine *Du* and worked for it throughout his career. Initially interested in still-life photography, he later turned more and more toward studies of people.

In 1945 he photographed war-torn areas of France, Germany, and The Netherlands, and in the late 1940s he free-lanced all over Europe. In 1949 he joined Magnum, a photographers' cooperative that then included Robert Capa, Henri Cartier-Bresson, David Seymour, and Ernst Haas. In the 1950s he free-lanced in India, Japan, Southeast Asia, Korea, the United States, and South America. He was killed in an automobile accident in Peru.

Collections of his photographs include *Japan* (1954), text by Robert Guillain; *The World of Werner Bischof* (1959); *Werner Bischof* (1966), edited by Anna Fárová; and *Photographs of Werner Bischof* (1967).

Bischop, Simon, Bischop also spelled BISCOP (Dutch theologian): *see* Episcopius, Simon.

Biscop Baducing (7th-century British abbot): *see* Benedict Biscop, Saint.

biscuit, in the United States, a small quick bread made from flour, salt, butter or vegetable shortening, and baking powder as a leavening agent. The dough is kneaded briefly and rolled out, and the biscuits are cut with a round cutter. The dough may also be dropped by spoonfuls for an irregular shape. Biscuits are usually eaten hot with butter and fruit preserves, sausage gravy, or ham. They are especially associated with the American South. The dough for beaten biscuits, also a Southern specialty, is literally beaten with a mallet or other utensil for about 30 minutes to produce a fine texture. A sweetened biscuit dough is used for strawberry shortcake, a dessert of biscuits split and covered with fresh strawberries and whipped cream.

In the United Kingdom a biscuit is a small crisp cake, either sweetened (American cookie) or unsweetened (American cracker).

bisexuality, in biology, the condition of an organism capable of producing both male and female gametes (sex cells). In plants and microorganisms, this condition is often referred to as monoecism. In multicellular animals, bisexuality is usually called hermaphroditism (*q.v.*).

bisexuality, in human sexuality, sexual interest in and attraction to members of one's own and the opposite sex. A bisexual is thus a person with both heterosexual and homosexual desires. Some clinical surveys suggest that a significant number of persons experience bisexual desires and engage in bisexual activity. As the tolerance of homosexual behaviour increased in many societies in the late 20th century, the number of people identifying themselves as bisexual also increased. *See also* homosexuality.

Bishamon, also called BISHAMONTEN, in Japanese mythology, one of the Shichi-fuku-jin (Seven Gods of Luck); he is identified with the Buddhist guardian of the north, known as Kubera, or Vaiśravaṇa. Bishamon is always depicted as dressed in full armour, carrying a spear and a miniature pagoda. He is the protector of the righteous and the Buddhist patron of warriors.

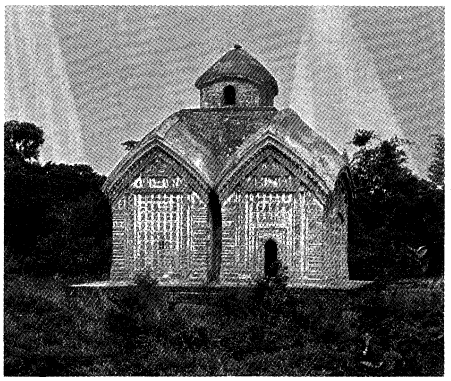
The temple city of Shigi near Ōji (west-central Honshu) is dedicated to him. It was founded, according to tradition, by Shōtoku Taishi (AD 573–621), who attributed a victory over an enemy of Buddhism to Bishamon's assistance. *See also* Shichi-fuku-jin.

Bishandās (fl. 17th century, India), one of the most skilled portrait painters of the 17th-century Jahāngīr school of Mughal painting. Almost nothing is known of his life, though his name indicates that he was a Hindu.

Bishandās was praised by the emperor Jahāngīr as "unequaled in his age for taking likenesses" and was sent with the embassy to Persia to paint portraits of the shah and the chief members of his court, where he stayed from 1613 to 1620. The portraits so pleased the emperor that Bishandās was honoured with the gift of an elephant. Some of the Mughal portraits of Persian noblemen of the period may be assumed to be the work of Bishandās. He also contributed to the *Anwār-e Suhaylī*, a book of fables (now in the British Museum), and several fine portraits in the albums made for the emperor.

Bishnupur, also spelled VISHNUPUR, historic town, central West Bengal state, northeastern India. It lies just south of the Dhaleśwarī (Dhalkisor) River. Bishnupur was the capital of the Hindu Mallabhūm kingdom, which was founded in the 8th century AD and was once the most important Hindu dynasty in Bengal. The town is surrounded by old fortifications and has more than a dozen temples, mostly dedicated to Rādhā and Krishna. The 16th-century Jor Bāṅgla and stepped Rās Mancha are excellent examples of brick temples of the Bengali style. The *dhrūpad* school of Indian music was founded (16th–17th century) there under royal patronage.

Bishnupur was constituted a municipality in 1863 and has two colleges affiliated with the University of Burdwān. It has major Grand Trunk Road and rail connections and is



Jor Bāṅgla temple in Bishnupur, West Bengal, India
Kaypix—Shostal/EB Inc.

an agricultural trade and silk-weaving centre. Pop. (1981) 47,529.

bishop, in some Christian churches, the chief pastor and overseer of a diocese, an area containing several congregations. The origins of the office are obscure, but it seems that the episcopacy (*q.v.*), or threefold ministry of bishops, priests, and deacons, was well-established in the Christian Church by the 2nd century AD. The Roman Catholic, Eastern Orthodox, and some other churches have maintained the view that bishops are the successors of the Apostles, a doctrine known as apostolic succession (*q.v.*).

From the Roman Empire's recognition of Christianity in the 4th century AD until the Protestant Reformation in the 16th century, the bishop was the chief pastor, priest, administrator, and ruler of his Christian community. He was the chief liturgical minister; he baptized, celebrated the Eucharist, ordained, absolved, controlled church finances, and settled matters of dispute.

In the course of the Reformation, some of the new Protestant churches repudiated the office of the bishop, partly because they believed the office to have acquired such broad temporal and civil powers during the Middle Ages as to endanger its spiritual purity, and partly because they saw no basis for the institution in the New Testament. Thus, of the post-Reformation Christian communions, only the Roman Catholics, the Eastern Orthodox, Old Catholics, Anglicans, and a few others have maintained both the bishop's office and the belief that bishops have continued the apostolic succession. Some Lutheran churches (primarily in Scandinavia and Germany) have bishops, but, except for those in Sweden, they have not maintained the doctrine of apostolic succession. Most other Protestant churches do not have bishops. In the Methodist Church in the United States, bishops function as superintendents of several congregations and have the power to ordain ministers.

Popes, cardinals, archbishops, patriarchs, and metropolitans are different gradations of bishops. A bishop is often assisted in the administration of his diocese by other, lesser bishops, who may be known as suffragans, assistants, auxiliaries, or coadjutor bishops. Bishops alone have the right to confirm and ordain members of the clergy, and their main duty is to supervise the clergy within their diocese. In the Roman Catholic Church, the bishop is selected by the pope and receives confirmation in his office at the hands of an archbishop and two other bishops. In the Anglican and other churches, a bishop is chosen by the dean and chapter of the cathedral of a diocese. In the Methodist churches the bishop is chosen by a synod. Among the insignia traditional to a bishop are a mitre, pastoral staff, pectoral cross, ring, and *caligae* (*i.e.,* stockings and sandals). *See also* episcopacy; ministry.

bishop, any of several small African birds belonging to the family Ploceidae (order Passeriformes) and constituting the genus *Euplectes.* The breeding males are black-bellied and reddish or yellow above, with rufflike head feathering and fluffy rump feathers nearly covering their stumpy tails. The male vigorously defends a bit of grassland or marsh, where his drab-streaked spouses—sometimes six or more—occupy globular nests. The 13-centimetre (5-inch) red bishop (*E. orix*), also called grenadier weaver, displays by flying about and clapping its wings. Red bishops have become established in southern Australia.

Red bishop (*Euplectes orix*)
Eric Hosking

Bishop, Billy (Canadian fighter pilot): *see* Bishop, William Avery.

Bishop, Elizabeth (b. Feb. 8, 1911, Worcester, Mass., U.S.—d. Oct. 6, 1979, Boston), American poet notable for her formally polished, witty verse. Her short stories appeared in *The New Yorker* and other magazines.

Bishop was reared by her maternal grandparents in Nova Scotia and an aunt in Boston. After graduating from Vassar College in 1934 she traveled abroad, settling in Key West, Fla. (1938–42), before moving on to Mexico (1943). During most of the 1950s and '60s she lived in Petrópolis, near the city of Rio de Janeiro, later dividing the year between Petrópolis and San Francisco. Her first book of poems, *North & South* (1946), which suggests the contrast between her New England origins and her love of hot countries, was reprinted (1955) with additions as *North & South: A Cold Spring.* Much of her work displays the dichotomy of warm and cold, a New England conscience in a tropic sphere. *Questions of Travel* (1965) contains powerful and rhythmically hypnotic verse. Bishop's *The Complete Poems* was published in 1969, and her *Geography III* appeared in 1977. She taught writing at Harvard University from 1970 to 1977. Posthumously published volumes include *The Complete Poems, 1927–1979* (1983) and *The Collected Prose* (1984).

Bishop also wrote a travel book, *Brazil* (1962), and translated from the Portuguese Alice Brant's Brazilian classic, *The Diary of Helena Morley* (1957). She edited and translated *An Anthology of Twentieth-Century Brazilian Poetry* (1972).

Elizabeth Bishop
By courtesy of Farrar, Straus & Giroux, Inc.

Bishop, Sir Henry Rowley (b. Nov. 18, 1786, London—d. April 30, 1855, London), English composer and conductor remembered for his songs "Home, Sweet Home" and "Lo, Here the Gentle Lark."

Bishop conducted at Covent Garden Theatre (1810), King's Theatre, Haymarket (1816–17), Drury Lane (from 1825), and Vauxhall Gardens (1830). He became professor of music successively at Edinburgh (1841) and at Oxford (1848) and was knighted in 1842. Bishop composed light operas and incidental music for plays and arranged operas by well-known composers. He wrote one opera with sung dialogue, *Aladdin* (1826). He also wrote oratorios, part-songs, and glees. His "Home, Sweet Home," with lyrics by John Howard Payne, was the theme song from his comic opera, a musical version of Payne's play *Clari, or The Maid of Milan.*

Sir Henry Rowley Bishop, detail of an oil painting by an unknown artist; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

Bishop, John Peale (b. May 21, 1892, Charles Town, W.Va., U.S.—d. April 4, 1944, Hyannis, Mass.), American poet, novelist, and critic, a member of the "lost generation" and a close associate of the American expatriate writers in Paris in the 1920s.

At Princeton, from which he graduated in 1917, he formed lifelong friendships with Edmund Wilson, the future critic, and with the novelist F. Scott Fitzgerald, who depicted Bishop as the highbrow writer Tom D'Invilliers in his first novel, *This Side of Paradise.* Bishop published his first volume of verse, *Green Fruit,* in 1917. After military service overseas in World War I, he was an editor at *Vanity Fair* magazine in New York City from 1920 to 1922. Until 1933 he lived in France and acquired a deep admiration for French culture. His collection of stories about his native South, *Many Thousands Gone* (1931), was followed with the poetry volume *Now with His Love* (1933). *Act of Darkness,* a novel tracing the coming of age of a young man, and *Minute Particulars,* a collection of verse, both appeared in 1935. He became chief poetry reviewer for *The Nation* magazine in 1940. That year he published perhaps his finest poem, "The Hours," an elegy on the death of F. Scott Fitzgerald. His *Collected Poems* (1948) was edited by the poet Allen Tate, who eulogized him in the poem "Seasons of the Soul" (1944). Edmund Wilson edited *The Collected Essays* (1948) of Bishop.

Bishop, William Avery, byname BILLY BISHOP (b. Feb. 8, 1894, Owen Sound, Ont., Can.—d. Sept 11, 1956, West Palm Beach, Fla., U.S.), Canadian fighter ace who shot down 72 German aircraft during World War I.

Bishop was educated at the Royal Military College, Kingston, and went overseas during World War I with the Canadian cavalry. In

1915 he transferred to the Royal Flying Corps, joining the 60th Squadron in France in 1917. He soon became highly skilled in aerial combat and shot down a total of 72 enemy aircraft, including 25 in one ten-day period. He was awarded the Victoria Cross and several other decorations, and in 1918 he was promoted to the rank of lieutenant colonel, assuming command of the 85th Squadron.

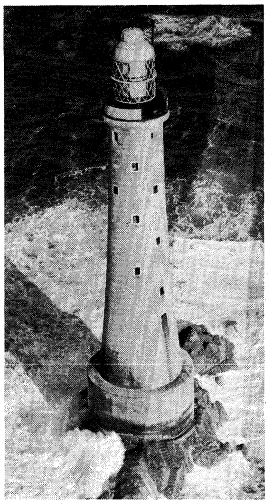
Bishop was appointed to the staff of the British Air Ministry in August 1918, and in this capacity he helped to form the Royal Canadian Air Force (RCAF) as a separate brigade. After the war he joined one of the first commercial aviation companies in Canada, and he eventually became a businessman. In 1936 he was appointed honorary air vice-marshal of the RCAF, and he became honorary air marshal during World War II. He was the author of *Winged Warfare* (1917) and *Flying Squad* (1926).

Bishop Hill, historic village, Henry County, northwestern Illinois, U.S. The settlement was established in 1846 by Swedish immigrants led by Erik Jansson, who had been influenced by the Pietist movement in Sweden. Fearing persecution, Jansson and his followers emigrated to America. They named their new home for Biskopskulla, Swed., Jansson's birthplace, in 1846. The colony prospered through farming, and new immigrants brought the population to about 1,500. All things were owned in common under Jansson's direct control until he was murdered in 1850 by John Root, his cousin's husband. Jonas Olson then became the leader of the community, which was incorporated in 1853. Economic problems and internal dissension caused the collapse of communal life, however, and the property was divided among the settlers in 1861 and 1862. Many residents left the community, and the remainder became members of other churches.

The settlers of Bishop Hill were superb carpenters and craftsmen, and several of the original buildings remain; some have been restored. Among these are the Old Colony Church, built in 1848 in the Greek Revival style, and the Steeple Building, constructed in 1854. Bishop Hill was designated a state historic site in 1946. The present village (inc. 1893) is in an agricultural and coal-mining area. Pop. (1984 est.) 169.

Bishop Museum, in full BERNICE P. BISHOP MUSEUM, in Honolulu, research centre for the study of Hawaiian and Polynesian archaeology, natural history, and culture. It also exhibits Hawaiian and Polynesian arts, crafts, artifacts, and flora and fauna. Among items on display at Hawaiian Hall are royal jewelry, crowns and thrones, weapons, feather capes and cloaks, outrigger canoes, surfboards, artifacts of whalebone and tortoise shell, and a ceiling-mounted whale. The museum was founded in 1889 by the American husband, Charles R. Bishop, of Hawaiian princess Bernice Pauahi (d. 1884), the last direct descendant of Kamehameha the Great. In 1961 a planetarium and observatory were added to emphasize the role of astronomy in the cultural history of Pacific Island peoples.

Bishop Rock Lighthouse, 19th-century lighthouse, Scilly Islands, Cornwall. The 19th-century civil-engineering landmark takes perhaps the worst buffeting from heavy seas of any lighthouse in the world. The first tower, begun in 1847, was swept away before the lantern could be installed. The present tower, of interlocking granite blocks with a solid drum base, was completed in 1858. It was subsequently reinforced by iron tie bars in the inner walls and a granite encasement of the outer wall. The structure was improved and its elevation was increased by Sir James N. Douglass in 1883–87. The lantern is 146 feet above high-tide level.



Bishop Rock Lighthouse, Scilly Islands, England, 1858
F.E. Gibson

Bishops, Synod of, in the Roman Catholic Church, the institution of periodic meetings of bishops established in 1965 by Pope Paul VI. According to the "Decree on the Bishops' Pastoral Office in the Church" issued by the second Vatican Council, the Synod is convoked by the pope with the intention of assisting the pope in church government and of demonstrating the responsibility of bishops as a body for the universal church in addition to their individual responsibility in their respective dioceses.

The pope determines its procedures and agenda and appoints no more than 15 percent of the bishops. The rest of the delegates are elected by their respective national episcopal conferences or are ex officio members. In the years after its institution, the Synod was convoked biennially, and the number of delegates averaged about 200. Issues discussed by the delegates included the nature of the priestly ministry, the putting into practice of the principle of collegiality (*q.v.*), the church's obligations in promoting social justice, and the revision of canon (ecclesiastical) law.

bishop's cap cactus (*Astrophytum,* or *Echinocactus, myriostigma*), species of cactus, family Cactaceae, native to central Mexico, with four or five distinct ribs that increase to eight or more with age. Spineless and globose, becoming cylindroid with age, it is covered with white flecks caused by scales.

Bishop's cap cactus (*Echinocactus myriostigma*)
Edward F. Anderson

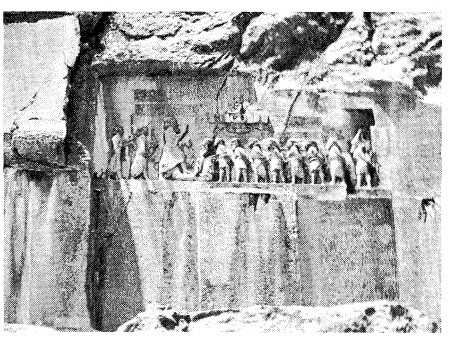
All four species of *Astrophytum,* which is sometimes regarded as a subgenus of *Echinocactus,* are cultivated as potted plants, their yellow flowers appearing on summer days. Fairly large, they are fragrant in at least some species or varieties.

Bishop's Stortford, town ("parish"), East Hertfordshire district, county of Hertfordshire, Eng. It lies along the River Stort on the northeast periphery of the metropolitan complex centred on London. In Norman times the manor was held by the bishop of London. The town developed only after the opening of the Stort Navigation in 1769, when it became a malting centre and grain depot. The town is largely residential, with a variety of schools and colleges. Cecil Rhodes was born at Netteswell House, now a memorial museum. Pop. (1981) 22,791.

Bishops' Wars (1639, 1640), in British history, two brief campaigns that were fought between Charles I and the Scots. The wars were the result of Charles's endeavour to enforce Anglican observances in the Scottish Church and of the determination of the Scots to abolish episcopacy. A riot in Edinburgh in 1637 quickly led to national resistance in Scotland; and, when in November 1638 the General Assembly at Glasgow set Charles's orders at defiance, he gathered an English force and marched toward the border in 1639. Lacking sufficient funds and lacking confidence in his troops, however, Charles agreed, by the Pacification of Berwick, to leave the Scots alone. The first Bishops' War thus ended without battle.

Misunderstandings broke out as to the interpretation of the pacification treaty; and Charles, having discovered that the Scots were intriguing with France, determined again on the use of force. To raise money he once more called a Parliament (April 1640). This Short Parliament, as it was called, insisted first on discussing grievances against the government and showed itself opposed to a renewal of the war against the Scots. Charles thereupon dissolved Parliament and raised a new expedition on his own. The subsequent military successes of the Scots in the second Bishops' War and their seizure of the whole of Northumberland and Durham made it necessary for Charles to summon the Long Parliament (November 1640), thus precipitating the English Civil War.

Bīsitūn, also spelled BĪSOTŪN, historically BEHISTUN, village and precipitous rock situated at the foot of the Zagros Mountains in the Kermanshah region of Iran. In ancient times Bīsitūn was on the old road from Ecbatana, capital of ancient Media, to Babylon, and it was on that scarp that the Achaemenid king Darius I the Great (reigned 522–486 BC) placed his famous trilingual inscription, the decipherment of which provided an important key for the study of the cuneiform script. The inscription and the accompanying bas-relief were carved in a difficult, though not inaccessible, rock face. Written in Babylonian, Old Persian, and Elamite, the inscription records the way in which Darius, after the death of Cambyses II (reigned 529–522 BC), killed the

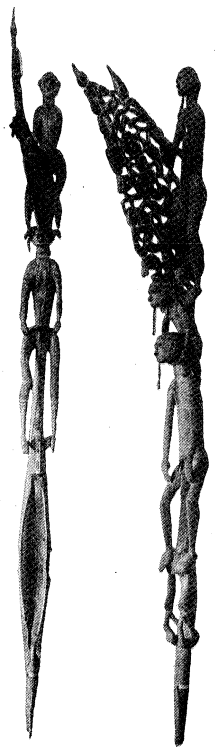


Relief and inscription at Bīsitūn, Iran, from *History of the Persian Empire* by A.T. Olmstead, 1948
© 1948 by the University of Chicago; photograph, Oriental Institute, the University of Chicago

usurper Gaumata, defeated the rebels, and assumed the throne. The organization of the Persian territories into satrapies or provinces is also recorded.

The inscriptions were first reached and copied (1835–47) by Henry Rawlinson, an officer in the East India Company working in Persia. Rawlinson published his findings in 1849 and virtually accomplished the task of deciphering the Old Persian cuneiform texts. Largely because of Rawlinson's success with the Old Persian text, the Babylonian and Elamite versions were also soon translated. Later efforts at Bīsitūn by various archaeological groups have clarified some of Rawlinson's readings, more accurately measured gaps in the text, and helped to determine when the events took place (*c.* autumn 522–spring 520 BC).

bisj pole, also spelled BIS POLE, carved wooden pole used in religious rites of the South Pacific Islands. *Bisj* poles are occasionally found in North America, but they are more common in New Zealand, Vanuatu (formerly the New Hebrides), and especially the Asmat area in southwestern (Indonesian) New Guinea and along the Casuarinan coast. The design of the poles—which range from 12 to 26 feet (3.7 to 7.9 metres) in height and consist of carved figures, thought to represent clan ancestors who were killed by enemies, placed one on top of the other—derives from the squatting figure motif, one of the germinal-figural forms in Oceanic art. The complex series of figures terminates in an ornate, open-work ornament fashioned from a flat root projection left on the trunk when the tree is felled. The complex religious significance and symbolism associated with *bisj* poles is reflected in the ceremony surrounding their



Bisj poles from the coastal area of the Asmat district, Irian Jaya (West New Guinea), Indonesia; in the Koninklijk Institute voor de Tropen, Amsterdam

Holle Bildarchiv, Baden-Baden, W.Ger.

creation. In the Asmat area, for example, the mangrove tree, representing the enemy, is ceremonially stalked and cut down. As the bark is stripped from the trunk and red sap seeps from the white wood, the Asmat is reminded of the conquered warrior's blood.

The *bisj* pole has been interpreted as another form of the "soul ship," a large ceremonial dugout canoe filled with carved figures said to possess special powers. The ships are intended to carry the souls of the recently dead away from the villages and to impart magical powers to novices during initiation rites. The rituals surrounding *bisj* poles show that they, too, are intended to harbour souls of the dead, keeping them away from the village; and in appearance they resemble an upended canoe with an exaggerated prow and a dwarfed shell. Like the soul ships, *bisj* poles are also used to transmit magical powers—in this case to the palms in the sago swamps, where they are disposed of after ceremonies associated with the ancestor cult.

Biskra, also spelled (after 1981) BESKRA, *wilāyah* (province, or *département*), northeastern

Biskra, Alg.

Dominique Darbois

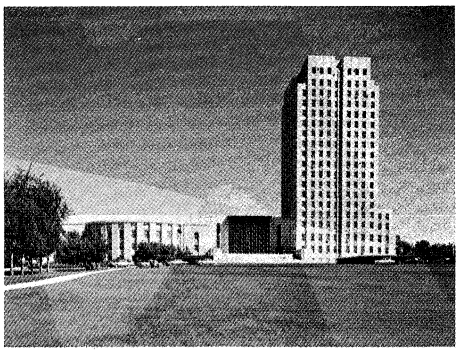
Algeria, on the northern edge of the Sahara, mostly in the Grand Erg (sand dunes) Oriental. Established in 1974, it has an area of 42,366 sq mi (109,728 sq km) and is bounded by Batna *wilāyah* (province) to the north, Tébessa *wilāyah* and Tunisia to the east, and the *wilāyāt* of Ouargla to the south, and Djelfa and M'Sila to the west. The northern border lies along the southern edge of the Aurès Massif, which acts as a rainfall barrier. In the north central part of the arid province are the Chott (salt lake) Melrhír and Chott Merouane, which are almost entirely below sea level. Most of the population lives in the area of Biskra or Souf oases. Aside from Biskra town, the *wilāyah* capital, the major population centres are Djamaa, el-Oued (el-Wad), and Tolga. Dates (especially the prized Deglet Nur, grown mostly in the Tolga oasis) are the principal crop together with figs, pomegranates, and apricots. Low-yield wheat and barley are raised in the north. Hammam Salahine ("Bath of the Marabouts") is a modern, nationally important health spa on the outskirts of Biskra town; the Romans called it Ad Piscinam and used it in the treatment of rheumatisms and skin diseases. Biskra town has an airport, and an asphalt road and a railway parallel to the 125-mi-long north–south series of oases between Biskra town and Touggourt, in neighbouring Ouargla province. A small oilfield is exploited in the southeast. Pop. (1980 est.) 531,895.

Biskra, also called (after 1981) BESKRA, town and capital of Biskra *wilāyah* (province, or *département*), Algeria, on the northern edge of the Sahara. It is the centre of the Zab (Ziban) group of oases south of a wide, open depression between the Aurès Massif and the Tell Atlas. On the site of Vescera, a fortified Roman post, Biskra prospered after Arab conquest in the 9th century. In the 1100s it was the semi-autonomous capital of the Zab region but later came under the influence of the Hafṣids. The Turks occupied Biskra in 1552. It was garrisoned by the French in 1844.

Ft. Saint-Germain (1849–51; built on the site of the former Turkish Casbah) became the nucleus of modern Biskra. Its location on the railway and road from Constantine to Touggart, its airport, and its temperate climate (November to April) have made Biskra a winter resort of broad, tree-lined streets, hotels, shops, and public gardens. Hammam Salahine (Bath of the Saints), hot sulfur springs of repute for their medicinal value, are 3 mi (5 km) northwest.

The oases stretch southward along the right bank of the Oued (stream) Biskra, covering an area of 3,250 ac (1,300 ha). Scattered among the thousands of date palms and fruit trees are the sun-baked brick villages that comprise Old Biskra. In the winter season, water collected in the Oued Biskra Barrage (dam) irrigates fields of wheat and barley. The area was subjected to disastrous floods in 1969. Pop. (1977 prelim.) mun., 90,471.

Bismarck, capital of North Dakota, U.S., and the seat (1873) of Burleigh County, in the south central part of the state, on the east bank of the Missouri River. It originated in the 1830s as a port called the "Crossing on the Missouri," and in 1872 Camp Greeley (later Camp Hancock), a military post, was established there to protect crews working on the Northern Pacific Railway. In 1873 the community was named in honour of the German chancellor Otto von Bismarck, in the hope of attracting German investment in the railway. With the discovery of gold in the Black Hills (to the southwest), Bismarck became an outfitting centre for prospectors. In 1883 the capital of Dakota Territory was moved from Yankton (in present-day South Dakota) to Bismarck; when the territory was divided and the two states admitted to the Union in 1889, Bismarck became the capital of the northern state. Since then, it has grown steadily and has become the region's business, cultural, and financial centre. In the heart of



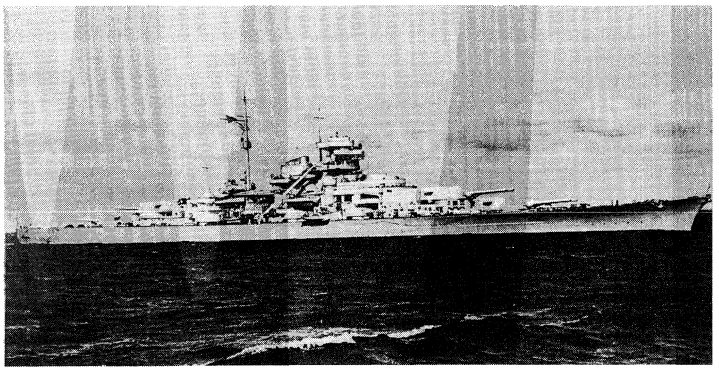
The State Capitol, Bismarck, N.D.

Grant Heilman—EB Inc.

spring-wheat country, Bismarck is a wholesale distributing point, mainly for grain and livestock. The state capitol (1932) is a 19-story skyscraper, and the governor's mansion and state museum are in its grounds. Bismarck Junior College was opened in 1939 and Mary College in 1959. Across the river are the city of Mandan and Fort Lincoln State Park. Inc. city, 1875. Pop. (1980) 44,485.

Bismarck, German battleship of World War II that had a short but spectacular career. The "Bismarck" was laid down in 1936 and launched in 1939. It displaced 52,600 tons, mounted eight 15-inch guns, and had a speed of 30 knots. Its sighting off Bergen, Nor., in May 1941 by a British reconnaissance aircraft sent practically the entire British Home Fleet into action to intercept it. Two cruisers made contact off the coast of Iceland, and the battleship "Prince of Wales" and battle cruiser "Hood" soon engaged it. After destroying the "Hood" with a shell that exploded in the magazine, the "Bismarck" escaped into the open sea. Sighted by aircraft 30 hours later (May 26), it was hit by a torpedo that crippled its steering gear and was bombarded throughout

the night by battleships. On the morning of May 27 the "King George V" and the "Rodney," in an hour-long attack, incapacitated the



The "Bismarck" shortly after commissioning in 1940
By courtesy of the Marineschule Murwik, Flensburg, W.Ger.

"Bismarck," and an hour and a half later it was sunk by three torpedoes from the cruiser "Dorsetshire."

Bismarck, Otto von, in full OTTO EDUARD LEOPOLD, FÜRST (prince) VON BISMARCK, GRAF (count) VON BISMARCK-SCHÖNHAUSEN, HERZOG (duke) VON LAUENBURG (b. April 1, 1815, Schönhausen, Altmark, Prussia—d. July 30, 1896, Friedrichsruh, near Hamburg), prime minister of Prussia (1862–73, 1873–90) and founder and first chancellor (1871–90) of the German Empire. A conservative and a temporizer in domestic affairs, he was at his greatest and most imaginative in foreign policy, building a system of important alliances and arranging a series of strategic military and diplomatic actions to secure both the position and security of Prussia and the peace of Europe.

A brief account of the life and works of Otto von Bismarck follows; for a full biography, *see* MACROPAEDIA: Bismarck.

After reading law (Göttingen and Berlin) Bismarck entered Prussian service and became a judicial administrator at Aachen; his conduct was unconventional, and the criticism of his official superiors drove him to resign from the service at the age of 24. In 1847 he became a member of the quasi-representative United Diet. Bismarck gained prominence in 1851 when he was chosen to represent Prussia in the Federal Diet. In 1859 he was sent as ambassador to Russia, from which he was recalled in March 1862 to become ambassador to France. Finally, on Sept. 22, 1862, Bismarck returned to Berlin as prime minister, devoting himself to the task of uniting Germany under Prussian leadership. In the war of 1866 he succeeded in defeating Austria and excluding it altogether from Germany. He involved his country in the Franco-German War (1870–71), a conflict that ended with Prussian success and a measure of German unity. On March 21, 1871, Bismarck, now a hero, was created a prince and appointed imperial chancellor. He initiated administrative reforms, developing a common currency, a central bank, and a single code of commercial and civil law for Germany. In foreign affairs, he presided over the Congress of Berlin (1878), and this seemed to symbolize his paramount position as mediator between the great powers. An alliance (1879) with Austria-Hungary marked a new period of conservatism in Bismarck's foreign policy, soon reflected at home in anti-Socialist policies. But in order to defeat the Social Democrats, Bismarck also became the first statesman in Europe to devise a comprehensive scheme of social security, offering workers insurance against accident, sickness, and old age. But by 1890, his policies had begun to come under attack.

On March 18, 1890, two years after William II's accession, Bismarck was forced to resign. His last years were devoted to discrediting the Emperor and to composing his memoirs.

Bismarck Archipelago, part of Papua New Guinea, island group in the Bismarck Sea, southwestern Pacific, northeast of the island of New Guinea. The largest components of the archipelago, which has a total land area of 19,173 sq mi (49,658 sq km), are New Britain, New Ireland, the Admiralty Islands, Lavongai (New Hanover), and the smaller Duke of York Group, St. Matthias Group, and the Witu (Vitu) Islands. They are generally volcanic or formed of raised coral limestone and are heavily forested.

Annexed by Germany in 1884, the archipelago was named after the German statesman Otto von Bismarck. It was occupied by Australia in 1914 and made a mandated territory of Australia in 1920. Seized by Japan during World War II and retaken by the Allies in 1944, the group was made part of the UN Trust Territory of New Guinea, administered by Australia. When Papua New Guinea attained independence in 1975, the group became part of that country.

The economic mainstay of the islands is copra, with some lumbering and, more recently, cocoa and oil palm. Development has been concentrated on the Gazelle Peninsula (*q.v.*) of New Britain, like New Ireland one of the most advanced and densely populated areas. Rabaul, on New Britain, is the chief town. *See also* Admiralty Islands; Duke of York Islands; New Britain; New Ireland; and Vitu Islands. Pop. (1980 prelim.) 314,308.

Bismarck Range, northeastern segment of the central highlands of eastern New Guinea, comprising a portion of the border between Madang, Chimbu, and Eastern and Western Highlands provinces of Papua New Guinea. The mountains reach 14,793 ft (4,509 m) at Mt. Wilhelm, the highest peak in Papua New Guinea, and often have snow on their summits. The Ramu River has its source in the range, as do tributaries of the Sepik and Purari rivers. Visited in 1886 by the German explorer G.E. von Schleinitz, the mountains were named after Otto von Bismarck.

Bismarck Sea, section of the southwestern Pacific Ocean, bounded by the northeast coast of Papua New Guinea (southwest) and the Bismarck Archipelago including the Admiralty Islands (north), New Ireland (east), and New Britain (south). With a total surface area of about 15,000 sq mi (40,000 sq km), it opens to the Pacific on the north and to the Solomon Sea on the southeast through Vitiaz and Dampier straits and St. George's Channel. It fills a depression created by central downwarping accompanied by upwarping of the rim. The basin, with a general depth of 6,600 ft (2,000 m) and maximum depths approaching 8,200 ft, is divided by a central ridge into the eastern New Ireland and western New Guinea sections. First systematically investigated by HMS "Challenger" in 1875, the sea was under German control from about 1885 until 1914 and bears the name of the German statesman Otto von Bismarck. A U.S.–Japanese encounter took place on the sea in 1943.

Bismāyah (Iraq): *see* Adab.

bismuth (Bi), the most metallic and the least abundant of the elements in the nitrogen family (Group Va of the periodic table). Bismuth is the most diamagnetic of all metals (*i.e.,* it exhibits the greatest opposition to being magnetized) and has the lowest thermal conductivity of all metals except mercury. It is a brittle, lustrous, coarsely crystalline metal, not very hard or ductile but somewhat malleable. It is tin-white in colour with a reddish tinge that distinguishes it from all other metals. It was described in 1450 by Basil Valentine, a German monk.

Often found free in nature, bismuth also occurs as the sulfide bismuthinite, or bismuth glance (Bi_2S_3), and the oxide bismite (Bi_2O_3); it is frequently associated with ores of tin, lead, or copper, from which it is separated as a by-product during their refining. Pure bismuth can also be obtained by reducing the oxide with carbon or by roasting the sulfide in the presence of charcoal and metallic iron to remove the sulfur.

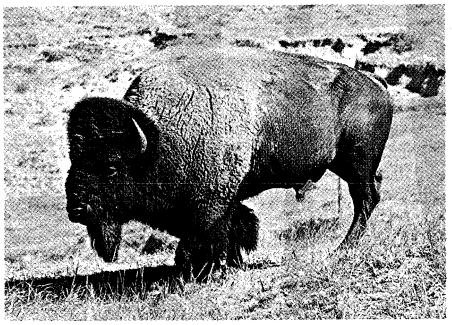
Although it does not tarnish in air at ordinary temperatures, bismuth forms an oxide coating when heated. The yellowish-brown colour of this oxide distinguishes it from those formed by other metals. At red heat, bismuth reacts with steam, but it is not affected by cold, air-free water; it unites directly with sulfur and with the halogens (fluorine, chlorine, bromine, iodine). The element is not attacked by hydrochloric acid, and only slightly by hot sulfuric acid, but it is rapidly dissolved by either dilute or concentrated nitric acid.

Like antimony and water, bismuth expands slightly upon solidifying, a property that renders bismuth alloys particularly suited to the manufacture of sharply detailed metal castings. Because the alloys have low melting points, they are used in special solders as well as in automatic sprinkler heads, fire-door release lines, fuses, safety plugs for compressed-gas cylinders, and many other fire-detection devices. Thermoelectric equipment for refrigeration uses bismuth telluride, Bi_2Te, and bismuth selenide, Bi_2Se_4. The principal chemical application of the element is in the form of bismuth phosphomolybdate, $BiPMo_{12}O_{40}$, a highly effective catalyst for the air oxidation of propylene and ammonia to acrylonitrile, which is used to manufacture acrylic fibres, plastics, and paints. Salts of bismuth frequently are used in soothing agents for the treatment of digestive disorders, in outlining the alimentary tract during X-ray examination, and in treating injuries and infections of the skin. The oxychloride BiOCl has been used to impart a pearlescent quality to lipstick, nail polish, and eye shadow.

atomic number	83
atomic weight	208.9806
melting point	271.3° C (520.3° F)
boiling point	1,560° C (2,840° F)
density	9.747 g/cc at 20° C (68° F)
oxidation states	+3, +5
electron config.	2-8-18-32-18-5 or $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 4f^{14} 5s^2 5p^6 5d^{10} 6s^2 6p^3$

bismutite, a rather common mineral, bismuth subcarbonate $(BiO)_2CO_3$, that has been formed as an alteration product of primary bismuth minerals in the oxidized portions of metal veins. Well-known localities include Cornwall, Eng.; Schneeberg, E.Ger.; and the Tazna district, Bolivia. For detailed physical properties, *see* carbonate mineral (table).

bison (*Bison bison*), oxlike grazing mammal, belonging to the family Bovidae, order Artiodactyla. The bison is larger than cattle and has a convex forehead and a pronounced shoulder hump. The coarse hair is especially long



American bison, or plains buffalo (*Bison bison*)
Alan G. Nelson—Root Resources

on the head, which is held low, and on the neck and shoulders. Both sexes bear heavy, curved horns, those of the cow being smaller. A mature bull stands about 2 metres (6½ feet) at the shoulder and weighs more than 900 kilograms (1,980 pounds). The coat is dark brown, although on rare occasions a white animal is born; these unusual animals were once especially honoured by American Indians.

The bison lives in herds that may remain in one place for several days or may move more or less constantly. The cow, which commonly breeds for 40 years, usually gives birth to a single calf in May after about nine months' gestation. In spite of its bulk, the bison is agile and fast. Unpredictable, it can sometimes be approached closely and at other times will stampede at the least provocation.

The European bison, or wisent, often called the species *B. bonasus,* is a woods dweller, rangier and slightly larger than the American bison, and has thicker, shorter, blunter horns. It became rare by the 16th century and in the late 20th century survived only in a few small, managed herds.

The American bison, commonly called buffalo, or plains buffalo, once roamed over most of North America in numbers estimated as high as 60,000,000 when Europeans arrived. It formed the mainstay of the economy of the Plains Indians, but with the westward movement of white civilization it was wantonly slaughtered—for meat, hides, sport, and sometimes only the tongue. One hunter, William F. Cody ("Buffalo Bill"), was renowned as a killer of buffalo. Much of the hostility between the Indians and the white men was caused by the depletion of the bison herds. Around 1900, as the animal neared extinction, concerted action by cattlemen and conservationists led to its protection on government preserves. The present managed herds now seem to ensure survival of the species, and indeed local herds often overpopulate their ranges and must be reduced by controlled hunting.

Bīsotūn (Iran): *see* Bīsitūn.

Bisrāmpur (India): *see* Surguja.

Bissagos Islands (Guinea-Bissau): *see* Bijagós Islands.

Bissau, port city and capital of Guinea-Bissau, West Africa. It originated in 1687 as a Portuguese fortified post and slave-trading centre. In 1941 it replaced Bolama as the capital and has since developed on a northwest–southeast axis by the Canal do Gêba, a channel that offers an excellent roadstead for the largest vessels; a wharf and pier have replaced the former outdated lighterage system. Recent port improvements have included enlargement of the harbour and the installation of refrigeration units. The city also has an international airport and is the site of a small university and a research institute. Pop. (1979) 105,273.

Bisschop, Simon (Dutch theologian): *see* Episcopius, Simon.

Bissell, Melville Reuben (b. Sept. 25, 1843, Hartwick, N.Y., U.S.—d. March 15, 1889, Grand Rapids, Mich.), U.S. inventor of the carpet sweeper.

After growing up in Berlin, Wis., Bissell joined his father in business at Kalamazoo, Mich., where they opened a grocery store. Selling crockery led the younger Bissell into the crockery business in Grand Rapids, where, by the time of the economic panic of 1873, he had made a fortune in industry and real estate. With business temporarily at a standstill, he turned his attention to the carpet sweeper and its large potential market. He soon patented (1876) a device with a central bearing brush; his device was made thoroughly practical by the addition of rubber tires and other improvements. Despite a disastrous fire (1884) in his first factory, he headed a highly successful business with worldwide production and marketing facilities.

Consult the INDEX *first*

Bissell, Richard (Pike) (b. June 27, 1913, Dubuque, Iowa, U.S.—d. May 4, 1977, Dubuque), U.S. novelist and playwright whose works provide fresh and witty images of Middle Western speech and folkways.

Bissell grew up in Dubuque, attended Phillips Exeter Academy, and graduated from Harvard in 1936. From his experiences as a mate and then a pilot on the Mississippi, Ohio, and Monongahela rivers came the novels *A Stretch on the River* (1950) and *The Monongahela* (1952). His first really successful novel was *7½ Cents* (1953; British title *A Gross of Pyjamas*), based on his experiences as a supervisor in a pajama factory in Dubuque. In collaboration with George Abbott, he turned *7½ Cents* into a musical, *The Pajama Game* (1954), which had a long run on Broadway and was made into a motion picture in 1957. From his experiences in the theatre he produced a novel, *Say, Darling* (1957), which he then wrote as a musical under the same title (1958), in collaboration with his wife, Marian Bissell, and Abe Burrows. Among his later books are the novels *Good Bye, Ava* (1960) and *Still Circling Moose Jaw* (1965). His last novel, *New Light on 1776 and All That* (1975), is a satire of the American Revolution.

Bisseni (Turkic people): *see* Pechenegs.

Bissorã, town, Oio region, northwestern Guinea-Bissau, West Africa. It lies on a tributary of the Rio Cacheu and is surrounded by the Casamance woodland, which provides hardwoods for export. A power station supplies the town's industry, which includes a sawmill. Subsistence agriculture predominates in the surrounding area, and corn (maize), sorghum, millet, sweet potatoes, cassava, and beans are the principal crops. Bissorã is connected by road with Bissau, the national capital. Pop. (1979) mun., 39,913.

Bistam (Iran): *see* Basṭām.

bistre, brown pigment made from boiling the soot of wood. Because bistre is transparent and has no body, it is frequently used in conjunction with pen and ink drawings as a wash, a liquid spread evenly to suggest shadows, and is especially associated with the appearance of the typical "old master drawing."

It was used to its greatest effect in the 17th and 18th centuries, when the bistre wash was especially favoured by such artists as Rembrandt, Claude Lorrain, Alexander Cozens, and Thomas Gainsborough. The pigment is also used by miniaturists.

"Young Woman at Her Toilette," by Rembrandt, pen and India ink with bistre and ink washes; in the Albertina, Vienna
By courtesy of the Albertina, Vienna

Bistriţa, town, capital of Bistriţa-Năsăud *judeţ* (district), northern Romania. Settled in the 12th century by immigrant Germans, it acquired free-city status in 1353. Holding an annual fair, it developed extensive markets throughout Moldavia, and its craftsmen travelled extensively. In 1713 the Romanian population was expelled by the Saxon magistrates, but they returned later, and Bistriţa was restored to Romania in 1918; it was part of Hungary from 1940 to 1945. Foodstuffs and building materials are important in the economy. The area around the town is noted for its timber and wines. Năsăud, a few miles northwest, is famous for its timber and fruit and for the fine embroidery on traditional peasant costumes. Pop. (1982 est.) 57,814.

Bistriţa-Năsăud, *judeţ* (district), northern Romania, occupying an area of 2,048 sq mi (5,305 sq km). The forested Eastern Carpathian Mountains, including the Rodna and Căliman Massifs, rise above the settlement areas in intermontane valleys. The Căliman Massif (6,896 ft [2,096m]) is the largest one of volcanic origin in Romania. The Someşul Mare and its tributaries, including the Ţibleş and Illişua rivers, flow southwestward through the district. Bistriţa is the district capital. Neolithic remains and Bronze Age tombs were found in Bistriţa city, and remains of a Dacian citadel are in Sărăţel town. Agricultural activities consist mostly of wine growing and livestock raising. Wood and pulp products are manufactured in Bistriţa, Năsăud, and Ilva-Mică. Building materials are produced in Bistriţa and Sîngeorz-Băi. Pyrite has been mined near Rodna since the 15th century. Rodna is a tourist centre for the picturesque Lake Lala, Vinţului Valley, and Mount Ineu (7,809 ft). Bîrgăul village, the centre of a substantial folk-art community, is situated near the pyramid-shaped Mount Henuil Mare (5,289 ft). Coşbuc town is named for the poet Gheorghe Coşbuc (1866–1918), who was born there. Beclean, Năsăud, and Rodna towns are noted for the architecture of their churches. A museum in Năsăud contains medieval weapons, ceramics, and money; and Reteag town has a museum devoted to Ion Pop Reteagul (1853–1905), a folktale chronicler and collector of folk art. Major highway and railway connec-

tions parallel the Someşul Mare and Bistriţa rivers. Pop. (1982 est.) 306,936.

Bisu (Egyptian god): *see* Bes.

bit, in communication and information theory, a unit of information equivalent to the result of a choice between only two possible alternatives, as between 1 and 0 in the binary number system generally used in digital computers. The term is shortened from the words "binary digit." It is also applied to a unit of computer memory corresponding to the ability to store the result of a choice between two alternatives.

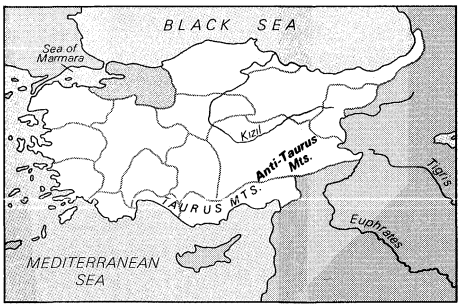
bit (hand tool): *see* brace and bit.

Bit-Adini, ancient Aramaean kingdom in Mesopotamia, located on both sides of the middle Euphrates River south of Carchemish. Probably founded in the 10th century BC, it was conquered by the Assyrians under Shalmaneser III in 856. Its capital, Til Barsib (Til Barsip; modern Tall al-Aḥmar), was renamed Kar-Shulmanashared (Quay of Shalmaneser) and was made an Assyrian provincial capital and garrison town. Til Barsib was later captured by the Chaldean king Nabopolassar in 611, and thereafter it never regained its former importance.

Bitek, Okot (African writer): *see* p'Bitek, Okot.

Bithūr, town, Kānpur district, Uttar Pradesh state, northern India, northwest of Kānpur, on the Ganges River. Bājī Rāo, peshwa of the Marāṭhās, established his court at Bithūr after the British deposed him in 1818. In 1857 the British levelled the town and blew up the temple and palaces in retaliation for Bājī Rāo's adopted son's part in the Indian Mutiny. The town's ruins are an important Hindu holy place. The principal object of worship is a footmark believed to be that of the god Brahmā. The epic *Rāmāyaṇa* is said to have been composed there. A large religious festival is held annually. Pop. (1981) 5,318.

Bithynia, ancient district in northwestern Anatolia, adjoining the Sea of Marmara, the



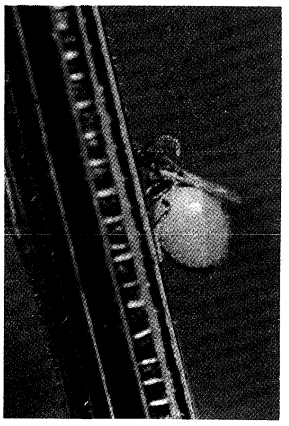
Bithynia

From W. Shepherd, *Historical Atlas,* Harper & Row, Publishers (Barnes & Noble Books), New York; revision copyright © 1964 by Barnes & Noble, Inc.

Bosporus, and the Black Sea, thus occupying an important and precarious position between East and West. Late in the 2nd millennium BC, Bithynia was occupied by warlike tribes of Thracian origin who harried Greek settlers and Persian envoys alike. Their remarkable pugnacity kept them from complete Persian domination after the 6th century; in addition, they never submitted to Alexander the Great or his Seleucid successors. By the 3rd century BC the small but powerful state had evolved from tribal government to Hellenistic kingship and reached the height of its power early in the 2nd century BC. There followed a century of inept leadership and rapid decline. Bithynia's last king, Nicomedes IV, little more than a Roman puppet, bequeathed his kingdom to the Romans in 74 BC.

biting louse: *see* chewing louse.

biting midge, the smallest bloodsucking insect (about 1 millimetre [0.04 inch] long), sometimes considered a member of the midge family (Chironomidae) but more recently



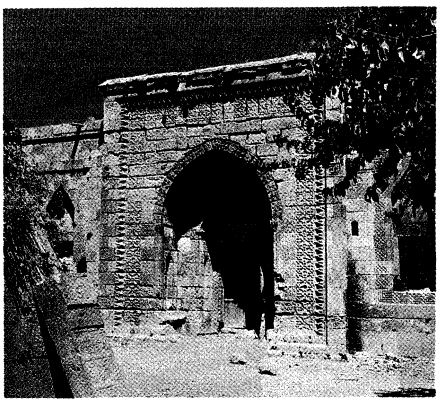
Biting midge (*Phasmidohelea wagneri*)
E.S. Ross

placed in the family Ceratopogonidae (order Diptera). Biting midges—often a serious pest along seashores, rivers, and lakes—may attack in great numbers and cause extreme discomfort. The nickname no-see-ums is descriptive, for, although its irritating bite is felt, the female midge is difficult to find.

The larvae live in fresh and brackish water, in moist soil, or under tree bark. The genera *Culicoides* and *Leptoconops,* also known as sand flies (*q.v.*), or punkies, attack humans but are not known to transmit any diseases to them. Many species attack other insects (*e.g.,* mantids, walking-sticks, and dragonflies).

Bitis, snake genus belonging to the poisonous viper family Viperidae, including the puff adders (*e.g., Bitis arietans; see* adder), the Gaboon viper (*q.v.; B. gabonica*), and the rhinoceros viper (*q.v.; B. nasicornis*).

Bitlis, city, capital of Bitlis *il* (province), southeastern Turkey, southwest of Lake Van at 4,600 ft (1,400 m) above sea level. Strategically situated in the narrow valley of the Bitlis Çay, a tributary of the Tigris River, it commands the only route from the Van basin to the Mesopotamian plains. It was mentioned frequently, as Bagesh, in old Armenian sources. Taken by the Muslim Arabs during the reign of the caliph 'Umar (634–644), it changed hands intermittently among the Arab dynasties, the Armenians, the Byzantines, the Persian Il-Khans, and the Mongols



Ancient caravansary, Bitlis, Tur.
H. Knaus—Bavaria-Verlag

until the establishment of a Kurdish dynasty in the 14th century. The Kurds at Bitlis, under Ottoman suzerainty, enjoyed considerable autonomy until 1847, when the town came under direct Ottoman administration. The Armenian insurrections at the end of the 19th century and the Russian occupation during World War I hurt Bitlis, reducing its population and damaging its weaving and dyeing industries. Historical monuments include a partly ruined medieval castle and numerous mosques, theological schools, and inns dating from the early Seljuq and Ottoman periods.

Bitlis *il,* 3,302 sq mi (8,551 sq km) in area, includes the eastern corner of the Muş Plain, the plateau west of Lake Van, and the wild, mountainous country on both sides of the city of Bitlis. The climate in mountainous areas is harsh, with long winters and heavy snowfalls. Agricultural products include fruits, grain, and tobacco; industry is limited to leatherworking, the manufacture of tobacco products, and the weaving and dyeing of coarse cloth. Kurds form the majority of the population. Tatvan, on Lake Van, is the province's chief port. Pop. (1980) city, 93,757; (1983 est.) *il,* 282,300.

Bitola, Serbo-Croatian BITOLJ, Turkish MONASTIR, southernmost city of Macedonia, Yugoslavia, 2,019 ft (615 m) in altitude on the Dragor River and at the western edge of the Bitola Plain, a few miles from the Greek frontier. Near the Greek-founded settlement Heraclea Lyncestis, later a Roman city, it was invaded by Slavic tribes in the 5th and 6th centuries, and thereafter declined. The Monastery of Obitelj (still visible) played an important role in the community until the city was taken by the Turks and became a thriving cosmopolitan city of commercial and military importance. There were 60 mosques in the city, of which 12 remain. In the Balkan Wars (1912–13) Bitola was taken by the Serbs, cutting off the city from a 500-year Muslim history. World War II brought a further decline in economic activity and in population; its Jewish community was wiped out.

Upon the reestablishment and reorganization of Yugoslavia, after 1945, Bitola became an important Macedonian centre. It has good transportation links to Skopje and into Greece. The fertile plain supports cereals, industrial crops (notably tobacco), and animal husbandry. Industrial activity includes sugar refining, leather craft, and the manufacture of textiles, carpets, and refrigeration equipment. Construction was underway in the late 1970s on the Bitola thermal power plant, which will provide electricity for much of Macedonia, especially the resort areas of Lakes Ohrid and Prespa. Ten miles north of Bitola is the great circular necropolis of Vissovi, comparable to the ancient centre of Mycenae, in Crete. Pop. (1981 prelim.) mun., 137,835.

Biton and Cleobis, Biton also spelled BITO, in Greek legend, the sons of Cydippe, priestess of Hera, queen of the gods, at Argos, noted for their filial devotion and for their athletic prowess and strength. During an Argive festival honouring Hera, Cydippe was called to the temple. When her oxteam could not be found, the brothers took up the yoke of the ceremonial wagon and conveyed her there themselves.

Cydippe begged the goddess to grant them, as a reward for their piety, whatever was best for mortal men. They feasted and slept that night in the temple, waiting to take their mother home on the following day, but they never awakened.

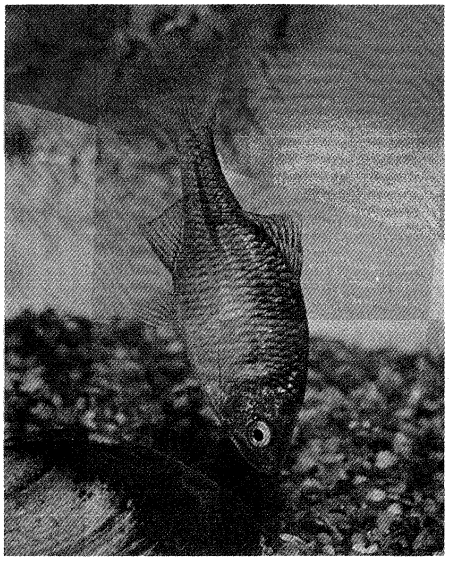
Bitonto, town and episcopal see, Bari province, Puglia (Apulia) region, southeastern Italy, just west-southwest of Bari. Many coins have been found at Bitonto dating from the 6th to the 3rd century BC. A Roman municipality (Butuntum, Botontum, and other forms), the town early became part of the Norman Kingdom of Naples. It is noted for its fine Romanesque cathedral (1175–1200) and also has remains of medieval walls built by the Normans and Angevins (House of

Anjou), the church of S. Francesco d'Assisi, with a 1286 facade, and several Renaissance palaces, including the Palazzo Sylos Labini. Bitonto is the site of several agricultural institutes, and its economy is based primarily on wines, olives, and almonds. Pop. (1981 prelim.) mun., 49,616.

bitter apple, also called BITTER CUCUMBER: *see* colocynth.

Bitter Springs microfossils, assemblage of microscopic fossil structures uncovered in the Bitter Springs Formation, a rock layer about 800,000,000 years old exposed in central Australia. Collections first made in 1965 revealed at least four general groups of organisms that possibly inhabited shallow seas of central Australia in Late Precambrian times (ending about 570,000,000 years ago); these groups resemble bacteria, filamentous blue-green algae, green algae, and fungi. The demonstration of cell division in a fossil green alga named *Glenobotrydion* is evidence that an evolutionary stage that would later lead to sexual reproduction and genetic variation already had been attained.

bitterling (*Rhodeus*), any of several small, carplike fish of the family Cyprinidae noted



Male bitterling (*Rhodeus*) preparing to eject sperm
Lawrence E. Perkins

for their unusual manner of breeding. Native to clear, stony streams of central and southern Europe, the bitterling is a silvery fish of little economic value, about 5 to 7.5 centimetres (2 to 3 inches) long. It spawns between April and June. At this time, the male develops an orange belly and reddish fins, while the female develops a long, tubular ovipositor, which inserts into the incurrent respiratory siphon of a freshwater clam or mussel and by which she deposits her eggs in the gill chamber of the mollusk. There, they are fertilized by sperm ejected by the nearby male and drawn by the mollusk into the gill chamber along with water for respiration.

The eggs develop in the gill chamber of the mollusk, and the young bitterlings leave their host about a month later. The breeding periods of fish and mollusk coincide, and the mollusk in return throws off its larvae onto the bitterling, where they undergo part of their development encysted (buried) in the skin of the fish.

bittern, any of 12 species of solitary marsh birds of the subfamily Botaurinae, family Ardeidae (order Ciconiiformes), allied to the herons (subfamily Ardeinae) but with shorter neck and stouter body. Most bitterns bear a camouflage pattern—streaks of variegated brown and buff—which enables them to escape detection by standing upright with bill pointed upward, imitating the reeds and grasses of their habitat. They feed upon fish, frogs, crayfish, and other small swamp and marsh animals, which they spear with their sharp-pointed bills. Bitterns occur almost worldwide. There are four species of *Botaurus* and eight species of *Ixobrychus*.

Bitterns of the genus *Botaurus*, occurring mainly in temperate regions, are large, and the sexes look alike. In spring the male utters booming calls audible for a considerable distance. The female undertakes nesting duties; assembling a crude mass of vegetation near water level, she lays four to six brownish eggs. The largest member of the genus is the Eurasian bittern (*B. stellaris*), to 75 centimetres (30 inches), ranging from the British Isles to southeastern Asia and occurring also in South Africa. The American bittern (*B. lentiginosus*), known locally as "stake driver" or "thunder pumper," is slightly smaller. Other forms are the Australian bittern (*B. poiciloptilus*) and the South American, or pinnated, bittern (*B. pinnatus*).

Bitterns of the genus *Ixobrychus* are small (30 to 40 cm, or about 12 to 16 in.). The sexes are unlike in appearance and share in the nesting duties. As many as 10 white, bluish, or greenish eggs are laid in a neat nest placed well above water level, sometimes in a tree. Superficially alike are the least bittern (*I. exilis*), of America; the little bittern (*I. minutus*), of Eurasia, Africa, and Australia; and the Chinese little, or yellow, bittern (*I. sinensis*). Rather similar are the variegated, or stripe-backed, bittern (*I. involucris*), of South America; the African dwarf bittern (*I. sturmii*); and, in southeastern Asia, Schrenk's little bittern (*I. eurhythmus*) and the cinnamon little, or chestnut, bittern (*I. cinnamomeus*). Somewhat larger is the black mangrove bittern (*I. flavicollis*), of southeastern Asia and Australia. This species shows plumelike development of

American bittern (*Botaurus lentiginosus*)
Ben Goldstein from Root Resources—EB Inc.

the crown and neck feathers and is sometimes separated as *Dupetor*. For information on tiger bitterns, or tiger herons, *see* heron.

bittern, in chemistry, liquid remaining after sodium chloride (table salt) has been crystallized from brine. It is a commercial source of magnesium compounds—magnesium sulfate (Epsom salts), magnesium chloride, magnesium bromide—which it holds in solution. The chemical term is a modification of "bitter." *See also* brine.

bitterroot (*Lewisia rediviva*), ornamental succulent plant of the purslane family (Portulacaceae), native to western North America and cultivated in rock gardens. The main stem and root merge into a tuberous structure. The leaves are barely 2.5 centimetres (1 inch) long, and the flowering stalk with pink or white flowers is also very short. The starchy root, resembling a forked radish, is edible in spring but acquires a bitter taste by summer. Other

Bitterroot (*Lewisia rediviva*)
C.C. Wendle—Tom Stack and Associates

species of the genus also are cultivated as rock-garden plants for their attractive flowers.

Bitterroot Range, segment of the northern Rocky Mountains, U.S., extending southward for 300 mi (480 km) along the Idaho–Montana border. Peaks average about 9,000 ft (2,700 m), with Scott Peak, in Idaho, the highest (11,394 ft). Owing to the inaccessibility of the mountains from the east, the explorers Meriwether Lewis and William Clark in 1805 were forced to travel northward more than 100 mi before finding a westward route through Lolo Pass (5,236 ft). Bitterroot National Forest extends across the centre of the range, which also passes through several other national forests. The region is drained by tributaries of the Columbia and Missouri rivers on the east and the Clearwater and Salmon rivers on the west.

bitters, any of numerous aromatized and often alcoholic liquids containing bitter substances (chiefly alkaloids, glycosides, or complexes), used as tonics, liqueurs, appetizers, digestives, flavourings, and ingredients to add tang or smoothness to alcoholic drinks. Bitters are prepared according to secret recipes by several manufacturers using bitter herbs, leaves, fruits, seeds, or roots and sometimes alcohol or sugar. The taste is imparted by substances such as orange peel, gentian root, rhubarb root, hop flowers, quassia-wood chips, cascarilla, cinchona bark, and quinine. Aroma is provided by juniper, cinnamon, caraway, anise, nutmeg, camomile, cloves, and other flavouring agents. Bitters are usually named according to the ingredient giving the predominant flavour, such as orange bitters and peach bitters. The alcoholic strength varies but is generally about 40 percent by volume.

Medicinal bitters, few in number and of minor therapeutic value, include compound tinctures of absinthe and of aloes. Early Hebrew history records the addition of sweet-scented or bitter herbs to wine in order to improve and give variety to the flavour. The preparation of aromatic liqueurs originated in France around 1533, and their use spread quickly over the world.

bittersweet, any of several vines with colourful fruit. The genus *Celastrus*, in the staff tree family (Celastraceae), includes the American bittersweet, or staff vine (*C. scandens*), and the Oriental bittersweet (*C. orbiculatus*), woody vines grown as ornamentals. The flowers, in whitish clusters, are followed by yellow to orange capsules, which split to reveal yellow

to crimson arils enclosing the seeds. Oriental bittersweet is a more vigorous climber, reaching up to 12 metres (40 feet); the American

American bittersweet (*Celastrus scandens*)
Kenneth and Brenda Formanek—EB Inc.

species, up to 7.5 m, often has many sterile individuals in its population. Both types climb by twining around supports. Another bittersweet, also called nightshade (*q.v.*) or woody nightshade (*Solanum dulcamara*), belongs to the family Solanaceae. It is an herbaceous vine, up to 4.5 m long; the violet and yellow star-shaped flowers are followed by shiny green berries that gradually turn bright red.

bitumen, any natural compound consisting of hydrogen and carbon, except coals and those in the gaseous state. In Great Britain and continental Europe the geologic terms bitumen and asphaltic bitumen are employed only with reference to the black or brown petroleum-like substances that are called asphalts in the United States. In its various forms, bitumen is one of the most widely distributed of substances. It occurs, in varying quantities, in nearly every part of the world and throughout the whole range of geological strata. In current terminology bitumen also may include synthetic hydrocarbon compounds.

The different forms of bitumen are listed in the table. Liquid petroleum, or crude oil, is a mixture of many kinds of hydrocarbon compounds that were formed by the gradual decomposition of organic matter. The solid or very dense, highly viscous bitumens, such as asphalts, probably have all been derived from liquid petroleum, either by evaporation of the lighter, more volatile fraction under atmospheric conditions or by metamorphism occurring deep within the Earth's crust. The solid and very dense bitumens are fusible and soluble in carbon disulfide. They are related to but quite different from pyrobitumens, which are infusible and insoluble hydrocarbons that occur in oil shale, peat, and the various coals, including the subbituminous and bituminous forms, and also from the asphaltites, which probably formed from sapropelic coals. The pyrobitumens, however, produce or become bitumen-like compounds when they are heated. Both bitumens and these bitumen-like compounds are employed as fuels, as roofing and paving materials, and in many other products. *Compare* pyrobitumens.

Bitumens

bitumens	liquid petroleum	paraffin base; mixed base; asphaltic base
	native mineral waxes	ozocerite (called ceresine when refined); montan wax (extracted from peat)
	native asphalts	vary from a pure solid bitumen to an impure bitumen containing a high percentage of sand, clay, etc.
	asphaltites	gilsonite, glance pitch, grahamite (characterized by a higher fusing point than the asphalts)

bituminous coal, also called SOFT COAL, most abundant form of coal that is intermediate between subbituminous coal and anthracite in rank (*i.e.*, degree of coalification). In Europe some bituminous coal with higher heat value is labelled hard coal, the designation soft coal being restricted to bituminous coal with lower heat value, lignite, and brown coal.

Bituminous coal is dark brown to black and usually banded. It consists of more than 95 percent vitrinite, a maceral group derived from woody plant tissue. Bituminous coal contains between 15 and 35 percent volatile matter and usually has a moisture content of less than 3 percent; it thus has a relatively high calorific, or heat, value. Because of these properties and its abundance, bituminous coal has the broadest range of commercial uses among the coals. It has long been utilized for steam generation in electric power plants and industrial boiler plants. In addition, those varieties of bituminous coal that contain a fairly small amount of sulfur and cake easily are the only coals suited for making coke, a hard substance of almost pure carbon important for smelting iron ore. Coke is produced by heating bituminous coal to approximately 1,100° C (2,000° F) in specially designed airtight ovens. The coal does not burn, because of the absence of oxygen, but the intense heat drives off much of the volatile matter in the coal in the form of gases, leaving coke. Some of the gases released during the coke-making process, moreover, condense into coal tar and liquid ammonia.

One major problem associated with bituminous coal is air pollution. Burning large quantities of bituminous coals with medium to high sulfur content releases sulfur dioxide into the air. When moisture in the air reacts with this chemical compound, sulfuric acid is formed. This substance then falls to the Earth mixed with water droplets as acid rain, a pollutant that causes crop damage and water contamination. Because of such serious pollution problems, a growing number of coal-fuelled electric power plants in the United States have switched to subbituminous coal, which contains much less sulfur. *See also* subbituminous coal.

Bituriges, Celtic tribe that in about 600 BC was the most powerful in Gaul. By about 500 BC the tribe was divided into two groups: the Cubi, with a capital at Avaricum (modern Bourges) in the region later known as Berry; and the Vivisci, with a capital at the port of Burdigala (modern Bordeaux) on the shore of the Gironde Estuary. During the Gallic revolt of 52 BC, the Cubi defended Avaricum, but Julius Caesar destroyed the town and its inhabitants. Both groups were later included in the Roman administrative district of Aquitania (modern Aquitaine).

Bitzer, Billy, byname of GOTTFRIED WILHELM BITZER (b. April 21, 1874, Boston—d. April 29, 1944, Hollywood), U.S. motion-picture cameraman who, in partnership with the pioneer director D.W. Griffith, developed camera techniques that set the standard for all future motion pictures and stimulated important experimentation in the field.

Bitzer achieved success in 1896 when his film of William McKinley being notified of the presidential nomination of his party was exhibited on the Biograph Company's first program. He filmed the Spanish–American War for the William Randolph Hearst organization, becoming the first motion-picture cameraman to cover a war. When Griffith joined Biograph, Bitzer became his cameraman. During the ensuing years, Bitzer successfully translated the director's creative visual concepts to the screen, especially in composition and the use of lighting to create mood. He photographed hundreds of Griffith's motion pictures, including *Judith of Bethulia* (1913), *The Birth of a Nation* (1915), *Intolerance* (1916), *Broken Blossoms* (1919), and *Way Down East* (1920).

Bitzer had been using lighting "effects," such as firelight, candlelight, or the morning sun, as early as 1909; he was the first cameraman to film completely under artificial lights, an innovation that eventually freed Hollywood technicians from dependence on natural light. Working with Griffith, he developed camera techniques that had a permanent influence on the industry—*e.g.*, soft-focus photography, using a light-diffusion screen in front of the camera lens; the fade-out, used to close a scene; and the iris shot, in which the frame either is gradually blacked out in a shrinking circle, thereby ending a scene, or gradually opened in a widening circle, beginning a scene. He refined methods of taking close-ups and long shots and was one of the first cinematographers to make effective use of perspective.

Bitzer left Griffith in 1924 but briefly rejoined him in 1928. He later was a cameraman for the Works Progress Administration and repaired old films for the New York Museum of Modern Art's film archive.

Bitzius, Albert (Swiss writer): *see* Gotthelf, Jeremias.

Biu, town, historic kingdom, and traditional emirate, Borno State, northeastern Nigeria. The town lies on the Biu Plateau and has road connections to Damaturu, Mubi, and Shani.

According to tradition, the Biu kingdom was founded by conquest in the mid-16th century by Yamta-ra-Wala (Yamta the Great; also called Yamta [Abdullahi] Ula). The defeated people, however, recovered much of their territory during the rule of Yamta's son; and not until *c.* 1670, in the reign of Mari Watila Tampta, did the kingdom become generally secure.

Buba Yero, the first ruler of Gombe emirate (to the west), brought the Fulani *jihād* (holy war) to the region in the early 19th century; but Biu's Mari Watirwa (reigned 1793–1838), whose capital was at Kogu, eventually defeated the Fulani forces. About 1870 Ari Paskur ordered Biu town, near Kogu, to be walled, and in 1878 his son, Mari Biya, became the first Bura (Pabir) king to rule from the town. Not until 1904, a year after the British established a military post in Gujba (64 mi [103 km] north-northwest), did Biu become the traditional capital. Biu division was created in 1918; and, in 1920, Mai Ari Dogo (King Ari I; title, Kuthli Viyu) was acknowledged as the first *amīr* of Biu. The region is mainly inhabited by Bura, Tera, Margi (Marghi), Hina (Hinna), and Fulani Kitaku (Kitije Filane) peoples. Since 1957, when the former districts of Shani and Askira (the home of the Margi) were added to Biu emirate, the area has been known as the Biu federation.

Most inhabitants in the region keep cattle, goats, sheep, horses, and donkeys; and Biu town is the chief trade centre (sorghum, millet, peanuts [groundnuts]) on the plateau.

The town, site of the *amīr*'s palace, has several government health offices and a dispensary. The Church of the Brethren operates a teacher-training college at nearby Biu Waka. The crocodiles of Tila Lake, a crater lake in an extinct volcano measuring 1,800 ft (550 m), just southwest of the town, are sacred to Biu's traditional rulers. Pop. (1972 est.) town, 26,710.

Biu Plateau, highlands in northeastern Nigeria, covering an area of approximately 2,000 sq mi (5,200 sq km) with an average elevation of 2,300 ft (700 m). Its highest point is Wiga Hill (2,693 ft), and its most prominent relief features are the many well-defined, extinct volcanic cones. Numerous tributaries of the Gongola River—including the Hawal, Ruhu, Gungeru, and Ndivana rivers—rise on the plateau and deeply dissect its surface. While Biu's southern and western sides are quite steep, the plateau slopes more gradually in the north onto the Bauchi Plains and the Chad Basin.

The plateau's thin soils, scarcity of water in the dry season, and relative inaccessibility have discouraged habitation. Most of its upland areas were first settled in the early 19th century by non-Muslim groups trying to escape the ravages of the Fulani *jihād* (holy war). The Bura (Pabir) inhabitants are almost entirely non-Muslim. The tsetse-free plateau has lured some Fulani cattle herdsmen and has provided grazing ground for its local peoples' dwarf cattle, horses, donkeys, goats, and sheep. Sorghum and peanuts (groundnuts) are the chief crops cultivated by these subsistence farmers. Biu town is the plateau's largest settlement and its principal trade centre.

bivalve, class name BIVALVIA, member of a class of mollusks characterized by having a two-valved shell.

A brief treatment of bivalves follows. For full treatment, *see* MACROPAEDIA: Mollusks.

Bivalves include such mollusks as clams, cockles, mussels, oysters, razor shells, and shipworms. They are characterized by laterally compressed shells consisting of two halves, or valves, joined by an elastic ligament. The ligament opens the valves, which are closed by the action of two (one, in some cases) transverse adductor muscles that join the valves. The animal is generally totally enclosed by the shell and by two sheets of tissue called the mantle. Bivalves have no head, and most of their sense organs are concentrated in the mantle margins. Most species feed on suspended phytoplankton by using a large pair of specialized gills that lie on either side of the animal and are folded into lamellae (platelike structures) composed of filaments. Large volumes of water are pumped across the gills by ciliary action, and trapped food particles are transported toward the mouth by specialized cilia. The food is further sorted by special organs (palps) before ingestion. Some other bivalves feed on organic material in sediment, and a few are carnivores, subsisting on small crustaceans.

Many bivalves burrow into soft substrates; they penetrate the sediment by probing and anchoring with a muscular foot and then rapidly closing the valves, thus fluidizing the sediment. Most burrowing bivalves have inhalent and exhalent siphons through which water passes to and from the sediment surface. The siphons consist of muscular mantle tissue that has been fused into extensible tubelike structures, which in some bivalves (*e.g.*, the geoduck) can extend more than one metre (three feet) in length. Other bivalves live on the substrate surface and are attached by tough horny threads (the byssus), which are secreted by a gland in the foot. In oysters and a number of other bivalves, actual cementation of one valve to the substrates occurs. Several groups of bivalves can bore into hard substrates. These include the date mussel (*Lithophaga*), which bores into limestone by chemical means, and the piddock and its relatives (*Pholadidae*), which penetrate rock by mechanical scraping. The shipworm (*Teredo*) bores into and digests wood. A few bivalves, such as certain scallops (*Pecten* and *Chlamys*) and file shells (*Lima*), are able to swim by rapidly flapping the valves together as an escape reaction to predators.

In most bivalves, male and female reproductive organs occur in separate individuals, but some are hermaphroditic (*i.e.*, have the organs of both sexes in the same individual). Still others experience sex changes through life. Both the eggs and sperm are shed into the water, and larval development usually takes place in the open sea. Bivalve larvae drift among plankton for several weeks before settling to the sea bottom.

There are about 8,500 species of marine bivalves. They are found in most parts of the ocean from the intertidal zone to abyssal depths. The largest bivalve is the giant clam *Tridacna gigas*, which reaches 137 centimetres (about 55 inches) in length. Three groups of bivalves, the Unionacea, Corbiculacea, and Dreissenacea, occur in freshwater habitats. The Unioncea, consisting of freshwater mussels, is particularly diverse and abundant in eastern North America, with many endemic species inhabiting individual river systems.

For more information on members of the bivalve group, *see* clam; cockle; mussel; oyster; scallop; shipworm.

biwa, short-necked Japanese lute related to the Chinese *p'i-p'a,* an instrument known for about 2,000 years. It has a graceful, pear-shaped body, with a shallow, rounded back and silken strings attached to slender lateral pegs. The usual number of strings is four, and they are tuned in fourths, with the melody almost solely appearing on the highest string.

Performers frequently pluck two notes simultaneously, producing a variety of intervals, especially when the singer is silent. With the older lutes, a heavy plectrum was used, creating a percussive sound; the more modern ones are plucked with the bare fingers.

Biwa, Lake, Japanese BIWA-KO, largest freshwater lake in Japan, located in Shiga Prefecture (*ken*), central western Honshu. About 40 mi (64 km) long from north to south, the lake covers an area of 260 sq mi (674 sq km). Its name refers to the *biwa,* a Japanese musical instrument that the lake resembles in shape. The lake occupies a structural depression and is fed by small rivers flowing from the encircling mountains. The sole outlet, the Yodo-gawa (Yodo River), flows from Lake Biwa's southern tip, past Seta southwest to Ōsaka-wan (Ōsaka Bay). Deepest water of 338 ft (103 m) is in the northwest corner, with depths of more than 197 ft common along the west coast. The lake's surface rises as much as 10 ft in spring and autumn. Lake Biwa is a breeding ground for freshwater fish, including trout, and for a pearl culture industry. It also serves as a reservoir for the cities of Kyōto and Ōtsu and is a valuable resource for nearby textile industries.

Pearl-oyster farmer on Lake Biwa, Japan

Imperial Press—FPG/EB Inc.

In early Japanese history, Lake Biwa was a principal avenue of movement between the Sea of Japan and the Inland Sea and later facilitated the economic development of the Hanshin (Ōsaka–Kōbe) Industrial Region. During the late 1970s plans were made to use Lake Biwa as an alternative water source for heavy industry in the region, where excessive withdrawal of groundwater has caused land subsidence; those plans aroused concern at possible damage to Lake Biwa's drinking water, fisheries, and landscape. Known for its scenic beauty and for the temples atop Hiei-zan (Mt. Hiei), Lake Biwa has been the subject of much Japanese poetry.

Biyidi, Alexandre: *see* Beti, Mongo.

Biysk, also spelled BIJSK, or BIISK, city, Altay *kray* (territory), central Russian Soviet Federated Socialist Republic, on the right bank of the Biya River, just above its confluence with the Katun, which then forms the Ob. At the head of navigation and the terminus of a railway from Barnaul, Biysk is linked by highway to Mongolia. It was founded in 1709 as a fortress and incorporated as a town in 1782. The modern city of Biysk has a range of engineering and consumer-goods industries. Pop. (1983 est.) 221,000.

Bizen ware, also called IMBE WARE, pottery manufactured at and near Imbe, Okayama Prefecture, on the Inland Sea of Japan, from at least the 6th century AD, in what was once Bizen province. Bizen ware has a dark-gray stoneware body that generally fires to a brick-red, brown, or deep-bronze colour. The surface of Bizen ware ranges from an unglazed matt to a glossy sheen; age has given some pieces a bronzelike patina and others the appearance of polished wood. A partial, splashed greenish-gray glaze is found on some examples. Bizen ware is classified into several types: *aka-e* (red) Bizen is a bronzelike pottery that shades to a deep-copper colour; *ao* (blue) Bizen is steely or slate blue and is rare because of the limited survival from the intense heat necessary to produce it; *ki* (yellow) Bizen is so named from its yellow glaze; *hidasuki* (fire stripe) Bizen has mottlings and reddish stringlike marks, produced by wrapping the dried wares in straw rope before firing.

Glazed Bizen incense-burner, *c.* 1670, Edo period; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph/EB Inc.

Production of Bizen ware flourished through-

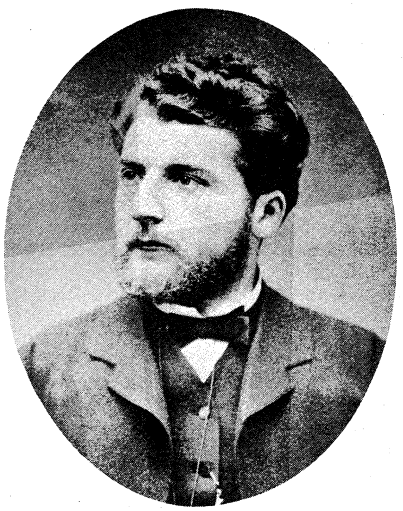
out the Imbe region until the industry was confined to Imbe village in the 13th century. It is sometimes impossible to distinguish the wares by location, since the clay at each site was high in iron content, and construction techniques, forms, and kiln designs were identical. In addition, all samples transmit the same sense of strength and long tradition. Generally speaking, clays used at Imbe were very viscous, and another distinguishing feature was the lip section of a vessel, rolled back in a curve from the opening and called the *tama-buchi*, or round rim. On Kamakura-period (1192–1333) vessels, mouths are usually small in proportion to the size of the vessel. From the late Muromachi period (1338–1573), subterranean field clays were utilized that tended toward more urbane refinement, although the individual characteristics were preserved.

Much of the early ware is dated, and the names and marks of most of the artist-potters are known. Some of them were 17th-century Kyōto artists who were attracted by the unusually supple clay, which invited fantastic and inventive modelling. It is in the precise, detailed, and animated representation of Japanese sages, divinities, and actual or mythical creatures that Bizen acquired its unique reputation. Depictions of the badger, cock, stork, ox, quail, and hare appear in a wide range of useful and decorative pottery forms, including articles for tea ceremonies, censers, water jars, sake bottles, basins, trays, hanging vases, and even utilitarian tiles. Bizen's best period was the 18th century; subsequently, wares were adapted to the European market, and in the 20th century the predominant trade has been in bricks and drainpipes, for which the local clay is appropriate.

Bizerta, also spelled BIZERTE (Tunisia): *see* Banzart.

Bizet, Georges, original name ALEXANDRE-CÉSAR-LÉOPOLD BIZET (b. Oct. 25, 1838, Paris—d. June 3, 1875, Bougival, near Paris), French composer best remembered for his opera *Carmen* (1875). His realistic approach influenced the *verismo* school of opera at the end of the 19th century.

Bizet's father was a singing teacher and his mother a gifted amateur pianist, and his musical talents declared themselves so early and so unmistakably that he was admitted to the Paris Conservatoire before he had completed his 10th year. There, his teachers included the accomplished composers Charles Gounod and Fromental Halévy, and he quickly won a succession of prizes, culminating in the Prix de Rome, awarded for his cantata *Clovis et Clotilde* in 1857. This prize carried with it a five-year state pension, two years of which musicians were bound to spend at the French Academy in Rome.



Bizet
The Bettmann Archive

Bizet had already shown a gift for composition far superior to that of a merely precocious boy. His first stage work, the one-act operetta *Le Docteur miracle,* performed in Paris in 1857, is marked simply by high spirits and an easy mastery of the operetta idiom of the day. His *Symphony in C Major,* however, written in 1855 but subsequently lost and not discovered and performed until 1935, will bear easy comparison with any of the works written at the same age of 17 by either Mozart or Felix Mendelssohn. Flowing and resourceful counterpoint, orchestral expertise, and a happy blend of the Viennese classical style with French melody give the symphony a high place in Bizet's output.

The young composer was already aware of his gifts and of the danger inherent in his facility. "I want to do nothing *chic,* " he wrote from Rome, "I want to have *ideas* before beginning a piece, and that is not how I worked in Paris." In Rome he set himself to study Robert Schumann, Carl Maria von Weber, Mendelssohn, and Gounod, who was regarded as more than half a German composer by the admirers of the fashionable French composer Daniel Auber.

> Mozart's music affects me too deeply and makes me really unwell. Certain things by Rossini have the same effect; but oddly enough Beethoven and Meyerbeer never go so far as that. As for Haydn, he has sent me to sleep for some time past.

Instead of spending his statutory third year in Germany, he chose to stay on in Rome, where he collected impressions that were eventually collected to form a second C major symphony (*Roma*), first performed in 1869. An Italian-text opera, *Don Procopio,* written at this time, shows Donizetti's style, and the ode *Vasco de Gama* is largely modelled on Gounod and Meyerbeer.

When Bizet returned to Paris in the autumn of 1860, he was accompanied by his friend Ernest Guiraud, who was to be responsible for popularizing Bizet's work after his death. In spite of very decided opinions, Bizet was still immature in his outlook on life (youthfully cynical, for instance, in his attitude toward women) and was plagued by an artistic conscience that accused him of preferring the facilely charming in music to the truly great. He was even ashamed of his admiration for the operas of his Italian contemporary Giuseppe Verdi and longed for the faith and vision of the typical Romantic artist, which he could never achieve. "I should write better music," he wrote in October 1866 to his friend and pupil Edmond Galabert, "if I believed a lot of things which are not true." In fact the skepticism and materialism of the dominant Positivist philosophy persistently troubled Bizet; it may well have been an inability to reconcile his intelligence with his emotions that caused him to embark on so many operatic projects that he never brought to a conclusion. The kind of drama demanded by the French operatic public of the day could very seldom engage his whole personality. The weaknesses in the first two operas that he completed after his return to Paris are a result not so much of the composer's excessive regard for public taste as of his flagging interest in the drama. Neither *Les Pêcheurs de perles* (*The Pearl Fishers;* first performed 1863) nor *La Jolie Fille de Perth* (1867; *The Fair Maid of Perth*) had a libretto capable of eliciting or focussing the latent musical and dramatic powers that Bizet eventually proved to possess. The chief interest of *Les Pêcheurs de perles* lies in its exotic Oriental setting and the choral writing, which is more individual than that of the lyrical music, over which Gounod still casts a long shadow. Although *La Jolie Fille de Perth* bears only a skeletal resemblance to Sir Walter Scott's novel, the characterization is stronger (the gypsy Mab and the "Danse bohémienne" anticipate *Carmen*), and even such conventional features as the night patrol, the drinking chorus, the ballroom scene, and the heroine's madness exhibit a freshness and elegance of language that raise the work unmistakably above the general level of French opera of the day.

Although warmly acknowledged by Berlioz, Gounod, Saint-Saëns, and Liszt, Bizet was still obliged during these years to undertake the musical hackwork that only the most successful French composers were able to avoid. Stories of his moodiness and readiness to pick a quarrel suggest a profound inner uncertainty, and the cynicism and vulnerability of adolescence hardly yielded to a mature emotional attitude of life until his marriage, on June 3, 1869, to Geneviève Halévy, the daughter of the composer of the opera *La Juive* (1835; *The Jewess*). Between his engagement in 1867 and his marriage, Bizet was himself aware of undergoing "an extraordinary change . . . both as artist and man. I am purifying myself and becoming better." Adverse criticism of certain features of *La Jolie Fille de Perth* prompted him to break once and for all with "the school of *flonflons,* trills and falsehoods" and to concentrate his attention on the two elements that had always been the strongest features of his music—the creation of exotic atmosphere and the concern with dramatic truth. The first of these was brilliantly exemplified in the one-act *Djamileh* (1872), original enough to be accused of "exceeding even Richard Wagner in bizarrerie and strangeness"; and the second in the incidental music for Alphonse Daudet's play *L'Arlésienne* (1872), which is marked by a delicacy and tenderness quite new to his music. Besides the happiness of his marriage, which was crowned by the birth of a son in July of this same year, his letters show that he was deeply stirred by the events of the Franco-Prussian War, and, during the siege of Paris, he served in the national guard.

It was in the first flush of this new emotional maturity, but with the ardour and enthusiasm of youth still unshadowed, that he wrote his masterpiece, *Carmen,* based on a story by the contemporary French author Prosper Mérimée. The realism of the work, which caused a scandal when it was first produced in 1875, was to inaugurate a new chapter in the history of opera; and the combination of brilliant local colour and directness of emotional impact with fastidious workmanship and a wealth of melody have made this opera a favourite with musicians and public alike. The philosopher Friedrich Nietzsche regarded it as the type of "Mediterranean" music that was the antidote to Wagner's Teutonic sound. The scandal caused by *Carmen* was only beginning to yield to enthusiastic admiration when Bizet suddenly died. (M. Du P.C.)

MAJOR WORKS. *Operas.* Eight published operas, including *Les Pêcheurs de perles* (first performed 1863); *Carmen* (1875).

Orchestral works. Symphony in C major (composed 1855); *Petite Suite,* arranged from *Jeux d'enfants* (1871); suite, *L'Arlésienne* (1872).

Incidental music. Incidental music for Daudet's *L'Arlésienne* (1872).

Piano music. Jeux d'enfants, 12 pieces for piano duet (1871); *Variations chromatiques de concert* (1868).

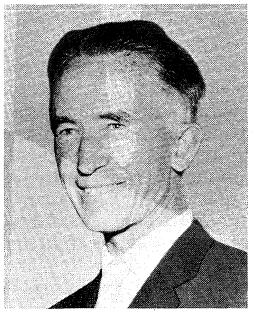
Songs. Thirty-seven published songs, including "Chanson d'avril" (1866?); "Berceuse" (1868).

BIBLIOGRAPHY. Winton B. Dean, *Bizet* (1948), a short but extremely thorough study of the composer and his work, with useful background information; Mina K. Curtiss, *Bizet and His World* (1959), a fascinating re-creation of Bizet as a man and of his position in his family and among his contemporaries, based on correspondence and documents that only became available after 1950.

Bizzozero, Giulio (b. March 20, 1846, Varese, Piedmont, Italy—d. April 8, 1901, Turin), Italian pathologist who, as professor of general pathology at the University of Turin, made it one of the most important European centres of medical scholarship. Among those who studied or worked in his laboratory were Edoardo Bassini, the surgeon who perfected the operation for inguinal hernia (Bassini's operation); Carlo Forlanini, who introduced therapeutic pneumothorax in treating pulmonary tuberculosis; and Antonio Carle and Giorgio Rattone, who demonstrated the transmissibility of tetanus. Bizzozero also contributed to knowledge of histology and public health, emphasizing the control of malaria and tuberculosis.

Bjarni Vigfússon Thórarensen (Icelandic poet): *see* Thórarensen, Bjarni Vigfússon.

Bjerknes, Jacob (Aall Bonnevie) (b. Nov. 2, 1897, Stockholm—d. July 7, 1975, Los Angeles), Norwegian-American meteorologist whose discovery that cyclones (low-pressure centres) originate as waves in sloping fronts that separate different air masses proved to be a major contribution to modern weather forecasting.



Jacob Bjerknes
By courtesy of Einar Hoiland, Oslo University

The work of his father, the Norwegian physicist and meteorologist Vilhelm F.K. Bjerknes, influenced Bjerknes in his choice of meteorology as a career. During World War I he assisted his father in establishing a network of weather observation stations throughout Norway. Data gathered by these stations gave rise to their theory of polar fronts, essential to understanding the dynamics of weather in the middle and high latitudes. During the 1920s and 1930s, in addition to his studies of cyclones, he gathered data on the structure of depressions and conducted research on the dynamics of atmospheric convection.

In 1939 Bjerknes moved to the United States and the next year became professor of meteorology at the University of California, Los Angeles. After World War II his studies chiefly concerned atmospheric circulation. In 1952 he utilized photographs taken by high-altitude research rockets for weather analysis and forecasting and was thus among those who initiated the use of space-age techniques for meteorological research. In later work he discovered relationships between Pacific Ocean temperatures and North American weather.

Bjerknes, Vilhelm F(riman) K(oren) (b. March 14, 1862, Christiania, Nor.—d. April 9, 1951, Oslo), Norwegian meteorologist and physicist, one of the founders of the modern science of weather forecasting.

As a youth Bjerknes assisted his father, a professor of mathematics at Christiania, with research in hydrodynamics. In 1890 he went to Germany and became an assistant to and scientific collaborator with the German physicist Heinrich Hertz. Bjerknes made a comprehensive study of electrical resonance that was decisive in the development of radio.

After two years as lecturer at the Högskola (School of Engineering), Stockholm, Bjerknes in 1895 became professor of applied mechanics and mathematical physics at the University of Stockholm. Two years later he discovered the circulation theorems that led him to a synthesis of hydrodynamics and thermodynamics applicable to large-scale motions in the atmosphere and the ocean. This work ultimately resulted in the theory of air masses, which is essential to modern weather forecasting. In 1904 he presented a farsighted program for physical weather prediction. The Carnegie Foundation awarded him an annual stipend (1905–41) to support his research.

Vilhelm F.K. Bjerknes, oil painting by Erik Werenskiold, 1932; in Det Kongelige Norske Videnskabers Selskab, Museet, Trondheim, Nor.
By courtesy of Det Kongelige Norske Videnskabers Selskab, Museet, Trondheim, Nor.; photograph, O. Vaering

In 1907 Bjerknes returned to Norway and accepted a professorship at the university in Kristiania (so spelled from 1877 to 1925). Five years later he became professor of geophysics at the University of Leipzig, where he organized and directed the Leipzig Geophysical Institute. In 1917 he accepted a position with the museum in Bergen (now a part of Universitetet I Bergen), Norway, and there founded the Bergen Geophysical Institute. His most productive years were spent at Bergen; there he wrote *On the Dynamics of the Circular Vortex with Applications to the Atmosphere and to Atmospheric Vortex and Wave Motion* (1921). Now a classic, this work clearly details the most important aspects of his research. In 1926 he obtained a position with the university in Oslo, where he continued his studies until his retirement in 1932.

Björketorp Stone, well-preserved 7th-century monument in Blekinge, Swed. More than 12 ft (3½ m) high, it bears a runic inscription, the exact interpretation of which has been much debated. The inscription is magical in nature and is obviously intended to protect a grave. One possible interpretation is: "I have here the secret meaning of powerful runes. He who destroys the monument will forever be tormented by evil witchcraft. He shall die a treacherous death. I prophesy ruin."

Björketorp Stone
By courtesy of Kungl. Vitterhets Historie Och Antikvitets Akademien, Stockholm

Björling, Jussi (Johan Jonaton) (b. Feb. 2, 1911, Stora Tuna, Swed.—d. Sept. 9, 1960, Siarö, near Stockholm), Swedish tenor, admired for the musicianship of his performances, particularly in the Italian and French repertory.

At the age of six Björling began singing under the guidance of his father, who then took him and his two brothers on tours in Scandinavia and the United States as a vocal quartet. At 17 he began his studies at the Royal Opera School in Stockholm, where he made his operatic debut in 1930 as Don Ottavio in Mozart's *Don Giovanni.* He appeared as guest performer in several opera houses in Europe before achieving a huge success at Covent Garden, London, in 1936. In the following year he gave his premiere performances in the United States, first on the radio, then on stage in Chicago.

In 1938 Björling made his Metropolitan Opera debut as Rodolfo in Puccini's *La Bohème,* a role he repeated in 1940 in San Francisco. He sang with the Metropolitan Opera from 1938 to 1941, and, after spending the war years in Sweden, he returned in 1946 to sing with the Metropolitan company until his death. He continued to perform in Sweden between seasons at the Metropolitan. His popular concerts and prolific recordings won him fame as a recitalist and soloist in symphonic choral works. His autobiography, *Med bagaget i strupen* ("With My Baggage in My Throat"), was published in 1945.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bjørneboe, Jens (Ingvald) (b. Oct. 9, 1920, Kristiansand, Nor.—d. May 9, 1976, Veierland), Norwegian novelist, dramatist, essayist, and poet whose work was generally inspired by a fierce sense of outrage at the misuse of power in the modern world.

Bjørneboe began his literary career with *Dikt* (1951; "Poems"), and he subsequently published two more collections, *Ariadne* (1953; "Ariadne") and *Den store by* (1958; "The Big City"), all notable for their restraint and classical formality.

Bjørneboe's principal literary work was a trilogy of novels in which he traced "bestiality's history," *i.e.,* recounted instances of increasing violence on the part of the state against the powerless: *Frihetens øyeblikk* (1966; *Moment of Freedom*), *Kruttårnet* (1969; "The Gun Powder Tower"), and *Stillheten* (1973; "The Silence"). His last novel, *Haiene* (1974; *The Sharks*), an allegorical sea novel, was one of his strongest.

As a dramatist, Bjørneboe criticized the Norwegian prison system in the satirical musical *Till lykke med dagen* (1965; "Happy Birthday"). In *Fugleelskerne* (1966; "The Bird Lovers"), he directed his attack against neo-Nazism. His last play, *Amputasjon* (1970; "Amputation") was wider in scope, an anarchic protest against power in general. Bjørneboe achieved some notoriety with a pornographic novel, *Uten en tråd* (1966; *Without a Stitch*), for which he was prosecuted and found guilty.

He was widely read as an essayist and journalist. An important collection of his political and newspaper articles is *Politi og anarki* (1972; "Police and Anarchy"). Another was the posthumously published *Om Brecht* (1977; "On Brecht"), about Bertolt Brecht, who strongly influenced Bjørneboe.

Björneborg (Finland): *see* Pori.

Bjørnson, Bjørnstjerne Martinius (b. Dec. 8, 1832, Kvikne, Nor.—d. April 26, 1910, Paris), poet, dramatist, novelist, journalist, editor, public speaker, theatre director, and one of the most prominent public figures in the Norway of his day. He is generally known,

Bjørnson
By courtesy of the Teaterhistorisk Museum, Copenhagen

together with Henrik Ibsen, Alexander Kielland, and Jonas Lie, as one of "the four great ones" of 19th-century Norwegian literature. His poem "Ja, vi elsker dette landet" ("Yes, We Love This Land Forever") is the Norwegian national anthem.

Bjørnson, the son of a pastor, grew up in the small farming community of Romsdalen, which later became the scene of his country novels. From the start his writing was marked by clearly didactic intent; he sought to stimulate national pride in Norway's history and achievements and to present ideals. For the first 15 years of his literary career he drew his inspiration from the sagas and from his knowledge of contemporary rural Norway. He exploited these two fields in what he described as his system of "crop rotation": saga material was turned into plays, contemporary material into novels or peasant tales. Both stressed those links that bound the new Norway to the old; both served to raise the nation's morale. The early products of this system were the peasant tale *Synnøve solbakken* (1857; *Trust and Trial, Love and Life in Norway,* and *Sunny Hill*), the one-act historical play *Mellem Slagene* (1857; "Between the Battles"), and the tales *Arne* (1859) and *En glad gut* (1860; *The Happy Boy*) and the play *Halte-Hulda* (1858; "Lame Hulda").

In 1857–59 he was Ibsen's successor as artistic director at the Bergen Theatre. He married the actress Karoline Reimers in 1858 and also became the editor of the *Bergenposten.* Partly because of his activity with this paper, the Conservative representatives were defeated in 1859 and the path was cleared for the formation of the Liberal Party a short time later. After traveling abroad for three years, Bjørnson became director of the Christiania Theatre, and, from 1866 to 1871, he edited the *Norsk Folkeblad.* During this same time there also appeared the first edition of his *Digte og sange* (1870; *Poems and Songs*) and the epic poem *Arnljot Gelline* (1870). Bjørnson's political battles and literary feuds took up so much of his time that he left Norway in order to write. The two dramas that brought him an international reputation were thus written in self-imposed exile: *En fallit* (1875; *The Bankrupt*) and *Redaktøren* (1875; *The Editor*). Both fulfilled the then current demand on literature (stipulated by the Danish writer and critic Georg Brandes) to debate problems, as did the two dramas that followed: *Kongen* (1877; *The King*) and *Det ny system* (1879; *The New System*). Of his later works, two novels are remembered, *Det flager i byen og på havnen* (1884; *The Heritage of the Kurts*) and *På Guds veje* (1889; *In God's Way*), as are a number of impressive dramas, including *Over Ævne I og II* (1883 and 1895; *Beyond Our Power* and *Beyond Human Might*). The first of the novels deals critically with Christianity and attacks the belief in miracles, whereas the second deals with social change and suggests that such change must begin in the schools. *Paul Lange og Tora Parsberg* (1898) is concerned with the theme of political intolerance. Later in life, Bjørnson came to think of himself as a Socialist, working tirelessly in behalf of peace and international understanding. Bjørnson enjoyed worldwide fame, his plays were influential in establishing social realism in Europe, and he was awarded the Nobel Prize for Literature in 1903. Nonetheless, his international reputation has diminished in comparison with that of Ibsen.

Björnsson, Sveinn (b. Feb. 27, 1881, Reykjavík, Ice.—d. Jan. 25, 1952, Reykjavík), statesman and diplomat who from 1944 to 1952 served as the first president of the Republic of Iceland.

Björnsson was a lawyer at the Supreme Court after 1907 and became a member of the Reykjavík town council in 1912, acting as its president (1918–20). A member of the Althing (parliament) in 1914–16 and 1920, he served as special envoy to the United States (1914) and Great Britain (1915), arranging the first British–Icelandic trade agreement. He acted as minister to Denmark (1920–24 and 1926–41) and was a delegate to several international conferences.

Although Iceland has been independent since 1918, its foreign affairs had been conducted by Denmark until the beginning of World War II. The German occupation of Denmark after May 1940, however, resulted in Iceland's autonomy, and Björnsson was elected regent three times in 1941–43, assuming all the prerogatives in Icelandic affairs previously held by the Danish king. In July 1941, U.S. troops entered Iceland on the invitation of Björnsson's government and remained, in reduced numbers, after the war; their continued presence provoked the leading controversy in the nation's postwar foreign policy. He was elected president on the inauguration of the Republic of Iceland in 1944 and, was reelected by acclamation in 1945 and 1949.

Bka'-brgyud-pa, also spelled KAGYUPA (Tibetan: "Transmitted Word"), third largest Buddhist sect in Tibet. Its members are followers of the 11th-century teacher Mar-pa, who distinguished himself as a translator of Buddhist texts while continuing to live the life of a householder. Mar-pa studied in India under the master yogin (spiritual adept, or ascetic) Nāropa, and the school stresses the more severe practices of Haṭha Yoga (Yoga of Force). Mar-pa's chief disciple was Mi-la ras-pa (Milarepa), who is revered as the greatest poet-saint in Tibetan history. Mi-la ras-pa in turn transmitted the teachings to Sgam-po-pa, whose own disciples established six separate schools of Bka'-brgyud-pa thought, known for the most part by the names of their monasteries but differing little in doctrine. Of these, the Karma-pa (also known by the nickname of a subsect, the Red Hats) was, during the 15th to early 17th century, the chief rival of the now-predominant Dge-lugs-pa for the temporal authority of Tibet, while the 'Brug-pa became the main school of Buddhism in Bhutan.

Bka'-'gyur (Tibetan: "Translation of the Buddha-Word"), also spelled BKAḤ-ḤGYUR, KAGYUR, KAN-GYUR, or KANJUR, the collection of Tibetan Buddhist sacred literature representing the "Word of the Buddha"—as distinct from the *Bstan-'gyur* ("Translation of Teachings"), or collection of commentaries and miscellaneous works. This body of canonical literature contains more than 1,000 works, most of them Sanskrit in origin and most translated (with great care) after the 8th century. They were gathered together in the 13th century, and the collection has been published in 100 volumes.

The *Bka'-'gyur* begins with a *vinaya* ("monastic discipline") section, the only group of works having much in common with the Pāli literature of southern Buddhism. Then follow a few hundred *sūtras,* mostly of the various Mahāyāna schools but including a number of Sarvāstivāda ("Doctrine That All Is Real") works, and several collections of *avadānas* (legends of "noble deeds"). Finally, there are several hundred *Tantras,* the special ritual and meditation texts of the Vajrayāna form of Buddhism characteristic of Tibet. These latter are divided into four groups, containing, respectively, worldly rites, religious rites, traditional yogic practices, and the esoteric forms of Tantric yoga.

BL Public Limited Company, formerly (1975–78) BRITISH LEYLAND LIMITED, or (1968–75) BRITISH LEYLAND MOTOR CORPORATION, LTD., British automotive corporation formed on Feb. 8, 1968, in the merger of British Motor Holdings Ltd. and Leyland Motor Corp. Ltd.; it was partly nationalized by the British government in 1975. The constituent companies embrace about 95 percent of the British automotive industry, producing a large range of vehicles from commercial trucks and buses to private motorcars and also supplying construction equipment and automotive, industrial, and marine engines and components. Headquarters are in London.

Leyland, initially the dominant partner in the merger, was the first British manufacturer to concentrate on commercial vehicles. James Sumner of Leyland, Lancashire, built his first steam-driven wagon in 1884; and in 1896 he allied with the wealthy Spurrier family to set up the Lancashire Steam Motor Company, renamed Leyland Motors Ltd. in 1907, after its first experiments with petrol engines. Except briefly in 1920–23, the company did not produce automobiles until 1961, when it acquired Triumph Motor Co. Ltd. (Triumph had begun in 1903 as a motorcycle manufacturer and began making cars in 1923.) In 1966 Leyland merged with another car manufacturer, The Rover Co. Ltd. (founded 1904), and the combined companies became Leyland Motor Corp. Ltd. The first chairman of the new British Leyland in 1968, Donald Gresham Stokes, Baron Stokes, had also been the old Leyland's last chairman.

British Motor Holdings Ltd. had a much more complex history, but basically it grew out of three auto manufacturers: Morris, Austin, and Jaguar.

Early in the century William Richard Morris (later 1st Viscount Nuffield) founded a garage in Oxford, which after 1910 became known as Morris Garages Limited. In the 1920s, with Cecil Kimber as general manager, it began producing the popular M.G. cars, which were manufactured until 1980, when they were discontinued because of rising production costs. The M.G. Car Company was created in 1927 and was absorbed by another Morris car company, Morris Motors Ltd., in 1935. In that same year, another organization, Wolseley Motors Ltd. (founded in 1901 and taken over by Morris in 1927), was similarly absorbed.

In 1952 another venerable car manufacturer, Austin Motor Co. Ltd. (founded in 1905 by Herbert Austin), merged with Morris Motors to form British Motor Corporation Ltd. It continued to turn out Austin, Morris, M.G.,

and Wolseley cars and the highly successful "Mini" series.

The first Jaguar car was produced in 1936 by S.S. Cars Ltd. (founded 1932 in Coventry), which was renamed Jaguar Cars Ltd. in 1945 both to avoid the accidental reminder of the German SS and to highlight the name of the make that had proved to be most successful. Jaguar in 1960 bought Daimler Co. Ltd. (founded 1893), makers of limousines and other prestige cars; and in 1961 it bought Guy Motors Ltd. (founded 1919), a commercial-vehicle manufacturer.

In 1966 Jaguar amalgamated with the Austin-Morris interests (*i.e.,* the British Motor Corporation) to form British Motor Holdings Ltd., which two years later merged with Leyland to become British Leyland; in 1984 Jaguar was sold. With two successive name changes, British Leyland became BL Limited in 1979. The company assumed its current name in 1982. In 1981 BL entered into a joint venture with Honda Motor Company, Ltd., of Japan to produce Japanese-designed Triumph Acclaims in the United Kingdom.

Blaby, district, county of Leicestershire, south central England, with an area of 50 square miles (130 square km), covering the southern and western suburbs of the city of Leicester. It arcs around the city boundary from southeast to northwest and extends southward across the River Sence nearly to the county boundary with Warwickshire on the southwest. Blaby district is administered from Narborough. Important towns are Braunstone, Glenfields, and Kirby Muxloe. Pop. (1985 est.) 80,300.

Blache, Paul Vidal de La: *see* Vidal de La Blache, Paul.

Blacher, Boris (b. Jan. 19, 1903, Niu-ch'ang, China—d. Jan. 30, 1975, Berlin), German composer best known for his instrumental music but noted also for operas and ballets.

Blacher studied in Berlin, later becoming professor (1948–70) at the Hochschule für Musik in West Berlin and serving as its director (1953–70). In 1955 he was appointed a regular member of the West Berlin Academy of Arts music section, which he served as director from 1961. He was president of the academy from 1968 to 1971.

He was equally successful in the use of traditional forms and modernistic techniques. The first of his large-scale theatre works written in the 12-tone method was the ballet *Lysistrata* (1950). Other important stage works include the chamber opera *Romeo und Julia* (1943) and the surrealist *Rosamunde Floris* (1960). In the 1960s he began to use electronic resources in his compositions. It was, however, the more traditional *Variations on a Theme of Paganini* for orchestra (1947) that established his reputation.

Black, Davidson (b. July 25, 1884, Toronto—d. March 15, 1934, Peking), Canadian physician and physical anthropologist who first postulated the existence of a distinct form of early man, popularly known as Peking man.

A graduate of the University of Toronto, Black taught at Western Reserve University, Cleveland, Ohio, which he left to join the Canadian Army medical corps in 1917. When he was studying comparative anatomy with G. Elliot Smith, at that time working on the Piltdown material, Black became deeply interested in the problems of man's origin. After World War I and until his death Black served in China as professor of embryology and neurology at the Peking Union Medical College. He first searched unsuccessfully for remains of early man in Jehol (North China), then in Thailand. Then in 1927, at Chou-k'outien, near Peking, a hominid lower molar of unusual pattern was discovered. The phylogenetic importance of this fossil was immediately recognized by Black, who inferred from this single tooth the existence of a previously unknown hominid genus and species, which he named *Sinanthropus pekinensis.* In 1932 he pointed out the close relationship between Peking man and *Pithecanthropus erectus* from Java. Later discoveries of skulls and other fossil bones proved the accuracy of Black's judgment.

Black, George (b. April 20, 1890, Birmingham, Warwickshire, Eng.—d. March 4, 1945, London), British manager and producer of entertainments. Black originated the brilliant, long-lived "Crazy Gang" revues at the London Palladium and later at the Victoria Palace, London, and was a pioneer of the motion-picture business.

As a young man Black helped his father establish the first permanent motion-picture theatres in Great Britain. Later he became proprietor of a circuit of theatres and music halls on the northeast coast. Black moved to London in 1928 and became the general manager of various music halls there and in Brighton, reviving much of the spirit of the old-time hall. In 1933 he took over the active management of Moss Empires theatres (extending all over Great Britain) and became the joint managing director in 1938. He initiated the "Crazy Gang" revues, for which he is chiefly remembered, in 1935 with *Life Begins at Oxford Circus;* the revues continued as an annual event that World War II interrupted only intermittently.

Black, Harold Stephen (b. April 14, 1898, Leominster, Mass., U.S.—d. Dec. 11, 1983, Summit, N.J.), American electrical engineer who discovered and developed the negative-feedback principle, in which amplification output is fed back into the input, thus producing nearly distortionless and steady amplification. The principle has found widespread applications in electronics.

In 1921 Black joined the American Telephone & Telegraph Company, working first with the Western Electric Company and from 1925 with Bell Telephone Laboratories, Inc. While working on a means of reducing amplifier distortion, he devised the negative-feedback amplifier.

The principle of negative feedback was essential for radar and other control mechanisms as well as for servomechanisms. The principle has also been applied to the study of physiology and psychology to understand better the mechanisms of the senses and response.

Black served with General Precision, Inc., Little Falls, N.J. (1963–66), and then became an independent communications consultant.

Black, Hugo (La Fayette) (b. Feb. 27, 1886, Clay County, Ala., U.S.—d. Sept. 25, 1971, Bethesda, Md.), lawyer, politician, and associate justice of the U.S. Supreme Court (1937–71), best known for his absolutist belief in the Bill of Rights as a guarantee of civil liberties. Perhaps his most important contribution to the American judicial tradition was his insistence that the Fourteenth Amendment made the Bill of Rights—originally adopted to limit the power of the national government—equally restrictive on the power of the states to curtail individual freedom.

During his first 40 years, Hugo Black's career was confined almost exclusively to his native Alabama. He attended law school at the state university at Tuscaloosa, and, after graduating and passing the bar in 1906, he practiced in Birmingham. From 1910 to 1911 he served as a police court judge, and from 1915 to 1917 he was the county prosecutor. After brief military service during World War I, he resumed his Birmingham law practice in 1919.

It was not until 1926 that Black became a figure of national prominence. He was elected that year as a Democrat to a seat in the U.S. Senate, where he served until 1937. There he won considerable acclaim for his investigation of utility lobbyists. But perhaps more importantly, he earned the gratitude of President Franklin D. Roosevelt for his unwavering support of New Deal legislation.

Roosevelt appointed Black to the Supreme Court in 1937, thereby unleashing a wave of liberal protest. For although Black had solid credentials as a Southern liberal and a supporter of the New Deal (he had fought big-business combinations and led the support for the Fair Labor Standards Act), it was revealed after his confirmation by the Senate that he had once briefly been a member of the Ku Klux Klan.

In the early part of his tenure, Black acted with a growing Court majority in its reversal of previous Court vetoes of New Deal legislation. Black combined this tolerance for increased federal powers of economic regulation with an activist stance on civil liberties. In the 1940s and '50s he frequently found himself dissenting from the Court's majority in his absolutist position on freedom of speech, and he denounced governmental restrictions on liberties as unconstitutional and dangerous.

He also took a strong stance on restricting judicial and executive power. While he let stand the order excluding Japanese-Americans from the West Coast during World War II, he invalidated the military courts set up in Hawaii. Later he wrote the majority opinion holding as unconstitutional President Harry S. Truman's seizure of the steel mills during the Korean War.

During the 1960s Black held a prominent position among the liberal majority on the Court who struck down mandatory school prayer and who guaranteed the availability of legal counsel to suspected criminals. His last major opinion supported the right of *The New York Times* to publish the so-called Pentagon Papers in 1971 in the face of government attempts to restrict their publication.

Black, Jeremiah Sullivan (b. Jan. 10, 1810, Stony Creek, Pa., U.S.—d. Aug. 19, 1883, Brockie, Pa.), U.S. attorney general during President James Buchanan's administration who counseled a firm stand by the federal government against secession.

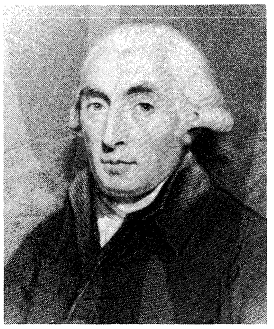
Primarily self-educated, Black served his legal apprenticeship in the offices of a prominent attorney, then in 1830 was himself admitted to the bar. Although active in the ranks of the Democratic Party, Black devoted most of the next two decades to developing a lucrative law practice in Somerset, Pa. In 1842 the governor made him a district judge, and Black served until elected to the Pennsylvania Supreme Court in 1851. He was reelected in 1854 but left three years later, when his old friend James Buchanan appointed him attorney general of the United States.

In the Buchanan Cabinet, Black launched a major investigation of land titles in California that eventually revealed systematic fraud. He was the leader of the administration's attacks on Senator Stephen Douglas and Douglas' notion of popular sovereignty as a solution to the slavery-expansion controversy. But Black distinguished himself most for his advocacy of sending troops, if necessary, to protect federal property in seceded states.

Black served as secretary of state during the final months of Buchanan's presidency. The president nominated him for a seat on the Supreme Court, but a coalition of Republicans, Douglas Democrats, and Southerners blocked confirmation. Following Abraham Lincoln's inauguration, Black resumed private law practice in York, Pa. He criticized the federal government's abrogation of constitutional rights during the Civil War, and he played a prominent role in the *Ex parte Milligan* and *Ex parte McCardle* cases at the conclusion of

the war. He advised Pres. Andrew Johnson on the veto of the first Reconstruction Act in 1867, and—but for a quarrel with Johnson's other lawyers—would have assisted in the President's defense during the impeachment trial. Black lost the use of his right arm in a serious accident in 1869, but he retained his acute mental faculties to the end of his life.

Black, Joseph (b. April 16, 1728, Bordeaux, Fr.—d. Nov. 10, 1799, Edinburgh), British chemist and physicist best known for the rediscovery of "fixed air" (carbon dioxide), the



Joseph Black, detail of an engraving by J. Rogers after a portrait by Sir Henry Raeburn
BBC Hulton Picture Library

concept of latent heat, and the discovery of the bicarbonates.

Black was born at Bordeaux, Fr., where his father—a native of Belfast but of Scottish descent—was engaged in the wine trade. He was educated at Belfast and in medicine and natural sciences at Glasgow University. There he had William Cullen (1712—90) for his instructor in chemistry, and the relation between the two soon became that of professor and assistant rather than of master and pupil. In 1751 Black transferred to Edinburgh to complete his medical studies. In 1756 he succeeded Cullen as lecturer in chemistry at the University of Glasgow and was also appointed professor of anatomy, though he exchanged that post for the chair of medicine. He also practiced as a physician.

In his investigations of the heating of magnesia alba (magnesium carbonate), Black anticipated Lavoisier and modern chemistry by indicating the existence of a gas, carbon dioxide, distinct from common air. Black's account of his studies, published in 1756 as *Experiments Upon Magnesia Alba, Quicklime, and Some Other Alcaline Substances,* proved that the mild alkalies (carbonates) are causticized (become more alkaline) when they lose carbon dioxide and that absorption of this gas converts the caustic alkalies again to mild ones. Black found that carbon dioxide acts as an acid and is produced by fermentation, respiration, and the burning of charcoal, and he inferred its presence in the atmosphere.

At the University of Glasgow, Black's studies ultimately led to his doctrine of latent heat. He noticed that when ice melts it takes up heat without undergoing any change of temperature, and he argued that this heat must have combined with the particles of ice and thus become latent. He verified this hypothesis quantitatively in 1761 and thereafter taught the doctrine. Although Black never published any detailed account of his work on latent heat, his friend James Watt doubtless was influenced by these ideas in his revolutionary construction of the condensing steam engine. Black also noticed that different bodies in equal masses require different amounts of heat to raise them to the same temperature, and so founded the theory of specific heats.

Black's lectures were written out posthumously from his own notes, supplemented by those of his pupils, and published with a biographical preface by his friend and colleague John Robison in 1803, as *Lectures on the Elements of Chemistry, Delivered in the University of Edinburgh.*

BIBLIOGRAPHY. W. Ramsay, *Life and Letters of J. Black* (1928); J.R. Partington, *A Short History of Chemistry*, 3rd ed. (1960).

Black, Max (b. Feb. 24, 1909, Baku, Russia), American Analytical philosopher.

Black studied at the Universities of Cambridge (B.A. 1930), Göttingen (1930–31), and London (Ph.D. 1939). He immigrated to the United States in 1940 and became a naturalized citizen in 1948. He taught philosophy at the University of Illinois from 1940 to 1946 and thereafter taught at Cornell University, becoming professor emeritus in 1977.

Black's early interest in mathematics resulted in *The Nature of Mathematics* (1933), a study of the various historical conceptions of that field. Black was heavily influenced by Ludwig Wittgenstein, and his interest in that philosopher's *Tractatus Logico-Philosophicus* bore fruit in the comprehensive and highly regarded study *A Companion to Wittgenstein's Tractatus* (1964). Black was concerned with the nature of clarity and meaning in language, and he analyzed these problems in several volumes of philosophical and general essays, most notably *The Importance of Language* (1962).

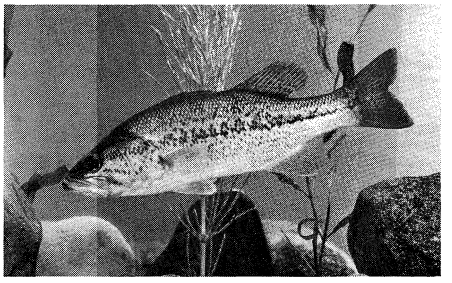
Black, Shirley Temple: *see* Temple, Shirley.

Black and Tan, member of a British auxiliary police force employed in Ireland against the republicans from July 1920 to July 1921. Their popular name derived from their attire of khaki coats and dark green trousers and caps. When Irish nationalist agitation intensified after World War I, a large proportion of the Irish police resigned, to be replaced by these temporary English recruits, mostly jobless ex-soldiers, who were paid 10 shillings a day and dressed in a mixed black and tan because of the shortage of police uniforms. In seeking to thwart the terrorism of the Irish Republican Army, the Black and Tans themselves engaged in fierce reprisals. Notably, on "Bloody Sunday," Nov. 21, 1920, the IRA murdered 11 Englishmen suspected of being intelligence agents; and the Black and Tans took revenge the same afternoon, attacking spectators at a football match in Croke Park, Dublin, killing 12 and wounding 60. The Black and Tans were withdrawn after the Anglo-Irish truce of July 1921.

Black Barty: *see* Roberts, Bartholomew.

black basaltes (stoneware): *see* basaltes ware.

black bass (*Micropterus*), any of about six species of elongated freshwater fishes of the sunfish family, Centrarchidae (order Perciformes), found in eastern North America.



Largemouth black bass (*Micropterus salmoides*)
Appel Color Photography

Two of these, the largemouth and smallmouth black basses (*M. salmoides* and *M. dolomieui*), have been introduced in other countries and are prized by fishermen as hard-fighting game fishes.

The black basses, like the sunfishes, have the spiny and soft-rayed portions of the dorsal fin joined as a single fin. They are, however, larger and longer bodied than the sunfishes, duller in colour, and more predatory in habit.

The largemouth black bass, growing to a maximum length and weight of about 80 centimetres (31½ inches) and 10 kilograms (22 pounds), is characteristically an inhabitant of quiet, weedy lakes and streams. It can be distinguished from the smallmouth by the deep cleft in its dorsal fin and by its relatively larger mouth, with the upper jawbone extending beyond the eye. It varies in colour from green to blackish and is marked with a dark, horizontal stripe. Like other black basses, it feeds mainly on smaller fishes.

The smallmouth black bass is typically a fish of clear, cool lakes and running streams. It varies from green to brownish and is generally mottled with a darker colour. It usually grows to 2–3 kg (4½–6½ lb) but can attain a length and weight of about 70 cm (27½ in.) and 5½ kg (12 lb).

black bear, also called AMERICAN BEAR (*Ursus americanus*), forest-dwelling bear (family Ursidae), reduced in population and range but still the most common North American bear; the cinnamon bear and the blue-gray or blue-

American black bear (*Ursus americanus*)
Leonard Lee Rue III

black glacier bear represent colour phases of this species. It may be tamed and taught various tricks but often becomes dangerous when mature. The American black bear probably constitutes only one species, rather than the more than 80 described "species," which are perhaps only subspecies' variants of the grizzly, or brown, bear. Asian black bears include the sloth bear (*q.v.*) and the Asiatic black bear (*q.v.*).

The adult ranges from 150 to 180 centimetres (about 5–6 feet) in length and weighs 90–270 kilograms (200–600 pounds). Regardless of coat colour, it may be recognized by its brown face and, usually, a white chest mark.

Besides animal prey, such as mammals and fish, it eats a variety of vegetable matter, such as pine cones, berries, and roots, and frequently raids campsites, seizing anything edible. A litter of one to four cubs, which often differ in colour, follows the gestation period of 100–215 days. The female breeds every second year.

Black Belt, in U.S. geography, physical region in Alabama and Mississippi, so named for its soil. The Black Belt is a fertile plain, generally 25–30 mi (40–50 km) wide and stretching approximately 300 mi across central Alabama and northeastern Mississippi. A region of dark, calcareous soils, it was one of the South's most important agricultural areas before the Civil War. Though corn was also grown, cotton was the most important crop until the destructive effects of the boll weevil encouraged agricultural diversification in the

early years of the 20th century. Beef cattle and soybeans are now also raised in the area.

Though strictly the name of a physical region, the term Black Belt has been borrowed widely by social scientists to denote those areas of the South where the plantation system, with its large number of black slaves, predominated.

black birch: *see* sweet birch.

Black Canyon of the Gunnison National Monument, national monument, comprising a deep, narrow gorge in western Colorado, U.S., 11 mi (18 km) east of Montrose. Established in 1933, the national monument occupies an area of 21 sq mi (54 sq km). The canyon was cut by the Gunnison River (named for John W. Gunnison [1812–53], army engineer and explorer) and its tributaries. At the section where its walls are steepest, it is 10 mi (16 km) long with depths ranging from 1,730 to 2,425 ft (525 to 750 m), while its rim width narrows to 1,300 ft (400 m) and its floor width to 40 ft (12 m). The Black Canyon derives its name from the black-stained, lichen-covered walls, which accentuate the gloom of the chasm. Roads on the North and South rims, with overlooks and foot trails, reach 8,000 ft above sea level. Block "islands" and pinnacles form the canyon's most striking features. The Black Canyon is the habitat of mule deer, coyotes, bobcats, foxes, rock squirrels, and a wide variety of birds, including the golden and bald eagles. Most of the monument has a vegetation cover of Gambel oak and juneberry.

black cat: *see* fisher.

black code, in the United States, any of numerous laws enacted in the states of the former Confederacy after the Civil War, in 1865 and 1866, designed to replace the social controls of slavery that had been removed by the Emancipation Proclamation and the Thirteenth Amendment to the Constitution and to assure continuance of white supremacy.

The black codes had their roots in the slave codes that had formerly been in effect. The general philosophy supporting the institution of chattel slavery in America was based on the concept that slaves were property, not persons, and that the law must protect not only the property but also the property owner from the danger of violence. Slave rebellions were not unknown, and the possibility of uprisings was a constant source of anxiety in colonies and then states with large slave populations. (In Virginia during 1780–1864, 1,418 slaves were convicted of crimes; 91 of these convictions were for insurrection and 346 for murder.) Slaves also ran away. In the British possessions in the New World, the settlers were free to promulgate any regulations they saw fit to govern their labour supply. As early as the 17th century, a set of rules was in effect in Virginia and elsewhere, but the codes were constantly being altered to adapt to new needs and they varied from one colony, and later one state, to another.

All the slave codes, however, had certain provisions in common. In all of them the colour line was firmly drawn, and any amount of Negro blood established the race of a person, whether slave or free, as Negro. The status of the offspring followed that of the mother, so that the child of a free father and a slave mother was a slave. Slaves had few legal rights: in court their testimony was inadmissible in any litigation involving whites; they could make no contract, nor could they own property; even if attacked, they could not strike a white person. There were numerous restrictions to enforce social control: slaves could not be away from their owner's premises without permission; they could not assemble unless a white person was present; they could not own firearms; they could not be taught to read or write or transmit or possess "inflammatory" literature; they were not permitted to marry.

Obedience to the slave codes was exacted in a variety of ways. Such punishments as whipping, branding, and imprisonment were commonly used, but death (which meant destruction of property) was rarely called for except in such extreme cases as the rape or murder of a white person. White patrols kept the slaves under surveillance, especially at night. Slave codes were not always strictly enforced, but whenever any signs of unrest were detected the appropriate machinery of the state would be alerted and the laws more strictly enforced.

The black codes enacted immediately after the Civil War, though varying from state to state, were all intended to secure a steady supply of cheap labour, and all continued to assume the inferiority of the freed slaves. There were vagrancy laws that declared a black to be vagrant if unemployed and without permanent residence; a person so defined could be arrested, fined, and bound out for a term of labour if unable to pay the fine. Apprentice laws provided for the "hiring out" of orphans and other young dependents to whites, who often turned out to be their former owners. Some states limited the type of property blacks could own, and in others they were excluded from certain businesses or from the skilled trades. Former slaves were forbidden to carry firearms or to testify in court, except in cases concerning other blacks. Legal marriage between blacks was provided for, but interracial marriage was prohibited.

It was Northern reaction to the black codes (as well as to the bloody anti-black riots in Memphis and New Orleans in 1866) that helped produce Radical Reconstruction (*see* Reconstruction) and the Fourteenth and Fifteenth amendments. The Freedmen's Bureau was created in 1865 to help the former slaves. Reconstruction did away with the black codes, but, after Reconstruction was over, many of their provisions were reenacted in the Jim Crow laws, which were not finally done away with until passage of the Civil Rights Act of 1964.

black comedy: *see* black humour.

Black Country, industrial area closely corresponding to the small south Staffordshire coalfield in the Midlands region of England; its name derives from its pollution-coated industrial landscape. The Black Country extends immediately to the west of the city of Birmingham, which itself lies off the coalfield, and makes up the western part of the metropolitan county of West Midlands. The clusters of industrial towns that earned this appellation sprang up in the 18th century with the intense exploitation and local use of coal and iron-ore resources. Collieries, blast furnaces, and foundries filled the air with smoke and grime. The area remains industrial in character and has become even more urbanized, although few coal mines and furnaces survive; industrial activity has shifted from ironmaking to metal-using plants, which no longer give rise to such extreme pollution. The industrial past has left its imprint on the despoiled landscape, however, and despite attempts to reclaim unused industrial sites and spoil heaps, much derelict land may still be seen.

Black Death, epidemic of plague (*q.v.*), probably both bubonic and pneumonic, that ravaged Europe between 1347 and 1351, taking a greater toll of life than any other known epidemic or war up to that time.

Originating in China and Inner Asia, the plague was transmitted to Europeans (1347) when a Kipchak army, besieging a Genoese trading post in the Crimea, catapulted plague-infested corpses into the town. The disease spread from the Mediterranean ports, affecting Sicily (1347); North Africa, Italy, Spain, England, and France (1348); Austria, Hungary, Switzerland, Germany, and the Low Countries (1349); and Scandinavia and the Baltic lands (1350). There were recurrences of the plague in 1361–63, 1369–71, 1374–75, 1390, and 1400.

The rate of mortality from the Black Death varied from place to place: whereas some districts, such as the Duchy of Milan, Flanders, and Béarn, seem to have escaped comparatively lightly, others, such as Tuscany, Aragon, Catalonia, and Languedoc were very hard hit. Towns, where the danger of contagion was greater, were more affected than the countryside; and within the towns the monastic communities provided the highest incidence of victims. Neither the great nor the powerful were immune: among royalty, Eleanor, queen of Peter IV of Aragon, and King Alfonso XI of Castile succumbed, and Joan, daughter of the English king Edward III, died at Bordeaux on the way to her wedding with Alfonso's son. Canterbury lost two successive archbishops, John de Stratford and Thomas Bradwardine; Petrarch lost not only Laura, who inspired so many of his poems, but also his patron, Giovanni Cardinal Colonna. The papal court at Avignon was reduced by one-fourth. Whole communities and families were sometimes annihilated.

The study of contemporary archives suggests a mortality varying in the different regions between one-eighth and two-thirds of the population, and the French chronicler Jean Froissart's statement that about one-third of Europe's population died in the epidemic may be fairly accurate. The population in England in 1400 was perhaps half what it had been 100 years earlier; in that country alone, the Black Death certainly caused the depopulation or total disappearance of about 1,000 villages. A rough estimate is that 25,000,000 people in Europe died from plague during the Black Death. The population of western Europe did not again reach its pre-1348 level until the beginning of the 16th century.

The consequences of this violent catastrophe were many. A cessation of wars and a sudden slump in trade immediately followed but were only of short duration. A more lasting and serious consequence was the drastic reduction of the amount of land under cultivation due to the deaths of so many labourers. This proved to be the ruin of many landowners. The shortage of labour compelled them to substitute wages or money rents in place of labour services in an effort to keep their tenants. There was also a general rise in wages for artisans and peasants. These changes brought a new fluidity to the hitherto rigid stratification of society. The psychological changes caused by the Black Death were also great, insecurity and a constant fear of death leading many into curious excesses of mysticism or to an unhealthy morbidity. The clergy, their ranks decimated by plague, were unable to provide the spiritual guidance needed at this time of crisis. The Dominicans and other religious orders were subsequently so reduced in numbers that they were forced to recruit priests with little education or culture. Thus the quality of their personnel and the intellectual vigour of the church seriously declined in the later 14th century, a fact connected with the subsequent increase in superstitious practices and the growth of various heresies.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

black duck (*Anas rubripes*), highly prized game bird (family Anatidae) of eastern North America, inhabiting salt, brackish, and freshwater marshes, as well as lakes, rivers, and beaver ponds. These ducks winter from Nebraska to Texas and along the Atlantic coast

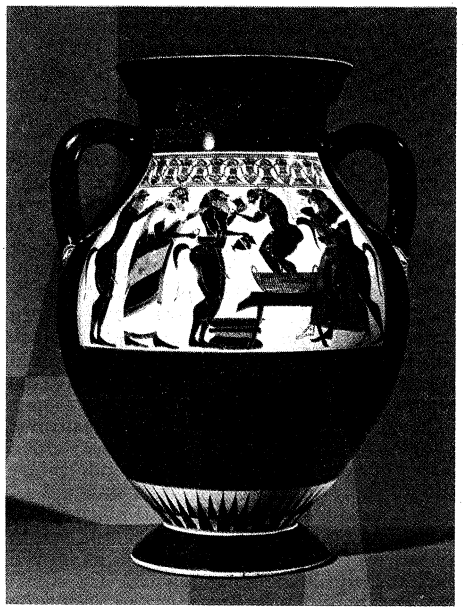
from Nova Scotia to Florida; their preference for seafoods such as periwinkles and mussels enables them to winter so far north. The sexes are similar in appearance—blackish brown bodies and tan heads—resembling a mallard hen but with reddish feet. The white underwing is conspicuous during flight.

The African black duck (*A. sparsa*), of sub-Saharan Africa, is not a close relative. It dives more than other dabbling ducks and is less social. Some authorities consider it a link with the perching duck (*q.v.*) group.

black earth: *see* chernozem.

black-eyed pea: *see* cowpea.

black-figure pottery, type of Greek pottery that originated in Corinth *c.* 700 BC and continued to be popular until the advent of red-figure pottery *c.* 530 BC. In black-figure painting, figures and ornamentation were drawn on the natural clay surface of a vase in glossy black pigment; the finishing details were incised into the black. The first significant

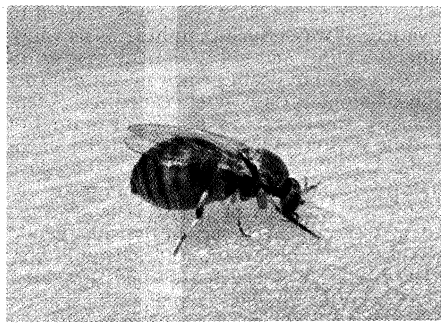


Dionysus and satyrs, amphora painted in the black-figure style by the Amasis Painter, c. 540 BC; in the Antikenmuseum, Basel, Switz.

By courtesy of the Antikenmuseum, Basel, Switz.; photograph, Colorphoto Hans Hinz

use of the black-figure technique was on the Proto-Corinthian style pottery developed in Corinth in the first half of the 7th century BC. The Corinthian painter's primary ornamental device was the animal frieze. The Athenians, who began to use the technique at the end of the 7th century BC, retained the Corinthian use of animal friezes for decoration until *c.* 550 BC, when the great Attic painters, among them Exekias and the Amasis Painter, developed narrative scene decoration and perfected the black-figure style. Outside Corinth and Athens the most important studios producing black-figure ware were in Sparta and eastern Greece.

black fly, also called BUFFALO GNAT, or TURKEY GNAT, any member of the insect family Simuliidae (order Diptera), usually black or dark gray. About 300 species of worldwide distribution are known. The black fly is small and humpbacked, with gauzy wings, stout antennae and legs, and rather short mouthparts adapted for sucking blood. The females bite and are sometimes so abundant that they may kill chickens, birds, and other domestic animals. Some species carry worms capable of causing onchocerciasis, which may result in



Black fly (Simuliidae)

E.S. Ross

blindness or in nodules beneath the skin. The larvae and pupae live in flowing water. When fully developed the fly frees itself from its pupal case, rises to the water surface on a bubble of air, and flies away.

In the spring along the Mississippi River, *Cnephia pecuarum* is a serious livestock pest. There are records of this species killing horses and mules either with bloodsucking bites or by smothering, which may occur when the animals' nostrils become blocked by large numbers of gnats. Also appearing in the spring is *Simulium meridionale,* which attacks bird combs and wattles. Repellents and grease or oil smears are used for protection.

Black Forest, German SCHWARZWALD, mountain region, Baden-Württemberg *Land* (state), southwestern West Germany, source of the Danube and Neckar rivers. It occupies an area of 2,320 sq mi (6,009 sq km) and extends toward the northeast for about 100 mi (160 km) from Säckingen on the Upper Rhine River (at the Swiss border) to Durlach (east of Karlsruhe). Its width varies from 10 to 25 mi. Structurally and topographically it forms the counterpart of the Vosges, which lies west of the Rhine Valley. The Black Forest drops abruptly to the Rhine plain but slopes more gently toward the Neckar and Nagold valleys to the east.

It is mainly a granite highland with rounded summits, although its northern part comprises forested sandstone; and it is bordered to the south by a narrow band of lower and more fertile limestone. Divided into two parts by the deep Kinzig Valley, its highest summits—Feldberg (4,897 ft [1,493 m]), Herzogenhorn, and Blössling—are to the south. Its northern half has an average height of 2,000 ft.

The raw climate of the higher districts supports only hardy grains, but the valleys are mild with good pastureland. Oak and beech woods clothe the lower slopes, while the extensive fir forests, which gave the range its name, climb to 4,000 ft. Lumbering, woodworking, and the manufacture of watches, cuckoo clocks, and mechanical toys are the principal industries. Tourism and winter sports are also prominent, and there are many mineral springs and watering places, such as Baden-Baden (*q.v.*) and Wildbad. Principal cities are Freiburg im Breisgau, Offenburg (*qq.v.*), Rastatt, and Lahr.

black fox: *see* fisher.

Black Friar: *see* Dominican.

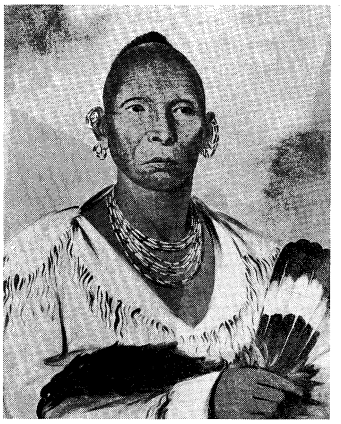
Black Friday, in U.S. history, Sept. 24, 1869, when plummeting gold prices precipitated a securities market panic. The crash was a consequence of an attempt by financier Jay Gould and railway magnate James Fisk to corner the gold market and drive up the price. The scheme depended on keeping government gold off the market, which the manipulators arranged through political influence. When Pres. Ulysses S. Grant finally became aware of the scheme, he ordered $4,000,000 of government gold sold on the market. This broke the corner and, in the ensuing panic, the rest of the market as well. It hurt the economy and the reputation of the Grant administration.

Black Hand, byname of UJEDINJENJE ILI SMRT (Serbo-Croatian: Union or Death), secret Serbian society of the early 20th century that used terrorist methods to promote the liberation of Serbs outside Serbia from Habsburg or Ottoman rule and was instrumental in planning the assassination of the Austrian archduke Francis Ferdinand (1914), precipitating the outbreak of World War I. The society was formed (1911) and led by Col. Dragutin Dimitrijević; its members were primarily army officers with some government officials. Operating from Belgrade, it conducted propaganda campaigns, organized armed bands in Macedonia (before the Balkan Wars, 1912–13), and established a network of revolutionary cells throughout Bosnia. Within Serbia it dominated the army and wielded tremendous influence over the government by terrorizing officials; it became so powerful that its authority challenged that of the government. In order to eliminate this rival, Prince Alexander, commander in chief of the expatriate Serbian Army, brought the leaders of the Black Hand to trial on dubious charges at Salonika in 1917. Dimitrijević and two others were executed, and more than 200 were imprisoned.

Black Hand, Italian MANO NERA, any of several extortion rackets run by immigrant Sicilian and Italian gangsters in the Italian communities of New York City, Chicago, New Orleans, Kansas City, and other U.S. cities from about 1890 to 1920. It consisted of sending threatening notes to local merchants and other well-to-do persons—notes printed with black hands, daggers, or other menacing symbols and extorting money on pain of death or destruction of property. The Black Hand declined with the entry of Prohibition and big-moneyed bootlegging.

Among the most notorious of Black Handers was Ignazio Saietta, known to residents of Manhattan's "Little Italy" as Lupo (the "Wolf"); in 1920 he was finally apprehended by federal authorities for counterfeiting and was sent to prison for 30 years. The most noted foe of the Black Hand was Lieut. Joseph Petrosino (1860–1909) of the New York Police Department, who had hundreds of gang members arrested, imprisoned, or deported before he was gunned down in Palermo on a visit to Sicily in 1909.

Black Hawk, Indian name MA-KA-TAI-ME-SHE-KIA-KIAK (b. 1767, Sauk Sautenuk, Virginia Colony—d. Oct. 3, 1838, village on the Des Moines River, Iowa), leader of a faction of Sauk and Fox Indians. Supported by part of the two tribes, Black Hawk contested the dis-



Black Hawk, oil painting by George Catlin, 1832; in the National Museum of American Art, Smithsonian Institution, Washington, D.C.

By courtesy of National Museum of American Art, Smithsonian Institution, Washington, D.C.

position of 50,000,000 acres of territory that had supposedly been granted to the United States by tribal spokesmen in 1804. His decision to defy government orders to vacate tribal villages and fertile fields along the Rock River in Illinois resulted in the brief but tragic Black Hawk War of 1832.

Antagonistic to whites settling in his people's territory, Black Hawk joined the British in a number of engagements in the War of 1812. Thereafter U.S. officials cultivated Keokuk, a rival chief, and thus incensed Black Hawk and confirmed him in his opposition to them. For a time Keokuk's moderation prevailed, but as white men continued taking over the Indians' cornfields and lodges, dissident Sauk and Fox Indians looked to Black Hawk for leadership.

In 1832 Black Hawk, who had been driven into Iowa the year before, led his people back across the Mississippi to the disputed Illinois area to plant crops and to resist further white encroachments. That the band of 1,000 included old men, women, and children shows that the move was not warlike. But Gov. John Reynolds called out the Illinois militia, and the U.S. government dispatched troops.

Black Hawk's band first caught the Illinois militia unawares and inflicted a stinging defeat on them. But the Indians' strength soon waned. Expected aid from other tribes did not materialize; food supplies were quickly exhausted; and desertions, malnutrition, and illness took their toll. Black Hawk retreated northward through the Rock River Valley, and in the final battle, or massacre, at the Bad Axe River in Wisconsin, most of the Indians were slaughtered. Black Hawk escaped, but he was soon captured and taken, first to Jefferson Barracks, Missouri, and then to Fortress Monroe in Virginia. In 1833 he was returned as a hostage to Keokuk's charge, a final blow to his pride from which he never recovered. His own story is told in *Life of Ma-ka-tai-me-she-kia-kiak* (1833).

As a condition of peace, the United States dispossessed the Sauk and Fox of their land in Illinois and eastern Iowa, and the Winnebago of theirs in southern Wisconsin. The ruthlessness of the Black Hawk War so affected the Indians that by 1837 all surrounding tribes had fled to the far West, leaving most of the Northwest Territory to the white settlers.

Black Hills, isolated, eroded mountain region in western South Dakota and northeastern Wyoming, U.S., lying largely within the Black Hills National Forest. Encompassed by the Cheyenne and Belle Fourche rivers, the hills rise approximately 3,000 ft (900 m) above the nearby Great Plains, culminating in Harney Peak (7,242 ft), the highest point in South Dakota. From a distance the rounded hilltops and well-forested slopes present a dark appearance, giving them their name.

A U.S. military expedition under George A. Custer discovered gold in the Black Hills in 1874. Following the gold rush boom (1875–76), many other minerals were discovered and worked. Tourist attractions include Mount Rushmore National Memorial, Jewel Cave National Monument, Wind Cave National Park, and Custer State Park, all in South Dakota. Devil's Tower National Monument is located in Wyoming.

black hole, hypothetical cosmic body of extremely intense gravity from which nothing, not even light, can escape. A black hole can be formed by the death of a massive star. When such a star has exhausted its internal thermonuclear fuels at the end of its life, it becomes unstable and gravitationally collapses inward upon itself. The crushing weight of constituent matter falling in from all sides compresses the dying star to a point of zero volume and infinite density called the singularity. Details of the structure of a black hole are calculated from Albert Einstein's general theory of relativity (*q.v.*). The singularity constitutes the centre of a black hole and is hidden by the object's "surface," the event horizon. Inside the event horizon the escape velocity (*i.e.,* the velocity required for matter to escape from the gravitational field of a cosmic object) exceeds the speed of light, so that not even rays of light can escape into space. The radius of the event horizon is called the Schwarzschild radius, after the German astronomer Karl Schwarzschild, who in 1916 predicted the existence of collapsed stellar bodies that emit no radiation. The size of the Schwarzschild radius is thought to be proportional to the mass of the collapsing star. For a black hole with a mass 10 times as great as that of the Sun, the radius would be 60 kilometres (37 miles).

Only the most massive stars—those of more than three solar masses—become black holes at the end of their lives. Stars with a smaller amount of mass evolve into less compressed bodies, either white dwarfs or neutron stars.

The most likely place to find a black hole seems to be in the vicinity of an ordinary star, because a black hole can only be detected by its gravitational effects on nearby matter. If a black hole is a member of a binary star system, matter flowing into it from its companion becomes intensely heated and then radiates X-rays copiously before entering the event horizon of the black hole and disappearing forever. Many investigators believe that one of the component stars of the binary X-ray system Cygnus X-1 is a black hole. Discovered in 1971 in the constellation Cygnus, this binary consists of a blue supergiant and an invisible companion star that revolve about one another in a period of 5.6 days.

Some black holes are thought to have nonstellar origins. In theory, a black hole can form when a mass of any amount is compressed to a sufficient degree. Various astronomers have speculated that large volumes of interstellar gas collect and collapse into supermassive black holes at the centres of quasars and peculiar galaxies (*e.g.,* galactic systems that appear to be exploding). A mass of gas falling rapidly into a black hole is estimated to give off more than 100 times as much energy as is released by the identical amount of mass through nuclear fusion. Accordingly, the collapse of millions or billions of solar masses of interstellar gas under gravitational force into a large black hole would account for the enormous energy output of quasars and certain galactic systems. By the mid-1980s there was mounting observational evidence that a supermassive black hole with a mass 4,000,000 times that of the Sun exists at the centre of our own Milky Way Galaxy.

The existence of another kind of nonstellar black hole has been proposed by the British astrophysicist Stephen Hawking. According to Hawking's theory, numerous tiny primordial black holes, possibly with a mass equal to that of an asteroid or less, might have been created during the big bang, a state of extremely high temperatures and density in which the universe is thought to have originated some 20,000,000,000 years ago. These so-called mini black holes, unlike the more massive variety, lose mass over time and disappear. Subatomic particles such as protons and their antiparticles (*i.e.,* antiprotons) may be created very near a mini black hole. If a proton and an antiproton escape its gravitational attraction, they annihilate each other and in so doing generate energy—energy that they in effect drain from the black hole. If this process is repeated again and again, the black hole evaporates, having lost all of its energy and thereby its mass, since these are equivalent.

Black Hole of Calcutta, scene of an incident (June 20, 1756) in which surviving defenders of Calcutta were shut away and many died, following the capture of the city by the nawab Sirāj-ud-Dawlah, of Bengal, and the surrender of the East India Company's garrison under a member of the council, John Z. Holwell. The incident became a cause célèbre in the idealization of British imperialism in India and a subject of controversy. The Nawab attacked Calcutta because of the company's failure to stop fortifying the city as a defense against its rivals in anticipation of war (the Seven Years' War, 1756–63). Following his surrender, Holwell and the other survivors were placed for the night in the company's local lockup for petty offenders, popularly known as the Black Hole. It was a room 18 feet (5.5 metres) long and 14 feet, 10 inches wide, and it had two small windows. According to Holwell, 146 people were shut up, and 23 emerged alive. The incident was held up as evidence of British heroism and the Nawab's callousness.

In 1915 J.H. Little pointed out Holwell's unreliability as a witness and other discrepancies, and it became clear that the Nawab's part was one of negligence only. The details of the incident were thus opened to doubt. A study in 1959 by Brijen Gupta suggests that the incident did occur but that the number of those entering the Black Hole was about 64 and the number of survivors was 21.

black humour, also called BLACK COMEDY, writing that juxtaposes morbid or ghastly elements with comical ones. Though in 1940 the French Surrealist André Breton published *Anthologie de l'humour noir* ("Anthology of Black Humour," frequently enlarged and reprinted), the term did not come into common use until the 1960s. Then it was applied to the works of the novelists Nathanael West, Vladimir Nabokov, and Joseph Heller. The latter's *Catch-22* (1961) is a notable example, in which Captain Yossarian battles the horrors of air warfare over the Mediterranean during World War II with hilarious irrationalities matching the stupidities of the military system. Other novelists who worked in the same vein included Kurt Vonnegut, particularly in *Slaughterhouse Five* (1969), and Thomas Pynchon, in *V* (1963) and *Gravity's Rainbow* (1973). A film exemplar is Stanley Kubrick's *Dr. Strangelove* (1963), a comedy of militaristic errors that ends in global nuclear destruction. Lenny Bruce, the mordant nightclub comedian, pursued the same path. The term black comedy has been applied to playwrights in the Theatre of the Absurd (*see* Absurd, Theatre of the), especially Eugène Ionesco, as in *La Leçon* (produced 1951; *The Lesson,* 1958) and *Les Chaises* (produced 1952; *The Chairs,* 1958).

Antecedents to black humour include the comedies of Aristophanes (5th century BC), François Rabelais's *Pantagruel* (1532), parts of Jonathan Swift's *Gulliver's Travels* (1726), and Voltaire's *Candide* (1759).

Black Hundreds, Russian CHERNOSOTENTSY, reactionary, antirevolutionary, and anti-Semitic groups formed in Russia during and after the Russian Revolution of 1905. The most important of these groups were the League of the Russian People (Soyuz Russkogo Naroda), League of the Archangel Michael (Soyuz Mikhaila Arkhangela), and Council of United Nobility (Soviet Obedinennogo Dvoryanstva). The Black Hundreds were composed primarily of landowners, rich peasants, bureaucrats, merchants, police officials, and clergymen, who supported the principles of Orthodoxy, autocracy, and Russian nationalism. Particularly active from 1906 until 1914, they conducted raids (with the unofficial approval of the government) against various revolutionary groups and pogroms against the Jews.

black knot, disease of wild and cultivated plums, cherries, and apricots in North Amer-

ica caused by the fungus *Dibotryon morbosum.* Infected twigs, branches, and fruit show light-brown swellings that turn velvety olive green in late spring. By autumn, hard, rough, coal-black knots girdle and kill affected parts. Older knots, often riddled by insects, stunt and kill the tree.

Black knot can be controlled by pruning infected parts during the winter (knots on large limbs are cut away, and the wound is treated), destroying nearby wild plums and cherries that may be affected, and spraying the opening buds with a fungicide. Japanese plums are less susceptible than most American and European varieties.

black lead, Old World name for graphite (*q.v.*), a misnomer because graphite contains no lead.

black letter, also called GOTHIC SCRIPT, or OLD ENGLISH SCRIPT, in calligraphy, style of alphabet that was used for handwriting throughout Latin Christendom for about 500 years, from the decline of the literary reforms under Charlemagne in the early 9th century to the humanistic revival of the Renaissance. It is distinguished by a uniform treatment of

Black-letter type as used in the 42-line Bible, issued at Mainz, 1456 (actual size)
EB Inc.

vertical strokes that end on the baseline, the use of angular lines instead of smooth curves and circles, and the overlapping of convex forms so that they lie back to back.

When printing by movable type was invented, typefaces were based on the handwriting styles of the time, and black letter, along with roman, was one of the two dominant letter shapes of medieval typography. Black-letter type was used in the only extant work known to have been printed by Johannes Gutenberg, the so-called 42-line Bible. Eventually, roman type, which was considered more suitable by humanists, superseded black letter throughout Europe, except in Germany (where it persisted until 1940, when Adolf Hitler ordered its discontinuance on the grounds of its "Jewish origin"). Black letter persisted in the 20th century mainly in the Old English script used on diplomas, Christmas cards, and in some liturgical writings.

Several styles of medieval black letter are recognized by their French or Latin names. *Lettre de forme,* or *littera textualis formata,* has the sharpest angles and most contrast between light and heavy strokes; *lettre de somme* is rounder and was widely used in southern Europe. *Lettre françoise* is a cursive (connected) black-letter style of script that was used in France during the Middle Ages. During the Renaissance it became a printing type, cut by the Parisian artist Robert Granjon. It became known as *civilité* because it was used to print a popular children's book, *La Civilité puerile,* written by Erasmus. During the 17th century, *lettre financière* became an officially approved script because it was a development from the old French national style, *lettre françoise.* Under the patronage of Louis XIV, this script became elegant, taking on dazzling Baroque line endings and flourishes.

Littera moderna was an ordinary black-letter script used in medieval Italy. *Littera antica* was an Italian script developed by the humanists during the Renaissance. *Littera a merchanti* was another Italian script—a late medieval style that was used in the commercial centres of Italy in the 16th century. Cancellaresca corsiva, also called *littera da brevi,* was developed in the 15th century out of the *antica corsiva* script used by the papal chancery. It was a popular script that became the vehicle for the New Learning throughout Christendom in the 16th century. *Cancellaresca formata* developed from cancellaresca corsiva and is a set hand, tightly drawn together rather than expansively written. Lettre bâtarde, or *littera bastarda,* is a slashing, cursive style developed by professional writing masters of the 16th century. It combines the techniques of cancellaresca corsiva and the older black-letter script that persisted at the time.

The most formal of the black-letter style is the German Fraktur. It has notably pointed and heavy-bodied letters. Typical examples were used in some of the earliest printing, including letters of indulgences printed in Mainz, Ger., in 1454. The style was taken into printing in its almost fully developed form and evolved little in succeeding years. Schwabacher was a less pointed, less heavy-bodied, rounded, and generally more informal typeface; it evolved slowly and was, for a brief time, the major black-letter form as a cursive, semi-italic. Some categories recognize a more informal cursive Schwabacher as a third form.

The black-letter scripts were called gothic by the "modernist" Lorenzo Valla and others in the middle of the 15th century. The modernists rejected the black-letter scripts because they associated them with the Middle Ages, which they considered a long intellectual deviation that separated their generation from the standards of the Classical age. The rejection of the black letter began with Petrarch and became calligraphically manifest with Coluccio Salutati, Poggio Bracciolini, and Niccolò Niccoli in Florence in the first quarter of the 15th century.

black lignite: *see* subbituminous coal.

black lung, also called BLACK LUNG DISEASE: *see* anthracosis.

black manner (engraving): *see* mezzotint.

black market, trading in violation of publicly imposed regulations such as rationing laws, laws against certain goods, and official rates of exchange among currencies. Rationing is common in wartime in order to equalize the distribution of scarce goods and services; black-market activity may consist of charging more than the legal prices, stealing or counterfeiting ration currency, and making side payments in addition to the official rate to obtain a given amount of merchandise.

Black-market activity in foreign exchange is prevalent in countries in which convertible foreign exchange is scarce and strict control of foreign exchange exists. The black market often sets a price for foreign exchange several times the official one.

black mass, in the Roman Catholic Church, a requiem mass during which the celebrant wears black vestments. The term is more commonly used, however, for a blasphemous and usually obscene burlesque of the true mass performed by Satanic cults. The naked back of a woman often serves as an altar, and a validly consecrated host is generally used to intensify the mockery. The rite commonly incorporates other elements of Satanic magic such as philtres or abortifacients.

Charges of Satanism and celebration of the blasphemous black mass have been made against persons accused of heresy and witchcraft since early Christian times. Allegations were made against the Knights Templars in the 14th century and against the Freemasons in the 19th. Joris-Karl Huysmans' novel *Là-bas* (1891; *Down There*) describes a black mass celebrated in late 19th-century France. *See also* Satanism.

black mica (silicate mineral): *see* biotite.

black mold (plant disease): *see* sooty mold.

black moss (plant): *see* Spanish moss.

Black Mountain poet, any of a loosely associated group of poets that formed an important part of the advance guard of American poetry in the 1950s, publishing innovative yet disciplined verse in the *Black Mountain Review* (1954–57), which became a leading forum of experimental verse. The group grew up around the poets Robert Creeley, Robert Duncan, and Charles Olson while they were teaching at Black Mountain College in North Carolina.

Turning away from the poetic tradition espoused by T.S. Eliot, these poets emulated the freer style of William Carlos Williams. Charles Olson's essay "Projective Verse" (1950) became their manifesto. Olson emphasized the creative process, in which the poet's energy is transferred through the poem to the reader. Inherent in this new poetry was the reliance upon decidedly American conversational language.

Much of the group's early work was published in the magazine *Origin* (1951–56). Creeley edited the *Black Mountain Review,* which featured the work of William Carlos Williams, Paul Blackburn, Denise Levertov, Allen Ginsberg, Gary Snyder, and many others who later became significant poets.

Black Mountain Range, southern spur of the Assam Himalayas in Bhutan, Asia. It lies between the Sankosh River (west) and the Tongsa River (east), and tributaries of the two rivers run through deep ravines down its steep slopes. The road between Punakha and Tongsa Dzong cuts across the range at Pele Pass, 11,055 feet (3,370 m) above sea level. The mountains are thinly settled, most settlements being strung out along river valleys or mountain trails. The people represent a mixture of the Nepalese and Tibeto-Burman cultures.

Black Mountains, mountain range in Yancey County in western North Carolina, U.S., extending north from the Blue Ridge, part of the Appalachian Mountains. The mountains include Mount Mitchell (6,684 feet [2,037 m]), the highest point east of the Mississippi River. Since they were not subject to glaciation, their slopes are covered with soil to the top, except for rocky precipices, and are heavily wooded. They lie within the Pisgah National Forest.

Black Muslim movement: *see* Islam, Nation of.

black nationalism, political and social movement prominent in the 1960s and early 1970s in the United States among some black Americans. The movement, which can be traced back to Marcus Garvey's Universal Negro Improvement Association of the 1920s, sought to acquire economic power and to infuse among blacks a sense of community and group feeling. Many adherents to black nationalism assumed the eventual creation of a separate black nation by black Americans. As an alternative to being assimilated by the American nation, which is predominantly white, black nationalists sought to maintain and promote their separate identity as a people of black ancestry. With such slogans as "black power" and "black is beautiful," they also sought to inculcate a sense of pride among black Americans.

black oak (*Quercus velutina*), North American timber tree belonging to the red oak group of the genus *Quercus* in the beech family (Fagaceae), distributed throughout the eastern United States. Usually growing to about 25 m (80 feet) tall, it may grow to 45 m (150 feet) on rich soils; it is common on exposed slopes and ridges, as it cannot tolerate shade. The tree's blackish outer bark is ridged in irregular blocks; the orange-yellow inner bark is a source of tannin and quercitron, a yellow dye. The leaf buds are sharply pointed,

yellowish gray, and covered with down. The leaves are usually seven-lobed and glossy dark green above, duller and sometimes fuzzy beneath, turning orange crimson or brown in autumn.

The California black oak (*Q. kelloggii*), a deciduous tree native to western North America, is occasionally 30 m tall. It grows at altitudes as high as 2,440 m above sea level, where its size is reduced to that of a small shrub; it often has a crooked trunk.

Black Obelisk, Assyrian monument of King Shalmaneser III (reigned 858–824 BC). The most complete Assyrian obelisk yet discovered, it is decorated with cuneiform inscriptions and reliefs recording military campaigns and other triumphs, including payment of

Black Obelisk of Shalmaneser III, 9th century BC; in the British Museum

By courtesy of the trustees of the British Museum

tribute by King Jehu of Israel (reigned 842–815). The six-foot black basalt piece was discovered in 1845 at ancient Kalhu (or Kalakh, biblical Calah; modern Nimrūd), south of Mosul, Iraq, by Austen Henry Layard and is now in the British Museum.

Black Panther Party, original name BLACK PANTHER PARTY FOR SELF-DEFENSE, U.S. black revolutionary party founded in 1966 in Oakland, Calif., by Huey Newton and Bobby Seale. The party's original purpose was to patrol black ghettoes to protect residents from acts of police brutality. The Panthers eventually developed into a Marxist revolutionary group that called for the arming of all blacks, the exemption of blacks from the draft and from all sanctions of so-called white America, the release of all blacks from jail, and the payment of compensation to blacks for centuries of exploitation by white Americans. At its peak in the late 1960s, Panther membership exceeded 2,000 and the organization operated chapters in several major cities nationwide.

Conflicts between Black Panthers and police in the late 1960s and early 1970s led to shoot-outs in California, New York, and Chicago, one of which resulted in Newton's going to prison for the murder of a patrolman. While some members of the party were guilty of criminal acts, the group as a whole was subjected to sustained police harassment that sometimes took the form of violent attacks, prompting congressional investigations of police activities in dealing with the Panthers. By the mid-1970s, having lost a great deal of their membership and having fallen out of favour with many American black leaders, who objected to the party's methods, the Panthers turned from violence to concentrate on conventional politics and on providing social services in black neighbourhoods.

black pepper, also called PEPPER (*Piper nigrum*), perennial climbing vine of the family Piperaceae indigenous to the Malabar Coast of India, or the hotly pungent spice made from its berries. One of the earliest spices known, pepper is probably the most widely used spice in the world today. It has a limited usage in medicine as a carminative and as a stimulant of gastric secretions.

In early historic times pepper was widely cultivated in the tropics of Southeast Asia, where it became highly regarded as a condiment. Pepper early became an important article of overland trade between India and Europe. It became a medium of exchange, and tributes were levied in pepper in ancient Greece and Rome. In the Middle Ages the Venetians and the Genoese became the main distributors, their virtual monopoly of the trade helping instigate the search for a sea route to the Far East.

The plant is widely cultivated throughout the East Indies. It has been introduced into tropical areas of Africa and of the Western Hemisphere. A woody climber, it may reach heights of 33 feet (10 metres) by means of its aerial roots. Its broad, shiny green leaves are alternately arranged. The inconspicuous flowers are in dense, slender spikes of about 50 blossoms each. The berrylike fruits, or peppercorns, are nearly globular, about 0.2 inch (5 millimetres) in diameter. They become yellowish red at maturity and bear a single seed. Their odour is penetrating and aromatic; the taste is hot, biting, and very pungent.

The plant requires a long rainy season, fairly high temperatures, and partial shade for best growth. Propagation is usually by stem cuttings, which are set out near a tree or a pole that will serve as a support. Pepper plants are sometimes interspersed in tea or coffee plantations. They begin bearing in two to five years and under good conditions may produce for as long as 40 years.

The berries are picked when they begin to turn red. The collected berries are immersed in boiling water for about 10 minutes, which causes them to turn dark brown or black in an hour. Then they are spread on mats or concrete floors to dry in the sun for three or four days. The whole peppercorns, when

Black pepper (*Piper nigrum*)

W.H. Hodge

ground, yield black pepper. White pepper is obtained from peppercorns from which the outer part of the pericarp has been removed. The outer coating is softened either by keeping the berries in moist heaps for 2 or 3 days or by keeping them in sacks submerged in running water for 7 to 15 days, depending on the region. Then the softened outer coating is removed by washing and rubbing or by trampling, and the berries are spread in the sun to dry. Whole white pepper can also be prepared by grinding off the outer coating mechanically. The flavour is less pungent than that of black pepper.

Pepper contains from 1 to 3 percent essential oil that has the aromatic flavour of pepper but not the pungency. The pungent principles are contained in the oleoresin and consist of piperine, chavicine, piperidine, and piperettine.

Various plants called pepper, including the California pepper tree *Schinus molle,* the pepper vine *Ampelopsis arborea,* and the sweet pepper bush *Clethra alnifolia,* are grown as ornamental plants and are not used as spices. *See also* pepper.

black powder, first type of explosive mixture invented for use in firearms and for blasting (*see* gunpowder).

Black Prince, The: *see* Edward the Black Prince.

Black Prince's ruby, large red gem set in the Maltese cross in the front of the imperial state crown of England. It is not a ruby but is one of the world's largest gem-quality red spinels, a polished lump five centimetres (two inches) long, pierced and partly filled with a small ruby. The stone was given to Edward the Black Prince by Pedro the Cruel, king of Castile, on the victory of Nájera in 1367. It narrowly escaped destruction when Henry V wore it at the Battle of Agincourt in 1415.

Black River, Vietnamese SONG DA, Chinese LI-HSIEN CHIANG, one of the chief tributaries of the Red River (Song Hong). Nearly 500 mi (800 km) long, it rises in central Yunnan Province in southwestern China and flows southeast into northern Vietnam parallel to the Red River, with which it unites near the city of Viet Tri, about 35 mi northwest of Hanoi. The Black River is broad and deep enough for navigation to Cho Bo, 45 mi upstream from Hanoi, where rapids interrupt navigation; steamers can reach Viet Tri via the Red River. Beyond the rapids, the Black River again becomes navigable, and junks and sampans can reach Lai Chau.

Black River, river in southeastern Missouri and Arkansas, U.S., rising in the Ozark Mountains in Reynolds County, Mo. It flows southeasterly to Poplar Bluff, Mo., and then continues southwest to enter the White River near Newport, Ark., after a course of 280 mi (451 km). Limited navigation is possible for shallow-draft vessels in the lower 15 mi of its course. Its main tributary is the Current River, which it receives near Pocahontas, Ark. Clearwater Dam, near Piedmont, Mo., was completed in 1948 on the Black River as a major flood-control project.

Black Riveran Stage, division of Ordovician time in North America (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years); the Black Riveran precedes the Trentonian Stage and follows the Chazyan Stage of the Champlainian Series. The type area for the Black Riveran is to be found in the exposures in the cliffs along the Black River of New York. Black Riveran rocks consist largely of marine limestones, although shales bearing fossil graptolites are also known. Several layers of volcanic ash are found interbedded with Black Riveran limestones.

Black Rock Desert, arid region of lava beds and alkali flats, composing part of the Basin and Range Province and lying in Humboldt and Pershing counties of northwestern Nevada, U.S. Embracing an area of about 1,000 sq mi (2,600 sq km), the desert is 70 mi (110 km) long and up to 20 mi wide. Once occupied by ancient Lake Lahontan, it

serves as the sink of the Quinn River and, at times, is largely covered with water only a few inches deep. After evaporation, the desert is left with a cover of hard clay, which is frequently encrusted with snowy-white saline matter. In Pershing County the desert is sometimes called the Granite Creek Desert, and a southwest extension lying north of Pyramid Lake is called the Smoke Creek Desert.

Black Rod, in full GENTLEMAN USHER OF THE BLACK ROD, an office of the British House of Lords, instituted in 1350. Its holder is appointed by royal letters patent, and his title is derived from his staff of office, an ebony stick surmounted with a gold lion. He is a personal attendant of the sovereign in the upper house and there functions as a sergeant at arms; his most prominent duty is the summoning of the Commons to the upper house to hear a speech from the throne or the royal assent given to bills. On such occasions the House of Commons closes its doors at the Black Rod's approach, whereupon he must knock three times before being admitted. The origin of this curious ceremony dates from the indignation of the lower house at the famous attempt of Charles I to arrest John Hampden, John Pym, and three other members of the House of Commons in 1642.

black sand, accumulation of fragments of durable heavy minerals (those with a density greater than that of quartz), usually of a dark colour. These accumulations are found in stream beds or on beaches where stream and wave energy was sufficient to carry away low-density material but not the heavy minerals. Thus, heavy minerals that are resistant to weathering and abrasion concentrate in these areas, even though they may be only minor constituents of inland rocks. Placer mining of such deposits yields magnetite, cassiterite, and zircon, as well as gold, platinum, and other rare metals.

Black Sea, Russian and Bulgarian CHERNOYE MORE, Turkish KARADENİZ, Romanian MAREA NEAGRĂ, large inland sea situated at the southeastern extremity of Europe, bordered by the Soviet Union to the north and east, Turkey to the south, and Bulgaria and Romania to the west.

The following article summarizes information about the Black Sea. For full treatment, *see* MACROPAEDIA: Europe.

The Black Sea is connected to the distant waters of the Atlantic Ocean by the Bosporus (a strait at its southwestern corner), the Sea of Marmara, the Dardanelles, the Aegean Sea, and the Mediterranean Sea. The peninsula of the Crimea extends into the sea from the north, and immediately to the east the narrow Kerch Strait (Kerchensky proliv) opens onto the smaller Sea of Azov. The water surface area is 162,280 sq mi (420,300 sq km), and the total volume of water is 131,000 cu mi (547,000 cu km), with a maximum depth of more than 7,250 ft (2,210 m) in the south central sector. The entire area has little coastal lowland; only the deltas of a few rivers push out to sea. In the east and south the Caucasus and Pontic Mountains encircle the sea. In the west, near the Bosporus, the shoreline relief is somewhat less steep. The Istranca (Dağlari in Turkey; Strandzha in Bulgaria) ranges to the southwest have smooth contours that become more jagged to the north. Farther north, in the Burgas Bay area, low mountains emerge where the Balkan Mountains of Bulgaria extend eastward. Continuing northward, a flatter plateau region gives way to the great Danube Delta, which thrusts out into the sea. The mountains of the southern Crimea form the only precipitous cliff areas. The Black Sea is a residual basin of the ancient Tethys Sea; its present form probably emerged about 40,000,000 years ago when structural upheavals in Asia Minor split off the Caspian Basin from the Mediterranean. The newly formed Black Sea basin gradually became isolated from the ocean, its salinity was reduced, and it was gradually separated from the Caspian region. The salinity of the Black Sea is almost half that of the world's oceans. An important feature of the sea is that oxygen is dissolved (being able to support a rich sea life) only in the upper water levels. Below a level of 510 ft deep at the centre but twice as deep near the edge, there is no oxygen because the sea is permeated by a high concentration of dissolved hydrogen sulfide, forming a saturated, "dead" zone inhabitable only by specially adapted bacteria. The gas is thought to be generated by natural biological processes and accumulates because of weak interchange between these deeper regions and the more highly oxygenated surface waters.

black shale, also called CARBONIFEROUS SHALE, variety of shale that contains abundant organic matter, pyrite, and sometimes carbonate nodules or layers and, in some locations, concentrations of copper, nickel, uranium, and vanadium. Fossils are rare and either are replaced by pyrite or are preserved as a film of graphite. Black shales occur in thin beds in many areas at various depths. They were deposited under anaerobic conditions, but the exact mode of origin is debated. Some geologists hold that the conditions were produced at depth by a stable stratification of lighter, fresher water overlying and sealing off from the atmosphere a more saline, stagnant layer. Others hold that the stagnant conditions were produced in shallow seas or in lagoons.

Black shales are of interest both historically and commercially. The oldest known shales are carboniferous varieties of the 3,200,000,000-year-old Figtree Series of South Africa. The Green River Shale Formation, an oil shale formation in Colorado, Utah, and Wyoming, is a potentially valuable source of petroleum. In East Germany and Poland the Kupferschiefer, a bituminous shale, is mined for copper, lead, and zinc.

black shark: *see* labeo.

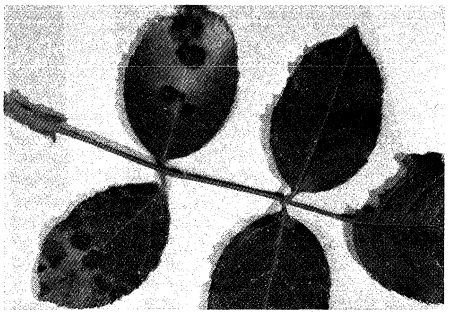
Black Sheep (Turkmen tribal federation): *see* Kara Koyunlu.

black snake, any of several species of snakes that are all black or nearly so. The black snake of Australian wetlands is *Pseudeschis porphyriacus,* a small-headed member of the cobra family, Elapidae. It is blue black, with a red belly; average length is about 1.5 metres (5 feet). If annoyed it expands its neck, cobra fashion. Its venom—more hemorrhagic than neurotoxic—is rarely fatal, though many people are bitten.

The spotted black snake (*P. guttatus*) of interior eastern Australia has pale spots and is bluish gray below. The mulga snake (*P. australis*) occurs across northern Australia and in dry parts of the southern interior. Occasionally 2.4 m (8 ft) long, it is reddish brown above and pinkish below. North American snakes called black snakes include the black racer, *Coluber constrictor* (*see* racer) and the pilot black snake, *Elaphe obsoleta* (*see* rat snake).

black spot, also spelled BLACKSPOT, common disease of aconitum, aster, cacti, delphinium, elm, erythronium, eugenia, goldenrod, holly, larkspur, leucothoe, orchids, primrose, raspberry, rose, and sugar beet. It is caused by species of *Pseudomonas* bacteria and by numerous fungus species in *Asterina, Asterinella, Asteroma, Diplotheca, Glomerella, Gnomonia, Microthyriella, Placosphaeria,* and *Stigmea.* Infections occur during damp periods and appear as round to irregular black leaf spots, sometimes on petioles and on stem and flower parts.

Commonly the term is used to mean black spot of roses, a serious worldwide disease, except in arid regions, caused by the fungus *Diplocarpon rosae.* On rose plants, spots are roundish, up to one-half inch (over one centimetre) in diameter with fringed margins. Leaves on susceptible varieties turn yellow and drop early. Affected plants may defoliate twice in a season, are greatly weakened, produce fewer and inferior blooms, and are subject to canker diseases and winterkill. Large numbers of spores are formed in speck-size fruiting structures (acervuli) and disseminated by



Black spot on rose leaves
W.H. Hodge

splashing rain, dew, overhead sprinkling, and gardeners working among wet plants. Spores germinate and penetrate rose tissue in 9 to 18 hours or longer; new leaf spots appear in 3 to 16 days and spores in 10 to 18 days. The cycle may be repeated throughout the growing season.

black state, formerly BANTU HOMELAND, or BANTUSTAN, any of the 10 designated national territories for South Africa's black populations, organized on the basis of ethnic and linguistic groupings. In the 1970s three of these units were declared independent: Transkei in 1976, Bophuthatswana in 1977, and Venda in 1979 (*qq.v.*). Ciskei (*q.v.*), was declared independent in 1981. Their independence did not receive international recognition. Six black states remained self-governing but non-independent in early 1984: Gazankulu, KwaZulu, Lebowa, Kwandebele and KaNgwane (*qq.v.*) and QwaQwa.

Land acts enacted in 1913 and 1936 defined a number of scattered areas as reserved for blacks. Some expansion, consolidation, and relocation occurred in the following decades. In 1959 a black self-government scheme, recognizing specific ethnic groups in designated areas, or "homelands," was enacted. This outlined steps toward self-government for all of the homelands as a response to increasing international pressure on South Africa to give some political rights to blacks. A homelands citizenship act of 1970 defined blacks living elsewhere in South Africa as legal citizens of the homelands designated for their ethnic groups. Many black political leaders have resisted the concept of the black state, hoping instead for eventual integration within the Republic of South Africa. As of 1982, only two of the black states had a totally contiguous land area, with the others varying from two to 10 separate land areas. According to the census of 1980, some 6,500,000 of South Africa's total black population of about 15,970,000 lived in the black states, excluding the then independent states of Transkei, Bophuthatswana, and Venda.

Black Stone of Mecca, Arabic AL-ḤAJAR AL-ASWAD, Muslim object of veneration, built into the eastern wall of the Ka'bah (small shrine within the Great Mosque of Mecca) and probably dating from the pre-Islāmic religion of the Arabs. It now consists of three large pieces and some fragments, surrounded by a stone ring and held together with a silver band. According to popular Islāmic leg-

Muḥammad returning the Black Stone of Mecca to the Ka'bah, manuscript illustration from the *Jāmi 'at-tawārikh,* by Rashīd ad-Dīn; in the University of Edinburgh Library (MS. Arabic 20)

By courtesy of Edinburgh University Library

end, the stone was given to Adam on his fall from paradise and was originally white but has become black by absorbing the sins of the thousands of pilgrims who have kissed and touched it. In 930 it was carried away by the fanatics of the Qarmatian sect and held for ransom for about 20 years.

black-tailed deer, Pacific Northwest subspecies of the mule deer (*q.v.*).

black theatre, American dramatic movement encompassing plays written by, for, and about blacks. Although the minstrel shows of the early 19th century are believed by some to be the roots of black theatre, they initially were written by whites, acted by whites in blackface, and performed for white audiences. After the American Civil War, blacks began to perform in minstrel shows, and by the turn of the century they were producing black musicals, many of which were written, produced, and acted entirely by blacks. The first known play written by an American black was James Brown's *King Shotaway* (1823). William Wells Brown's *Escape, or a Leap for Freedom* (1858), was the first black play published, but the first real success of a black dramatist was Angelina W. Grimké's *Rachel* (1916).

Black theatre flourished during the Harlem Renaissance of the 1920s and '30s. Experimental groups and black theatre companies emerged in Chicago, New York City, and Washington, D.C. Among these was the Ethiopian Art Theatre, which established Paul Robeson as America's foremost black actor. Garland Anderson's play *Appearances* (1925) was the first play of black authorship to be produced on Broadway, but black theatre did not create a Broadway hit until Langston Hughes's *Mulatto* (1935) won wide acclaim. In that same year the Federal Theater Project was founded, providing a training ground for blacks. In the late 1930s, black community theatres began to appear, revealing talents such as those of Ossie Davis and Ruby Dee. By 1940 black theatre was firmly grounded in the American Negro Theater and the Negro Playwrights' Company.

After World War II black theatre grew more progressive, more radical, and more militant, reflecting the ideals of black revolution and seeking to establish a mythology and symbolism apart from white culture. Councils were organized to abolish the use of racial stereotypes in theatre and to integrate black playwrights into the mainstream of American dramaturgy. Lorraine Hansberry's *Raisin in the Sun* (1959) and other successful black plays of the 1950s portrayed the difficulty of blacks maintaining an identity in a society that degraded them.

The 1960s saw the emergence of a new black theatre, angrier and more defiant than its predecessors, with Imamu Amiri Baraka (originally LeRoi Jones) as its strongest proponent. Baraka's plays, including the award-winning *Dutchman* (1964), depicted whites' exploitation of blacks. He established the Black Arts Repertory Theatre in Harlem in 1965 and inspired playwright Ed Bullins and others seeking to create a strong "black aesthetic" in American theatre.

black titi: *see* buckwheat tree.

black varnish, also called JAPAN, any of a class of oil varnishes in which bitumen (a mixture of asphaltlike hydrocarbons) replaces the natural gums or resins used as hardeners in clear varnish. Black varnish is widely used as a protective coating for interior and exterior ironwork such as pipework, tanks, stoves, roofing, and marine accessories. The bitumen forms a protective barrier against atmospheric corrosion. Bitumens used include petroleum bitumen; natural asphalts, such as uintaite; and pitches, as from coal tar.

The cheapest black varnish is Brunswick black (*q.v.*), a solution of bitumen in white spirit. In coachbuilders' black japan, only the purest grades of asphalt or pitch are used, together with a hard gum, such as copal. Berlin black has a matte or eggshell finish, achieved by incorporating a proportion of vegetable or other carbon black. *See also* japanning.

Black Volta River, French VOLTA NOIRE, also called (in Burkina Faso) MOUHOUN, river in Burkina Faso (formerly Upper Volta), Ghana, and Côte d'Ivoire (Ivory Coast), headstream of the Volta River in western Africa. It rises as the Baoulé in low hills in southwestern Burkina Faso near Bobo Dioulasso, and at the end of its course it empties into Lake Volta (in Ghana), a large artificial reservoir created by the Volta River Project and stretching to just above the former confluence of the Black Volta and White Volta rivers.

From its source in Burkina Faso the Black Volta flows roughly north and east for about 200 miles (320 km) and then turns to flow south for 340 miles (550 km), forming the border between Ghana and Burkina Faso and then between Ghana and Côte d'Ivoire. At Bamboi, Ghana, it turns again, first north and then east, and approximately 80 miles (130 km) farther east it empties into Lake Volta, after a course of about 720 miles (1,160 km). Its gradient is relatively gentle (about 2 feet per mile [40 cm per km]), and the rainfall in its river valley is likewise small (for that part of the world). The Black Volta may stop flowing in the height of the dry season, but between Bamboi and the Côte d'Ivoire border the river's regime has permitted construction of a dam. The principal riparian town is Lawra in Ghana; there is a ferry at Bamboi.

black walnut (*Juglans nigra*), tall tree, native to eastern North America, valued for its decorative wood. *See* walnut.

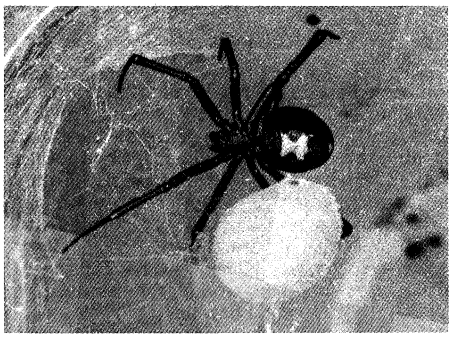
Black War (1804–30), period of continuing hostilities between Aborigines and European soldiers and settlers on the Australian island of Tasmania (then called Van Diemen's Land), which resulted in the virtual extermination of the Aboriginal population of the island. The term is often applied only to the last year of hostilities. The "war" began in May 1804, when a military detachment opened fire on an Aboriginal hunting party. The bitterness of the Aborigines increased in the next few years as white settlers occupied choice hunting areas of the island for sheep raising and, when other food ran short, took to hunting kangaroos, greatly depleting this staple of the Aborigines' life. In the course of the next generation white settlers continually harassed the natives; kidnapping, rape, and murder were common. Unable to meet the European terror in force, the Aborigines resorted to attacks on isolated individuals and small groups.

In the autumn of 1830, the lieutenant governor, George Arthur, decided to segregate the Aborigines on the southeastern peninsula of the island. Several thousand settlers were formed into a Black Line to drive the Aborigines out of the bush. The campaign was a failure—only a woman and a boy were found. Between 1831 and 1835, however, a humanitarian, George A. Robinson, persuaded most of the elusive natives (approximately 200) to resettle on the Bass Strait island of Flinders. There, their number rapidly dwindled; by the second half of the 19th century, they had virtually disappeared as a separate group.

Black Warrior River, river in western Alabama, U.S. It is formed by the Locust and Mulberry forks about 20 miles (30 km) west of Birmingham and flows 178 miles (286 km) southwest to join the Tombigbee River near Demopolis. The river is navigable, and with the Tombigbee it forms an inland waterway between Mobile and Birmingham. The name is a translation of *Tuscaloosa,* a Choctaw word. Between Demopolis and Tuscaloosa, the river is sometimes known as the Warrior.

black widow (*Latrodectus*), any of a genus of spiders of the family Theridiidae (order Araneida). In South Africa these spiders are known as button spiders, in Australia as redbacks, and in New Zealand as katipos. About six species are known. All are venomous, but their bite is rarely fatal to humans.

Latrodectus geometricus is found in Africa; *L. curacaviensis* in the Americas; *L. hystrix, L. dahli,* and *L. pallidus* in southern Europe, northern Africa, and southwestern Asia; and *L. mactans* in most warm areas of the world. *L. mactans, L. curacaviensis,* and *L. geometricus* are found in the United States.



Black widow (*Latrodectus mactans*), with egg case

Ann Moreton

In the northern part of its range, *L. mactans* is found most often in trash and near dwellings; *L. curacaviensis* lives under logs and stones and in woods and fields. In the southeastern United States *L. curacaviensis* lives in trees and shrubs above the ground; *L. mactans* lives on the ground.

The female of *L. mactans,* the most com-

mon North American species, is shiny black, usually with a reddish hourglass-shaped design on the underside of the spherical abdomen. Sometimes two small spots, instead of an hourglass, are present. The body is about 2.5 centimetres (1 inch) long. The male, seldom seen because it is often killed and eaten by the female after mating, is about one fourth the size of the female. In addition to the hourglass design the male often has four pairs of reddish stripes on the sides of the abdomen.

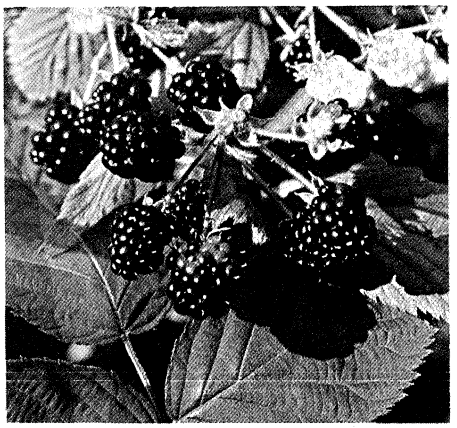
The large web of black widows has a funnel-shaped centre. The female may lay several masses of eggs during one summer. The egg case, suspended in the web, is white or tan, papery in texture, and up to 12 millimetres (½ inch) in diameter. It contains 250–750 eggs. The young spiders, which are orange and white, emerge in 14 to 30 days. Females may live for more than 1½ years.

Like most spiders, the black widow preys on insects. It makes small punctures in the victim's body and sucks the liquid contents. It, in turn, is attacked by mud-dauber wasps and other insect parasites and predators.

The bite of the black widow often produces severe pain, nausea, and mild paralysis of the diaphragm. Most bite victims, however, recover without serious complications.

Blackbeard (pirate): *see* Teach, Edward.

blackberry, usually prickly, fruit-bearing bush of the genus *Rubus* (family Rosaceae), native chiefly to the north temperate regions of the Old and New World; the thornless blackberry is a modern development. The blackberry is particularly abundant in eastern North America and on the Pacific coast; in the British Isles and western Europe it is a



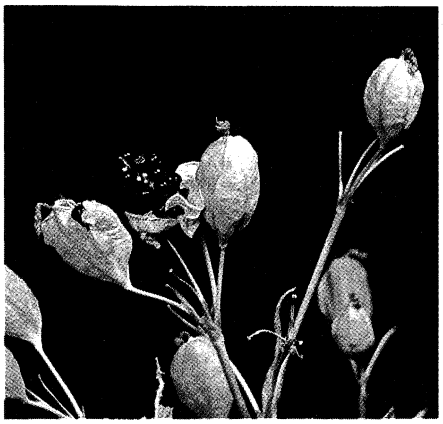
Blackberry (*Rubus*)
Derek Fell

common copse and hedge plant. The bush is characterized by its usually biennial, prickly, erect, semi-erect, or trailing stems; leaves with usually three or five oval, coarsely toothed, stalked leaflets, many of which persist through the winter; white, pink, or red flowers in terminal clusters; and black or red-purple fruits, each consisting of numerous drupelets adhering to a juicy core. The several trailing species of *Rubus,* which lack woody fibre in the stem, are commonly called dewberries.

In modern times there are tens of thousands of blackberry hybrids and segregates of various types. In the U.S. there are about 10,000 acres (4,000 hectacres) under blackberry cultivation; in the U.K., about 1,000.

Blackberries are a fairly good source of iron and vitamin C. They are eaten fresh; in preserves, conserves, jams, or jellies; and in baked goods, particularly cobblers and pies.

blackberry lily, also called LEOPARD LILY (*Belamcanda chinensis*), with orange-spotted



(Top) flower and (bottom) seed pods of blackberry lily (*Belamcanda chinensis*)
A to Z Botanical Collection—EB Inc.

red flowers, a popular garden flower. It is native to East Asia and is naturalized in some parts of North America.

It is a member of the iris family (Iridaceae) and has branching stems, lower, grassy foliage, a stout rootstalk, and blackberry-like seeds. The flowers have the six petallike segments. Shorter, with light-yellow flowers, *B. flabellata* is another East Asian ornamental of the same genus.

blackbird, in the New World, any of several species belonging to the family Icteridae (order Passeriformes); also, an Old World thrush (*Turdus merula*). The Old World blackbird

Male red-winged blackbird (*Agelaius phoeniceus*)
Kirtley-Perkins—The National Audubon Society Collection/Photo Researchers

is 25 centimetres (10 inches) long; males are black and females brown, with orange bill and eye-rims. Common in woods and gardens throughout temperate Eurasia and established also in Australia and New Zealand, it resembles the American robin in general behaviour.

The best known icterid of this name is the red-winged blackbird (*Agelaius phoeniceus*), ranging from Canada to the West Indies and Central America. It is 20 cm long, and the male's black plumage is set off by red shoulder patches. All-black icterids in North America are the rusty blackbird (*Euphagus carolinus*) and Brewer's blackbird (*E. cyanocephalus*). The red-breasted blackbird (*Leistes militaris*), common over most of South America, is one of the so-called military blackbirds (also called, erroneously, starlings), or marshbirds. For species also grouped with them, *see* meadowlark. For crow-blackbird, *see* grackle.

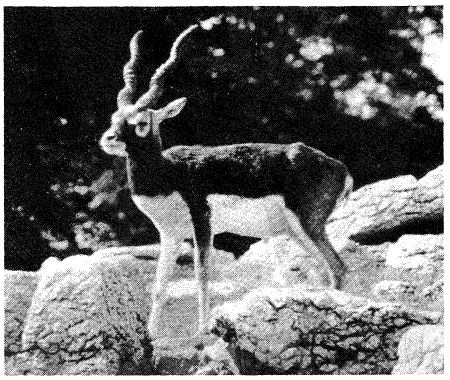
To make the best use of the Britannica, consult the INDEX *first*

blackbirding, the 19th- and early 20th-century practice of enslaving (often by force and deception) South Pacific islanders on the cotton and sugar plantations of Queensland, Australia (as well as those of the Fiji and Samoan islands). The kidnapped islanders were known collectively as Kanakas (*see* Kanaka). Blackbirding was especially prevalent between 1847 and 1904. The Queensland government's first attempt to control it came only in 1868 with the Polynesian Labourers Act, which provided for the regulation of the treatment of Kanaka labourers—who theoretically worked of their own free will for a specified period—and the licensing of "recruiters." Because the Queensland government lacked constitutional power outside its own borders, the regulations could not be enforced; moreover, the fact that notorious and brutal blackbirders were able to retain their licenses seemed to indicate that the government was not seriously trying to end the practice. British government acts of the 1870s—especially the 1872 Pacific Islanders Protection Act (the Kidnapping Act)—provided for agents on British recruiting vessels, stricter licensing procedures, and patrol of British-controlled islands; these measures reduced the incidence of blackbirding by British subjects. Because of the continuing heavy demand for labour in Queensland, however, the practice continued to flourish. Blackbirding died out only in 1904 as a result of a law, enacted in 1901 by the Australian commonwealth, calling for the deportation of all Kanakas after 1906.

blackbody, in physics, a surface that absorbs all radiant energy falling on it. The term arises because incident visible light will be absorbed rather than reflected, and therefore the surface will appear black. The concept of such a perfect absorber of energy is extremely useful in the study of radiation phenomena.

The best practical blackbody is a small hole in a box with a blackened interior, because practically none of the radiation entering such a hole could escape again, and it would be absorbed inside. A surface covered with lampblack will absorb about 97 percent of the incident light and, for most purposes, can be considered a blackbody. Polished metal surfaces, on the other hand, absorb only about 6 percent of the incident radiation, reflecting the rest.

blackbuck (*Antilope cervicapra*), swift, keen-sighted antelope, family Bovidae (order Artiodactyla), found in herds in grasslands of India. The male stands about 80 centimetres (32 inches) at the shoulder and has long, ringed, spirally twisted horns. Its coat is brown, deepening with age to black; the underparts, inner sides of the legs, and an area around each eye are pure white. The female is



Blackbuck (*Antilope cervicapra*)
Wolf Suschitzky

usually hornless and yellowish brown, though similarly patterned with white.

Blackburn, district (borough), county of Lancashire, England. It has an area of 53 sq mi (137 sq km).

The famous weaving tradition of the town of Blackburn had beginnings in the 13th-century wool trade. By the reign of Elizabeth I, Blackburn was a flourishing market town of 2,000 people, with Irish flax being utilized in the production of fabrics. The introduction of the spinning jenny (invented by James Hargreaves *c.* 1764 at nearby Stanhill) and other textile machinery speeded cotton spinning, while the Leeds and Liverpool Canal (completed 1816) aided transport and was a useful source of water. The abundance of coal, lime, and building materials also helped expansion. Textiles remain important, but there is now a wide diversity of industry, including electronics, engineering, and brewing. The Lewis Textile Museum records the development of the textile industry.

Darwen developed especially after the Industrial Revolution, with cotton spinning and weaving, coal mining, and paper manufacturing. Wallpaper is important, and engineering and paint and plastics manufacturing have been developed.

Turton Tower, a 16th-century and older mansion, contains a museum of furniture and weapons. Pop. (1981 prelim.) town, 88,236; (1982 est.) district, 142,800.

Blackburn, Gideon (b. Aug. 27, 1772, Augusta County, Va.—d. Aug. 23, 1838, near Carlinville, Ill., U.S.), Presbyterian clergyman, educator, and missionary to the Cherokee Indians.

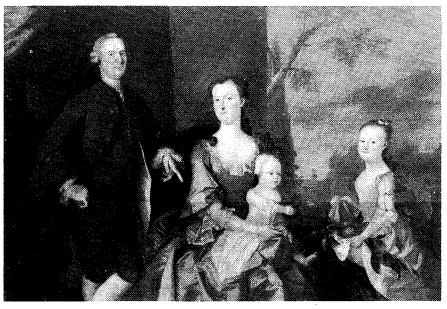
He became a Presbyterian minister about 1794 and was stationed at the military post that later became Maryville, Tenn. He was active in the second Great Awakening (1800–03), an evangelical religious movement in the southeastern U.S. After the revival he argued before the General Assembly of the Presbyterian Church in favour of evangelical work among the Cherokee Indians. He opened a school for Indian children in 1804 and for the next seven years worked with the Cherokees preaching, teaching, and introducing new agricultural methods. When his health began to fail, he left missionary work for a position as a schoolteacher near Nashville, Tenn. In 1827 he became president of Centre College, Danville, Ky. Invited in 1833 to Illinois, he raised funds for Illinois College at Jacksonville and later bought land for a theological school near Carlinville. Opened in 1857, it was known as Blackburn Theological Seminary until the theological curriculum was discontinued, and it was renamed Blackburn College.

Blackburn, Helen (b. May 25, 1842, Valentia Island, Ire.—d. Jan. 11, 1903, London), early leader of the British movement for the emancipation of women.

In 1859, when her family moved to London, she became interested in the cause of woman suffrage. In 1874 she became secretary of the National Society for Women's Suffrage, which had been formed in 1867. She wrote *Women's Suffrage: A Record of the Movement in the British Isles* (1902). One of the first to recognize the significance of women in industry, Blackburn wrote important studies of *The Condition of Working Women and the Factory Acts* (1896) and *Women Under the Factory Acts* (1903). She edited *The Englishwoman's Review* from 1881 to 1890.

Blackburn, Joseph, also called JONATHAN B. BLACKBURN (b. *c.* 1730, England—d. after 1774, Eng.), itinerant portrait painter who, working in Bermuda (*c.* 1752–53) and later in New England (*c.* 1753–64), introduced the decorative tradition of English Rococo portraiture to the American colonies. Blackburn's services were eagerly sought by wealthy American colonials.

In an occasional portrait, such as that of Theodore Atkinson (Worcester Art Museum, Worcester, Mass.), Blackburn achieved some degree of individuality in the features; but most of his works, particularly his likenesses of women, emphasize pose and costume at the expense of characterization. Blackburn frequently repeated a composition, even to details of clothing and jewelry. His posing of his subjects and compositional arrangements briefly exerted an influence on the youthful John Singleton Copley. In about 1764 Blackburn returned to England. His career after that is obscure, but there is a record of a payment made in 1774 for two portraits painted by him in England.



"The Winslow Family," oil on canvas by Joseph Blackburn, 1755; in the Museum of Fine Arts, Boston
By courtesy of the Museum of Fine Arts, Boston

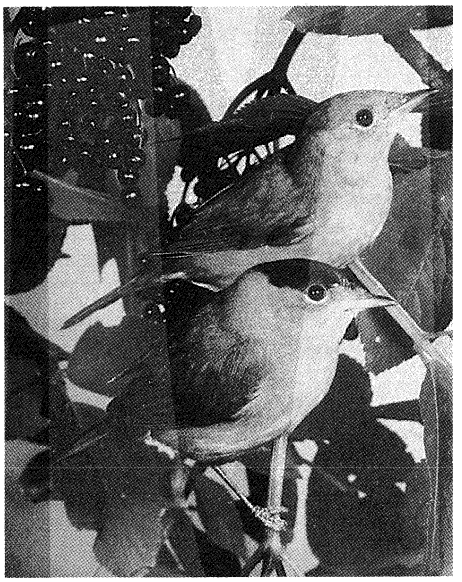
Blackburn, Thomas (b. Feb. 10, 1916, Hensingham, Cumberland, Eng.—d. Aug. 13, 1977, Wales), English poet and critic whose early work exhibited to a degree the influence of William Butler Yeats, but whose later poetry is rhythmically looser and more conversational.

The son of a clergyman, Blackburn was educated at the University of Durham. In his autobiographical novel, *A Clip of Steel* (1969), he depicts a childhood tormented by a tense and repressive father, his own breakdown in his early twenties, and his successful psychoanalysis.

Blackburn's first notable volume of verse was *The Holy Stone* (1954). Later verse includes *A Smell of Burning* (1961), *A Breathing Space* (1964), and *Selected Poems* (1976). Among his prose works are *Robert Browning* (1967); a collection of criticism, *The Price of an Eye* (1961); and a musical drama, *The Judas Tree* (1967).

Blackburn was an inspiring teacher, first at Marylebone Grammar School in London, then at the University of Leeds, for many years at the College of St. Mark and St. John in Chelsea, London, and finally at Whitelands College in London.

blackcap (*Sylvia atricapilla*), common warbler from Europe and northwestern Africa to central Asia. It belongs to the family Sylviidae (order Passeriformes). It is 14 centimetres (5½ inches) long, with brownish upperparts, gray underparts and face, and black (male) or reddish-brown (female) crown. Common in woodland border and rough hedges, it has a rich song.



Male (bottom) and female blackcaps (*Sylvia atricapilla*)
Hans Reinhard—Bruce Coleman Ltd.

Blackett, Patrick M(aynard) S(tuart), BARON BLACKETT OF CHELSEA (b. Nov. 18, 1897, London—d. July 13, 1974, London), winner of the Nobel Prize for Physics in 1948 for his discoveries in the field of cosmic radiation, which he accomplished primarily with cloud-chamber photographs that revealed the way in which a stable atomic nucleus can be disintegrated by bombarding it with alpha particles (helium nuclei). Although such nuclear disintegration had been observed previously, his data explained this phenomenon for the first time and were useful in explaining disintegration by other means.

After graduating from Cambridge University in 1921, he spent ten years as a research worker in the Cavendish Laboratory. There he began to develop the Wilson cloud chamber—a device that detects the path of ionizing particles—into an automatic instrument for the study of cosmic radiation. He received the Nobel Prize for his interpretation of the data he obtained from this device. Blackett became professor of physics at the University of London in 1933 and Langworthy professor of physics at the University of Manchester in 1937. He established a school of cosmic-ray research and stimulated the development of other research interests, which led to the creation of the first chair of radio astronomy, at the University of Manchester, and to the building of the Jodrell Bank Experimental Station for Radio Astronomy. In 1953 he was appointed professor and head of the physics department of the Imperial College of Science and Technology in London, where he became senior research fellow in 1965. He was created a life peer in 1969.

blackfish, name given to various dark-coloured fishes, including the tautog (*see* wrasse), bowfin, Alaska blackfish (*qq.v.*), and black sea bass (*see* sea bass). Also known as blackfish are the pilot whale (*q.v.*), a mammal; *Orthodon microlepidotus,* a California minnow; the black ruff (*Centrolophus niger*), a European deep-sea rudderfish; and several Australian food fishes.

Blackfoot, group of three closely related Algonkian-speaking Indian tribes in Alberta and Montana, comprising the Pikuni, or Piegan, the Kainah, or Blood, and the Siksika, or Blackfoot proper (often referred to as the Northern Blackfoot). They were among the first Algonkians in the westward movement from timberland to open grassland and probably migrated on foot using wooden travois drawn by dogs to transport their goods. In the early 18th century these tribes were pedestrian buffalo hunters living in the Saskatchewan Valley about 400 miles east of the Rockies. They acquired horses and firearms before 1750. Driving weaker tribes before them, they pushed westward to the Rockies and southward into present Montana. At the height of their power, in the first half of the 19th century, the Blackfoot held a vast territory extending from northern Saskatchewan to the southernmost headwaters of the Missouri.

In a Piegan lodge, photograph by Edward S. Curtis, 1910; from *The North American Indian*

Courtesy of the Edward E. Ayer Collection, The Newberry Library, Chicago

The Blackfoot were known as the strongest and most aggressive military power on the northwestern plains. For a quarter of a century after 1806, they prevented white men, whom they regarded as poachers on Indian land, from trapping in the rich beaver country of the upper tributaries of the Missouri. At the same time they warred upon neighbouring tribes, capturing horses and taking scalps.

Each Blackfoot tribe was divided into several hunting bands led by one or more chiefs. These bands wintered separately in sheltered river valleys. In summer the scattered bands gathered in a great encampment to observe the Sun Dance, the principal tribal religious ceremony. Many individuals owned elaborate medicine bundles, which they believed would bring success in war and hunting and protection against sickness and misfortune.

For three decades after their first treaty with the United States in 1855, the Blackfoot declined to forsake hunting in favour of farming. When the buffalo were almost exterminated in the early 1880s, nearly one-quarter of the Piegan died of starvation. Thereafter the Blackfoot made some progress as farmers and cattlemen. In the late 20th century more than 6,000 Indians (mostly of Piegan descent) lived on the Blackfeet Indian Reservation in Montana. Fewer than 20 percent of them were full bloods. In addition, there were 2,600 Indians on the Blackfoot, Blood, and Piegan reserves in Alberta.

Blackfoot, city, seat (1885) of Bingham County, southeastern Idaho, U.S., near the confluence of the Snake and Blackfoot rivers. Founded on the Utah Northern Railroad in 1878, at the northern edge of Fort Hall Indian Reservation (1869), it evolved as the centre of an irrigated agricultural (chiefly potato-growing) area. Development was stimulated by the establishment in 1949 of the National Reactor Testing Station (now Idaho National Engineering Laboratory), 32 miles (51 km) northwest. Nearby is the site of the original Ft. Hall trading post built in 1834 by the Hudson's Bay Company. Inc. 1907. Pop. (1982 est.) 10,082.

Blackfriars Theatre, either of two separate theatres, the second famed as the winter quarters (after 1608) of the King's Men, the company of actors for whom Shakespeare served as chief playwright and also as a performer. The name of the theatres derives from their location on the site of a 13th-century Dominican (the Black Friars) priory lying within the City of London between the River Thames and Ludgate Hill. The estates of the priory were split up in 1538 at the suppression of the English monasteries under Henry VIII, and in 1576, under Elizabeth I, Richard Farrant, Master of the Children of the Chapel (*see* children's company), leased part of the buildings along the western side of the priory cloisters so that the Children could present their plays in this "private" theatre before performing them at court. Other children's companies also acted there, until 1584, when the buildings reverted to their owner.

In 1596 another part of the old monastery was bought by James Burbage, who converted it into a theatre. Opposition to the scheme forced him to lease it to children's companies. Richard Burbage, principal actor with the Chamberlain's Company (or Chamberlain's Men, who acted at the Globe Theatre), inherited the second Blackfriars Theatre in 1597, and in 1608 he formed a company of "owners" (called housekeepers) along the lines of that operating at the Globe Theatre. His company of players (by now called the King's Men) played at the Blackfriars during the winter seasons. Shakespeare's later plays were performed there, as were works by Beaumont and Fletcher. The Blackfriars was forced to close on the outbreak of Civil War in 1642. It was demolished in 1655. Its site is today commemorated by Playhouse Yard.

Blackheath, open common and residential area mainly in the Greater London boroughs of Lewisham and Greenwich, about 6 miles (10 km) southeast of the centre of London. Formerly a heath crossed by the Roman Watling Street (now Shooter's Hill), it was the rallying ground of two historic English popular rebellions, under Wat Tyler (died 1381) and Jack Cade (died 1450). It is reputed to be the site of England's first game of golf (by James I of Great Britain [1566–1625]), was a notorious haunt of highwaymen, and now serves as a recreational common of 267 acres (108 hectares).

Blackjack, also called B.J., TWENTY-ONE, VINGT-ET-UN, VAN JOHN, and PONTOON, the most popular bank card game. Its origin is disputed, but it is certainly related to the French Ferme and Chemin de Fer and the Italian Seven and a Half. Players hope to get a total card value of 21 or to come closer to it, without going over, than the dealer, against whom all betting is done.

In the noncasino private game, a 52-card deck is used. The dealer, who may be chosen in several ways in a preliminary round of play, declares his limit on bets. Aces count as 1 or 11, at the option of the holder; face (court) cards count 10 each; all others take their number value. The dealer shuffles the deck, and any other player has the right to cut it. The deck is then placed upon an upturned joker, which serves as an indicator card, or, if no joker is available, the dealer exposes the top card and "burns" it by placing it face up at the bottom of the deck; if the top card is an ace, he reshuffles and tries again. Depending on the version of private play, bets may be placed before the deal; after each player has been dealt one card face down; or after each player has received two cards face down and the dealer has exposed one of his cards. If a player's first two cards total 21 (one must be an ace, the other a 10 or face card), he has a natural, or blackjack, and wins double his bet. If the dealer has a blackjack, he collects the bets, or in some cases double the bets, of every player, except a player with another blackjack, who usually has his bet returned but in some versions of the game must also pay the dealer.

After settling any natural blackjack bets, the dealer offers additional cards to each other player in turn. If a player stands, it means he wants no more cards. If he says "hit me," he receives cards one at a time until he stands or he goes over 21. If the latter occurs, the player loses and pays the dealer immediately.

The dealer, who plays last, also stands or draws additional cards. If he goes over 21, all remaining players are paid their bets. If the dealer stands on, say, 18, he announces "pay 19," because the dealer wins on ties as well as on hands that total less than his. Bets are settled; the collected cards go face up at the bottom of the deck; and a new hand is dealt. The deal passes to the first player not the dealer to receive a blackjack.

Because of the betting advantage in having the deal, casinos assign a permanent dealer to each table, and the players oppose the house. Casino rules differ from those described above: players place bets before receiving cards, blackjacks are paid one and a half times the bet, ties are a standoff, and the dealer stands on counts of 17 or more and draws on 16 or less. The players receive two cards face down; the dealer may use a single deck from the hand or two or four decks from a holder called a shoe.

Blackmore, Sir Richard (b. 1654, Corsham, Wiltshire, Eng.—d. 1729, Boxted, Essex), English physician and writer, physician in ordinary to King William III (who knighted him in 1697 for professional services) and Queen Anne. Though he regarded poetry as merely the entertainment of his idle hours, he wrote four epics in 10 or more books, *Prince Arthur* (1695), *King Arthur* (1697), *Eliza* (1705), and *Alfred* (1723).

To each poem he wrote a preface censuring the lewdness and impiety of modern wits, a subject also treated in his verse *Satyr Against*

Wit (1700). These and other writings in prose provoked retorts from Alexander Pope and his friends and earned Blackmore his reputation as "father of the Bathos, and indeed the Homer of it."

Blackmore, Richard Doddridge (b. June 7, 1825, Longworth, Berkshire, Eng.—d. Jan. 20, 1900, Teddington), English Victorian novelist whose novel *Lorna Doone* (1869) won a secure place among English historical romances.

Educated at Blundell's School, Tiverton, and at Exeter College, Oxford, Blackmore was called to the bar but withdrew because of ill health. He married in 1852 and taught classics for five years. Then, upon receiving a legacy, he bought a property at Teddington and settled down to fruit growing and novel writing. After publishing some poems, Blackmore produced *Clara Vaughan,* a first and fairly successful novel, in 1864 and *Cradock Nowell* in 1866. *Lorna Doone* (1869) was his third. Its popularity grew slowly, until the qualities of this imaginative and exciting tale of Exmoor eventually brought it fame. Blackmore himself, a shy, reserved, but kindly man who was prouder of his peach orchard than of his 14 novels, preferred his *Maid of Sker* (1872).

Blackmun, Harry Andrew (b. Nov. 12, 1908, Nashville, Ill., U.S.), associate justice of the United States Supreme Court from 1970.

Blackmun graduated in mathematics from Harvard in 1929 and received his law degree from that institution in 1932. He joined a Minneapolis, Minn., law firm in 1934, and while advancing to general partner in the firm he also taught at the St. Paul College of Law (1935–41). In 1950 he became resident counsel for the Mayo Clinic in Rochester, Minn., and held this post until 1959, when he was appointed a judge of the U.S. Court of Appeals by Pres. Dwight D. Eisenhower. During his 11 years of service on that bench Blackmun earned a reputation for fairness, thoroughness, and judicial caution.

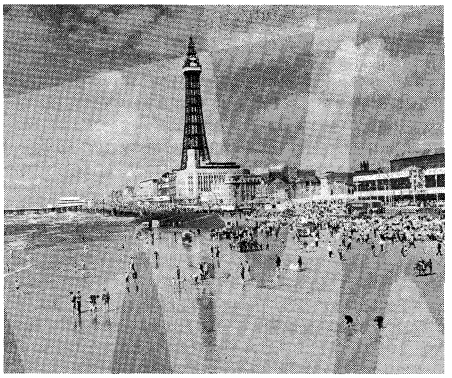
In 1970, after two of his previous nominees had been rejected by the Senate as unqualified, Pres. Richard M. Nixon named Blackmun to the Supreme Court. Blackmun was unanimously confirmed by the Senate and took his seat in June 1970. On the court he joined his close friend from boyhood, Chief Justice Warren E. Burger.

Blackmun was most often characterized as a moderate who leaned slightly toward conservatism on some issues. He wrote the court's majority decision in *Roe* v. *Wade,* the landmark 1973 case in which a woman's right to decide for herself whether or not to bear a child was guaranteed under the Fourteenth Amendment. The decision established women's right to have abortions without undue restrictive interference from the government.

blackpoll warbler, species of woodwarbler (*q.v.*).

Blackpool, district (borough), county of Lancashire, England, on the Irish Sea coast. The largest and most popular resort in the country, it has an area of 13 sq mi (35 sq km).

Blackpool's growth has been fairly rapid since the late 18th century, when it was transformed from a small hamlet clustered around a "black pool" into a fashionable sea-bathing centre. Its early popularity is ascribed to the British scientific writer William Hutton, who popularized the health-giving properties of seawater. Its proximity to the Lancashire industrial towns and the introduction of fast railway services brought about Blackpool's rapid 19th-century growth. About 7 mi (11 km) of seafront were laid out along the famous sandy beach. Further attractions included the building (1895) of the 520-ft (158-m) Blackpool Tower, a regional landmark modeled on the Eiffel Tower in Paris, and the introduction of illuminations, a complex decoration of seafront buildings by coloured lights and tableaux.



The tower (modeled after the Eiffel Tower in Paris) and the beach at Blackpool, Lancashire

Gavin Mather—DPI

Piers, golf courses, swimming pools, an ice rink, a zoological park, and extensive amusement parks help to attract millions of visitors to Blackpool annually, many of them members of working-class families from the industrial regions of the North of England. The borough has also developed as a major British conference and convention centre. Pop. (1984 est.) 146,000.

Blackrock, Irish CARRAIG DUBH, southeastern suburb of Dublin and an administrative part of Dun Laoghaire borough, on Dublin Bay. Blackrock grew substantially in the 18th century as a fashionable bathing resort; it developed further with the opening of the Dublin–Kingstown railway in 1834. Blackrock is now a popular seaside resort. Reminders of its former elegance are the 18th-century Maretimo and Frescati houses. Blackrock College, a boys' school, was founded in 1860. Pop. (1981) Blackrock electoral division, 13,824.

Blackshirt, Italian CAMICIA NERA, plural CAMICIE NERE, member of any of the armed squads of Italian Fascists under Benito Mussolini, who wore black shirts as part of their uniform.

The first squads—each of which was called Squadre d'Azione ("Action Squad")—were organized in March 1919 to destroy the political and economic organizations of the Socialists. By the end of 1920 the Blackshirts were attacking and destroying the organizations not only of Socialists but also of Communists, republicans, and others, and hundreds of people were killed as the Fascist squads expanded in number. A Fascist convention in Naples on Oct. 24, 1922, provided the pretext for the concentration of armed Blackshirts from all over the country for the famous March on Rome that put Mussolini into power.

Early the next year, on Feb. 1, 1923, the private Blackshirts were officially transformed into a national militia, the Milizia Volontaria Fascista per la Sicurezza Nazionale. The black shirt was worn not only by these military Fascists but often also by other Fascists and their sympathizers, especially on patriotic occasions. With the fall of Mussolini in 1943, however, the black shirt and the Blackshirts fell in disgrace.

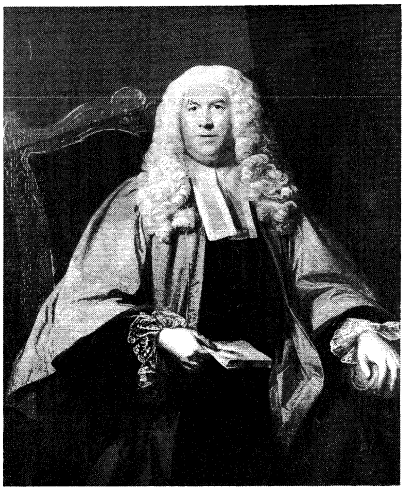
Blackshirts (Nazi corps): *see* SS.

blacksmith, also called SMITH, or FARRIER, craftsman who fits iron shoes to horses or other hoofed animals, and who fabricates other objects out of iron by hot and cold forging on an anvil or with a power hammer, or by welding and other means. The term blacksmith derives from iron, formerly called "black metal," and farrier from the Latin *ferrum,* "iron." The craft has been dying out with a decline in the use of horses for agriculture and transport.

In horseshoeing, the blacksmith first cleans and shapes the sole and rim of the horse's hoof with rasps and knives, a process painless to the animal owing to the tough, horny, and nerveless character of the hoof. He then selects a U-shaped iron shoe of appropriate size from his stock and, heating it red-hot in a forge, modifies its shape to fit the hoof, cools it by quenching it in water, and affixes it to the hoof with nails.

Blacksmiths also came to be general-purpose repairers of farm equipment and other machinery. The smithy, or blacksmith shop, with its clangor and sparks and neighing hobbled horses, in 19th-century America and later, became a place of fascination for children to visit, as reflected in Henry Wadsworth Longfellow's "The Village Blacksmith."

Blackstone, Sir William (b. July 10, 1723, London—d. Feb. 14, 1780, Wallingford, Oxfordshire, Eng.), English jurist who was the author of *Commentaries on the Laws of England,* 4 vol. (1765–69), the best known description of the doctrines of English law. The



Blackstone, oil painting attributed to Sir Joshua Reynolds; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

work became the basis of university legal education in England and North America. He was knighted in 1770.

Early life. Blackstone was the fourth and posthumous son of Charles Blackstone, a silk merchant of moderate means, and his wife, Mary, daughter of Lovelace Bigg of Chilton Foliat, Wiltshire. His mother died when Blackstone was 12. He was educated by his uncle Thomas Bigg, a London surgeon, first at the Charterhouse (1730–38) and then at Pembroke College, Oxford, where he read not only the classics but also logic and mathematics. Everything that he wrote shows a wide knowledge of literature and an allusive and elegant literary style.

In 1741 he became a student at the Middle Temple (Inn of Court). In 1743 he was elected a member of All Souls College, Oxford; a year later he became a fellow, and by 1746 he had become a barrister. His practice was not very successful, but in college affairs he at once proved himself an active and efficient man of business, zealous for order and improvement.

In 1750 Blackstone took the degree of Doctor of Civil Law. In July 1753 he decided to retire from his practice and concentrate on the teaching of academic law and legal work in and around Oxford. He had been recorder of Wallingford since 1749 and assessor (that is, judge) of the Chancellor's Court since 1751.

Blackstone had developed a great interest in common law, and in 1753 he began to lecture in that subject. These were the first lectures on English law ever delivered in a university. His listeners were captivated by the lucidity and charm of his style and by the simplicity with

which he presented the subject. Blackstone blurred the difficulties and contradictions of English law. He gave the whole subject an air of completeness and mutual interdependence as if it were a uniform logical system, suppressing or ignoring its archaic aspects and instead acclaiming English law as the embodiment of 18th-century wisdom. He stated his aims in a notice of his lectures dated June 23, 1753:

> It is proposed to lay down a general and comprehensive Plan of the Laws of England; to deduce their History; to enforce and illustrate their leading Rules and fundamental Principles; and to compare them with the Laws of Nature and of other Nations.

In 1756 he published *An Analysis of the Laws of England,* a synopsis of his lectures for the guidance of his pupils. In October 1758 Blackstone was elected the first holder of a chair (the Vinerian professorship) of common law. His lectures formed the basis of his *Commentaries,* which were published in four successive volumes between 1765 and 1769.

Public life. For several years Blackstone combined academic life in Oxford with an increasingly active public life in London. In 1759 he resigned the office of assessor of the Chancellor's Court and in 1761 became a bencher (lecturer and supervisor) of the Middle Temple. In March 1761 he was elected member of Parliament for Hindon, in Wiltshire, but with no great enthusiasm on his own part. In May 1761 he married Sarah, daughter of James Clitherow of Boston House, Brentford, and bought Priory Place, Wallingford. In July 1761 he was appointed principal of New Inn Hall, and in 1763 he became solicitor general to the queen. Blackstone decided to leave academic life after his proposal to convert New Inn Hall into a specialized college of common law was rejected. In 1766 he resigned both his chair and his headship of the hall.

Blackstone sat in the House of Commons for nine years as member of Parliament for Hindon (1761–68) and for Westbury (1768–70). He was not a zealous politician. He described himself as "amid the Rage of contending Parties, a Man of Moderation." He was not a particularly successful politician, and he spoke mainly on legal and constitutional questions. The most conspicuous of these was the Middlesex election of 1769, when he supported the expulsion of the political reformer John Wilkes from the House of Commons. His opinion on this controversy was attacked as being inconsistent with the legal principles he enunciated in his *Commentaries.*

In 1770 Blackstone refused the office of solicitor general but accepted that of judge of the Common Pleas. In the 10 years of his judgeship he administered the law satisfactorily but attained no special distinction. Toward the end of the 1770s his health failed; he died in February 1780 and was buried, by his wish, in St. Peter's Church.

Assessment. Blackstone was a good judge but a better commentator. The *Commentaries* is a systematic, clear, and elegant description of the state of English law in the middle of the 18th century. It had an immediate and outstanding success. In England and America the *Commentaries* became the basis of university legal education.

Blackstone was by no means a scientific jurist. He had only the vaguest possible grasp of the elementary conceptions of law. He evidently regarded the law of England as the rules of action or conduct imposed by a superior power on its subjects. He propounds the doctrine that municipal laws derive their validity from their conformity to the so-called law of nature, or law of God. "No human laws," he says, "are of any validity if contrary to this." His fundamental distinction between the rights of persons and the rights of things, implying as it did that things as well as persons have rights, is attributable to a misunderstanding of the technical terms of the Roman law. In distinguishing between private and public wrongs (civil injuries and crimes) he fails to understand the true principle of the division. By his tendency to substitute loose literary phrases for precise and closely defined terms he falls occasionally into irreconcilable contradictions. Even in discussing a subject of such immense importance as equity, he hardly discriminates between the legal and popular senses of the word, and, from the small place which equity jurisprudence occupies in his arrangement, he would scarcely seem to have realized its true position in the law of England. Subject, however, to these strictures, the completeness of the treatise, its serviceable if not scientific order, and its powerful and lucid exposition demand recognition. Blackstone's defects as a jurist are more conspicuous in his treatment of the underlying principles and fundamental divisions of the law than in his account of its substantive principles.

Blackstone did not confine himself to the work of a legal commentator. It was his business, especially when he touched on the framework of society, to find a basis in history and reason for all the most characteristic English institutions. There is not much either of philosophy or fairness in this part of his work, and Blackstone generally shows himself to be a specious defender of the existing political and social order.

Contemporary criticism of the *Commentaries* was directed not against the book as a whole but against particular points. Blackstone's view that dissent, in law, remained a crime was particularly criticized. The most damaging criticism came near the end of Blackstone's life and had its greatest effect after his death. This was the philosopher Jeremy Bentham's attack on him as an "enemy of reformation," an attack which was basically that of a dogmatic legal reformer upon a historical expositor of the law. But Blackstone was not necessarily a defender either of the status quo or of vested interests. He certainly believed that the constitution was "wisely contrived," but he was aware that it had faults. Passages in the *Commentaries* could well have been quoted in favour of parliamentary reform—the statement that there might be "a more complete representation of the people," and the disapproval of influence and of rotten boroughs, for example.

But it would be absurd to expect the *Commentaries* to be primarily a plea for reform. Its purpose, like that of the lectures it is based on, is to explain and describe. Blackstone's description of the law as it existed was accurate and comprehensive and was of great use to those who wished to reform it. His description of the constitution was much more in keeping with the facts than some of his critics allowed; his statement of the sovereignty of Parliament and his recognition of the implications of sovereignty went beyond those of all predecessors. Having said this, it is still undeniable that the *Commentaries*' merit as a work of literature easily outweighs its value as a treatise on government. It is written in an allusive and elegant style and its language is simple and clear. Whether because of its literary qualities or its flattery of public prejudices, the influence of the book in England was extraordinary. It was accepted as an authoritative revelation of the law, and it performed for the educated classes in England much the same service as was rendered to the people of Rome by the publication of their previously unknown laws. It is more correct to regard it as a handbook of the law for laymen than as a legal treatise; and as the first book of the kind in England it was received with somewhat indiscriminating reverence. To this day Blackstone's criticism of the English constitution probably expresses the most profound political convictions of the majority of the English people.

The fame of Blackstone in the 19th century was greater in the United States than in Blackstone's native land. After the American Revolution the *Commentaries* was the chief source of the knowledge of English law in the American republic. A book that in the old country was a textbook became in the new an oracle of law. The results of this transposition were not always good, but, fortunately, living law in America was being shaped through local institutions, and the country's legislators and judges were practical men in spite of the *Commentaries.* By the later 19th century American legal scholars had begun to escape from Blackstone's influence, and by the mid-20th century few Americans had read Blackstone even as a classic. Nevertheless, Blackstone is a symbol American lawyers remember.

BIBLIOGRAPHY. James Clitherow, preface to *Reports of Cases Determined in the Several Courts of Westminster-Hall from 1746 to 1779, Taken and Compiled by Sir W. Blackstone,* 2 vol. (1781), the basic account of Blackstone's life, written by his brother-in-law; William S. Holdsworth, *A History of English Law,* vol. 12 (1938), a full account of Blackstone's career and an assessment of the *Commentaries;* Harold G. Hanbury, *The Vinerian Chair and Legal Education* (1958), contains chapters on Blackstone, the *Commentaries,* and minor works; W.R. Ward, *Georgian Oxford: University Politics in the Eighteenth Century* (1958), gives an account of Blackstone's part in Oxford politics; for references to Blackstone's constitutional ideas, see B. Kemp, *King and Commons, 1660–1832* (1957).

Blackstone River, river rising in south central Worcester County, Mass., U.S., and flowing generally southeast past Worcester city and Northbridge, Mass.; it continues across the northeast corner of Rhode Island, past Woonsocket, Central Falls, and Pawtucket, where it becomes the Seekonk River (*q.v.*). In its course of about 50 mi (80 km), the Blackstone furnishes power to a highly industrialized region. It was named for William Blackstone, first white settler in what is now Cumberland, R.I.

blackthorn, also called SLOE (*Prunus spinosa*), spiny shrub, of the rose family (Rosaceae), native to Europe but cultivated in other regions. The name is also applied to *Cratageus calopendron* (or *C. tomentosa*), commonly called pear haw, another shrub or

Blackthorn (*Prunus spinosa*)
G.R. Roberts

small tree of the rose family. *P. spinosa* usually grows less than 3.6 metres (12 feet) tall and has numerous, small leaves. Its dense growth makes it suitable for hedges. The white flowers, about 2 centimetres (0.8 inch) in diameter, appear before the leaves. The bluish-black, tart-flavoured fruit is about 2 cm in diameter and is used to flavour sloe gin.

blacktip shark, any of several shark species in the family Carcharhinidae. *See* carcharhinid.

Blackton, J(ames) Stuart (b. Jan. 5, 1875, Sheffield, Yorkshire, Eng.—d. Aug. 13, 1941, Hollywood), British-born U.S. film director and producer who introduced animation and other important film techniques that helped

shape and stimulate the development of cinematic art.

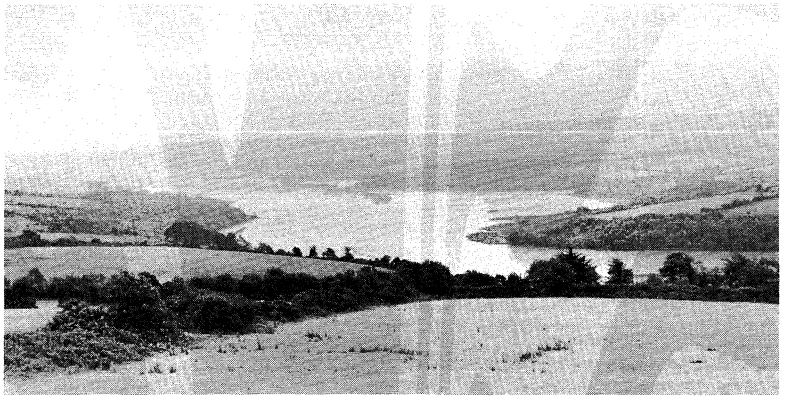
While interviewing Thomas A. Edison in 1895, Blackton's interest in films was so aroused that in the following year he and Albert E. Smith established Vitagraph; in 1899 they were joined by William T. Rock. Their first film, *The Burglar on the Roof* (1897), was followed by a long series of film successes that made Blackton a millionaire. He left Vitagraph for a while but returned to work for the company until it was sold in 1926 to Warner Brothers.

Blackton's motion-picture adaptations of Shakespeare's dramas were the first such produced in the United States. Many other of his films were centred on such well-known characters as Sherlock Holmes, Oliver Twist, Salome, Richelieu, Moses, and Saul and David. After losing his fortune in the economic depression of 1929, Blackton supported himself by exhibiting his old films at sideshows.

Blackwater, town, central Queensland, Australia. It lies along the Capricorn Highway, 100 miles (160 km) west of Rockhampton. The explorer Ludwig Leichhardt noted the presence of coal in the area in 1844–45; the town was laid out in 1886 and given its name because of the dark colour of the local waterholes, but until 1962 its population remained at about 25. In that year, the first of several seams of coking coal was discovered, and the Utah Development Company commenced mining about 15 miles (24 km) south of the town. Beef cattle are also grazed in the area. Pop. (1981) 5,434.

Consult the INDEX *first*

Blackwater, River, Irish AN ABHAINN MHÓR, river rising in the uplands on the border of Counties Cork and Kerry, Ireland, and flowing 104 miles (167 km) to the sea at Youghal, County Cork. In its upper course the Blackwater flows between uplands and a sandstone ridge with summits above 2,200 feet (670 m). East–west lines of hills mark the entire upper course of the Blackwater, and so for most of its length the river flows west to east; but at Cappoquin, County Waterford, it suddenly turns southward and flows for the last 15 miles (24 km) of its course across the Drum Hills and the Youghal and Clashmore anticlines. Above Cappoquin the river's broad valley is characterized by pastures, woodlands, and large estates. Below Cappoquin the river cuts across the grain of the land in a series of gorges and depressions. The Blackwater is noted for its trout and salmon fishing.



River Blackwater near Youghal, County Cork
Claude Jacoby

Blackwater, River, Irish AN ABHAINN MHÓR, river in Northern Ireland, rising in the uplands near the Dungannon Fermanagh district boundaries and fed by a network of small streams northeast of a drainage divide near Fivemiletown. The river flows northeast through southern Dungannon district and then turns southeast, forming part of the border with the Republic of Ireland. West of Tynan it turns northeast again and flows across the Moy-Caledon lowland and the central lowland to enter Lough (lake) Neagh, after a course of 50 miles (80 km). Immediately south of Lough Neagh, drumlins (oval mounds of glacial till) provide the only sites that are normally dry in an area subject to flooding.

blackwater fever, also called MALARIAL HEMOGLOBINURIA, one of the most dangerous complications of malaria. It occurs almost exclusively with infection from the parasite *Plasmodium falciparum*. Blackwater fever has a high mortality. Its symptoms include a rapid pulse, high fever and chills, extreme prostration, a rapidly developing anemia, and the passage of urine that is black or dark red in colour (hence the disease's name). The distinctive colour of the urine is due to the presence of large amounts of hemoglobin, released during the extensive destruction of the patient's red blood cells by malarial parasites. Patients frequently develop anemia because of the low numbers of red blood cells. The presence of blood pigments in the blood serum usually produces jaundice early in the course of the disease.

Blackwater fever is one of the less-common complications of malaria; it is most prevalent in Africa and the Far and Middle East. Nonimmune immigrants in heavily endemic areas are frequent sufferers from the complication. Blackwater fever seldom appears until a person has had at least four attacks of malaria and has been in an endemic area for six months. Blackwater fever is treated by whole-blood transfusions and complete bed rest, but even with these measures the mortality remains about 25 to 50 percent.

Blackwell, Alice Stone (b. Sept. 14, 1857, Orange, N.J., U.S.—d. March 15, 1950, Cambridge, Mass.), suffragist and editor of the leading American women's rights newspaper.

Blackwell was the only child of Henry Blackwell and Lucy Stone, noted Abolitionists and women's rights advocates, and was also the niece of the feminist leaders Elizabeth Blackwell and Antoinette Brown Blackwell. Alice Blackwell graduated from Boston University in 1881. From 1882 to 1917, she was an editor of the *Woman's Journal*, the major newspaper of the suffragist movement. She is credited with the merging of the two rival suffrage organizations—the National and the American Woman Suffrage associations—into one unified group in 1890. She then served for nearly 20 years as secretary of the National American Woman Suffrage Association.

Her publications include, with Anna Howard Shaw and Lucy E. Anthony, *The Yellow Ribbon Speaker* (1890), *Lucy Stone, Pioneer in Women's Rights* (1930), and translations of poems into English from 10 languages, including Armenian, Russian, and Yiddish.

Blackwell, Antoinette Brown, *née* BROWN (b. May 20, 1825, Henrietta, N.Y., U.S.—d. Nov. 5, 1921, Elizabeth, N.J.), first woman to be ordained a minister of a recognized denomination in the United States.

Antoinette Brown studied theology at Oberlin College (Ohio) and, while there, organized, with Lucy Stone, the first debating society for college women. Although she completed her courses in 1850, she was not allowed to graduate officially because of her sex. In 1853 she was ordained minister of a Congregational church in Wayne County, N.Y., becoming the first woman minister in America and eliciting nationwide controversy. The next year, however, she resigned her pulpit because of theological differences with the congregation; she later became a Unitarian minister and served a church in Elizabeth, N.J.

Brown also was known as a lecturer on topics of abolition, temperance, and women's rights. In 1856 she married Samuel Charles Blackwell, a businessman who supported her activities. She was a prolific writer, contributing to the *Woman's Journal,* a suffrage periodical, and writing several books on evolution, feminism, and religion. Her works include *Shadows of Our Social System* (1855), *The Sexes Throughout Nature* (1875), and *The Making of the Universe* (1914).

Blackwell, Elizabeth (b. Feb. 3, 1821, Counterslip, Bristol, Gloucestershire, Eng.—d. May 31, 1910, Hastings, Sussex), Anglo-American physician who is considered the first female doctor of medicine in modern times. She was the first woman to gain the M.D. degree from a medical school in the United States, graduating in 1849 from the Geneva (N.Y.) Medical College (forerunner of Hobart College).

The Blackwell family immigrated to New York in 1832. When her father died in 1838, she and her sister helped to support the family by establishing a boarding school for girls. She began her medical education by reading medical books and later had private instruction from Samuel H. Dickson, of the Charleston (S.C.) Medical College. Medical schools in New York and Pennsylvania rejected her applications for formal study until, in 1847, she was accepted at the Geneva Medical College. Although she suffered social ostracism by her fellow students and the public, she graduated at the head of her class in 1849.

After graduate studies at St. Bartholomew's Hospital, London, and on the Continent, she practiced in New York City, where in 1857, in spite of much opposition, she established the New York Infirmary, a hospital staffed entirely by women. Later she founded a full course of medical education for women there. In 1869 Blackwell moved to England, where she was a founder of the London School of Medicine for Women.

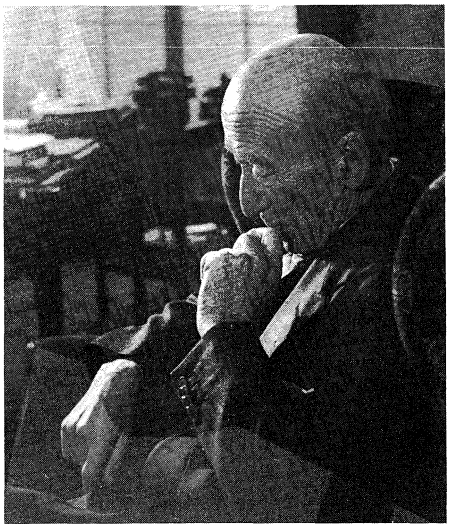
Blackwell, John, pseudonym ALUN (b. 1797, Mold, Flintshire, Wales—d. May 19, 1840, Cardigan, Cardiganshire), poet and prose writer, regarded as the father of the modern Welsh secular lyric.

While an apprentice shoemaker, he began attending meetings of the Cymreigyddion, an organization of Welshmen in London dedicated to preserving ancient Welsh literature, and he competed at eisteddfodau (poetic assemblies). With financial help from friends he attended the University of Oxford, graduating in 1828, in which year his elegy to Bishop Heber won the prize at the Denbigh eisteddfod. In 1833 Blackwell became rector of Maenordeifi, Pem-

brokeshire, and in 1834–35 he was editor of a Welsh magazine, *Y Cylchgrawn.* His collected works were published as *Ceinion Alun* (1851).

Blackwood, Algernon Henry (b. March 14, 1869, Shooters Hill, Kent, Eng.—d. Dec. 10, 1951, London), preeminent British writer of tales of mystery and the supernatural.

After farming in Canada, operating a hotel, mining in the Alaskan goldfields, and working as a newspaper reporter in New York City, ex-



Algernon Blackwood, 1948
Tom Blau from Camera Press

periences that he recalled in *Episodes Before Thirty* (1923), Blackwood returned to England in 1899. Seven years later he published his first book of short stories, *The Empty House* (1906), and became a full-time fiction writer. Later collections include *John Silence* (1908), stories about a detective sensitive to extrasensory phenomena, and *Tales of the Uncanny and Supernatural* (1951), 22 stories selected from his nine other books of short stories.

In his later years Blackwood achieved a wide audience as a teller of ghost tales on British radio and television.

Blackwood, Frederick Temple Hamilton-Temple-: *see* Dufferin and Ava, Frederick Temple Hamilton-Temple-Blackwood, 1st marquess of.

Blackwood, William (b. Nov. 20, 1776, Edinburgh—d. Sept. 16, 1834, Edinburgh), Scottish bookseller and publisher, founder of the publishing firm of William Blackwood and Sons, Ltd.

After learning antiquarian bookselling, Blackwood set up a business in Edinburgh in 1804. By 1810 he was acting in Scotland for several London publishers and publishing on his

William Blackwood, detail of an oil painting by Sir William Allan; in a private collection
By courtesy of William Blackwood & Sons Ltd.

own account. In 1816 he brought out Walter Scott's *Tales of My Landlord.* In 1817 he founded the *Edinburgh Monthly Magazine,* later called *Blackwood's Edinburgh Magazine,* and from 1905 called *Blackwood's Magazine.* Established as a Tory counterweight to the Whiggish *Edinburgh Review,* it quickly gained notoriety with its satire on the Edinburgh Whigs and attacks on the Cockney school of poets, as it chose to designate Leigh Hunt and his circle; it also gained circulation by publishing stories, poems, and serialized novels. Later the magazine became less controversial and exercised a wide and steady literary influence. Scott, James Hogg, and Thomas De Quincey were among its early contributors.

Blackwood was succeeded by his sons Alexander (1806–45), Robert (1808–52), and John (1818–79). They added a London office to the business in 1840 and an Edinburgh printing office in 1847. After them the conduct of the firm passed, in turn, to William Blackwood (1836–1912), George Blackwood (1876–1942), James Blackwood (1878–1951), and George Douglas Blackwood (1909–), great-great-grandson of the founder. After the mid-19th century, the magazine published serially and then in book form works by George Eliot, Edward Bulwer-Lytton, Charles Lever, Anthony Trollope, and Joseph Conrad.

blackwork, embroidery worked in black silk thread, usually on white linen. It originated in Moorish Spain but is different from the embroidery known as Spanish work. Blackwork became especially popular in England as decoration for costumes and nightcaps and for common household objects such as bedding, tapestries, and pillow covers in Tudor and early Stuart times, reaching its peak during the Elizabethan Age.

Blackwork was occasionally embellished by the use of gold or silver thread and "owes," or sequins. A few examples of blackwork exist in which the colours are reversed—white embroidery worked into a solid black background.

Blad el-Hawa (Algeria): *see* Constantine.

bladder, membranous sac in animals that serves as the receptacle of a fluid or gas. *See* gallbladder; swim bladder; urinary bladder.

bladdernose seal: *see* hooded seal.

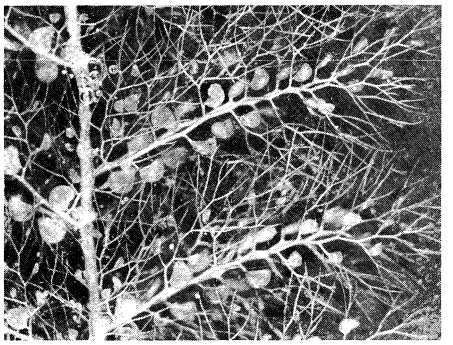
bladdernut, any shrub or small tree of the genus *Staphylea* of the family Staphyleaceae.

Bladdernut (*Staphylea colchica*)
Walter Dawn

All of the 10–15 known species occur in the North Temperate Zone.

The commonest species usually grow to about 3.5–4.5 metres (12–15 feet) tall. The trees are admired more for their handsome green foliage than for their rather inconspicuous flowers, which are white, greenish white, or pinkish. The fruit of the bladdernut is a distended membranous capsule usually with three sides.

bladderwort, any plant of the genus *Utricularia* (family Lentibulariaceae of the flowering



(Top) flowers and (bottom) leaves and bladders of bladderwort (*Utricularia*)
(Top) L.N. Dexter and Anella Dexter, (bottom) Grant Heilman—EB Inc.

plant order Scrophulariales). The bladderwort genus contains about 120 widely distributed species of land and water plants characterized by small hollow sacs that actively capture and digest tiny animals such as insect larvae, aquatic worms, water fleas, and other small swimmers.

The bladderwort plant is usually a horizontal attached or floating stem bearing simple or divided leaves and having bisexual, bilaterally symmetrical (two-lipped) flowers with two sepals, five fused petals, two stamens, and a superior ovary (*i.e.,* positioned above the attachment point of the other flower parts) composed of two ovule-bearing segments (carpels) and producing many seeds at maturity.

The bladders, or traps, are hollow structures having an entrance closed by a flexible door or valve. The interior of the trap is maintained under a state of water tension (pressure lower than that of the surrounding water) by a physiological process that causes water to pass from the interior to the outside. This results in a flattening or incurving of the trap walls, but the door remains secure. When a small animal approaches and strikes certain bristles that project from the surface of the door, it suddenly releases, and a quick inflow of water sucks the prey inside, where it is digested. The door closes again within about 1/35 second. Within about 15 to 30 minutes the trap again is "set" by passing water to the exterior.

Closely related to the bladderworts in the same family are the butterworts (*Pinguicula*), 35 species of land plants that capture insects by means of sticky glands on the leaf surfaces and digest them in specialized leaf margins that roll up on the prey, unrolling again after digesting it.

The bladderwort family also contains the genera *Genlisea* (15 species) and *Polypompholyx* (2 species). The family is of little economic importance except for its ornamental and novelty interest to plant growers.

blady grass: *see* cogon grass.

Blaenau Gwent, district, northwestern Gwent County, southeastern Wales. It was created in 1974 and covers 49 sq mi (127 sq km) of deep valleys and plateau uplands on the eastern rim of the South Wales coalfield. Blaenau Gwent district borders the districts of Brecknock to the north, Monmouth and Torfaen to the east, Islywn to the south, and Rhymney Valley to the west. Situated on the western edge of the

gateway region between England and Wales, the area experienced significant Norman influence during the 11th and 12th centuries, and many castles with characteristics similar to those of the nearby Welsh Marches (border country) were erected. In 1839 Chartists (agitators for parliamentary reform) held a secret meeting at Natyglo in the north and decided to march on nearby Newport. The attack was poorly planned; the Chartists walked into a trap and their leaders were arrested.

Blaenau Gwent, traditionally a coal-mining and steel-working region, has suffered serious economic decline in the mid-20th century as funds and industry were diverted south to the coastal areas fronting the Bristol Channel. Ebbw Vale, the administrative seat of the district, first developed as a coal-mining centre in the 18th century and subsequently turned to steel. In 1935 the faltering steelworks were subsidized by the government in order to retain jobs in the economically depressed area. In 1978, however, the steelworks closed down. The town of Abertillery in southern Blaenau Gwent likewise experienced the growth and decline of the coal trade, and since the 1930s it has also received economic aid from the government. New industries introduced in the area include the manufacture of nylon, textiles, electronics, and foodstuffs. The Brecon Beacons National Park extends into northeastern Blaenau Gwent and provides varied recreational opportunities. The district has excellent highway and motorway connections with western Wales, the Midlands, London, and northern and southern England. Pop. (1982 est.) 79,200.

Blagoevgrad, chief town of Blagoevgrad *okrŭg* (province), southwestern Bulgaria, in the Struma River Valley. An ancient Thracian settlement, Scaptopara, existed around its warm mineral springs, which still function as a spa. During the Turkish occupation (1396–1878), the town was called Dzhumaya (Džumaja), later, Gorna Dzhumaya; it was renamed in 1950 for Dimitŭr Blagoev, founder of the Bulgarian Communist Party. The chief centre of Bulgarian Macedonia, it trades chiefly in Oriental tobacco. Wood, canning, textile, and craft industries also have been developed. Pop. (1981 est.) town, 61,715; (1982 est.) *okrŭg*, 337,615.

Blagoveshchensk, also spelled BLAGOVEŠČENSK, city and administrative centre, Amur *oblast* (region), far eastern Russian Soviet Federated Socialist Republic, at the confluence of the Amur and Zeya rivers. Founded in 1856 as a fort, Blagoveshchensk has become a major centre of the Soviet Far East, with good communications by the navigable Amur, a connection to the Trans-Siberian Railroad, and several motor roads. Its industries are food processing; timber working; the making of gold-mining machinery, electrical apparatus, and woollens; and the building and repair of rivercraft. Pop. (1983 est.) 186,000.

Blaine, James G(illespie) (b. Jan. 31, 1830, West Brownsville, Pa., U.S.—d. Jan. 27, 1893, Washington, D.C.), a leading Republican politician and diplomat for 37 years (1859–93), who was particularly influential in launching the Pan-American Movement with Latin-American countries.

Blaine moved to Augusta, Maine, in 1854 to become editor and part owner of the *Kennebec Journal*, a crusading Republican newspaper. In 1856 he attended the first national convention of the newly organized Republican Party. He served in the state legislature from 1858 until his election to the U.S. House of Representatives in 1862. After the Civil War, he favoured a more moderate Reconstruction policy than the radicals of his party, although he was a strong advocate of Negro suffrage.

In 1868 Blaine was elected speaker of the House, where his eloquence and leadership won him a devoted body of followers. He became known as the "Plumed Knight," an appellation given him by Col. Robert G. Ingersoll of Illinois, who offered Blaine's name in nomination at the National Republican Convention of 1876. Blaine failed, however, to reply convincingly to charges that he had used his office for personal gain, and on the seventh ballot he lost the nomination to Rutherford B. Hayes.

Immediately after the election Blaine was appointed to the Senate to fill a vacancy, and he soon won election to a full term. In 1880 he again lost a bid for the presidential nomination, and, on the election of James A. Garfield, he resigned his Senate seat to become secretary of state. In this office he envisaged a system of inter-American arbitration to relieve tensions and strengthen the Monroe Doctrine, and in 1881 he revived the idea—conceived earlier in the century—of calling an inter-American conference to consider an arbitration plan designed to prevent wars in the Western Hemisphere. This idea marked the beginning of the Pan-American Movement. The assassination of President Garfield (1881), however, brought Blaine's resignation, and his Pan-American Conference was shelved by his successor.

Blaine finally won nomination for the presidency in 1884, only to lose by a narrow

Blaine, photograph by Mathew Brady
By courtesy of the Library of Congress, Washington, D.C.

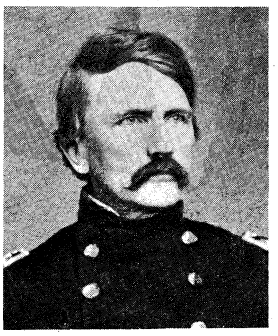
margin to the Democratic candidate, Grover Cleveland, after one of the most virulent campaigns in U.S. history. By 1889 the Republicans were back in power, and Blaine again became secretary of state. As such, he assumed the chairmanship of the first Pan-American Conference, which had been authorized by Congress the previous year. The recommendation of separately negotiated reciprocity treaties was the only positive action of the conference. Blaine's proposals for a customs union and arbitration were defeated.

Blaine resigned as secretary of state in June 1892, partly as a result of failing health (he was dead within seven months) but also to block a movement to place his name before the 1892 nominating convention. A standard biography is *James G. Blaine: A Political Idol of Other Days* (1934) by David S. Muzzey. See also Alice Felt Tyler, *The Foreign Policy of James G. Blaine* (1927).

Blair, Eric Arthur (English novelist): *see* Orwell, George.

Blair, Francis P(reston) (b. April 12, 1791, Abingdon, Va., U.S.—d. Oct. 18, 1876, Silver Spring, Md.), journalist and longtime Democratic politician who helped form the Republican Party in the 1850s in an effort to stem the expansion of slavery.

A loyal supporter of the Democratic leader Andrew Jackson, he established in 1830 the Washington *Globe*, a party organ, and also published the *Congressional Globe*. He was a political journalist of the first rank, a skillful party organizer, and a member of the "Kitchen Cabinet" during Jackson's presidency (1829–37). Although himself a slaveholder, as an expansionist he opposed the extension of slavery and in 1848 supported the Free-Soil presidential candidate, Martin Van Buren. One of the founders of the Republican Party, he assisted materially in Abraham Lincoln's nomination in 1860 and became an influential adviser in Lincoln's administration. The President approved Blair's unofficial and unsuccessful mission to negotiate peace at a conference at Hampton Roads, Va., in February 1865. After the war Blair supported Pres. Andrew Johnson's Reconstruction measures, opposed the Radical Republicans, and rejoined the Democratic Party.



Francis P. Blair
By courtesy of the Library of Congress, Washington, D.C.

Blair, Francis Preston, Jr. (b. Feb. 19, 1821, Lexington, Ky., U.S.—d. July 9, 1875, St. Louis, Mo.), Missouri politician of the antebellum, Civil War, and Reconstruction eras who opposed slavery and secession but later came out against Radical Reconstruction and black suffrage.

The son of the political journalist of the same name, Blair grew up in Washington, D.C.; was graduated from Princeton in 1841; and attended law school at Transylvania University, Lexington, Ky. By 1842 he was practicing law with his brother Montgomery in St. Louis.

During the Mexican War, Blair served briefly as attorney general of the conquered New Mexico Territory. Then he returned to his St. Louis law practice but shortly thereafter established the *Barnburner*, official newspaper of the Free-Soil Party in Missouri. Although a slaveowner himself, Blair opposed the extension of slavery into the territories on economic as well as moral grounds. He advocated gradual emancipation, followed by deportation and colonization of the freed blacks.

Although a controversial figure in Missouri due to his prominent role in organizing the state's Free-Soil Party, Blair was twice elected to terms in the Missouri legislature. In 1856 he won a seat in Congress, the only Free-Soiler from a slave state to do so. He lost his campaign for reelection in 1858 but returned to Congress as a Republican in 1860.

An outstanding stump speaker, Blair vigorously campaigned for Lincoln in the 1860 presidential contest while organizing the Republican Party in Missouri. In the House, he served as chairman of the Military Affairs Committee, while in Missouri he mobilized a secret pro-Union militia unit called the Wide Awakes. It was largely owing to Blair that the secession sympathizers in Missouri were held in check and that the state did not join the Confederacy.

In 1862 Blair recruited seven regiments in Missouri and accepted appointment as a brigadier general. He was promoted to major general after proving his ability as a commander at Vicksburg and other battlefronts. His final military activity of the Civil War was in

command of troops marching through Georgia with General Sherman.

Back in Congress in 1864, Blair boldly criticized the Radical Republicans and supported Pres. Abraham Lincoln's plan for Reconstruction. He opposed giving blacks the vote, disfranchising Southern whites, and imposing military governments on the states of the defeated Confederacy. He tried but failed to win back control of the Republican Party in Missouri from Radical control. By 1865 he had switched to the Democratic Party, and in 1868 he was the Democratic candidate for vice president.

Following Grant's victory in that election, Blair sought to align Missouri Democrats with the Liberal Republicans. This coalition eventually ousted the Radicals from control of the state government. Meanwhile, Blair won a seat in the state legislature and, in 1870, was chosen to fill an unexpired term in the U.S. Senate. When in 1872 he ran for a full term in the Senate, however, he was defeated. Shortly after that loss, he was stricken with paralysis and never again held major public office.

Blair, James (b. 1656, probably Edinburgh—d. April 18, 1743), clergyman and founder (1693) of the College of William and Mary, Williamsburg, Va., the second oldest institution of higher learning in the United States.

Blair was ordained in the Church of England (1679) but was deprived of his parish in Edinburgh in 1681 for refusing to take an oath supporting the legitimate claim of the Roman Catholic duke of York (afterward James II) as heir to the throne. In 1685 he left for North America, where he was elected rector of Varina parish, Henrico County, Va.

Appointed bishop's representative in Virginia in 1689, he proposed (1691) the founding of a college. With the endorsement of the Virginia General Assembly he returned to England to secure from the English sovereigns William III and Mary II a charter and a grant of funds for the college, which was named for its royal patrons. The charter was granted on Feb. 8, 1693. As first president of the college, Blair proved to be a canny and expert fund-raiser, extracting money from people of all ranks and persuasions and, especially, from the estate of the scientist Robert Boyle. He served for 50 years, one of the longest tenures of any university president.

Blair, John (b. 1732, Williamsburg, Va.—d. Aug. 31, 1800, Williamsburg, Va., U.S.), associate justice of the United States Supreme Court (1790–96).

A member of one of Virginia's most prominent landed families and a close friend of George Washington, Blair studied law at the Middle Temple in London and, in 1766, was elected to represent William and Mary College in the Virginia House of Burgesses. He served in the Burgesses until 1770 and then for five years as clerk of the royal governor's Council.

In 1776 he took part in the convention to frame a constitution and plan of government for the new commonwealth of Virginia and was elected to the state Privy Council. In 1778 he was elected one of the judges of the state General Court and later became its chief justice. He subsequently served as a judge of the High Court of Chancery and was a judge of the Court of Appeals when it heard the case of *Commonwealth of Virginia* v. *Caton* in 1782. He sided with the majority when it laid down the principle that a court can annul a law deemed to conflict with the constitution. Blair took part in the constitutional convention of 1787 and, in 1789, was appointed by Pres. Washington to the U.S. Supreme Court (taking his oath of office the following year). He was a judicial conservative and served on the court until his retirement in 1796.

Blair, Robert (b. 1699, Edinburgh—d. Feb. 4, 1746, Athelstaneford, East Lothian, Scot.), Scottish poet remembered for a single poem, *The Grave*, which was influential in giving rise to the graveyard school (*q.v.*) of poetry.

Educated in Edinburgh and Holland, Blair was ordained in 1731 and appointed to Athelstaneford, East Lothian. He was happily married, had six children, and devoted his leisure to poetry, botany, and optical experiments.

The Grave (1743), a long, uneven poem in blank verse, is a reflection on human mortality in mortuary imagery. Though it appeared a year after Edward Young's *The Complaint: Or, Night-Thoughts on Life, Death, & Immortality*, it is apparently uninfluenced by that work but reflects the general tendency to exploit sensibility and pathos that coexisted peacefully with 18th-century Rationalism. *The Grave* has none of the oppressive self-pity or pretentiousness of *Night-Thoughts*. Its blend of Scottish ghoulishness and brisk sermonizing is presented in Shakespearean rhythms with a certain natural cheerfulness. William Blake made 12 illustrations that appeared in the 1808 edition.

Blais, Marie-Claire (b. Oct. 5, 1939, Quebec [city]), French-Canadian novelist and poet, known for reporting the bleak inner reality of characters born without hope, their empty lives often played out against a featureless, unnamed landscape. In her work, inner and outer desolation pursue her social outcasts, exiles, prostitutes, homosexuals, and, especially, mothers and children through loveless relationships. Without pity or passion, Blais recreates a harsh milieu of grinding poverty, peopled with victims tied by ignorance to low concerns.

In two early dreamlike novels, *La Belle Bête* (1959; *Mad Shadows*) and *Tête blanche* (1960), Blais stakes out her territory—lower-class people doomed to unrelieved sorrow and oppression. In later novels, *Une Saison dans la vie d'Emmanuel* (1965; *A Season in the Life of Emmanuel*); *Manuscrits de Pauline Archange* (1968) and *Vivre! Vivre!* (1969), published together as *The Manuscripts of Pauline Archange* in English in 1970; and *Un Joualonais sa Joualonie* (1973; *St. Lawrence Blues*), she moves her characters into a recognizably Canadian world. Blais studied at Laval University, Quebec, and was made a Companion of the Order of Canada. In 1966 the French awarded her the Prix Médicis.

Blaise, SAINT, Latin BLASIUS, also called BLAZEY (b. Sebastia, Cappadocia, Asia Minor—d. *c.* 316, Sebastia?; feast day, Western Church, February 3; Eastern Church, February 11), early Christian bishop and martyr, one of the most popular medieval saints, solemnly venerated as the patron saint of sufferers from throat diseases.

According to tradition, he was of noble birth and, after being educated in the Christian faith, was made bishop of Sebastia. Although Christianity had been adopted *c.* 300 as the state religion in Armenia, the Roman emperor Licinius began a persecution of the Christians, and Blaise was discovered and apprehended. While imprisoned he miraculously cured a boy from fatally choking. After being torn with wool combers' irons, Blaise was beheaded.

Subsequent legends, notably the apocryphal *Acts of St. Blaise*, claim that before Blaise was made bishop he was a physician possessed of wonderful healing power. Numerous miracles were also attributed to him, including the cure of diseased beasts during his refuge, thus accounting for his also being the patron saint of wild animals. He was venerated as the patron of sufferers from throat diseases in the East by the 6th century and in the West by the 9th century. Blaise's cult spread throughout Christendom from the 8th century. In Germany he was counted among the Fourteen Holy Helpers.

Begun in the 16th century, the Blessing of St. Blaise is a ceremony still practiced and celebrated on his feast day. Two candles are consecrated and crossed before the congregation; or a wick, consecrated in oil, is touched to the throats of the faithful. Blaise's emblems are wax, taper, iron combs (the supposed instruments of his passion), or two crossed candles; in art he is sometimes represented in a cave with animals. Many churches, such as that in Regensburg, W.Ger., were dedicated to him.

Blake, Eubie, byname of JAMES HUBERT BLAKE (b. Feb. 7, 1883, Baltimore, Md., U.S.—d. Feb. 12, 1983, Brooklyn, N.Y.), American pianist and composer of ragtime music and show tunes.

Blake first exhibited a natural aptitude for the keyboard on a home pump-organ at age six. As a teenager, he played piano in cafes and brothels, and in 1899 he played his first rag, "Sounds of Africa," published in 1919 as "Charleston Rag." His meeting with the lyricist and vocalist Noble Sissle in 1915 resulted in a long association between the two entertainers. They were among the first black performers to appear onstage without minstrel makeup. Their show *Shuffle Along* (1921) was among the first musicals to be written, produced, and directed by blacks. It featured Blake's best remembered song, "I'm Just Wild About Harry," and introduced three entertainers whose later careers would be notable: Paul Robeson, Florence Mills, and Josephine Baker. After Blake and Sissle broke up in 1925, he teamed with lyricist Andy Razaf to write the score to *Blackbirds of 1930,* which contained the popular song "Memories of You."

Blake continued his career as an entertainer, making both piano rolls and records and appearing in concerts. His sophisticated, witty elegance gave him a popularity that continued throughout his career. He retired at 63 to study music composition, transcribe his songs, and compose new songs but came out of retirement in 1969 to record an album. From then on he resumed performing, giving his last public concert in June 1982. He achieved his greatest fame when a musical based on his songs, *Eubie,* opened on Broadway (1978). In 1981 Blake was awarded the Medal of Freedom. In 1973 a picture biography, *Reminiscing With Sissle and Blake*, by Robert Kimball and William Bolcom, was published.

Blake, Eugene Carson (b. Nov. 7, 1906, St. Louis, Mo., U.S.—d. July 31, 1985, Stamford, Conn.), churchman and ecumenical leader who was a major figure in American Protestantism during the 1950s and '60s.

Blake was educated at Princeton University (B.A., 1928) and at Princeton Theological Seminary (Th.B., 1932). He held Presbyterian pastorates in New York City, Pasadena, Calif., and elsewhere from 1932 to 1950. In 1948 he was a delegate to the first meeting of the World Council of Churches. Blake served as president of the National Council of Churches from 1954 to 1957. He was stated clerk, or executive director, of the General Assembly of the Presbyterian Church in the U.S.A. and its successor group, the United Presbyterian Church in the U.S.A., from 1951 to 1966. He left the latter post to serve as general secretary of the World Council of Churches (1966–72).

Blake was a talented administrator and organizer, but he was best known for his controversial and progressive stands on major church issues. He was a major advocate of church unity, and in 1960 he called for the unification of several major Protestant denominations into a single Protestant church. He also helped win acceptance of the Russian Orthodox Church and several other Eastern Orthodox denominations into the World Council of Churches. During the 1960s he participated in the U.S. civil rights movement and spoke out against the Vietnam War.

Blake, Robert (b. August 1599, Bridgwater, Somerset, Eng.—d. Aug. 7, 1657, at sea off Plymouth, Devon), admiral who, as commander of the navy of Oliver Cromwell's Commonwealth, became one of the most renowned seamen in English history.

The son of a well-to-do merchant, Blake graduated from Oxford University in 1625

Robert Blake, portrait miniature by Samuel Cooper; in the National Maritime Museum, Greenwich, Eng.
By courtesy of the National Maritime Museum, Greenwich, Eng.

and in 1640 was elected to the Short Parliament. His staunch Puritanism led him to join the Parliamentary cause against King Charles I at the outbreak of the Civil War in 1642. Soon he won fame as a general by brilliantly defending Lyme, Dorset, in 1644 and by holding Taunton, Somerset, from its besiegers for more than a year (1644–45).

In February 1649 Blake was appointed one of three "generals at sea" to command the navy. Two months later he set out to annihilate the small Royalist fleet of Prince Rupert. When Rupert took refuge with the Portuguese at Lisbon, Blake retaliated by seizing several Portuguese ships. He then pursued Rupert into the Mediterranean Sea and destroyed the Royalist squadron at Cartagena, Spain, in November 1650. The following May, Blake captured the Scilly Isles, off southwestern England, from the Royalists. Shortly thereafter he began to serve on the Council of State. On the outbreak of war between England and the Netherlands in 1652, Blake took command of the fleet in the English Channel, losing only one of the four major engagements he fought with the Dutch admiral Maarten Tromp between May 1652 and June 1653. After peace was concluded with the Dutch in 1654, Cromwell instructed Blake to make English naval power felt in the Mediterranean. Accordingly, the admiral destroyed a fleet of the Barbary pirates at Porto Farina, on the Gulf of Tunis, in April 1655. War broke out between England and Spain a year later, and in April 1657 Blake attacked a Spanish treasure fleet in the bay of Santa Cruz de Tenerife, in the Canary Islands. He totally destroyed the Spanish vessels and the coastal defenses while losing not a single ship. Ill health compelled him to leave for home before the end of the summer. He died one hour before his victorious fleet entered Plymouth Sound.

Blake's "Fighting Instructions" for the improvement of naval operations described in detail the type of battle tactics that were used throughout the next century; he also was responsible for introducing the Articles of War, which became the basis of naval discipline. Biographies include C.D. Curtis, *Blake, Captain at Sea* (1934), and R. Beadon, *Robert Blake* (1935).

Blake, William (b. Nov. 28, 1757, London—d. Aug. 12, 1827, London), English poet, painter, engraver, and visionary mystic whose hand-illustrated series of lyrical and epic poems, beginning with *Songs of Innocence* (1789) and *Songs of Experience* (1794), form one of the most strikingly original and independent bodies of work in the Western cultural tradition. Blake is now regarded as one of the earliest and greatest figures of Romanticism. Yet he was ignored by the public of his day and was called mad because he was single-minded and unworldly; he lived on the edge of poverty and died in neglect.

Education and early career. Blake was the second of five children; his father was a hosier. William grew up in London and later described the visionary experiences he had as a child in the surrounding countryside, when he saw angels in a tree at Peckham Rye and the prophet Ezekiel in a field. He wanted to be an artist and in 1767, at age 10, started to attend the drawing school of Henry Pars in the Strand. He educated himself by wide reading and the study of engravings from paintings by the great Renaissance masters. In 1772 he was apprenticed to an engraver, James Basire, who taught him his craft very thoroughly. Basire sent him to make drawings of the sculptures in Westminster Abbey, and thus awakened his interest in Gothic art.

On completion of his apprenticeship in 1779 Blake entered the Royal Academy as an engraving student. His period of study there seems to have been stormy. He took a violent dislike to Sir Joshua Reynolds, then president of the Royal Academy, and felt that his talents were being wasted. While still at the Academy he was earning his living by engraving for publishers and was also producing independent watercolours. At this time his friends included a group of brilliant young artists, among them the sculptor John Flaxman and the painter Thomas Stothard. He also came into contact with the painter Henry Fuseli.

On Aug. 18, 1782, Blake married a poor, illiterate girl, Catherine Boucher, who was to make a perfect companion for him. Flaxman introduced him to the Rev. Anthony S. Mathew and his wife, and for a time Blake was one of the chief attractions at their literary parties. Flaxman and Mathew paid for the printing of a collection of verses by their young friend, *Poetical Sketches. By W.B.* (1783). A preface provides the information that the verses were written between Blake's 12th and 20th years. This is a remarkable first volume of poetry, and some of the poems contained in it have a freshness, a purity of vision, and a lyric intensity unequaled in English poetry since the 17th century.

Blake's visits to the Mathews' eventually became less frequent and finally ceased. Nevertheless, in the 1780s he was one of a group of progressive-minded people that met at the house of Blake's employer, the Radical bookseller Joseph Johnson. In about 1787 he wrote the fragment of a prose fantasy called *An Island in the Moon,* in which members of this group are satirized. In 1784, after his father's death, Blake started a print shop in London and took his younger brother Robert to live with him as assistant and pupil. Early in 1787 Robert fell ill and in February he died; and William, who had nursed him devotedly, later said that he had seen Robert's soul joyfully rising through the ceiling. He also said that Robert had appeared to him in a vision and revealed a method of engraving the text and illustrations of his books without having recourse to a printer. This method was Blake's invention of what he called "illuminated printing," in which, by a special technique of relief etching, each page of the book was printed in monochrome from an engraved plate containing both text and illustration: an invention foreshadowed by his friend, George Cumberland. The pages were then usually coloured with watercolour or printed in colour by Blake and his wife, bound together in paper covers, and sold for prices ranging from a few shillings to 10 guineas. Most of Blake's works after the *Poetical Sketches* were engraved and "published" in this way, and so reached only a limited public during his lifetime; today these "illuminated books," with their dynamic designs and glowing colours, are among the world's art treasures.

The first books in which Blake made use of his new printing method were two little tracts, *There is No Natural Religion* and *All Religions are One,* engraved about 1788. They contain the seeds of practically all the subsequent development of his thought. In them he boldly challenges accepted contemporary theories of the human mind derived from Locke and the prevailing rationalistic-materialistic philosophy and proclaims the superiority of the imagination over other "organs of perception," since it is the means of perceiving "the Infinite," or God. Immediately following these tracts came Blake's first masterpieces, in an astonishing outburst of creative activity: *Songs of Innocence* and *The Book of Thel* (both engraved 1789), *The French Revolution* (1791), *The Marriage of Heaven and Hell* and *Visions of the Daughters of Albion* (both engraved 1793), and *Songs of Innocence and Experience* (1794). The production of these works coincided with the outbreak of the French Revolution, of which Blake, like the other members of the group that met at Johnson's shop, was at first an enthusiastic supporter. Blake significantly differed from other English revolutionaries, however, in his hatred of deism, atheism, and materialism, and his profound, though undogmatic, religious sense.

William Blake, watercolour portrait by John Linnell; in the National Portrait Gallery, London.
By courtesy of the National Portrait Gallery, London

Songs of Innocence and Experience. Songs of Innocence is Blake's first masterpiece of "illuminated printing." In it the fragile and flowerlike beauty of the lyrics harmonizes with the delicacy and rhythmical subtlety of the designs. *Songs of Innocence* differs radically from the rather derivative pastoral mode of the *Poetical Sketches;* in the *Songs,* Blake took as his models the popular street ballads and rhymes for children of his own time, transmuting these forms by his genius into some of the purest lyric poetry in the English language.

In 1794 he finished a slightly rearranged version of *Songs of Innocence* with the addition of *Songs of Experience;* the double collection, in Blake's own words in the subtitle, "shewing the two contrary states of the human soul." The "two contrary states" are innocence, when the child's imagination has simply the function of completing its own growth; and experience, when it is faced with the world of law, morality, and repression. *Songs of Experience* provides a kind of ironic answer to *Songs of Innocence.* The earlier collection's celebration of a beneficent God is countered by the image of him in *Experience,* in which he becomes the

tyrannous God of repression. The key symbol of *Innocence* is the Lamb; the corresponding image in *Experience* is the Tyger, the subject of the famous poem that stands at the peak of Blake's lyrical achievement:

> Tyger! Tyger! burning bright
> In the forests of the night;
> What immortal hand or eye
> Could frame thy fearful symmetry?

The Tyger in this poem is the incarnation of energy, strength, lust, and cruelty, and the tragic dilemma of mankind is poignantly summarized in the final question, "Did he who made the Lamb make thee?" Blake also viewed the larger society, in the form of contemporary London, with agonized doubt in *Experience,* in contrast to his happy visions of the city in *Innocence.* The great poem "London" in *Experience* is an especially powerful indictment of the new "acquisitive society" then coming into being, and the poem's naked simplicity of language is the perfect medium for conveying Blake's anguished vision of a society dominated by money.

Early narrative poems. Blake was experimenting in narrative as well as lyrical poetry at this time. *Tiriel,* a first attempt, was never engraved. *The Book of Thel,* with its lovely flowing designs, is an idyll akin to *Songs of Innocence* in its flowerlike delicacy and transparency. In *Tiriel* and *The Book of Thel* Blake uses for the first time the long unrhymed line of 14 syllables, which was to become the staple metre of his narrative poetry. The fragment called *The French Revolution* is a heroic attempt to make epic poetry out of contemporary history. In *The Marriage of Heaven and Hell* satire, prophecy, humour, poetry, and philosophy are mingled in a way that has few parallels. Written mainly in terse, sinewy prose, it may be described as a satire on institutional religion and conventional morality. In it Blake defines the ideal use of sensuality: "If the doors of perception were cleansed every thing would appear to man as it is, infinite." Blake reverses the tenets of conventional Christianity, equating the good with reason and repression and regarding evil as the natural expression of a fundamental psychic energy. The book includes a famous criticism of Milton and the "Proverbs of Hell," 70 pithy aphorisms that are notable for their praise of heroic energy and their sense of creative vitality. *The Marriage* culminates in the "Song of Liberty," a hymn of faith in revolution, ending with the affirmation that "everything that lives is Holy." In *Visions of the Daughters of Albion* Blake develops the theme of sexual freedom suggested in several of the *Songs of Experience.* The central figure in the poem, Oothoon, finds that she has attained to a new purity through sexual delight and regeneration. In this poem the repressive god of abstract morality is first called Urizen.

Lambeth. All Blake's works of the revolutionary period were produced at a house in Soho in London, where he and his wife went to live shortly after Robert's death. In 1793 they moved south of the Thames to Lambeth. They lived there for seven years, and this, the period of Blake's greatest worldly prosperity, was also that of his deepest spiritual uncertainty. Blake's poetry of this period appears in the so-called "Prophetic books": *America, A Prophecy* (1793), *Europe, A Prophecy* (1794), *The Book of Urizen* (1794), and *The Book of Ahania, The Book of Los,* and *The Song of Los* (all 1795). In these works Blake elaborates a series of cosmic myths and epics through which he sets forth a complex and intricate philosophical scheme. A principal symbolic figure in these books is Urizen, a spurned and outcast immortal who embodies both Jehovah and the forces of reason and law that Blake viewed as restricting and suppressing the natural energies of the human soul.

The Prophetic books describe a series of epic battles fought out in the cosmos, in history, and in the human soul, between entities symbolizing the conflicting forces of reason (Urizen), imagination (Los), and the spirit of rebellion (Orc). *America,* illustrated with brilliantly coloured designs, is a powerful short narrative poem giving a visionary interpretation of the American Revolution as the uprising of Orc, the spirit of rebellion. *Europe* shows the coming of Christ and the French Revolution of the late 18th century as part of the same manifestation of the spirit of rebellion. *The Book of Urizen* is Blake's version—or parody—of the biblical Book of Genesis. Here the Creator is not a beneficent, righteous Jehovah, but Urizen, a "dark power" whose rebellion against the primeval unity leads to his entrapment in the material world. The poetry of *The Book of Urizen,* written in short unrhymed lines of three accents, has a gloomy power, but is inferior in effect to the magnificent accompanying designs, which have an energy and monumental grandeur anticipating the quality of those of *Jerusalem,* Blake's most splendid illuminated book. Blake's saga of myths is continued in *The Book of Ahania,* a kind of Exodus following the Genesis of *Urizen,* and in *The Book of Los.* In *The Song of Los* Blake returns to the cosmic theme and brings the story of humanity down to his own time. By this time Blake seems to have reached his spiritual nadir, and his poetry peters out in the last of the Prophetic books. He had lost faith in the French Revolution as an apocalyptic and regenerating force, and was finding his attempt at a synthesis based on the "contraries" of good and evil inadequate as an answer to the complexities of human existence.

Major epics. With *The Song of Los* the experimental period of his poetic career ended: he engraved no more books for nearly 10 years. In 1795 he had been commissioned by a bookseller to make designs for an edition of Edward Young's *Night Thoughts.* He worked on this until 1797, producing 537 watercolour drawings. It seems to have been while he was working on these illustrations that a fresh creative impulse led to the beginning of his first full-scale epic poem. The first draft of the epic, called *Vala,* was begun in 1795. He worked on it for about nine years, during which period he rewrote it under the title of *The Four Zoas,* but never engraved it. It remains a magnificent torso, but the quality of this work's poetry and its thought are obscured by its overly complicated mythological scheme. In spite of the grandeur of individual passages and of the major conception, *The Four Zoas* remains fragmentary and lacking in coherence. It provided the materials out of which Blake constructed his later epics, *Milton* and *Jerusalem.*

In 1800, at the invitation of William Hayley, a Sussex squire, Blake and his wife went to live in a cottage provided by Hayley at Felpham on the Sussex coast. This well-meaning, obtuse dilettante, who had employed Blake to make engravings, regarded his imaginative works with contempt and tried to turn him into a miniature painter and tame poet on his estate. At first Blake was delighted with life in Sussex, but he soon found the patronizing Hayley intolerable. The cottage was damp and Mrs. Blake's health suffered, and in 1803 the Blakes returned to London. Toward the end of his stay at Felpham, Blake was accused by a soldier called Schofield of having uttered seditious words when he had ejected him from his cottage garden. He was tried at the quarter sessions at Chichester, denied the charges, and was acquitted. Hayley gave bail for Blake and employed counsel to defend him. This experience became part of the mythology underlying *Jerusalem* and *Milton.*

It was also probably at Felpham that Blake wrote the most notable of his later lyrical poems, including "Auguries of Innocence," with its memorable opening stanza:

> To see a World in a Grain of Sand
> And a Heaven in a Wild Flower,
> Hold Infinity in the palm of your hand
> And Eternity in an hour.

It was at Felpham, too, that he wrote some of his finest letters, many of them addressed to Thomas Butts, a government clerk who was for years a generous and loyal supporter and patron of Blake and who commissioned almost his total output of paintings and watercolours at this period.

In 1804–08 Blake engraved *Milton.* This poem is a comparatively brief epic which deals with a contest between the hero (Milton) and Satan; it too is couched in the prophetic grandeur and obscurity of Blake's invented mythology. Milton's struggle with evil in the poem is a reflection of Blake's own conflicts with the domineering patronage of William Hayley.

Jerusalem is Blake's third major epic and his longest poem. Begun about 1804, and written and engraved soon after the completion of *Milton,* it is also the most richly decorated of Blake's illuminated books, and only a few of its 100 plates are without illustration. Although the details are complex and present many difficulties, the poem's main outlines are simple. At the opening of the poem the giant Albion (who represents both England and humanity) is shown plunged into the "Sleep of Ulro," or the hell of abstract materialism. The core of the poem describes his awakening and regeneration through the agency of Los, the archetypal craftsman or creative man. The poem's consummation is the reunion of Albion with Jerusalem (his lost soul) and with God through his acceptance of Jesus' doctrine of universal brotherhood.

Last years. Blake's life during the period from 1803 to about 1820 was one of worldly failure. He found it difficult to get work, and the engravings that can be identified as his from this period are often hack jobs. In 1809 he made a last effort to put his work before the public and held an exhibition of 16 paintings and watercolour drawings. He wrote a thoughtful *Descriptive Catalogue* for the exhibition, but only a few people attended. But after this long period of obscurity, Blake found in 1819 a new and generous patron in the painter John Linnell, who introduced him to a group of young artists among whom was Samuel Palmer. In his last years Blake became the centre of this group, whose members shared Blake's religious seriousness and revered him as their master.

The most notable poetry Blake wrote after *Jerusalem* is to be found in *The Everlasting Gospel* (1818?), a fragmentary and unfinished work containing a challenging reinterpretation of the character and teaching of Christ. But Blake's last years were devoted mainly to pictorial art. In 1821 Linnell commissioned him to make a series of 22 watercolours inspired by the Book of Job; these include some of his best known pictures. Linnell also commissioned Blake's designs for Dante's *Divine Comedy,* begun in 1825 and left unfinished at his death. These consist of 102 watercolours notable for their brilliant colour. Blake thus found in his 60s a following and support for the imaginative work he had longed to do all his life. As a result, it was in his last years that he produced his most technically assured and beautiful designs. Toward the end of his life Blake still coloured copies of his books while resting in bed, and that is how he died in a room off the Strand in his 70th year. He was buried in an unmarked grave in Bunhill Fields.

Pictorial work. In his painting, as in his poetry, Blake seemed to most of his contem-

poraries to be completely out of the artistic mainstream of their time. But his paintings belong to a recognizable artistic tradition, that of English figurative painting of the later 18th century. Blake was initially influenced by the engravings he studied of the works of Michelangelo and Raphael. He then became deeply impressed with the work of such contemporary figurative painters as James Barry, John Mortimer, and Henry Fuseli. These artists, like Blake, depicted dramatically posed nude figures with strongly rhythmic, linear contours. Fuseli's extravagant pictorial fantasies in particular helped to liberate Blake's visual imagination and gave him the freedom to distort his figures for the sake of the expression of his own inner vision.

Throughout his life Blake stressed the preeminence of line, or drawing, over colour, commending the "hard wirey line of rectitude." He condemned everything that he felt made painting indefinite in contour, such as painterly brushwork and shadowing. Finally, Blake stressed the primacy of art created from the imagination over that drawn from the observation of nature. This is to be expected, considering that Blake had what is now called eidetic imagery—*i.e.*, the rare ability to view remembered or imagined images with extraordinary accuracy and vividness. When Blake talked of his visions, he meant images so vivid that they almost took on a physical presence to him. It is against this background that we should regard Blake's belief in the visionary and transforming power of painting and his hatred of Reynolds and Gainsborough, who, to him, served the materialistic rulers of England by painting debased imitations of the mere external forms of nature.

The figures in Blake's many prints and watercolour and tempera paintings are notable for the rhythmic vitality of their undulating contours, the monumental simplicity of their stylized forms, and the dramatic effectiveness and originality of their gestures. Blake's favourite subjects were episodes from the Bible, along with episodes found in the works of Milton and Dante. He also showed himself a daring and unusually subtle colourist in many of his works. Among his finest series of pictures are the 12 large colour prints he painted during 1790–95, the series of illustrations to the Bible he did from 1799 to 1805, and his illustrations for the Book of Job done late in life, the latter marking the summit of his achievement in the visual arts.

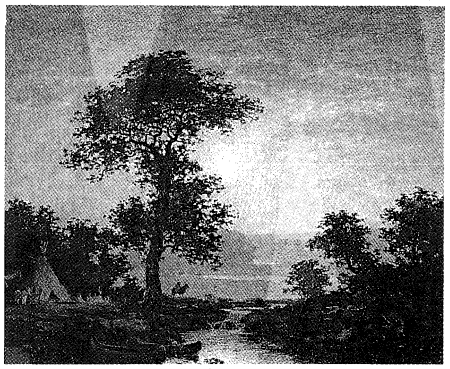
Reputation. Blake was long appreciated only by fellow artists and poets. Dante Gabriel Rossetti bought a sketchbook in which Blake had also written drafts and versions of poems from an attendant at the British Museum in 1847 for 10 shillings. He lent it to Blake's first biographer, Alexander Gilchrist, in 1861 and to Algernon Charles Swinburne for his long *Critical Essay* on Blake in 1868. William Butler Yeats helped to prepare and annotate a major edition of Blake's works in 1893. In 1920 T.S. Eliot included in *The Sacred Wood* an essay on Blake that made his name familiar to a new reading public. In 1927 the centenary of his death was marked by a number of articles and books that established Blake's modern reputation.

BIBLIOGRAPHY. Gerald Eades Bentley and Martin K. Nurmi, *A Blake Bibliography: Annotated Lists of Works, Studies and Blakeana* (1964).

Editions and selections. E.J. Ellis and W.B. Yeats (eds.), *The Poetical Works of William Blake,* 3 vol. (1893); J. Sampson (ed.), *The Poetical Works of William Blake* (1913); Geoffrey Keynes (ed.), *The Complete Writings of William Blake* (1957) and *The Letters of William Blake,* 2nd ed. rev. (1968); David V. Erdman (ed.) and Harold Bloom (commentary), *The Poetry and Prose of William Blake* (1965).

Biography and criticism. A. Gilchrist, *Life of William Blake* (1863; rev. ed. by R. Todd, 1945); A.C. Swinburne, *William Blake: A Critical Essay* (1868; with illustrations from Blake's designs in facsimile, 1967); J.H. Wicksteed, *Blake's Vision of the Book of Job* (1910; rev. ed., 1925); Samuel Foster Damon, *William Blake: His Philosophy and Symbols* (1924 and 1947); Mona Wilson, *The Life of William Blake* (1927; reset with additional notes and revisions, 1948); Mark Schorer, *William Blake: The Politics of Vision* (1946); Northrop Frye, *Fearful Symmetry: A Study of William Blake* (1947); David V. Erdman, *Blake, Prophet Against Empire: A Poet's Interpretation of the History of His Own Times* (1954; rev. ed., 1969); Arthur Leslie Morton, *The Everlasting Gospel: A Study in the Sources of William Blake* (1958); John Beer, *Blake's Humanism* (1968); Kathleen J. Raine, *Blake and Tradition,* 2 vol. (1969).

Blakelock, Ralph Albert (b. Oct. 15, 1847, New York City—d. Aug. 9, 1919, near Elizabethtown, N.Y., U.S.), American painter whose luminous impasto paintings of moonlit scenes convey a mysterious romanticism.



"Moonlight," oil on canvas by R.A. Blakelock, *c.* 1885; in the Brooklyn Museum, New York

By courtesy of the Brooklyn Museum, Dick S. Ramsay Fund

Blakelock graduated from the College of the City of New York in 1867 and was basically self-taught as an artist. He developed a highly original and subjective style of landscape painting as his career progressed. His subjects were almost always forests, often harbouring the Indian encampments that Blakelock had observed during a trip he took to the West in 1869. These forest scenes are notable for the moody interplay of their nocturnal lighting and strangely dappled representations of tree branches and foliage.

Blakelock was neglected by the public throughout his career and was often forced to dispose of his paintings for humiliatingly small sums. Under the strain of continual failure, with his large family in a condition of poverty, Blakelock suffered a breakdown in 1899. He ceased to paint and spent most of the remainder of his life in an asylum. During his confinement his fame burgeoned, and his paintings began to bring high prices. Blakelock's work was extensively forged as his popularity continued to rise throughout the early 20th century.

Blakeslee, Albert Francis (b. Nov. 9, 1874, Geneseo, N.Y., U.S.—d. Nov. 16, 1954, Northampton, Mass.), prominent American botanist and geneticist who achieved world renown for his research on plants.

The son of a Methodist minister, Blakeslee was awarded a B.A., cum laude, from Wesleyan University, Middletown, Conn. (1896). After three years of teaching mathematics and science in a preparatory school, he entered Harvard University (1899) for graduate work. In 1900 he received his M.A. and in 1904 his Ph.D. His doctoral thesis, published the same year, entitled "Sexual Reproduction in the Mucorineae," brought him immediate distinction because of his discovery and elucidation of sexuality in the lower fungi. His work at once became part of every botany textbook.

Until 1914 he served as professor of botany at the Connecticut Agricultural College at Storrs, where he continued his experimental work, but with higher plants rather than fungi. In 1915 Blakeslee took a position as resident investigator in plant genetics at the Carnegie Institution experimental laboratories at Cold Spring Harbor, Long Island, N.Y.; by 1936 he had become director. On his retirement from the Carnegie Institution (1941), he was appointed professor of botany at Smith College, Northampton, Mass., where he established the Genetics Experimental Station. His joint work with graduate students and research associates resulted in the publication of a long series of papers on the genetics and cytology of *Datura stramonium*, the Jimson weed. Among other important discoveries, he demonstrated the use of colchicine to increase the number of chromosomes and thus opened up a new field of artificially produced polyploids.

Blakistone Island: *see* Saint Clement's Island.

Blalock, Alfred (b. April 5, 1899, Culloden, Ga., U.S.—d. Sept. 15, 1964, Baltimore), American surgeon who devised a surgical treatment for infants born with the condition known as the tetralogy of Fallot, or "blue baby" syndrome.

After graduating from the University of Georgia in 1918 Blalock entered the Johns Hopkins University School of Medicine, from which he received his M.D. degree in 1922. From 1925 to 1941 he was a resident in surgery in the school of medicine of Vanderbilt University. During that time he conducted research on traumatic and hemorrhagic shock; his conclusion that the effects of shock were due to loss of blood volume led to the volume replacement treatment that was credited with saving countless lives during World War II.

Blalock returned to Johns Hopkins in 1941 as professor and head of the department of surgery in the school of medicine and as surgeon-in-chief of the Johns Hopkins Hospital. In collaboration with the pediatric cardiologist Helen B. Taussig, he devised a procedure known as subclavian-pulmonary artery anastomosis, by which the congenital heart defect that produced the "blue baby" syndrome could be corrected and the patient enabled to lead a nearly normal life. The first such operation was performed by Blalock in 1944, and it was soon being duplicated with great success by surgeons around the world.

During his last years Blalock devoted much energy to the creation of the Children's Medical and Surgical Center in Baltimore.

Blanc, Louis, in full JEAN-JOSEPH-CHARLES-LOUIS BLANC (b. Oct. 29, 1811, Madrid—d. Dec. 6, 1882, Cannes, Fr.), French utopian Socialist, noted for his theory of

Blanc

H. Roger-Viollet

worker-controlled "social workshops." He was a member of the provisional government of the Second Republic following the Revolution of 1848, but after the defeat of the workers' revolt in June he was exiled (1848–70) in England.

Early life. Louis Blanc was born while his father was serving as inspector general of finances in the Spanish regime of Joseph Bonaparte. When that regime collapsed in 1813, the Blancs returned to France. Louis studied at schools in Rodez and Paris. He became a tutor in the family of a wealthy industrialist in northern France who employed more than 600 workers; there he came in contact with liberal political circles and found employment on a Republican newspaper. In 1837 he became a member of a committee for electoral reform directed by leaders of the opposition to King Louis-Philippe. In 1839 He founded the *Revue du Progrès.* It was in this newspaper that his most important work, *L'Organisation du travail* ("The Organization of Labour"), appeared serially in 1839. The principles laid down in that essay, which first brought him to public attention, formed the basis of his subsequent career.

Theory of socialism. Blanc believed that the competitive capitalism then developing in France tended to stunt the human personality, pitting one man against another and driving the weaker to the wall. The first step toward a better society would be to guarantee work for everyone by establishing "social workshops" financed by the state. These workshops, controlled by the workers themselves, would gradually take over most production until a socialist society would come into being. Blanc did not believe in human equality. But he did not agree with the followers of the socialist Saint-Simon, who held that workers should be paid according to their performance; he argued that justice would be satisfied only "when each one in accordance with the law written in some shape in his organization by God Himself, produces according to his faculties and consumes according to his wants."

Politics. In 1843 Blanc joined the committee of *La Réforme,* the journal of the extreme left-wing Republicans. In 1847 he became prominent in the so-called banquets campaign for electoral reform, holding large audiences with his oratory. The culminating banquet, arranged to take place in Paris on Feb. 22, 1848, was banned, but a riot on the following day led to an insurrection and the fall of the monarchy. Blanc became a member of the provisional government of the Second Republic. On Feb. 25, 1848, following a motion by Blanc, the government undertook "to guarantee the livelihood of the workers by work" and "to guarantee work for every citizen." But the government was divided. For the majority the revolution represented a political change in which a monarchy with a restricted franchise was to be replaced by a free democratic republic based upon universal suffrage; for the minority, including Blanc, it also heralded a social and economic transformation.

Although Blanc and his friends were a minority in the government, they had many supporters in the streets; and their colleagues made important concessions to their ideas by reducing working hours, proclaiming the right to work, appointing Blanc chairman of a permanent commission to investigate labour problems, and establishing national workshops to relieve the more acute unemployment. The national workshops were a travesty of those envisaged by Blanc; they were established by his opponents to discredit him and became little more than a gigantic system of outdoor relief. Meanwhile, unemployment grew from 6,100 on March 7 to 118,310 on June 15. The celebrated Luxembourg Commission, of which Blanc had been made chairman, became an arbiter in trade disputes and a centre of socialist propaganda; it was unable, however, to win acceptance of its recommendations for the reorganization of labour and industry.

Exile. Blanc was forced to flee to England after the workers unsuccessfully revolted in June 1848. He did not return to France until the fall of the Second Empire of Louis-Napoleon in 1870. He supported himself during his exile by teaching and lecturing; he wrote a history of the Revolution of 1848 and a history of the French Revolution as well and also a series of books on British political and social conditions.

When he returned to France after 22 years, he was still a famous man and was elected a deputy to the National Assembly. He refused to join in the revolutionary commune that seized control of Paris in the spring of 1871, but after the commune was crushed he sought to obtain a political amnesty for the communards. He remained a man of the left, although without much following. One of his last speeches in 1881 was in support of a proposal to reduce the length of the working day.

(J.Vi.)

BIBLIOGRAPHY. Louis Blanc's principal works are *Histoire de dix ans, 1830–1840,* 5 vol. (1841–44; *The History of Ten Years, 1830–1840,* 2 vol., 1844–45, reprinted 1969), an attack on the government and person of King Louis-Philippe; and *Histoire de la Révolution française,* 12 vol. (1847–62), a political, economic, and social interpretation. Leo O. Loubere, *Louis Blanc: His Life and His Contribution to French Jacobin-Socialism* (1961, reprinted 1980), is a good study written in English. Jean Vidalenc, *Louis Blanc, 1811–1822* (1948), is a short biography (in French) written for the centenary of the Revolution of 1848.

Blanc, Mont (France): *see* Mont Blanc.

Blanchard, Jean-Pierre-François (b. July 4, 1753, Les Andelys, Fr.—d. March 7, 1809, Paris), French balloonist who, with the American physician John Jeffries, made the first aerial crossing of the English Channel. He was also the first to make balloon flights in England, North America, Germany, Belgium, and Poland.

During the 1770s Blanchard worked on the design of heavier-than-air flying machines, notably one based upon a theory of rowing in the air currents with oars and tiller. Following the demonstrations of hot-air-balloon flying by the Montgolfier brothers in Annonay, Fr., in 1783, Blanchard took up ballooning.

Blanchard, engraving by James Newton, 1785, after an oil painting by Richard Livesay

By courtesy of the Library of Congress, Washington, D.C.

On March 2, 1784, in Paris, Blanchard made his first ascent. On Jan. 7, 1785, he and Jeffries ascended over Dover, Eng. The two aviators were compelled to heave all cargo overboard except the package of the first international airmail, delivered successfully upon their safe landing in the Forêt de Felmores, France.

Ever the showman, Blanchard tossed a dog equipped with an experimental parachute over the side of a balloon and later tried parachute jumping himself. He also unsuccessfully tried using sails to add maneuverability and facilitate propulsion in balloons.

After making a number of exhibition flights in Europe, Blanchard made the first balloon flight in North America, on Jan. 9, 1793, when he ascended from the Washington Prison Yard in Philadelphia and landed in Gloucester County, N.J. This flight, observed by Pres. George Washington, spurred interest in ballooning in the United States. Blanchard returned to Europe and, with his wife, Marie, who had also learned to fly balloons, performed many other exhibitions.

Blanchard suffered a heart attack on a flight over The Hague in February 1808 and fell more than 50 feet; he never recovered from the fall. His widow continued flying in balloons, but in 1819 she fell to her death when her hydrogen balloon was ignited during a fireworks display in Paris.

Blanchard, Thomas (b. June 24, 1788, Sutton, Mass., U.S.—d. April 16, 1864, Boston), American inventor who made major contributions to the development of machine tools.

Blanchard began as a self-taught tinkerer. As a boy he invented an apple parer and a tack-making machine for his brother's factory. Later he designed a lathe capable of turning both the regular and irregular sections of gun barrels. In 1818, as an employee of the Springfield (Mass.) Arsenal, he invented the lathe that duplicated the form of a pattern object by transmitting to the cutting tool the motion of a friction wheel rolling over the pattern. His lathe was an essential step in the development of mass-production techniques. The success of his device led to piracy of his design, however, and Blanchard spent several years fighting for Congressional renewal of his patent. In 1825 he designed a steam carriage, and later he became interested in railroads but received no encouragement. He then turned to designing shallow-draft steamboats and produced several successful designs.

Blanche OF CASTILE, French BLANCHE DE CASTILLE, Spanish BLANCA DE CASTILLA (b. 1188, Palencia, Castile—d. Nov. 12, 1252, Paris), wife of Louis VIII of France, mother of Louis IX (St. Louis), and twice regent of France (1226–34, 1248–52), who by wars and marital alliances did much to secure and unify French territories.

Blanche was the daughter of Alfonso VIII of Castile and Eleanor, who was the daughter of Henry II of England. Her grandmother Eleanor of Aquitaine, queen of England, traveled to Spain to take the 11-year-old Blanche to France, where a marriage treaty was concluded with Louis, the young son of King Philip II Augustus. This politically motivated marriage had been arranged by Blanche's uncle, King John of England, and was celebrated in 1200 at Portsmouth, Hampshire. It represented only a brief truce in the struggle between England and France for control over certain French territories.

Blanche, who became French through marriage, was gradually to become French in spirit as well. Although she did not cease to be concerned for her family, among them her uncle John and his allies, her brother-in-law Ferrand of Portugal, and her cousin Otto of Brunswick (later Holy Roman emperor Otto IV), she rejoiced at the French victory over Otto and the English at Bouvines in 1214, marking the first stage of French unification, a goal for which she was constantly to strive. In the same year, she gave birth to Louis, the future king of France. Upon John of England's death, Blanche boldly tried to seize the English throne: in 1216 Louis of France invaded England on her behalf. The English stood firm against him, and John's nine-year-old son was finally crowned Henry III.

A devout Catholic, Blanche soon became involved in what she sincerely believed to be a

holy war against the heretical Cathari, a sect founded on the belief that good and evil had two separate creators, which was flourishing throughout southern France. Her husband, who became Louis VIII in 1223, took part in a crusade against the Cathari but suffered a fatal attack of dysentery upon returning to the north of France in 1226. In accordance with her husband's will, Blanche became both guardian of the 12-year-old Louis and regent of France. She zealously pressed to have Louis crowned immediately, and the coronation took place at Reims three weeks after Louis VIII's death.

Her most pressing problem was to deal with a rebellion of the great barons, organized by Philip Hurepel, the illegitimate son of King Philip II Augustus, and supported by King Henry III of England. In the face of such adversity, Blanche showed herself by turns a delicate diplomat, a clever negotiator, and a strong leader. Dressed in white, on a white palfrey draped in the same colour, she rode into battle at the head of her troops. After an attempted abduction of the young king, Blanche did not hesitate to replace rebel noble associates with commoners if she thought it necessary. She also created local militias. Blanche was gradually able to subdue the revolt, establish a new truce with England, and, in 1229, pacify the south of France by signing the Treaty of Paris with Raymond VII, count of Toulouse. France then entered an era of domestic stability, which saw the construction of many cathedrals throughout the country.

On only one occasion did Blanche fail to exhibit diplomatic conduct. In 1229 a dispute between an innkeeper and some students took place in the Latin Quarter in Paris. The police were summoned, and the students were beaten and thrown into the Seine; such intervention in the Latin Quarter, however, was contrary to the prerogatives granted to the university, and the faculty and students threatened to strike if the university's privileges were not respected. Badly advised, Blanche held firm, but the university closed its doors, and the faculty and students left Paris for the provinces and abroad. It was to take four years and the intervention of the pope before the university would return to Paris with new prerogatives, this time granted by Blanche herself.

Although Louis IX came of age on April 25, 1236, Blanche remained at his side as his most loyal and steadfast supporter. She lacked tact, however, with regard to her son's private life. Although Blanche herself had chosen Margaret of Provence to be Louis's wife, she treated Margaret with great severity. In 1244, after Louis recovered from a serious illness, he and his wife, much against Blanche's wishes, made a vow to go on a crusade against the Muslims. They embarked in 1248, and once again the kingdom was entrusted to Blanche. Informed of Louis's defeat at al-Manṣūrah, Egypt, and subsequent imprisonment, Blanche herself went to seek his ransom and that of the French army. She petitioned her parents, her allies, and the pope himself for funds and supplies, but interest in the crusade had dwindled.

Although weakened by a heart ailment, Blanche did not neglect her obligations as a regent. Continuing to preside over council meetings, she signed laws and watched over the poor of Paris. When some of the poor were mistreated by the cathedral chapter, she herself rode, as formerly, to open the gates to their prison. On her way to the Abbey of the Lys, one of her favourite retreats, Blanche suffered an attack of the heart ailment that was to take her life. She was returned to the palace of the Louvre, dressed in a nun's habit, and laid on a bed of hay. There, after begging forgiveness of all and having received the last sacraments, she died. She was buried at Maubuisson Abbey and her heart taken to the Abbey of the Lys. Louis IX was in Jaffa when he learned of his mother's death. The news distressed him greatly, for he was aware that he had lost not only an incomparable parent but also the strongest supporter of his kingship. (Y.J.)

BIBLIOGRAPHY. Jean de Joinville, *Histoire de Saint Louis* (Natalis de Wailly edition, 1874); and Guillaume de Nangis, *Chronique latine . . .*, 2 vol. (Géraud edition, 1843), two works contemporary of Blanche's reign, supply interesting opinions on her actions. The language used is sometimes archaic and difficult to comprehend. T. Nisard, *Histoire de la reine Blanche, mère de Saint Louis* (1851); and J.S. Doinel, *Histoire de Blanche de Castille* (1870), are dated but still remain quite interesting. Other important works are Elie Berger, *Histoire de Blanche de Castile, reine de France* (1895), and Yette Jeandet, *Blanche de Castille, reine de l'unité française* (1965). See also Margaret Wade Labarge, *Life of Louis IX of France* (1968).

Blanchet, François-Étienne, THE ELDER (b. *c.* 1695, Paris?—d. 1761, Paris?), one of the finest harpsichord builders of the Baroque era (*c.* 1600–1750).

François's father, Nicolas, was the first of the five makers composing the Blanchet dynasty; after 1722 Nicolas and François worked as partners, producing instruments based largely on models of the Ruckers family, the great Flemish harpsichord makers. François's son, François the Younger, died at an early age, leaving a widow who later married Pascal Taskin the Elder, another excellent builder, who continued the family business.

A number of inventories of the Blanchet concern are extant, providing valuable information about the technique of French harpsichord building. A large part of their business was devoted to rebuilding and enlarging earlier instruments, particularly those of the Ruckers. In addition, the Blanchets and Taskins made important improvements in harpsichord construction, so that their workshop flourished. At the last, however, the great-grandson of François the Elder, Nicolas Blanchet, engaged in making pianos to accommodate the demand of the 19th century. The harpsichord revival of the mid-20th century saw Blanchet and Taskin instruments used as models for new instruments made by leading builders catering to a demand for authenticity and superior tone quality.

Blanco, Antonio Guzmán: *see* Guzmán Blanco, Antonio.

Blanco Fombona, Rufino (b. June 17, 1874, Caracas—d. Oct. 17, 1944, Buenos Aires), Latin-American literary historian and man of letters who, as a literary critic and publisher, played a major role in bringing the works of Spanish-American writers to world attention.

Jailed during the early years of the dictatorship (1908–35) of Juan Vicente Gómez, he fled to Europe where he established *Editorial América* in Madrid (1914), which presented Latin-American writers to the European literary world. A prolific author, he wrote poetry, short stories, novels, and essays. (His novel *El hombre de oro*, published in 1912, was translated and published as *The Man of Gold* in 1977.) His literary essays are considered his best work, and two of his critical works, *El modernismo y los poetas modernistas* (1929; "Modernism and the Modernist Poets") and *Camino de imperfección, diario de mi vida (1906–1913)* (1929; "Road of Imperfection, a Diary of My Life 1906–1913"), are considered standard works on the Modernist movement in Spanish. His most important work includes *Letras y letrados de Hispano-américa* (1908; "Letters and the Learned in Spanish America"); and *Grandes escritores de América* (1919; "Great Writers of America").

Blanco y Crespo, José Maria: *see* White, Joseph Blanco.

Blanda, George (Frederick) (b. Sept. 17, 1927, Youngwood, Pa., U.S.), U.S. professional football player, who first as a quarterback and later as a kicker established records for most seasons played (26), most games played (340), most points scored (2,002), most points after touchdowns (943 of 959 attempted), and most field goals (335 of 638 attempted; broken by Jan Stenerud in 1983).

Blanda played football at Youngwood High School, graduating in 1945, and at the University of Kentucky (Lexington; B.S., 1949) before he joined the National Football League (NFL) Chicago Bears in 1949. In 1953 he became starting quarterback and led the league in pass completions. After an injury in 1954, he was mainly a placekicker through 1958. He was inactive in 1959 and joined the Houston Oilers of the American Football League (AFL) in 1960. He led them to league championships as a quarterback (1960–61) and led the league in touchdown passes (36) in 1961, an all-time record he shares with Y.A. Tittle. He was traded to the AFL Oakland Raiders (NFL from 1970) in 1967 and retired in 1976. He was elected to the football Hall of Fame in 1981.

Blandford, John Churchill, marquess of: *see* Marlborough, John Churchill, 1st duke of.

Blandford Forum, parish (town), North Dorset district, county of Dorset, England, on the River Stour. Chipping Blandford (the name was later Latinized to Blandford Forum) was founded as a fording point on the Stour. Most of the town was destroyed in a fire in 1731, and little remains from the earlier period. The church of SS. Peter and Paul, built in neo-Grecian style, dates from 1739, and there are also Georgian buildings in the marketplace. Pop. (1981 prelim.) 3,915.

Blanding's turtle, also called SEMIBOX TURTLE (*Emys blandingi*), freshwater turtle, family Emydidae, found in southern Canada and the north-central to northeastern United States. The upper shell of Blanding's turtle averages about 20 centimetres (8 inches) in length; it is smooth, rounded, and elongate with yellow markings on a blackish ground colour. The chin of the turtle is bright yellow; the lower shell is hinged in the centre and can be drawn up to protect the head, legs, and tail.

Blanding's turtle is usually found in ponds, quiet streams, and other shallow bodies of water. Although well adapted to aquatic life, it frequently leaves the water and travels about on land. The diet consists of animals, such as insects and crustaceans, and some vegetation.

Blandrata, Georgius, Italian GIORGIO BIANDRATA (b. *c.* 1515, Saluzzo, Piedmont—d. early May 1588, Gyulafehérvár, Transylvania), physician who became the leading organizer and supporter of Unitarianism in Transylvania.

After serving as physician to Queen Bona Sforza of Poland from 1540 to 1552, he returned to Italy to practice medicine at Pavia, where he aroused the hostility of the authorities of the Inquisition by his interest in theological speculation. In 1556 he fled to Geneva and became an elder in the Calvinist congregation of Italians there. He soon antagonized the Reformed theologian John Calvin by declaring that debates over the nature of the Trinity threatened the concept of the unity of God. Two years later Blandrata was back in Poland, where he became an influential elder in the Minor Church, an anti-Trinitarian organization.

In 1563 the Unitarian king John Sigismund I summoned him to Transylvania as court physician. There Blandrata and the Unitarian bishop Ferenc Dávid won many converts from Calvinist to Unitarian beliefs, although

later (about 1571) Dávid lost Blandrata's confidence by teaching that Christ should not be worshipped at all by Unitarians. Such an extreme position endangered the religious toleration constitutionally granted to Unitarians, and Blandrata invited the Unitarian theologian Faustus Socinus from Italy to confute Dávid. The effort failed, and Blandrata's reputation as the leading Unitarian layman waned. The death of Sigismund in 1571 and the accession of the Catholic Stephen Báthory further contributed to the decline of Unitarianism, although Blandrata allied himself to Báthory to maintain a semblance of the earlier toleration.

Blane, Sir Gilbert, 1ST BARONET (b. August 1749, Blanefield, Ayr, Scot.—d. June 26, 1834, London), physician known for his reforms in naval hygiene and medicine, which included the use of citrus fruits to prevent scurvy.

Blane studied medicine at the University of Edinburgh and took his M.D. degree at Glasgow in 1778. He then became private physician to Admiral (later Lord) Rodney, whom he accompanied to the West Indies in 1779. On the expedition, Blane enforced the use of lemon juice and other fresh foods in the diet.

After his return to London, Blane became physician to St. Thomas' Hospital (1783–95) and physician-in-ordinary to George IV and to William IV. He received a baronetcy in 1812. Blane was the author of *Observations on the Diseases of Seamen* (1785) and *Elements of Medical Logick* (1819).

blank verse, unrhymed iambic pentameter, the preeminent dramatic and narrative verse form in English and also the standard form for dramatic verse in Italian and German. Its richness and versatility depend on the skill of the poet in varying the stresses and the position of the caesura (pause) in each line, in catching the shifting tonal qualities and emotional overtones of the language, and in arranging lines into thought groups and paragraphs.

Adapted from unrhymed Greek and Latin heroic verse, blank verse was introduced in 16th-century Italy along with other classical metres. The Italian Humanist Francesco Maria Molza attempted the writing of consecutive unrhymed verse in 1514 in his translation of Virgil's *Aeneid.* Other experiments in 16th-century Italy were the tragedy of *Sofonisba* (written 1514–15) by Gian Giorgio Trissino, and the didactic poem *Le api* (1539) written by Giovanni Rucellai. Rucellai was the first to use the term *versi sciolti,* which became translated as "blank verse." It soon became the standard metre of Italian Renaissance drama, used in important works such as the comedies of Ariosto, *L'Aminta* of Tasso, and the *Il pastor fido* of Guarini.

Henry Howard, earl of Surrey, introduced the measure, along with the sonnet and other Italian Humanist verse forms, to England in the early 16th century. Thomas Sackville and Thomas Norton used blank verse for the first English tragic drama, *Gorboduc* (first performed 1561), and Christopher Marlowe developed its musical qualities and emotional power in *Tamburlaine, Doctor Faustus,* and *Edward II.* Shakespeare transformed the line and the instrument of blank verse into the vehicle for the greatest English dramatic poetry. In his early plays, he combined it with prose and a 10-syllable rhymed couplet; he later employed a blank verse dependent on stress rather than on syllabic length. Shakespeare's poetic expression in his later plays, such as *Hamlet, King Lear, Othello, Macbeth,* and *The Winter's Tale,* is supple, approximating the rhythms of speech, yet capable of conveying the subtlest human delight, grief, or perplexity.

After a period of debasement, blank verse was restored to its former grandeur by Milton's *Paradise Lost* (1667). Milton's verse is intellectually complex, yet flexible, using inversions, Latinized words, and all manner of stress, line length, variation of pause, and paragraphing to gain descriptive and dramatic effect. In the 18th century, James Thomson used blank verse in his long descriptive poem *The Seasons,* and Edward Young's *Night Thoughts* uses it with power and passion. Later, Wordsworth wrote his autobiography of the poetic spirit, *The Prelude* (completed 1805; published 1850), in blank verse; Shelley used it in his drama *The Cenci* (1819), as did Keats in *Hyperion* (1820). The extreme flexibility of blank verse can be seen in its range from the high tragedy of Shakespeare to the low-keyed, conversational tone of Robert Frost in *A Masque of Reason* (1945). It is still used to voice the moods of modern man in a rhythm linking him to the past.

Blank verse was established in German drama by Gotthold Lessing's *Nathan der Weise* (1779). Examples of its use are found in the writings of Goethe, Schiller, and Gerhart Hauptmann. It was also used extensively in Swedish, Russian, and Polish dramatic verse.

Blankenburg, city, Magdeburg *Bezirk* (district), western East Germany, southwest of Magdeburg at the north foot of the Unterharz (Lower Harz) Mountains. First mentioned in 1123, the town was chartered in the mid-14th century and passed to the Welf dukes of Brunswick-Wolfenbüttel in 1599. It is dominated by the former ducal castle (1705–18), now a commercial training school, which was the residence of Louis XVIII of France from 1796 to 1798. Other landmarks include the early 13th-century St. Bartholomew's Church and the town hall (1233). A health resort, it is also known for its tree and seed nurseries, ironworks, and stone quarries. Blankenburg's economy was stimulated after World War II by the Bodewerk, a system of dams and power stations on the Bode River to the southwest. Pop. (1983 est.) 18,635.

Blanqui, (Jérôme-)Adolphe (b. Nov. 21, 1798, Nice, Fr.—d. Jan. 28, 1854, Paris), French liberal economist whose *History of Political Economy in Europe* (1837–38) was the first major study of the history of economic thought.

In 1830 he succeeded J.-B. Say, under whom he had studied, to the chair of political economy at the Conservatoire des Arts et Métiers. Blanqui's work blended theoretical and empirical approaches in an analysis of industry and commerce. He devoted himself to examining the conditions of the working class. Though he advocated government action in the protection of the worker, he remained a liberal in the tradition of Adam Smith.

Blanqui, (Louis-)Auguste (b. Feb. 1, 1805, Puget-Théniers, Fr.—d. Jan. 1, 1881, Paris), revolutionary Socialist, a legendary martyr-figure of French radicalism, imprisoned in all for more than 33 years. His disciples, the Blanquists, played an important role in the history of the workers' movement even after his death.

Blanqui's father was a subprefect in the little town of Puget-Théniers in the French Maritime Alps. In 1818 Blanqui joined his elder brother, Adolphe, the future liberal economist, in Paris and studied both law and medicine until 1824. From 1827 he began taking part in the student demonstrations against the restored Bourbon monarchy, but he was disappointed by the Revolution of July 1830, which established the bourgeois monarchy of Louis-Philippe. Blanqui then began his true political career. A member of the Société des Amis du Peuple (Society of the Friends of the People), he was pursued and twice imprisoned (1831 and 1836). In these years he was much influenced by the doctrines of Filippo Buonarroti, who in 1796 had been involved in the abortive rising against the Directory government by François Noël (Gracchus) Babeuf's Société des Égaux (Society of Equals). He studied the popular insurrections of the French Revolutionary period and became increasingly convinced of the inevitability of class struggle, in which he regarded the rich as the aggressors. Blanqui was thereafter convinced that in order to establish a popular government it was absolutely necessary first to build up heavily disciplined groups of conspirators. His taste for secret societies stemmed from this conviction; he organized first the Société des Familles (Society of Families) and then the Société des Saisons (Society of the Seasons). The latter society's disastrous attempt at insurrection on May 12, 1839, was the classic prototype of the Blanquist surprise attack. Five hundred armed revolutionaries took the Hôtel de Ville (City Hall) of Paris, but, isolated from the rest of the population, they were easily defeated after two days of fighting. Blanqui escaped but was later arrested. His death sentence was commuted to life imprisonment, and he was sent to the island of Mont-Saint-Michel off the Normandy coast. After four years of solitary confinement, he was believed to be dying and was granted a formal pardon; but he was not able to leave the prison hospital at Tours until just before the Revolution of 1848.

Auguste Blanqui, lithograph by Menut Alophe, 1849
By courtesy of the Bibliotheque Nationale, Paris

This revolution was a decisive experience for Blanqui. Returning to Paris, he founded the Société Républicaine Centrale (Central Republican Society) and urged the provisional government that had formed after Louis-Philippe's fall to pursue more Socialistic policies. Although he took an active part in the organization of workers' demonstrations, he was convinced that the people were not ready for the universal suffrage that the provisional government proposed, and he demanded the postponement of the impending elections. The election results confirmed Blanqui's apprehensions: the conservatives constituted the majority of the Constituent Assembly. Blanqui was sentenced to 10 years' imprisonment for having participated, on May 15, in a popular demonstration of which he had, in fact, disapproved. Released in 1859, he again organized secret societies and was rearrested in 1861, remaining in prison until he escaped to Belgium in 1865. Great changes occurred in France while the man they had begun to call *l'enfermé* ("the locked-up one") was able to take no part in events. The Parisian workers were defeated on the barricades of June 1848. Louis-Napoleon executed his coup d'etat of Dec. 2, 1851, and became, as Napoleon III,

hereditary emperor of the French the following year. An unprecedented industrial growth created conditions suited for the development of a modern workers' movement. Consideration of these changes led Blanqui to study and write about political economy and Socialism; most of these works were published after his death under the title *Critique sociale.* After 1865 Blanqui often went clandestinely from Brussels to Paris, where the first Blanquist groups were being organized among students and, later, among workers. He also wrote *Instruction pour une prise d'armes* (1867–68; "Instruction for a Taking Up of Arms"), a kind of manual for urban guerrilla warfare. When the first defeats of the French Army in the Franco-German War of 1870 began to threaten Napoleon III's position, Blanqui returned to Paris.

On Sept. 4, 1870, two days after Napoleon III's surrender to the Germans, there was a bloodless revolution in Paris, as a result of which the Third Republic was proclaimed and a provisional government was formed. In this action the Blanquist groups took some part. With the German armies advancing on Paris, Blanqui showed himself a patriot as well as a revolutionary, founding both a club and a newspaper of the same extremely Jacobin name: *La Patrie en danger* ("Our Country in Danger"). He invited Parisians to unite against Germany and support the government, and he showed considerable military skill in indicating what measures should be taken for the defense of Paris. He very soon became convinced that the provisional government, fearing the populace, was failing to take adequate defense measures. Consequently, the Blanquists twice unsuccessfully attempted to overthrow the government (Oct. 31, 1870; Jan. 22, 1871). After the capitulation of Paris and the elections of Feb. 8, 1871, which were won by conservatives, Blanqui retired to the country, where he was arrested on March 17 for his part in the revolt of October 31.

The day after Blanqui's arrest the insurrection called the Paris Commune occurred, and the Blanquists played a very important role in it. Blanqui himself was elected president of the Commune, but the government of Adolphe Thiers refused to release him from prison. Eventually the Commune capitulated, and, in the struggle for amnesty for its adherents, Blanqui became a kind of symbol. Still in prison, he was elected deputy for Bordeaux in April 1879. His election was invalidated, but he was pardoned and set free. For two years, in spite of his advanced age, he continued as a journalist and an ardent campaign speaker in favour of Socialism. On the eve of a meeting, he was struck by apoplexy and died a few days later. Shortly afterward, a rapprochement between the Marxists and the Blanquists resulted in the founding in 1881 of the Comité Révolutionnaire Central (Central Revolutionary Committee) and in 1898 of the Parti Socialiste Révolutionnaire (Revolutionary Socialist Party).

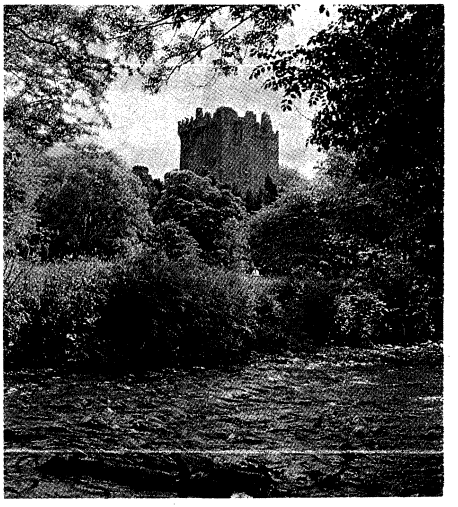
In relation to other Socialists, Blanqui cannot be considered either an economist or a philosopher. He was essentially a theoretician of revolution and a practitioner of insurrection. He thought that the taking of power could be the act only of a small minority. Blanqui's main idea was that there could be no Socialist transformation of society without a temporary dictatorship that would first disarm the bourgeoisie, confiscate the wealth of the church and of the large property holders, and bring the great industrial and commercial enterprises under state control. The next stage would be to establish industrial and agricultural-production associations and develop education so as to render the people capable of organizing the country's economy to their own benefit. (J.Bru.)

BIBLIOGRAPHY. Gustave Geffroy, *L'Enfermé* (1897), an old work, but still quite useful; Maurice Dommanget, *Les Idées politiques et sociales d'Auguste Blanqui* (1957), a work by a great French specialist on Blanqui, including an important bibliography; Neil Stewart, *Blanqui* (1939); Samuel Bernstein, *Auguste Blanqui and the Art of Insurrection* (1971), a critical biography locating Blanqui in the history of Socialism and comparing him to Marx; Auguste Blanqui, *Critique sociale,* 2 vol. (1885), a collection of studies by Blanqui; *Textes choisis* (1955), with an introduction by a Soviet specialist on Blanqui, V.P. Volguine.

blanquillo (fish): *see* tilefish.

Blantyre, largest city in Malawi, administrative headquarters of the Southern Region. In the Shire Highlands in Blantyre District (1,612 sq mi [4,175 sq km]), Blantyre is at an altitude (3,409 ft [1,039 m]) that moderates the tropical climate. It has a rainy season (December to March), a cool season (April to August), and a hot season (September to November). It was founded (1876) as a Church of Scotland mission station and was named after David Livingstone's Scottish birthplace. It became a British consular post in 1883 and attained municipal status in 1895, making it Malawi's oldest municipality. Its colonial trade in ivory laid the communications foundation for its present importance as a major commercial and distribution centre. In 1956 Blantyre was united with Limbe, 7 mi east, a town (founded 1909) that had grown around the headquarters of the Malawi (then Nyasaland) Railways, with branch lines to Beira, Mozambique, and Harare (formerly Salisbury), Zimbabwe. The amalgamated city is sometimes called Blantyre/Limbe. It has two cathedrals and the Polytechnic campus of the University of Malawi. Light industries at the Chichiri industrial estate include shoe manufacture, corn (maize) milling, brewing, soft drinks production, baking, printing, and tobacco manufacture. While Blantyre acts as the regional shopping and administrative centre, Limbe is the centre for wholesale commerce, conducted mainly by the Indian community, and the headquarters of Malawi's tobacco auctions. Pop. (1981 est.) city, 230,000; (1977) district, 408,062.

Blarney, Irish AN BHLARNA, village, County Cork, Ireland, 5 mi (8 km) northwest of Cork city, famous for Blarney Castle (*c.* 1446). Below the battlements on the southern wall of the castle is the Blarney Stone, reputed to confer eloquence on those who kiss it; this feat can be achieved only by hanging head downward. "Blarney," as an expression of dubiousness, is attributed to Elizabeth I of England, who used it when impugning the worth of Lord Blarney's promises. Blarney lies in wooded country. Tweed is manufactured there, as also are polypropylene sacks. Pop. (1981) 3,186.



Blarney Castle, County Cork
G.F. Allen—Bruce Coleman

Blaschka glass, glass models, primarily of natural history specimens, made by Leopold Blaschka (died 1895) and his son Rudolph (died 1939). The Blaschkas were Bohemian, or Czech, by birth but worked in Germany. Their most famous production was a collection of several thousand models of flora, made at Dresden between 1887 and 1936. In their minute representational accuracy, they fulfill their original purpose of botanical study; moreover, technically and artistically they are among the finest glass objects ever made. The Blaschkas also made models of marine life for the Museum of Comparative Zoology at Harvard.

Consult the INDEX *first*

Blaschke, Wilhelm Johann Eugen (b. Sept. 13, 1885, Graz, Austria-Hungary—d. March 17, 1962, Hamburg), German mathematician whose major contributions to geometry concerned kinematics and differential and integral geometry.

Blaschke became extraordinary professor of mathematics at the Deutsche Technische Hochschule (German Technical University), Prague, in 1913 and two years later accepted a post at the University of Leipzig. In 1917 he was appointed professor of mathematics at the University of Königsberg. He accepted a professorial post with the University of Hamburg in 1919.

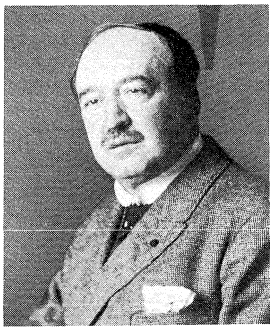
Blaschke discovered kinematic mapping, which later became important to the axiomatic foundations of various geometries, and established it as a fundamental technique in kinematics. He also originated topological differential geometry, the study of invariant differentiable mappings. His more important works include *Kreis und Kugel* (1916; "Circle and Sphere"); *Vorlesungen über Differentialgeometrie,* 3 vol. (1921–29; "Lectures on Differential Geometry"); *Vorlesungen über Integralgeometrie,* 2 vol. (1935–37; "Lectures on Integral Geometry"); *Grundlagen von Einsteins Relativitatstheorie* (1921–23; "Foundations of Einstein's Theory of Relativity"); and *Analytische Geometrie* (1948; "Analytical Geometry").

Blasco Ibáñez, Vicente (b. Jan. 29, 1867, Valencia, Spain—d. Jan. 28, 1928, Menton, Fr.), Spanish writer and politician, who achieved world renown for his novels dealing with World War I, the most famous of which, *Los cuatro jinetes del Apocalipsis* (1916; *The Four Horsemen of the Apocalypse,* 1918), was used as the basis for two U.S. films. He was associated with the Generation of '98 (*q.v.*).

At the age of 18, while studying law at Madrid and contributing articles to political journals, Blasco Ibáñez wrote an anti-monarchist poem for which he was sent to prison—the first of many such punishments for his political beliefs. He founded the republican journal *El Pueblo* in 1891 and was first elected to the Cortes (parliament) in 1901, to which he was returned seven times before he voluntarily exiled himself in 1923 and settled on the Riviera. He did so because of his opposition to the military dictatorship of Miguel Primo de Rivera.

Blasco Ibáñez' early work, composed mainly of regional novels such as *Flor de mayo* (1895; *Mayflower,* 1921), *La barraca* (1899; *The Cabin,* 1917), and *Cañas y barro* (1902; *Reeds and Mud,* 1966), is marked by a vigorous and intense realism and considerable dramatic force in the depiction of the life of Valencia. Later novels, such as *La bodega* (1906; *The Fruit of the Vine,* 1919), are held to have suffered from a heavy ideological treatment of serious social problems. More popular novels, *Sangre y arena* (1909; *Blood and Sand,* 1922);

La maja desnuda (1906; *Woman Triumphant,* 1920); his best known, *Los cuatro jinetes del Apocalipsis;* and others, brought him fame



Blasco Ibáñez
Archivo Mas, Barcelona

but cost him critical approval because of their sensational nature. He became a member of the French Legion of Honour in 1906.

Blasis, Carlo (b. Nov. 4, 1803, Naples—d. Jan. 15, 1878, Cernobbio, Italy), Italian ballet teacher and writer on the technique, history, and theory of dancing. He was the first to codify and publish an analysis of the classic ballet technique in his *Traité élémentaire, théorique,*

Blasis, engraving by Adolfo Bignami after a portrait by Innocent-Louis Goubaud
By courtesy of the Bibliotheque de l'Opera, Paris; photograph, Pic

et pratique de l'art de la danse (1820; *An Elementary Treatise upon the Theory and Practice of the Art of Dancing,* 1944).

A student of Jean Dauberval, Blasis danced briefly at the Paris Opéra, appeared in Salvatore Viganò's ballets at La Scala in Milan, and performed and choreographed at King's Theatre in London. In 1837 he was appointed director of the ballet school at La Scala, where he trained many of the 19th century's most brilliant dancers. Carlotta Grisi and Fanny Cerrito studied with him as established stars.

Blasis is credited with creating the position of *attitude* with inspiration from Giambologna's statue of Mercury; in this, the dancer's working leg is raised and extended to the back but bent at the knee. He also discovered the technique for preventing dizziness while turning, called spotting, by which the dancer can snap his head around more quickly than the rest of his body, and so be able to maintain a focus on one "spot" and not become dizzy. Many of Blasis' traditions and innovations, which were handed down directly through his pupils and were also recorded in his second book, *The Code of Terpsichore* (1830), still form the basis of classic dance training.

Blasius, SAINT: *see* Blaise, Saint.

Blasko, Bela (actor): *see* Lugosi, Bela.

Blaskowitz, Johannes (b. July 10, 1883, Peterswalde, Ger.—d. Feb. 5, 1948, Nürnberg), German field marshal, a tank specialist who led German military forces on several fronts during World War II and protested Nazi atrocities.

A professional soldier who served in World War I, he rose rapidly during the Third Reich, acting as a field commander in the invasion of Austria and the Czech Sudentenland and becoming commander in chief of the Eighth Army in the Polish campaign. On Oct. 22, 1939, he was made military governor of occupied Poland. There he directed two memoranda to higher authorities documenting cases of rape, murder, and looting of Jewish and Polish shops by the SS and other nonmilitary Nazi police and complaining that they operated outside the law and that he had no control over them. Hitler, infuriated at such statements, dismissed him from several army commands.

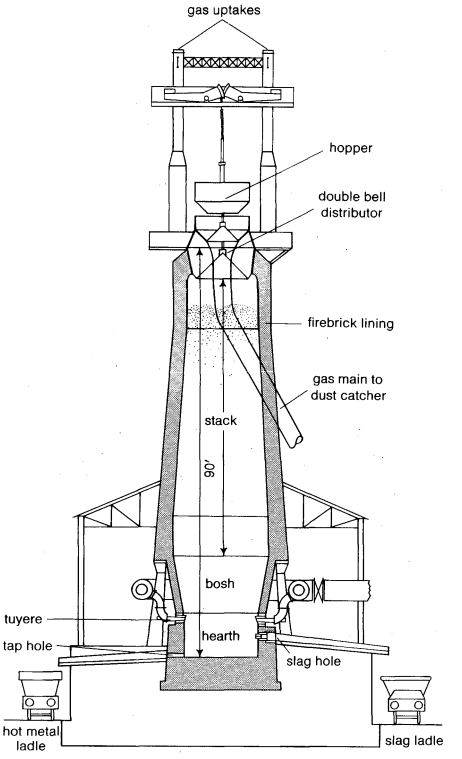
Returned to command, he was credited with effecting the breakthrough at Sedan in 1940, which led to France's defeat. As early as 1942 he was reported one of a group seeking to sacrifice Hitler to secure favourable peace terms, and he was said to have disapproved of the decision to invade Russia. Named a field marshal in 1944, he was in charge of the German defense of southern France and also of the fixed defenses of the German west wall. He became German commander in the west in March 1945, and as chief of the German 25th Army he signed the surrender terms in The Netherlands. A defendant in one of the war crimes trials, he apparently committed suicide, leaping to his death in the Nürnberg prison. (There were claims that he was pushed to his death by agents of the SS.)

blasphemy, irreverence toward God, and by extension, the use of profanity. Blasphemy has points in common with heresy but is differentiated from it in that heresy consists of holding a belief contrary to the orthodox one. Thus, it is not blasphemous to deny the existence of God or to question the established tenets of the Christian faith unless this is done in a mocking and derisive spirit. In the Christian religion, blasphemy has been regarded as a sin by moral theologians; St. Thomas Aquinas described it as a sin against faith. For the Muslim it is blasphemy to speak contemptuously not only of God but also of Muḥammad.

Among many peoples blasphemy in some form or another has been an offense punishable by law. The Mosaic Law decreed death by stoning as the penalty for the blasphemer. Under Emperor Justinian I (reigned 527–565) the death penalty was decreed for blasphemy. In the United States many states have legislation aimed at the offense. In Scotland until the 18th century it was punishable by death, and in England it is both a statutory and a common-law offense. It was recognized as the latter in the 17th century; the underlying idea apparently was that an attack on religion is necessarily an attack on the state. This idea probably has been the reason why penalties have been laid down for blasphemy in some secular legal codes.

blast furnace, furnace in which rapid combustion is maintained by a current of air under pressure. It is used to obtain pig iron from iron ore by the reducing action of carbon (supplied as coke) at a high temperature in the presence of a fluxing agent such as limestone. Blast furnaces are also used in the production of lead, copper, and other metals.

The hearth, the lower section of the blast furnace, in which molten iron accumulates, is a thick-walled structure of firebrick. Tuyeres (nozzles), spaced around the circumference near the top of the hearth, supply preheated air for the combustion (*see* Cowper stove); the tuyeres are supplied, in turn, from a bustle pipe, a large pipe that encircles the furnace.



Cross-section of modern blast furnace

The hearth has a tap hole to draw off the molten iron and, higher up, a slag hole to remove the mixture of impurities and flux. Just above the hearth is the hottest part of the blast furnace, called the bosh. To keep the brickwork from burning out, plates for circulating cool water are built into it. The stack, made of plate steel lined with firebrick, extends from the bosh to the top of the furnace.

The stack is kept full with alternating layers of coke, ore, and limestone admitted at the top during continuous operation. Coke is ignited at the bottom and burned rapidly with the forced air from the tuyeres. The iron oxides in the ore are chemically reduced to molten iron by carbon and carbon monoxide from the coke. The slag formed consists of the limestone flux, ash from the coke, and substances formed by the reaction of impurities in the ore with the flux; it floats in a molten state on the top of the molten iron. Hot gases rise from the combustion zone, heating fresh material in the stack and then passing out through ducts near the top of the furnace.

During the early Middle Ages charcoal was used in relatively small furnaces that reduced ore to a pasty mass of iron. The metal was then hammered to remove impurities. The furnace was improved in the later Middle Ages by the addition of a stack, an upper portion in which materials were preheated, which made it possible to make the metal free of earthy impurities and produce pig iron, a great advance over the forged metal made before. Charcoal was the only furnace fuel until the 18th century, when the depletion of forests that provided the charcoal in England led to experiments with coke, which is produced from coal. By the early 1700s iron smelting with coke had been accomplished by Abraham Darby at Coal-brookdale, Salop. In the 19th century cokes made from Pennsylvania coals proved strong enough to support heavy burdens without crumbling and made it feasible to build blast-furnace stacks 95 feet (29 metres) high.

By the end of the 19th century carbon brick refractories had been developed in Germany for lining furnace hearths; in modern practice they are preferred over firebrick construction.

High-pressure operations were developed in

the United States in the 1940s. Modern blast furnaces are more than 100 feet (30 metres) high with hearths more than 45 feet (14 metres) in diameter. Pressures may reach 60 pounds per square inch (420 kilopascals).

blast injury, any injury caused by a pressure wave such as that following an explosion. Blast injuries may be inflicted by such waves travelling in gases, liquids, or solids. The first is exemplified by the air blast caused by bomb explosions. Underwater blasts may originate from torpedoes, mines, and depth charges. Solid blast is the effect of a pressure wave that strikes the walls of a contained environment like that of a submarine or tank. Regardless of the medium through which the wave reaches the victim, it may cause internal fractures, organ perforations, damaged blood vessels, and massive bruises although the external skin may not be injured.

Persons in the immediate vicinity of an explosion are always subject to blast injuries. Minor effects include nervousness, shaking, and apprehensiveness; mild shock is common and, though itself of little moment, may be a manifestation of extensive internal injuries. Internal wounds may cause dizziness, unconsciousness, laboured breathing, and bleeding. Blast waves frequently cause rupture of the fragile eardrum membrane. Usually this is manifested by pain, difficulty in hearing, and traces of blood. If the lungs have been injured, there may occur a blue colouring to the skin (cyanosis), chest pain, rapid and shallow breathing, coughing, a frothy red mucus from the nose or mouth, or, possibly, respiratory arrest. Abdominal blast injuries are characterized by abdominal pain, tenderness to the touch, and slight swelling. If the abdominal injuries are severe, there may be vomiting and passage of blood in the urine or stools.

Blastares, Matthew (fl. 14th century), Greek Orthodox monk, theological writer, and Byzantine legal authority whose systematizing of church and civil law influenced the development of later Slavic legal codes.

A priest-monk of the Esaias monastery at Thessalonica, Greece, Blastares compiled, in 1335, the *Syntagma kata stoicheion* ("Alphabetic Constitution"), a handbook of church and civil laws that synthesized material from previous collections. It was almost immediately translated into Slavonic at the behest of King Stefan Dušan of Serbia and appeared in a Bulgarian version during the 15th century and in a Russian edition in the early 16th century. By the 18th century it was recognized as the standard expression of Eastern Orthodox canon law. The *Syntagma* helped to establish Slavic customs relating to the rules of legal procedure and laws regulating state protection of the poor and persecuted; moreover, it transmitted the principle of a political realm transcending the interests of individuals and classes, ruled by a sovereign himself and subject to the laws he had promulgated.

Blastares also wrote controversial tracts against Latin sacramental doctrine and against the Jews. Other works include treatises on divine grace, political verse on the officials of Constantinople's court, and a series of liturgical essays and hymns.

blastema, also called REGENERATION BUD, in zoology, a mass of undifferentiated cells that has the capability to develop into an organ or an appendage. In lower vertebrates the blastema is particularly important in regeneration of severed limbs. In the salamander, for example, tissues in the stump of a limb dedifferentiate—that is, they lose their individual characteristics—and revert to an embryonic appearance. Under the influence of regenerating nerve fibres, they will form a blastema, a mound of cells resembling the original limb bud, from which the replacement limb gradually emerges.

In some invertebrates, such as flatworms, reserve cells scattered throughout the body supply the cells of blastemas. In vertebrates, dedifferentiated skin and muscle cells at the site of a wound constitute the developing blastema. If for any reason the regenerating nerve fibres are damaged or destroyed, the blastema will fail to develop and scar tissue will form instead.

blasting, process of reducing a solid body, such as rock, to fragments. An explosive or, occasionally, compressed air may be used. Conventional blasting operations include (1) drilling holes in a converging pattern; (2) placing a charge and detonator in each hole; (3) tamping and stemming the charge to compact the explosive, and filling the remainder of the hole with clay or rock; (4) igniting or detonating the charge; and (5) clearing away the broken material.

In primary blasting (breaking rocks from the solid), an explosive is usually confined in holes to make more efficient use of the explosive energy. In secondary blasting (breaking rocks into smaller pieces), the charge is usually placed in a hole or on the surface with a cover of mud, called a mudcap. The shock of the blast is most intense near the charge.

Compressed air, because it is not a fire hazard, is usually used in bituminous coal mines to break the coal into large fragments. Black powder and high explosives may cause crushing immediately around the hole, but at the limit of the crushed zone the strain wave proceeds radially, diminishing rapidly in intensity. The shock from nuclear explosives produces melting and vaporization of rock in the immediate vicinity, then a crushed zone, and, finally, if the charge is near enough to a free surface, a fractured zone.

In surface blasting, large-diameter holes (over 3 inches [7.5 centimetres]) are used, with an average diameter of about 6 inches (15 centimetres) and an average depth of about 30 feet (9 metres). In underground blasting, shorter, small-diameter holes are used.

Holes are so placed as to require a minimum quantity of explosive per volume of rock broken (called the powder factor). Most blast-hole patterns are based on the fact that fragmentation is most uniform if the exploding charge is within a particular distance from an exposed face of the rock. To break up a large body of rock, charges are placed in series of holes drilled so that, as the holes nearest the exposed surface are fired, the blasts create new exposed faces at the proper distances from the next set of holes, in which firing of the charges is slightly delayed. The holes are fired in a predetermined order, at intervals of only thousandths of a second.

The detonation of each charge of explosives is initiated by a blasting cap. Timing of the blasts with fuses is fixed by the length of the fuses, while timing with electric blasting caps is done with timing elements in the caps themselves.

blasting cap, also called DETONATOR, device that initiates the detonation of a charge of a high explosive by subjecting it to percussion by a shock wave. In strict usage, the term detonator refers to an easily ignited low explosive that produces the shock wave, and the term primer or priming composition denotes a substance that produces a sudden burst of flame to ignite the detonator. The primer may be set off by the brief application of heat (from a burning fuse or an electrically heated wire), by friction, or by mechanical shock (like the impact of the firing pin of a gun).

Depending on the preferred method of initiating the explosion, the blasting cap may contain a primer alone or both a primer and a detonator. *See also* percussion cap.

blastocyst, a distinctive stage of a mammalian embryo. It is a form of blastula that develops from a berrylike cluster of cells, the morula. A cavity appears in the morula between the cells of the inner cell mass and the enveloping layer. This cavity becomes filled with fluid. The blastocyst differs from the blastula in that it is composed of two already differentiated cell types, the inner cell mass and the enveloping layer.

Further differentiation produces a thin layer of cells, called the hypoblast, between the inner cell mass and the cavity. These cells contribute to the formation of the embryonic endoderm, from which derive the respiratory and digestive tracts.

The enveloping layer is now referred to as the trophoblast. It does not contribute directly to the formation of the embryo but rather serves to establish a connection with the maternal uterus. It is a precursor of the placenta.

blastoid, any member of an extinct class (Blastoidea) of echinoderms, animals related to the modern starfish and sea lilies, that existed from Middle Ordovician to Late Permian time (the Ordovician Period began 500,000,000 years ago; the Permian Period ended 225,000,000 years ago). The blastoids were sedentary animals anchored to the sea floor by a stemlike column of circular plates. Unlike other echinoderms, the blastoids are characterized by a regularity of structure; the blastoid body region consisted of 13 plates of calcium carbonate, an external framework, or skeleton, arranged in 3 circles about the body. Some blastoids are useful as index, or guide, fossils that allow correlation of rock units; the genus *Pentremites* is especially well-known and common.

blastomycosis, infection of the skin and viscera caused by fungal organisms of the genus *Blastomyces.* There are two major types of blastomycosis: the North American, caused by *Blastomyces dermatitidis,* and the South American, caused by *Blastomyces brasiliensis.* In North American blastomycosis, skin and lung lesions are most common: pulmonary lesions vary in size from granulomatous nodules to confluent, diffuse areas of pus-forming inflammation involving the entire lobe of the lung; in the skin, micro-abscesses lie just beneath the epidermis, the outermost layer of the skin, and are associated with a granulomatous appearance of the surrounding skin. In South American blastomycosis, the portal of entry is usually the nasopharynx (the part of the alimentary canal between the cavity of the mouth and the esophagus that is continuous with the nasal passages); swelling and ulceration of the mouth or nose may cause the infection to spread to the nearby lymph nodes; primary lesions may also occur in the lymphoid tissues in the lower abdomen. In both North and South American varieties, the infection may spread not only to the lymph nodes but also to such organs as the brain, bones, liver, spleen, and adrenals.

Treatment includes the use of antibiotics, antifungal agents, and sulfonamide drugs. *See also* chromoblastomycosis; cryptococcosis.

blastopore, the opening by which the cavity of the gastrula, an embryonic stage in animal development, communicates with the exterior. During maturation of some animals it evolves into the anus or the mouth; in others it is covered over and contributes to the canal joining the primitive gut with the cavity of the neural tube, the primitive nervous system.

blastula, hollow sphere of cells, or blastomeres, produced during the development of an embryo by repeated cleavage of a fertilized egg. The cells of the blastula form an epithelial (covering) layer, called the blastoderm, enclosing a fluid-filled cavity, the blastocoel.

After the blastula develops, it undergoes transition to the gastrula (*q.v.*), a process called gastrulation. In organisms such as mammals, the earlier morula (*q.v.*), a berrylike cluster of cells, develops into a somewhat different form of blastula, the blastocyst (*q.v.*).

Blatch, Harriot Eaton Stanton, *née* STANTON (b. Jan. 20, 1856, Seneca Falls, N.Y., U.S.—d. Nov. 20, 1940, Greenwich, Conn.), leader in the woman suffrage movement in the United States.

The daughter of the suffragist Elizabeth Cady Stanton and the abolitionist Henry Brewster Stanton, Blatch graduated from Vassar College in 1878. She contributed a large chapter to the *History of Woman Suffrage* (1881–87), a monumental work jointly edited by her mother, Susan B. Anthony, and Matilda J. Gage. She was married to William Henry Blatch, an English businessman, in 1882 and spent most of the next 20 years in England, where she worked for educational and social reform and participated in the British suffragette movement.

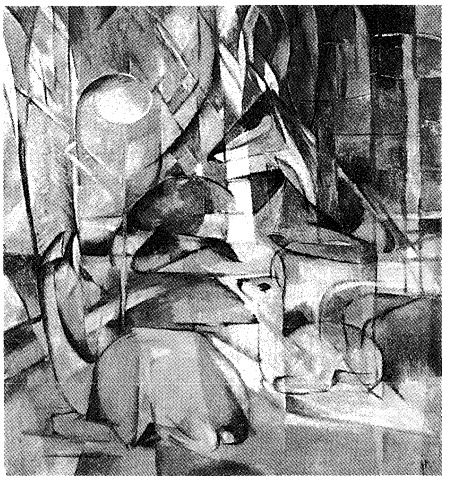
Blatch returned to the United States in 1902 and is credited with helping at that time to revitalize the moribund suffrage campaign. She also organized the first suffrage parades in the United States (1910), as well as open-air meetings. She later joined the militant Congressional Union (later the National Woman's Party) and worked for the passage of a federal equal rights amendment. Blatch subsequently headed the U.S. Food Administration's Speaker's Bureau, and during World War I she directed the Women's Land Army, an organization promoting farm labour. She wrote four books, including an analysis of war, *A Woman's Point of View, Some Roads to Peace* (1920), and, with Alma Lutz, her memoirs, *Challenging Years* (1940).

Blatchford, Samuel (b. March 9, 1820, New York City—d. July 7, 1893, Newport, R.I., U.S.), associate justice of the United States Supreme Court (1882–93).

Blatchford graduated from Columbia College (later Columbia University) in 1837 and served as private secretary to William H. Seward until attaining his majority. In 1842 he was admitted to the bar and began to practice with his father. He later practiced with Seward and subsequently started his own firm in New York City, becoming a noted authority on international and maritime law.

In 1867 he was appointed district judge of the southern district in New York and five years later was made a circuit judge for the second judicial district. He was elevated to the U.S. Supreme Court by Pres. Chester A. Arthur in 1882 and gained a reputation as one of the most hardworking justices, giving opinions in 430 cases. He notably gave the opinion of the majority in *Cunningham* v. *Neagle,* a case that extended federal authority. Moreover, Blatchford's decisions on the status of design patents and his rulings regarding the infringement of design formed the basis for legislation passed by Congress in 1887 to provide remedies for patent infringement.

Blaue Reiter, Der, English THE BLUE RIDER, organization of artists, formed in December 1911 in Munich, that contributed greatly to the development of abstract art. Its founding members, Franz Marc and Wassily Kandinsky, co-edited a volume of essays on aesthetics entitled *Der Blaue Reiter,* a name that they had derived from a painting by Kandinsky and that, in turn, became the name of the group. Neither a movement nor a school and having no definite program, Der Blaue Reiter was a loosely knit organization of numerous artists who exhibited their works together between 1911 and 1914.



"Deer in Forest II," oil painting by Franz Marc, one of the members of Der Blaue Reiter, 1913–14; in the Staatliche Kunsthalle, Karlsruhe, W.Ger.
By courtesy of the Moderne Galerie, Munich

Der Blaue Reiter artists were expressionistically oriented, as was the earlier German organization Die Brücke; but, unlike that of Die Brücke, their expressionism took the form of lyrical abstraction and did not exhibit as many common stylistic characteristics. Wishing to give form to mystical feelings, they wanted to imbue their art with deep spiritual content. Der Blaue Reiter painters were variously influenced by the Jugendstil group, Cubist and Futurist painting styles, and naïve folk art.

The first exhibition of Der Blaue Reiter, held December 1911 to January 1912, at the Moderne Galerie Tannhäuser, Munich, included among its participants the following artists: Henri Rousseau, David and Vladimir Burlyuk, Albert Bloch, August Macke, and founders Marc and Kandinsky. Although not officially a member of Der Blaue Reiter, the Russian painter Alexey von Jawlensky supported its aims. The Swiss painter Paul Klee became associated with the group in 1912, when he joined in a graphic-art exhibition held in Munich. Among others included in this show were André Derain, Jean Arp, Georges Braque, Maurice de Vlaminck, Mikhail Larionov, Natalya Goncharova, and Pablo Picasso.

The final exhibition of Der Blaue Reiter took place at the famous Galerie Der Sturm (*see* Sturm, Der) in Berlin, where they were included in an exhibition called the "First German Autumn Salon," held in 1913; at this time the German-American artist Lyonel Feininger also became affiliated with the group. With the outbreak of World War I, Der Blaue Reiter dispersed.

After the war, in 1924, Feininger, Kandinsky, Klee (all of whom were teaching at the Weimar Bauhaus at the time), and Jawlensky formed a successor group, Die Blaue Vier (The Blue Four). Members of the group were united by a desire to exhibit together, which they did between 1925 and 1934, rather than by similarity of style.

Blavatsky, Helena Petrovna, *née* HAHN (b. Aug. 12 [July 31, old style], 1831, Yekaterinoslav, Ukraine, Russian Empire—d. May 8, 1891, London), Russian spiritualist, author, and co-founder of the Theosophical Society to promote Theosophy, a pantheistic philosophical–religious system.

At the age of 17, Helena Hahn married Nikifor V. Blavatsky, a Russian military officer and provincial vice governor, but they separated after a few months. She became interested in occultism and spiritualism and for many years travelled extensively throughout Asia, Europe, and the United States; she also claimed to have spent several years in India and Tibet studying under Hindu mahatmas. In 1873 she went to New York City, where she met and became a close companion of H.S. Olcott, and in 1875 they and several other prominent persons founded the Theosophical Society.

In 1877 her first major work, *Isis Unveiled,* was published. In this book she criticized the science and religion of her day and asserted that mystical experience and doctrine were the means to attain true spiritual insight and authority. Although *Isis Unveiled* attracted attention, the society dwindled. In 1879 Mme Blavatsky and Olcott went to India; three years later they established a Theosophical headquarters at Adyar, near Madras, and began publication of the society's journal, *The Theosophist,* which Mme Blavatsky edited from 1879 to 1888. The society soon developed a strong following in India.

Asserting that she possessed extraordinary psychic powers, Blavatsky, during journeys to Paris and London, was accused by the Indian press late in 1884 of concocting fictitious spiritualist phenomena. Protesting her innocence while on a tour of Germany, she returned to India in 1884 and met with an enthusiastic reception. After an investigation in 1885 by the London Society for Psychical Research, however, she was declared a fraud; she left India in failing health, never to return. She lived quietly in Germany, Belgium, and finally in London, working on her small, meditative

Helena Blavatsky, detail of an oil painting by Hermann Schmiechen, 1884; in a private collection

classic *The Voice of Silence* (1889) and her most important work, *The Secret Doctrine* (1888), which was an overview of Theosophical teachings. It was followed in 1889 by her *Key to Theosophy.*

At least 14 volumes of Blavatsky's *Complete Writings* were published by the early 1980s. Her life has been described in several biographies, including Marion Meade's *Madame Blavatsky* (1980).

Blazey, SAINT: *see* Blaise, Saint.

bleach, solid or liquid chemical used to whiten or remove the natural colour of fibres, yarns, paper, and textile fabrics; in textile finishing the bleaching process is used to produce white cloth, to prepare fabrics for other finishes, or to remove discoloration that has occurred in other processes. Chlorine, sodium hypochlorite, calcium hypochlorite, and hydrogen peroxide are commonly used as bleaches.

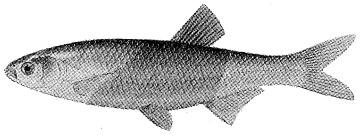
Sunlight was the chief bleaching agent up to the discovery of chlorine in 1774 by the Swedish chemist Karl Wilhelm Scheele and the demonstration of its bleaching properties in 1785 by the French chemist Claude Berthollet. Bleaching powder, a solid combination of chlorine and slaked lime, introduced in 1799 by the Scottish chemist Charles Tennant, was thereafter produced in large quantity to bleach cloth and paper. It had the same effect as chlorine and could be more easily handled and shipped, but it was unstable and contained a large proportion of inert material. It remained the standard bleaching agent until

the 1920s, but then it was gradually replaced by liquefied chlorine and solutions of sodium hypochlorite.

In the production of bleaching powder, slaked lime spread on the floors of large rectangular chambers of lead or concrete is exposed to chlorine gas; or lime is propelled through horizontal tubes that are fed with the gas.

Hydrogen peroxide is now most commonly used to bleach cotton cloth, with sodium chlorite and sodium hypochlorite as alternatives. Wood and animal fibres are bleached by acidic reducing agents such as sulfur dioxide. In the pulp and paper industry chlorine dioxide, hydrogen peroxide, sodium peroxide, sulfur dioxide, sodium bisulfite, and sodium hydrosulfite are commonly used. Synthetic fibres are bleached with either oxidizing or reducing agents, depending on their chemical composition. Optical bleaches, fluorescent white chemicals giving off a bluish-white light, are not true bleaches.

bleak (*Alburnus alburnus*), small, slender fish of the carp family, Cyprinidae, found in rivers and lakes of England and Europe. A silvery-green fish, it grows to a maximum length of about 20 centimetres (8 inches). It lives in schools, usually near the surface, and eats



Bleak (*Alburnus alburnus*)
Painted especially for *Encyclopaedia Britannica* by Tom Dolan, under the supervision of Loren P. Woods, Chicago Natural History Museum

aquatic invertebrates. The bleak is edible but bony. Its scales are used in eastern Europe for the manufacture of artificial pearls.

Bled, Lake, Serbo-Croatian BLEDSKO JEZERO, glacial lake in the extreme northwestern region of Slovenia, Yugoslavia, northwest of Ljubljana. A summer health and holiday resort and a winter sports centre at the foot of the Julian Alps, 1,558 ft (475 m) above sea level, it has good road and rail connections and summer air service. Nearby is Triglav National Park and other mountains in the Julian Alps and Karavanke. The mild subalpine climate affords a long summer season for bathing.

The town of Bled has historic landmarks. On a small island in the lake is the Church of St. Maria, on which a Slavic pagan shrine stood until the 11th century. Bled castle stands atop a 460-ft cliff on the lakeshore.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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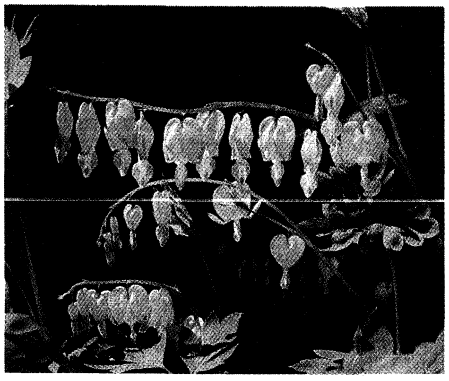
bleeding heart, any of several species of *Dicentra,* a genus of herbaceous flowering plants



Bleeding heart (*Dicentra spectabilis*)
Grant Heilman—EB Inc.

of the fumitory family (Fumariaceae). The old garden favourite is the Japanese *D. spectabilis,* widespread for its small rosy-red and white, heart-shaped flowers dangling from arching stems about 60 centimetres (2 feet) tall. There is also a white form, *D. spectabilis alba.* The deeply cut leaf segments are larger than those of other cultivated species of *Dicentra,* such as the shorter eastern, or wild, bleeding heart (*D. eximia*), which produces sprays of small pink flowers from April to September in the Allegheny mountain region of eastern North America. The Pacific, or western, bleeding heart (*D. formosa*) of mountain woods, which ranges from California to British Columbia, has several varieties of garden interest.

Bleeding Kansas (1854–59), small civil war in the United States, fought between proslavery and antislavery advocates for control of the new territory of Kansas under the doctrine of popular sovereignty (*q.v.*). Sponsors of the Kansas–Nebraska Act (May 30, 1854) expected its provisions for territorial self-government to arrest the "torrent of fanaticism" that had been dividing the nation regarding the slavery issue. Instead, free-soil forces from the North formed armed emigrant associations to populate Kansas, while proslavery advocates poured over the border from Missouri. Regulating associations and guerrilla bands were formed by each side, and only the intervention of the Governor prevented violence in the Wakarusa War, launched in December 1855 over the murder of an antislavery settler. "Bleeding Kansas" became a fact with the Sack of Lawrence (May 21, 1856), in which a proslavery mob swarmed into the town of Lawrence and wrecked and burned the hotel and newspaper office in an effort to wipe out this "hotbed of abolitionism." Three days later, an antislavery band led by John Brown retaliated in the Pottawatomie Massacre (*q.v.*). Periodic bloodshed along the border followed as the two factions fought battles, captured towns, and set prisoners free. A political struggle to determine the future state's position on slavery ensued, centred on the Lecompton Constitution (*q.v.*) proposed in 1857. The question was finally settled when Kansas was admitted as a free state in January 1861, but, meanwhile, "Bleeding Kansas" had furnished the newly formed Republican Party with a much needed antislavery issue in the national election of 1860. Claims for $400,000 in damages sustained in the border war were later approved by territorial commissioners.

Bleek, Wilhelm (Heinrich Immanuel) (b. March 8, 1827, Berlin—d. Aug. 17, 1875, Cape Town), comparative linguist known for his pioneer studies of South African languages as the "Father of Bantu Philology."

In his doctoral dissertation at the University of Bonn (1851), Bleek attempted to prove a North African origin of the Hottentot language. In about 1855 he went to Natal to study the language and customs of the Xhosa. Before going to Cape Town, he wrote *The Languages of Mosambique* (1856). The following year he was appointed interpreter to the British governor of Cape Colony, Sir George Grey, and, from about 1860, served as librarian of a valuable collection of books presented to the colony by Grey. Bleek wrote a number of works, including *Handbook of African, Australian and Polynesian Philology,* 3 vol. (1858–63); *A Comparative Grammar of South African Languages* (1862–69); and *Reynard the Fox in South Africa; or, Hottentot Fables and Tales* (1864).

Blegen, Carl (William) (b. Jan. 27, 1887, Minneapolis, Minn., U.S.—d. Aug. 24, 1971, Athens), archaeologist who found striking evidence to substantiate and date the sack of Troy described in Homer's *Iliad.* He also discovered, in 1939, clay tablets incribed with one of the earliest known European scripts and dating from about 1250 BC.

While associated with the American School of Classical Studies, Athens (1913–27), Blegen excavated a number of sites, notably in the northeastern Peloponnese, of great importance for reconstructing the prehistory of Greece. With the British archaeologist A.J.B. Wace, he published a major advance in the method of dating pre-Mycenaean culture from pottery remains (1916–18). Blegen was professor of classical archaeology at the University of Cincinnati, Ohio (1927–57); he directed the university's excavation of the mound of Hisarlık, Tur., the site of Troy, from 1932 to 1938. There he and his staff found that the previously identified nine major periods of Troy's construction, destruction, and rebuilding each represented two or more phases. His team's stratigraphic study disclosed a total of 46 such phases. Moreover, Blegen suggested that the remains of King Priam's Troy dated from the major period VIIa (*c.* 1250 BC), which offered evidence of large-scale human violence as well as fiery devastation. The research was described in *Troy: Excavations Conducted by the University of Cincinnati, 1932–38,* 4 vol. (1950–58), which he edited. Blegen published a popular account of his findings in *Troy and the Trojans* (1963).

Continuing to investigate sites described by Homer, Blegen returned to Greece in 1939 and sought to locate the Pylos of King Nestor. He decided upon Epano Englianos, a hilltop in Messenia, five miles north of the Bay of Navarino, as the probable site of Nestor's palace. Excavation revealed the remains of a large structure or complex of structures. His most significant findings were the first examples of Greek writing, similar to the Linear B script found earlier in Crete. With continued excavation from 1952, more than 1,000 inscribed tablets were found at Pylos, and a fine 13th-century-BC Mycenaean palace was revealed. Remaining at Pylos until 1964, he also excavated a number of tombs that yielded exceptionally rich finds. Blegen and Marion Rawson edited *The Palace of Nestor at Pylos in Western Messinia,* 3 vol. (1966–73).

Blekinge, *län* (county) and *landskap* (province), southern Sweden, between the *landskapen* (provinces) of Småland and Skåne and the Baltic Sea. With a land area of 1,127 sq mi (2,919 sq km), it is the second smallest Swedish *landskap,* after Öland. The coast is much indented, and the low, undulating interior slopes up toward the Småland Plateau, where it ends in a forest belt of birch, pine, and beech. Blekinge was ceded to Sweden by Denmark under the Peace of Roskilde (1658). Intensively cultivated, it is known as "the garden of Sweden." Potatoes, a leading crop, are used as a source of starch and alcohol as well as for food. Steel and textile milling, stone quarrying, and the manufacture of industrial and home equipment are important industries. Karlshamn is the chief commercial and industrial centre, but Karlskrona, a Swedish naval base since 1680, is the administrative capital of the *län.* Pop. (1983 est.) 152,091.

blende (mineral): *see* sphalerite.

blended whiskey, mixture of straight whiskey (that distilled from mash of a single grain) and mixed-grain whiskey or neutral spirits. Blended straight whiskey is a mixture of straight whiskeys only. Whiskeys are blended in order to achieve a uniform product with a balanced character and, generally, a lighter, somewhat less pronounced taste than that of straight whiskey. *See* whiskey.

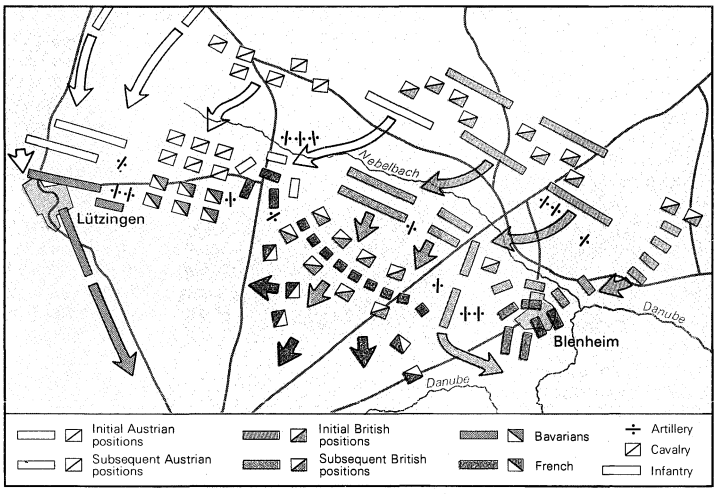
blending, in yarn production, process of combining fibres of different origins, length, thickness, or colour to make yarn. Blending

is accomplished before spinning and is performed to impart such desirable characteristics as strength or durability, to reduce cost by combining expensive fibres with less costly types, or to achieve special colour or texture effects.

Fabrics made from such fibres are called blends. Blending also refers to the process of combining small amounts of the same fibre taken from different lots to achieve a uniform result.

Blenheim, borough, northeastern South Island, New Zealand, on the Wairau Plain at the confluence of the Omaka and Opawa rivers. Around 1830, the entire plain was sold by the local Maoris to a whaling captain. First settled in 1847, it grew rapidly following the discovery of gold (1864) and was made capital of Marlborough Province (1865–76). Proclaimed a town in 1866, it became a borough in 1869 and is now the administrative centre of Marlborough region. It was named after the Battle of Blenheim (1704) in which the Duke of Marlborough defeated the French. A junction of several major highways and of the South Island Main Trunk Railway, it uses the port of Picton (17 mi [27 km] north). Serving an area of sheep, dairy, seed crop, and cereal farming, the town has light-engineering, motor-body, food-processing, furniture, flax-milling, and animal-feed plants. Pop. (1983 est.) 18,300.

Blenheim, Battle of (Aug. 13, 1704), the most famous victory of John Churchill, 1st duke of Marlborough, and Eugene of Savoy in the War of the Spanish Succession. The first major defeat that the French army suffered in over 50 years, it saved Vienna from a threatening Franco-Bavarian army, preserved



The Battle of Blenheim, Aug. 13, 1704

From David Chandler (ed.), *A Guide to the Battlefields of Europe*, vol. 2, copyright © 1965 by Hugh Evelyn, Ltd.; published by Dimension Books, Denville, New Jersey

the alliance of England, Austria, and the United Provinces against France, and knocked Bavaria out of the war.

The battle was fought at Blenheim (now Blindheim) on the Danube River, 10 miles (about 20 kilometres) west of Donauwörth (now in West Germany), between 52,000 English and Austrian troops under Marlborough and Eugene, and 60,000 French and Bavarian troops under the French marshal Camille, comte de Tallart. Marlborough and Eugene joined forces on August 12 and the next day attacked the surprised and unprepared French. The French were drawn up behind a stream (the Nebelbach) in two sections, with their centre weakly held by almost unsupported cavalry. The initial Allied attacks forced Tallart to commit his reserves to both flanks, further weakening his centre. Marlborough then launched the main attack across the Nebelbach and its marshes, beating off French efforts to turn back the attack, and finally smashing through Tallart's centre. Tallart was captured, and many of his troops were drowned in the Danube. Maximilian II Emanuel, the elector of Bavaria, managed to withdraw his troops from the battle, but on the French right wing all the infantry around Blenheim surrendered. At a cost of 12,000 casualties the Allies captured 13,000 Franco-Bavarian troops and killed, wounded, or caused to be drowned about 18,000 more.

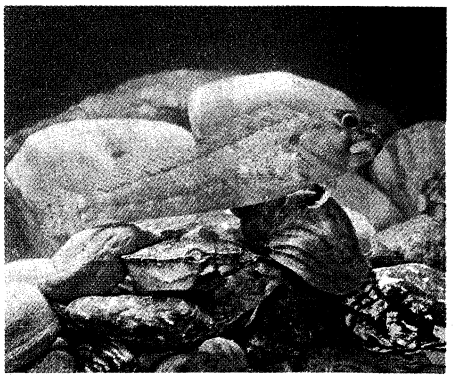
Blenheim Palace, residence near Woodstock, Oxfordshire, Eng., built (1705) by a grateful English Parliament as a national gift to John Churchill, the first duke of Marlborough, for his victory in Germany in 1704 over the French and Bavarians at the Battle of Blenheim during the War of the Spanish Succession. The palace was designed by Sir John Vanbrugh and is regarded as the finest example of truly Baroque architecture in Great Britain.

In the early 18th century Queen Anne's gardener, Henry Wise, designed the grounds in the formal style of André Le Nôtre's famed gardens for Vaux-le-Vicomte and Versailles in France. Little remains of Wise's landscaping, however, because tastes changed in the mid-18th century, and Lancelot Brown was asked to redesign the grounds in his pastoral style of informal or seemingly natural landscapes of woods, lawns, and waterways. Sir Winston Churchill was born at Blenheim Palace.

Blenkinsop, John (b. 1783, near Leeds, Yorkshire, Eng.—d. Jan. 22, 1831, Leeds), English inventor, designer of the first practical and successful railway locomotive (1812). Blenkinsop's two-cylinder, geared steam locomotive utilized the tooth-rack rail system of propulsion. Four Blenkinsop engines (built 1812–13) hauled coal over cast-iron rails from Middleton, Yorkshire (where the inventor was employed as a mine inspector), to nearby Leeds.

blenny, any of the numerous and diverse fishes of the suborder Blennioidei (order Perciformes). Blennies are mostly small, usually marine fishes found from tropical to cold seas. They are slim, ranging in form from moderately elongated, as in some of the tropical species, to very long and eel-like, as in the gunnel and wolffish (*qq.v.*) of northern waters. As a group, however, they are united by such features as a long dorsal fin and pelvic fins, when present, that are placed near the throat and contain one spine and two to four rays.

Blennies live in a variety of habitats, from rocky pools to sandy beaches, reefs, and beds



Shanny (*Blennius pholis*), a common European blenny

Jane Burton—Bruce Coleman Ltd.

of kelp. Many live in shallow water, but some range to depths of about 450 metres (1,500 feet). Some are mainly herbivorous; the others are partially to wholly carnivorous. Blennies can be generally characterized as unobtrusive, bottom-dwelling fishes. They are of little economic importance to man.

Taxonomically, blennies can be divided into a number of families. The two largest are Clinidae, or clinids, with about 180 species, and Blenniidae, or blenniids, with about 300. The clinids, or scaled blennies, are carnivorous fishes, usually less than about 30 centimetres (12 inches) long. They have a long, many-spined dorsal fin and generally have a rather pointed nose. Many have fringed tentacles on their heads and snouts. In some, the first three dorsal spines are longer than the rest and form a distinct, though not separate, section of the fin. Members of this family include the hairy blenny (*Labrisomus nuchipinnis*), a dark-banded, brownish blenny living in the tropical Atlantic, and growing about 20 centimetres (8 inches) long, and the sarcastic fringehead (*Neoclinus blanchardi*), an eastern Pacific species of about the same size, noted for its long, shovel-like jaws.

The blenniids, or combtooth blennies, are small, blunt-nosed, scaleless blennies of warm and temperate seas. They have a single, sometimes notched, dorsal fin consisting of a number of weak spines followed by as many, or more, soft rays. The teeth are slim and comb-like, and the fishes often have a pair of large fangs toward the back of the jaws. Combtooth blennies are found worldwide. Included in the family are the shanny (*Blennius pholis*), a common European blenny, usually green and brown and about 16 centimetres (6¼ inches) long; the molly miller (*B. cristatus*), a common mottled species found on both Atlantic coasts; the rockskipper (*Istiblennius zebra*), a small Hawaiian fish representative of several that live along shores and are able to hop about on land; and the Hawaiian *Runula goslinei* and the Pacific *R. tapeinosoma,* both of which are small and are noted for nipping at swimmers.

blepharitis, inflammation of the eyelids, most commonly occurring in association with seborrhea, a skin disorder springing from overactivity of the sebaceous glands. In sebaceous blepharitis, also called squamous blepharitis, the margins of the lids are red and irritated, with greasy scales clinging to the bases of the eyelashes. The inflammation extends onto the lining of the lids. The condition is remedied by treating the underlying disorder. In allergic blepharitis the eyelid skin is thickened and red and the tissues of the lids are swollen with abnormal quantities of fluid. This type of lid inflammation may be caused by reaction to nail polish, soap, hair spray, or medications used in the eyes. Allergic blepharitis may closely resemble the early stages of exophthalmic goitre. In another type of blepharitis

the inflammation is caused by infection with staphylococcus organisms. The eyelid margins may be ulcerated, and there are dry scales in the eyelashes at their bases. The infection is treated with antibiotic or sulfonamide ointments.

blepharochalasis, sagging of the skin of the upper eyelid down over the eye, so that vision may be obstructed. The condition sometimes develops in elderly persons. It results from changes in the two fibrous proteins, elastin and collagen, that form the supporting framework of the skin: the quantity of elastin decreases, and the attachments between collagen fibres increase in number. Blepharochalasis is also a feature of a strange, probably inherited, disorder, Ascher's syndrome, in which the eyelid abnormality is coupled with goitre and with a swelling that makes the upper lip seem double.

Blériot, Louis (b. July 1, 1872, Cambrai, Fr.—d. Aug. 2, 1936, Paris), aviator who made the world's first over-the-ocean flight in a heavier-than-air craft.

Blériot had amassed a modest fortune as an inventor of automobile lights and accessories and had taken an early interest in aviation. He experimented first with towed gliders on the River Seine. Then, as lightweight engines became available, he developed a series of airplanes of various configurations ranging from box-kite biplanes to a tail-first (canard) monoplane. By 1909 he had settled on more conventional designs; on July 25 of that year he piloted the Blériot XI, a monoplane with a 28-horsepower engine, across the English Channel from Calais to Dover. This feat won him lasting fame and a prize of £1,000 offered by the London *Daily Mail.*

Blériot
H. Roger-Viollet

Blériot was active in building aircraft for the French government during World War I, first producing trainers of his own designs, then associating with the makers of the famous Spad fighter. After the war he formed his own company for the development of commercial aircraft.

blesbok, African antelope species closely related to the bontebok (*q.v.*).

blesmol, any of certain mole rat species. *See* mole rat.

Blessington, Marguerite Gardiner, countess of, *née* POWER (b. Sept. 1, 1789, Knockbrit near Clonmel, County Tipperary, Ire.—d. June 4, 1849, Paris), Irish writer chiefly remembered for her *Conversations of Lord Byron* and for her London salon.

Her father sold her into marriage at 15 to Capt. Maurice St. Leger Farmer, a sadist from whom she fled after three months. He died in a drunken brawl in 1817, after which Marguerite married Charles Gardiner, Viscount Mountjoy and earl of Blessington. Of rare beauty, generosity, and wit, Lady Blessington had been painted at 18 by Thomas Lawrence. She formed a brilliant salon and began to write essays and sketches of London life.

In 1822 the Blessingtons went abroad, accompanied by the young Comte d'Orsay, who married the Earl's daughter by his first wife. They spent two months in Genoa with Byron and lived in Italy and then in France until the Earl's death in May 1829. Their extravagant tastes had drained his fortune, and the Countess, returning to London accompanied by d'Orsay, whose marriage had broken up and who remained with her all the rest of her life regardless of scandal, began to support herself by writing. Her first novel, *Grace Cassidy, or, The Repealers* (1833), was a success. Her journals furnished material for *Conversations of Lord Byron* (1834), *The Idler in Italy* (1839–40), and *The Idler in France* (1841). She wrote several other novels and edited two annuals, *The Book of Beauty* and *The Keepsake,* to which she contributed.

Countess of Blessington, portrait after A.E. Chalon; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

In spite of her literary success Lady Blessington could not stay out of debt, and in April 1849, to avoid ruin, she and d'Orsay fled to Paris, where they remained until their deaths.

Blessingway rite, central ritual of a complex system of ceremonies performed by the Navajo Indians to restore equilibrium to the cosmos.

Of the many rituals classified by the Navajos according to their purpose, the largest group is the Chantways, which are concerned with curing and are divided into three groups. The first group are the Holyway chants—including the Blessingway, parts of which are found throughout most of the rituals, and the Windways—all of which are used to cure diseases that can be traced to some violation by man of the supernatural provinces of the Holy People, or supernatural beings. These rituals are further classified into Peacefulways, which invoke the beneficence of the Holy People, and Injuryways, which are primarily exorcistic.

A second subdivision is that of the Ghostway, or Evilway, chants—the best known being the Upward-Reaching-Way—that are practiced for exorcism and the curing of illnesses caused by ghosts and witches.

A third subdivision is the Lifeways, which are concerned with healing accidental injuries—the most notable being the Flintway.

In addition to the Chantways, other major groups are concerned with success in war (the Enemyways) and hunting (the Gameways), but these have mostly become obsolete.

Set apart from all these specifically oriented ways is the Blessingway, a comparatively short—taking only two days to perform—and simple ritual. Performed for the general well-being of the community, rather than for specific curative purposes, it contains none of the typical features of curing rituals (*e.g.,* sand paintings, prayer sticks, medicine songs, and herbs). To invoke good fortune—such as during childbirth, in blessing a new hogan (home), and in a girl's puberty ceremony—the traditional Navajo family would have the Blessingway sung at least twice a year. Parts of the Blessingway are incorporated into almost all other Chantways.

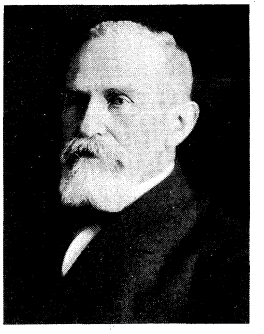
The story of the Blessingway contains various details of the mythical events that occurred after the legendary emergence of the Navajo from the earth at creation. These events provide the prototypes for the organization of the cosmos, important Navajo ceremonials, and their central cultural institutions.

Blest Gana, Alberto (b. May 4, 1830, Santiago, Chile—d. Nov. 9/11, 1920, Paris), novelist who founded the Chilean social novel.

Blest Gana began his education at the Santiago military academy, and, while studying military engineering in France, he came under the influence of the French Realists, especially Honoré de Balzac. He returned to Chile in 1852 and taught mathematics in military academies. The fame he achieved through his literary work led to political appointments, and Blest Gana spent the last 50 years of his life serving as Chile's ambassador to England and France.

His early novels, such as *La aritmética en el amor* (1860; "Arithmetic in Love"), *Martín Rivas* (1862; Eng. trans., 1977), and *El ideal de una calavera* (1863; "A Foolish Ideal"), realistically depict the lives of the middle and upper classes of Santiago. These novels are generally of a stiff nature, character and plot often suffering at the hands of the author's concern for the evils of materialism. After a period of more than 30 years, during which he published no new works, he wrote what are considered to be his best novels. *Durante la Reconquista* (1897; "During the Reconquest") and *Los transplantados* (1905; "The Uprooted"), both laden with moralistic overtones, are held to be his masterpieces.

Bleuler, Eugen (b. April 30, 1857, Zollikon, Switz.—d. July 15, 1939, Zollikon), one of the most influential psychologists of his time, best known today for his introduction of the term schizophrenia to describe the disorder previously known as dementia praecox and for his studies of schizophrenics.



Bleuler
By courtesy of IBA, Zurich/Oberengstringen

Bleuler studied medicine at the University of Bern and later was appointed professor of psychiatry at the University of Zürich and director of the Burghölzli Asylum in Zürich, where he served from 1898 to 1927. He first advanced the term schizophrenia in 1908 in a paper based on a study of 647 Burghölzli patients and then expanded on his work in *Dementia Praecox oder Gruppe der Schizophrenien* (1911; *Dementia Praecox; or the Group of Schizophrenias,* 1950). In this monograph, he argued that dementia praecox was not a single disease, was not invariably incurable, and did not always progress to full dementia—all conclusions at odds with the

accepted wisdom of the time. He described a group of diseases, the schizophrenias, the basic symptoms of which were a disordered train of mental associations and splitting or fragmentation of the personality. He believed that a large number of cases were latent (not fully expressed) and suggested that schizophrenics could in some cases have derangements of thought processes on specific questions rather than generally in all circumstances.

Bleuler is credited with the introduction of two concepts fundamental to the analysis of schizophrenia: autism, denoting the loss of contact with reality, frequently through indulgence in bizarre fantasy, and ambivalence, denoting the coexistence of mutually exclusive contradictions within the psyche.

Bleuler was an early proponent of the theories of Sigmund Freud, and he attempted to show how the various mechanisms Freud had found in neurotic patients could also be recognized in psychotic patients. Bleuler challenged the prevailing belief that psychosis was the result of organic brain damage, insisting instead that it could have psychological causes.

Bleuler's *Lehrbuch der Psychiatrie* (1916; *Textbook of Psychiatry*) became a standard text and went through many editions. During the early 1900s Bleuler's assistant was Carl Gustav Jung, and the two men were early members with Freud in the Vienna Psycho-Analytical Society.

Blicher, Steen Steensen (b. Oct. 11, 1782, Vium, Jutland, Den.—d. March 26, 1848, Spentrup, Jutland), Danish poet and short-story writer who portrayed the people of Jutland with humour and irony and with a realism well in advance of his time.

Blicher, detail of a drawing in pencil and India ink by E.-D. Baerentzen; in the Nationalhistoriske Museum på Frederiksborg, Denmark

By courtesy of the Nationalhistoriske Museum pa Frederiksborg, Denmark

An unhappily married, impoverished country parson, Blicher led an outdoor life, walking, shooting game, and talking to peasants, gypsies, farmers, and squires. Thus, he acquired an impressive command of the Jutland dialect and the materials for his short stories. His first volume of original poems appeared in 1814, and his subsequent poetry expressed both humour and a melanchcoly acceptance of life. In the "Prelude" to *Trækfuglene* (1838; "Birds of Passage"), his finest collection of poems, he presents a self-portrait of a caged bird longing for freedom. As his private life worsened, Blicher took to drink.

Blicher's fame rests primarily on his short stories and short novels. His best-known work, the novella *Brudstykken af en landsbydegns dagbog* (1824; "Fragments of the Journal of a Parish Clerk"), is written in masterful prose and shows Blicher's psychological insight into the Jutlanders' character. In his stories he ranges from resignation to humour to irony. The general feeling of his narrative style is realistic; life is seen as the great shatterer of illusions since it never keeps its promises. An English translation by H.A. Larsen of 12 of Blicher's stories appeared in 1945.

Blida, also called (after 1981) EL-BOULAIDA, town, northern Algeria. It lies on the southern edge of the Mitidja plain at the base of the Tell Atlas and is situated about 30 miles (48 km) southwest of Algiers. French in character, the town is surrounded by orchards, trades in oranges and flour, and has light manufacturing industries. The Wadi el-Kebîr, an affluent of the Wadi Chiffa, supplies water for fountains and gardens in the town and is a source for hydropower. Blida (*boleida,* diminutive of the Arabic *balad,* "city") occupies the site of a Roman military station. Formerly walled with six gates, the present town was founded in 1553 by Moorish refugees from Andalusia. A mosque was built in the town by order of Khayr ad-Dīn (Barbarossa). Blida was severely damaged by earthquakes in 1825 and 1867. It is overlooked (south) by the ruined Fort Mimich. Mount el-Mergueb (5,344 feet [1,629 m]), Chiffa Gorge, and Chrea mountain and ski resort are nearby. Crops grown in adjacent areas of the Mitidja plain include wheat, barley, citrus fruits, vegetables, tobacco, and olives. There are also vineyards in the area. Pop. (1987 prelim.) mun., 131,615.

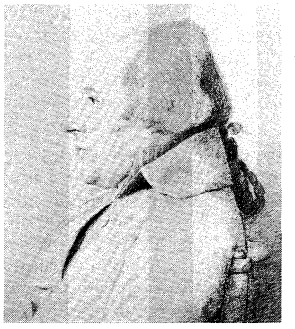
Consult the INDEX *first*

Bligh, William (b. Sept. 9, 1754, County of Cornwall, Eng.—d. Dec. 7, 1817, London), English admiral who commanded HMS *Bounty* at the time of the celebrated mutiny on that ship.

Bligh first went to sea as a cabin boy at the age of seven and joined the Royal Navy in 1770. He sailed on Captain James Cook's second voyage of 1782–84 and was master of the *Resolution* on Cook's third and final voyage (1776–80). He was appointed to the command of the 215-ton *Bounty* in 1787, when the vessel was being used in a scheme for taking breadfruit trees from Tahiti for replanting in the West Indies. The ship duly sailed to Tahiti, picked up breadfruit trees, and had sailed as far as the Friendly Islands (Tonga) on the voyage to Jamaica when it was suddenly seized by Fletcher Christian, the master's mate, on April 28, 1789. Bligh and 18 members of the crew who were loyal to him were turned adrift in the *Bounty*'s longboat. The causes of the mutiny have been much-discussed. Bligh's opponents charged him with tyranny, and it is true that Bligh had insulted many of his officers. Bligh himself imputed the mutiny to purely opportunistic motives, claiming that the crew "had assured themselves of a more happy life among the Otaheitans than they could possibly have in England, which, joined to some female connections, has most likely been the leading cause of the whole business."

In a remarkable feat of seamanship, Bligh eventually reached Timor in the East Indies on June 14, 1789, after a voyage of about 3,600 miles (5,800 km) in the open longboat. Christian and eight others took the *Bounty* to Pitcairn Island, where the small colony that they founded was undiscovered until 1808 and where their descendants still reside. Of the mutineers who later went to Tahiti, three were taken to England and hanged.

The mutiny made little difference to Bligh's career. He visited Tahiti again and successfully transported more breadfruit trees to the West Indies (1792). As captain of the *Director,* he was put ashore when his crew joined the mutiny of The Nore (1797). He commanded this ship with distinction at the Battle of Camperdown that year, however, as he did the *Glatton* at Copenhagen (1801). He was sent to



Bligh, pencil drawing by George Dance, 1794; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

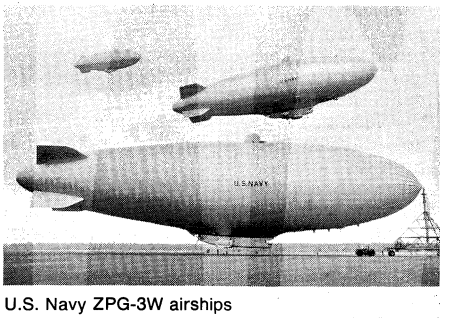
New South Wales as governor in 1805. Again, complaints of his "oppressive behaviour" led in 1808 to a mutiny, this time under the acting head of the New South Wales Corps in Sydney, Major George Johnston, who put Bligh under arrest. The mutineers were subsequently found guilty of conspiracy. Bligh was later promoted to rear admiral (1811) and vice admiral (1814).

Bligh's character has been variously interpreted. He does not seem to have been unduly tyrannical, but his abusive tongue and his overbearing manner made him unpopular as a commander. He possessed undoubted courage in battle and great skill as a navigator.

blight, any of various plant diseases whose symptoms include sudden and severe yellowing, browning, spotting, withering, or dying of leaves, flowers, fruit, stems, or the entire plant. Usually the shoots and other young, rapidly growing tissues of a plant are attacked. Most blights are caused by bacterial or fungal infestations, but they can also occur from strictly physiogenic causes such as drought. Fungal and bacterial blights are most apt to occur under cool, moist conditions. Most economically important plants are susceptible to one or more blights.

Measures for controlling and preventing blight typically involve the destruction of the infected plant parts; use of disease-free seed or stock and resistant varieties; crop rotation; pruning and spacing of plants for better air circulation; controlling pests that carry the fungus from plant to plant; avoidance of overhead watering and working among wet plants; and, where needed, the application of fungicide or antibiotics. Sanitation to stop the spread of the infestation is the cardinal measure. For bacterial blights (*e.g.,* fire blight), fixed copper or streptomycin is an effective antibiotic when applied weekly during damp weather when leaves and shoots are expanding. *See also* botrytis blight; chestnut blight; fire blight; late blight.

blimp, nonrigid or semirigid airship dependent on internal gas pressure to maintain its form. The origin of the name *blimp* is uncertain, but the most common explanation is that it derives from "British Class B airship" plus "limp"—*i.e.,* nonrigid. Blimps



U.S. Navy ZPG-3W airships

By courtesy of the Goodyear Aerospace Corporation

were used by navies during World War I in convoy and antisubmarine patrol duty, became attractions at fairs and expositions, and later carried advertising messages.

The U.S. Navy's ZPG-3W airship—403 feet (150 metres) long, 85 feet in diameter, with a capacity of more than 1,500,000 cubic feet (42,450 cubic metres)—was the world's largest nonrigid blimp. Four of them were commissioned in 1958. One exploded and crashed two years later, and the Navy retired the others by 1962.

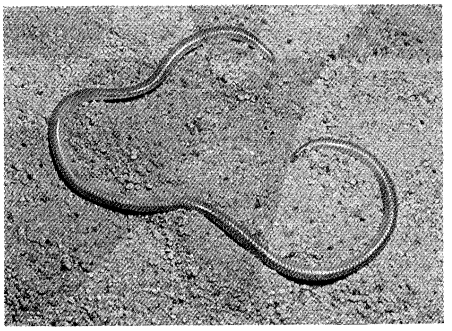
blind fish, any of various eyeless fishes, among them several unrelated cave-dwelling species of the families Amblyopsidae, Characidae, and others. *See* cave fish.

Blind Harry: *see* Harry the Minstrel.

blind snake, any of about 150 species of small, burrowing snakes that make up the family Typhlopidae. Their vestigial eyes are buried under the head scales. Most are of the genus *Typhlops,* which ranges over most tropical areas. Blind snakes feed on small invertebrates, mainly ants and termites. Some of these snakes grow to about 75 centimetres (30 inches) long, but most are less than 20 cm (8 in.).

Blunt-headed, shiny, smooth, and cylindrical, blind snakes also have bluntly rounded tails, usually ending in a short spine. The teeth are small and are usually present only in the upper jaw. The name worm snake is sometimes applied to the Typhlopidae but seems better reserved for certain colubrids (*see* worm snake).

The closely related thread snakes, or slender blind snakes, are African and tropical American snakes that total more than 60 species of



Thread snake, or slender blind snake (*Leptotyphlops*)
Robert H. Wright—The National Audubon Society Collection/Photo Researchers

the family Leptotyphlopidae. Thread snakes have a well-developed pelvis and an internal thighbone; some have external claws on either side of the anus. The largest species, the Venezuelan *Leptotyphlops macrolepis,* reaches a length of 30 cm (12 in.); most are 10–17 cm (4–7 in.). Thread snakes feed on insect larvae, primarily those of ants and termites; some lay their eggs in termite nests, which provide protection for the eggs and food for the young.

blind spot, also called OPTIC DISK, the place on the retina of the eye from which the optic nerve emerges. This spot is insensitive to light. In binocular vision it is not noticed, because the part of the visual field covered by the blind spot of one eye is covered by a sensitive area in the other. *See also* visual-field defect.

blind staggers, symptom of several unrelated animal diseases, in which the affected animal walks with an unsteady, staggering gait and seems to be blind. The many possible causes include poisoning from ingesting plants containing a high level of selenium or from ingesting grasses infected with the fungal disease known as ergot. Magnesium or calcium deficiency may also cause blind staggers, as may inflammation of the brain (encephalitis) or of the brain coverings (meningitis).

blindman's buff, children's game played as early as 2,000 years ago in Greece. The game is variously known in Europe: Italy, *mosca cieca* ("blind fly"); Germany, *Blinderkuh* ("blind cow"); Sweden, *blindbock* ("blind buck"); Spain, *gallina ciepa* ("blind hen"); and France, *colin-maillard* (named for a medieval French lord who kept laying about him with his sword after he had been blinded in battle).

One player is carefully blindfolded and then disoriented by being spun around several times. The other players, who are not blindfolded, amuse themselves by calling out to the "blind man" and dodging away from him. In the Middle Ages it was an adult game, and the blindfolded player was usually struck and buffeted as well, hence "buff." A player touched or caught by the blind man takes on the blindfold, although sometimes the blind man must guess the identity of his captive before the blindfold is removed (if the guess is wrong, the captive is released and the game continues).

The game has been popular at later times among adults: the English diarist Samuel Pepys reported a game played by his wife and some friends in 1664, and the English poet laureate Alfred, Lord Tennyson, is said to have played it in 1855.

blindness, transient or continuing inability to see with one or both eyes. Transient blindness, in this instance called blackout, affects such persons as aviators or astronauts if they undergo acceleration that exerts its force on them in the direction from head to foot and if the force reaches five or six times the force of gravity. Transient blindness may also be a feature of kidney disease (glomerulonephritis). Continuing blindness may arise from injury or disease that affects any of the structures or substances that light passes through on its way to the retina, the layer of light-sensitive tissue that lines the back and sides of the eye, or the causes of the blindness may lie in injuries or disease of the retina itself, of the optic nerve, or of the visual centres of the brain.

A number of infectious diseases, including the venereal diseases, can cause blindness. Gonorrhea organisms in the pregnant woman, for example, caused blindness in infants until the practice of routinely putting silver nitrate drops in infants' eyes at birth was instituted. Untreated syphilis in the pregnant woman can cause imperfect development of infants' eyes, with resultant blindness, as can German measles in the pregnant woman during the first three months of pregnancy. Trachoma and leprosy frequently cause blindness in those parts of the world in which the diseases are prevalent. Other infections that can be the cause of blindness include tuberculosis, meningitis, measles, diphtheria, and scarlet fever. Onchocerciasis, or infestation with the roundworm *Onchocerca volvulus,* occasionally results in blindness if the worms invade the eyes.

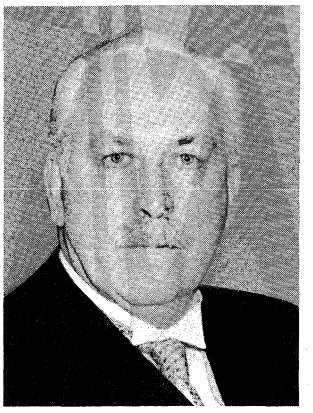
Certain noninfectious systemic diseases may cause blindness. Diabetes mellitus, for example, an endocrine disease arising from insufficient secretion or utilization of insulin, may damage the retina or cause cataracts—opacity of the crystalline lens—which prevent light from reaching the retina. Atherosclerosis, the form of arteriosclerosis (hardening of the arteries) in which fatty plaques form in the linings of blood vessels, may, by blocking the blood supply, cause atrophy of retinal tissue and the optic nerve. Diseases springing from nutritional deficiencies may cause blindness by making the cornea—the normally transparent section of the globe in front of the pupil and iris—soft and cloudy.

Diseases of the eye itself that may bring blindness include cataract (*q.v.*)—opacity of the crystalline lens—and glaucoma (*q.v.*), the effect of intraocular pressure upon the optic nerve. *See also* visual-field defect.

blindworm, also called SLOWWORM (*Anguis fragilis*), a legless lizard of the family Anguidae. It lives in grassy areas and open woodlands in Great Britain and throughout Europe eastward to the Caucasus Mountains. The adult is about 30 centimetres (1 foot) long, but some specimens grow to 50 cm. They are usually brown, chestnut, gray, bronze, brick red, or coppery. The female's underside is usually black.

The lizard eats snails and slugs and other soft animals, using pointed, fanglike teeth. Internal pelvic girdles are the only vestiges of legs.

Bliss, Sir Arthur (Edward Drummond) (b. Aug. 2, 1891, London—d. March 27, 1975, London), one of the leading English composers



Sir Arthur Bliss, 1953
Keystone

of the first half of the 20th century, noted both for his early, experimental works and for his later, more subjective compositions.

Bliss studied under Ralph Vaughan Williams and Gustav Holst. Up to the early 1920s, his music was frequently experimental, *e.g.*, *Rhapsody* (1919), for solo voices and chamber ensemble, in which the voice plays an instrumental role, singing vocalises (meaningless syllables), and *A Colour Symphony* (1922, revised 1932), whose four movements are intended to suggest the colours purple, red, blue, and green. Later, although he never abandoned experimentation, he began composing in classical forms, *e.g.*, the quintets for oboe and strings and for clarinet and strings, the *Piano Concerto,* and the *Conversations* for chamber orchestra. He composed the scores for three films, including *Things to Come* (1935; after H.G. Wells). Other works include the television opera *Tobias and the Angel* (1960) and his choral symphony *Morning Heroes* (1930). His ballets are *Checkmate* (1937; choreographed by Ninette de Valois), *Miracle in the Gorbals* (1944; choreographed by Robert Helpmann), and *Adam Zero* (1946; Helpmann). His last composition, a choral work called *Shield of Faith,* was performed initially a few weeks after his death, at the 500th anniversary celebration at St. George's Chapel, Windsor. Bliss was knighted in 1950 and in 1953 became Master of the Queen's Musick.

Bliss, Gilbert Ames (b. May 9, 1876, Chicago—d. May 8, 1951, Harvey, Ill.), U.S. mathematician and educator known for his work on the calculus of variations.

He received his B.S. degree in 1897 from the University of Chicago and remained to study mathematical astronomy under F.R. Moulton. He received his M.S. degree in 1898 and two years later his doctorate. Bliss immediately went into teaching as an assistant professor of mathematics at the University of Minnesota from 1900 to 1902, followed by a two-year assistantship at the University of Chicago, a

year at the University of Missouri, and three years (1905–1908) as preceptor at Princeton University—a period in which he also served as an editor of the *Annals of Mathematics.* In 1908 Bliss returned to the faculty at the University of Chicago as an associate professor; he was named professor five years later. He became department chairman in 1927 and served until his retirement in 1941.

Bliss applied his knowledge of calculus to the field of ballistics during the latter days of World War I, when he designed an improved set of firing tables for artillery. His book *Mathematics for Exterior Ballistics* (1944) was based on this work. His research in algebraic functions led to his paper "Algebraic Functions and Their Divisors," and Bliss expanded on this work in his book *Algebraic Functions* (1933). Bliss's extensive study of the calculations of extreme values of an integral or function culminated in 1946 in his major work, *Lectures on the Calculus of Variations.* Bliss served as president of the American Mathematical Society from 1921 to 1922.

Bliss, Tasker Howard (b. Dec. 31, 1853, Lewisburg, Pa., U.S.—d. Nov. 9, 1930, Washington, D.C.), U.S. military commander and statesman who directed the mobilization effort upon the United States' entry into World War I.

After graduating from the U.S. Military Academy at West Point in 1875, Bliss served in various military assignments, including that of instructor at West Point and military attaché at the U.S. legation in Madrid. During the Spanish-American War (1898), Bliss was chief of staff under General James H. Wilson in Puerto Rico and later served in Cuba. Promoted to the rank of brigadier general, he negotiated the U.S.–Cuban reciprocity treaty (1902). After service as commandant of the Army War College (1903–05) and in the Philippines (1905–09), he drew various staff assignments and in 1915 was promoted to major general.

With the United States' entry into World War I in 1917, Bliss was made general and chief of staff. In that position he promptly expanded and upgraded the Army to battle-readiness and resisted attempts to divide the U.S. force among the various Allied commands. At the appointment of President Woodrow Wilson, he sat on the Allied Supreme War Council and was a delegate to the peace conference at Versailles. An ardent supporter of Wilson's worldview, Bliss promoted the Fourteen Points, American participation in the League of Nations, and international arms control.

Bliss, William D(wight) P(orter) (b. Aug. 20, 1856, Constantinople [now Istanbul]—d. Oct. 8, 1926, New York City), social reformer and organizer of Christian Socialist societies in the United States.

The son of American missionaries in Turkey, Bliss was educated at the Hartford Theological Seminary (Hartford, Conn.). First as a Congregationalist and later as an Episcopalian, he held several pastorates following his graduation from Hartford in 1882.

In the late 1880s Bliss became deeply interested in Christian Socialism, a movement intent upon applying the teachings of Jesus to the social dislocations caused by industrialization and urbanization. Bliss organized the first U.S. Christian Socialist Society in 1889 and edited its publication, *The Dawn.* Bliss traveled extensively, lecturing on the problems of labour and social reform. He compiled and edited many books, the best known being the *Encyclopedia of Social Reform* (1897). He unsuccessfully ran for lieutenant governor of Massachusetts in 1887 on the Labor Party ticket, and he also served as an investigator for the Bureau of Labor. He did educational work among French and Belgian soldiers interned in Switzerland during World War I. He returned to the United States after the war and preached in New York City until his death.

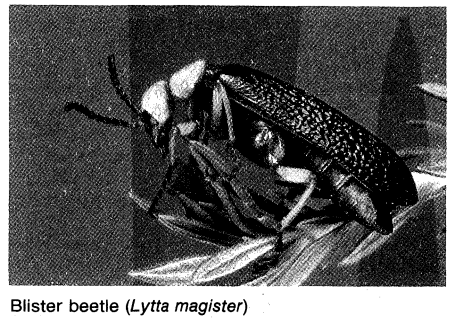
Bliss Classification, also called BIBLIOGRAPHIC CLASSIFICATION (BC), bibliographic system devised by Henry Evelyn Bliss, of the College of the City of New York, and published in 1935 under the title *A System of Bibliographic Classification;* the full, second edition appeared in 1940–53. The system is utilized most extensively in British libraries. Characterized by liberal cross-references, it is primarily a bibliographic tool that aids in the organization of special subject fields. Arranged into 35 main classes, consisting of 9 numerical and 26 alphabetical classes, it has a notation system utilizing uppercase and lowercase roman letters, with Arabic numerals for major fixed categories or common subdivisions. Commas and apostrophes separate adjacent letters or groups of letters that, when combined into a single class mark, might be read as a single unit; they also avoid confusion of letters for numbers (*e.g.,* 5 for *s,* 2 for *z*).

blister, a rounded elevation of the skin containing clear fluid, caused by a separation either between layers of the epidermis or between the epidermis and the dermis. Blisters are classified as vesicles if they are 0.5 cm (0.2 inch) or less in diameter and as bullae if they are larger. Blisters can commonly result from pressure and friction on sites such as the palms or soles; they are produced when friction causes an upper skin layer to move back and forth over an underlying skin layer. A small gap opens up between them and becomes filled with fluid. Blisters may also occur as symptoms of contact dermatitis, viral infection, or an autoimmune disease, in which case they can appear anywhere on the body.

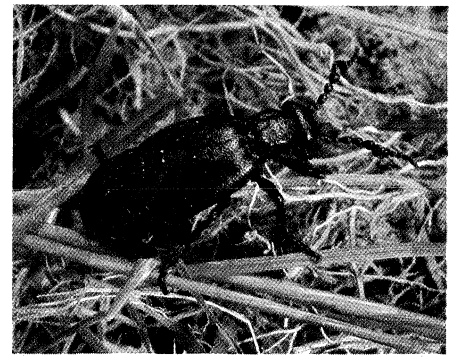
Blistering usually takes place within the uppermost layer of the skin (epidermis), producing fragile, easily broken blisters; subepidermal blisters are tenser and are more difficult to break. In either case, the blister fluid is usually clear and colourless; yellowish fluid is a sign that it contains pus and red that it contains blood. Friction blisters generally heal spontaneously, sometimes leaving a thickened callus; disease blisters may leave scars, particularly when they are located deep in the epidermis.

blister beetle, any of the approximately 2,000 species of the insect family Meloidae (order Coleoptera). These beetles secrete an irritating substance, cantharidin, which is collected mainly from *Mylabris* and the European species *Lytta vesicatoria,* commonly called Spanish fly. Cantharidin is used medically as a topical skin irritant to remove warts. In the past, when inducing blisters was a common remedy for many ailments, cantharidin was commonly used for this purpose. It was also a major ingredient in so-called love potions. Blister beetles are both helpful and harmful to humans. The larvae eat grasshopper eggs, but the adults destroy crops.

Adult blister beetles are often brightly coloured, the need for camouflage being eliminated by their ability to secrete cantharidin. They range between 3 and 20 mm (0.1 to 0.8 inch) in length, with the majority between 10 and 15 mm (0.4 and 0.6 inch). Their long, slender, leathery bodies are covered by metallic green or blue wing covers, often marked with bands or stripes.



Blister beetle (*Lytta magister*)
Photo Research International



Oil beetle (*Meloe proscarabaeus*)
S.C. Bisserot—Bruce Coleman Ltd.

The female lays between about 3,000 and 4,000 eggs; only a few of the young survive, however, because of their complicated and haphazard life history (hypermetamorphosis). The female of *Sitaris muralis* deposits masses of eggs near solitary bees' nests. The larvae hatch from the eggs and remain dormant throughout the winter. In the spring tiny active forms (triungulins), sometimes known as bee lice, attach themselves to a bee. They feed on eggs and stored food in the bee nest as they pass through several more developmental stages, changing from a larva to a legless grub. When the pupal stage is complete, the newly emerged adult drops to the ground and begins feeding on cultivated plants.

The female of some blister beetles (*e.g., Epicauta vittata*) deposits masses of eggs either on or in the ground. The triungulin feeds on grasshopper eggs, undergoes a series of molts (periodic shedding of skin), and spends the winter in a pupallike stage. After passing through several more larval stages and a true pupal stage, the adult blister beetle emerges.

The members of the subfamily Meloinae are sometimes known as oil beetles. They do not have hindwings as do most blister beetles, nor do their wing covers meet in the middle of the back; rather, the covers are much shorter and overlap. Oil beetles secrete an oily substance that protects them from predators because of its bad taste. In some species the forcepslike antennae of the male are used to hold the female during mating. An oil beetle genus common in both Europe and North America is *Meloe.*

Blitar, city and *kabupaten* (regency), Jawa Timur *propinsi* (East Java province), Java, Indonesia. It is located 70 miles (113 km) southwest of Surabaya, the provincial capital. The city lies at an elevation of 528 feet (161 m) above sea level. Linked by road and railway with Malang to the east and with Tulungagung to the west, it has a rural character because of the ancient temples and historical sites located in and around the city. Blitar is a trade and transshipment centre for commodities including coffee, rice, sugar, rubber, peanuts (groundnuts), and cassava. Its industries produce iron and copper ware, woodwork, tiles and slates, processed rubber, footwear, tires, and textiles. The population is mainly Javanese. The graves of Sukarno, Indonesia's disgraced revolutionary hero and first president, and of his mother are located in the vicinity of Blitar. To the south of the city are the Gedo and Arju temples; along the highway from Wlinge to Malang are the remains of the Salaraja temple; 37 miles (60 km) south is the Pautai Serang beach; and 7 miles (11 km) south is

the Holy Gong of Lodoyo. Pop (1980) city, 78,503; regency, 1,037,258.

blitzkrieg (German: "lightning war"), military tactic calculated to create psychological shock and resultant disorganization in enemy forces through the employment of surprise, speed, and superiority in materiel or firepower. Tested by the Germans during the Spanish Civil War in 1938 and against Poland in 1939, the blitzkrieg proved to be a formidable combination of land and air action. The essence of blitzkrieg is the use of mobility, shock, and locally concentrated firepower in a skillfully coordinated attack to paralyze an adversary's capacity to coordinate his own defenses, rather than attempting to physically overcome them, and then to exploit this paralysis by penetrating to his rear areas and disrupting his whole system of communications and administration. The tactics, as employed by the Germans, consisted of a splitting thrust on a narrow front by combat groups using tanks, dive-bombers, and motorized artillery to disrupt the main enemy battle position at the point of attack. Wide sweeps by armoured vehicles followed, creating large pockets of trapped and immobilized enemy forces. These tactics were remarkably economical of both lives and matériel, primarily for the attackers but also, because of the speed and short duration of the campaign, among the victims.

Blitzkrieg tactics were used in the successful German invasions of Belgium, The Netherlands, and France in 1940. They were used by the German commander Erwin Rommel during the desert campaigns in North Africa and by U.S. Gen. George Patton in the European operations of 1944. More recent manifestations of blitzkrieg were the combined air and ground attacks by Israeli forces on Syria and Egypt in June 1967 and the Israeli counterattacks and final counteroffensive against the same adversaries in October 1973.

Blitzstein, Marc (b. March 2, 1905, Philadelphia—d. Jan. 22, 1964, Fort-de-France, Martinique), U.S. pianist, playwright, and composer known for his aesthetically unorthodox and politically radical operas and plays.

As a child, Blitzstein was a musical prodigy, performing at age five, composing at seven, and at fifteen being introduced as a soloist with the Philadelphia Orchestra. In the 1920s he studied piano with Nadia Boulanger in Paris and Arnold Schönberg in Berlin. His first opera, *The Cradle Will Rock* (1937), is the story of a capitalist's resistance to unionization. Controversy surrounded much of Blitzstein's work, which is experimental in subject matter and characterized by unexpected tonalities. Blitzstein believed Fascism should be fought with art, and he had a gift for composing music that was dramatic and meaningful. He wrote *Regina* (1949), an opera based on Lillian Hellman's *The Little Foxes,* and is best known for his translation and musical adaptation of *The Threepenny Opera* (first performed in 1952) by Kurt Weill and Bertolt Brecht. Although Blitzstein's operatic music was in the spotlight because of its political content, it was not popularly acclaimed. He was working on a major opera, *Sacco and Vanzetti,* at the time of his death.

Blixen, Karen, BARONESSE (Baroness) BLIXEN-FINECKE (Danish fiction writer): *see* Dinesen, Isak.

blizzard, also called BURAN, BURGA, or PURGA, severe weather condition that is distinguished by low temperatures, strong winds, and large quantities of snow. The U.S. Weather Service defines a blizzard as a storm with winds of more than 51 kilometres (32 miles) per hour and enough snow to limit visibility to 150 metres (500 feet) or less. A severe blizzard is one with winds of more than 72 kilometres per hour, visibility near zero, and temperatures of −12° C (10° F) or lower.

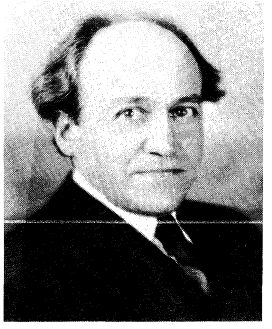
The name originated in the central U.S., where blizzards are brought by northwesterly winds following winter depressions, or low-pressure systems. In the United States and in England, the term is commonly used for any strong, heavy snowstorm. In Antarctica, blizzards are associated with winds spilling over the edge of the ice plateau at an average velocity of 160 kilometres per hour.

bloat, also called HOVEN, or TYMPANITES, disorder of ruminant animals involving distention of the rumen, the first of the four divisions of the stomach, with gas of fermentation. Bloated cattle are restless and noticeably uncomfortable, and have distended left flanks. Bloat may occur after cattle have eaten young clover, turnips, potatoes, cabbage, or any food that is cold and wet. Though deaths have occurred, economic losses from bloat usually derive from reduction in milk production and weight-gain rate.

Bloc National, right-wing coalition elected to the French Chamber of Deputies (lower house of the legislature) on a wave of nationalist sentiment at the end of World War I; it controlled the French government until 1924. The Bloc gained about three-fourths of the seats in the elections of November 1919, one of the largest conservative majorities in the history of the Third Republic (1870–1940). The Chamber of Deputies, dominated by devout Catholics and war veterans, was called *bleu horizon,* the colour of the military uniform. Many of the new deputies wished to reconcile the anticlerical Third Republic with the Roman Catholic Church, but they were forced to turn their attention to foreign affairs during this postwar period. The governments of the Bloc tried to insure French security vis-à-vis Germany by a strict enforcement of the Treaty of Versailles. The Bloc's leaders, among them the wartime president Raymond Poincaré, tried to force Germany to pay its war reparations by invading German territory (the occupation of the Ruhr, January 1923). Its hard-line foreign policy began to lose public support, and, when a fall in the value of the franc and lack of government revenue caused its financial position to deteriorate, the Bloc National was defeated in the parliamentary elections of May 1924.

Bloch, Ernest (b. July 24, 1880, Geneva—d. July 15, 1959, Portland, Ore., U.S.), composer whose music reflects Jewish cultural and liturgical themes as well as European post-Romantic traditions. He was influential as a teacher, and his students included Roger Sessions, Randall Thompson, and Elliott Carter.

Bloch studied with the noted Swiss composer Émile Jaques-Dalcroze and in Belgium with the violinist Eugène Ysaÿe. From 1911 to 1915 he taught at the Geneva Conservatory. He toured the U.S. in 1916 with the dancer Maud Allen, and after the tour company went bankrupt he settled in New York.



Ernest Bloch
By courtesy of the Cleveland Institute of Music

He was director of the Cleveland Institute of Music (1920–25) and of the San Francisco Conservatory (1925–30). In 1930 he went to Switzerland, but he returned to the U.S. in 1939, settling in Oregon in 1943. He taught composition for several summers at the University of California in Berkeley.

Bloch's music reflects many post-Romantic influences, among them the styles of Claude Debussy, Gustav Mahler, and Richard Strauss. His interest in Impressionism appears in the tone poem *Hiver-Printemps* (1905; *Winter-Spring*). He composed a significant group of works on Jewish themes, among them the *Israel Symphony* (1916), *Trois poèmes juifs* (1913; *Three Jewish Poems*) for orchestra, the tone poem *Schelomo* (1916; *Solomon*) for cello and orchestra, and the suite *Baal Shem* (1923) for violin and piano (or orchestra). His sacred service *Avodath Hakodesh,* for baritone, chorus, and orchestra, represents the full maturity of his use of music appropriate to Jewish themes and liturgy. Many of Bloch's works show a strong Neoclassical trend, combining musical forms of the past with 20th-century techniques. Examples include his first *Concerto Grosso* (1925) and his *Quintet for Piano and Strings* (1923), which utilizes quarter tones to colour and heighten the emotional intensity of the music. Other notable works include his "epic rhapsody" *America* (1926) for orchestra, his *Suite for Viola and Piano* (1919), and his five string quartets, which are admired for their power and precision.

Bloch, Ernst (b. July 8, 1885, Ludwigshafen, Ger.—d. Aug. 4, 1977, Stuttgart), Marxist philosopher who developed the "philosophy of hope" (Philosophie der Hoffnung) to complete what he considered Marxism's partial outlook on reality.

Having begun his career at the University of Leipzig (1918), he fled from Nazi Germany to Switzerland (1933), then went to the U.S., where he wrote the first two volumes of his major work, *Das Prinzip Hoffnung,* 3 vol. (1954–59; "The Hope Principle"). He returned to the University of Leipzig in 1948 and won the *Nationalpreis* of the German Democratic Republic (East Germany) in 1955. He had, however, become critical of the development of Marxist thought and provoked the disapproval of the ruling Communist Party officials; the journal *Deutsche Zeitschrift für Philosophie,* which he had edited since 1953, was suppressed, he was forbidden to publish, and in 1957 he was declared a revisionist and his works were condemned. In 1961 he defected to the Federal Republic of Germany (West Germany) and became a visiting professor at the University of Tübingen.

Bloch, Felix (b. Oct. 23, 1905, Zürich—d. Sept. 10, 1983, Zürich), Swiss-born U.S. physicist who shared (with E.M. Purcell) the Nobel Prize for Physics in 1952 for developing the nuclear induction (nuclear magnetic resonance) method of measuring the magnetic field of atomic nuclei. Bloch's doctoral dissertation (University of Leipzig, 1928) promulgated a quantum theory of solids that still provides the basis for our present understanding of electrical conduction.

Bloch taught at the University of Leipzig until 1933; when Hitler came to power he emigrated to the United States and was naturalized in 1939. After joining the faculty of Stanford University, Palo Alto, Calif., in 1934, he proposed a method for splitting a beam of neutrons into two components that corresponded to the two possible orientations of a neutron in a magnetic field. In 1939, using this method, he and Luis Alvarez (winner of the Nobel Prize for Physics in 1968) measured the magnetic moment of the neutron (a property of its magnetic field). Bloch worked on atomic energy at Los Alamos, N.M., and radar countermeasures at Harvard University during World War II and returned to Stan-

ford in 1945 to develop, with physicists W.W. Hansen and M.E. Packard, the principle of nuclear induction, which helped establish the relationship between nuclear magnetic fields and the crystalline and magnetic properties of various materials. Nuclear induction later became useful in determining the composition and structure of molecules. Nuclear magnetic resonance techniques have become increasingly important as diagnostic methods in medicine.

Bloch was the first director general of the European Commission for Nuclear Research (1954–55). In 1971 he became professor emeritus at Stanford University.

Bloch, Jean-Richard (b. May 25, 1884, Paris—d. March 15, 1947, Paris), essayist, novelist, and playwright active in the cause of Socialism.

In 1910, while teaching in Poitiers, he started *L'Effort libre,* a "review of revolutionary civilization." His essay *Naissance d'une culture* (1936; "Birth of a Culture") expressed his faith in a new art that would associate the democratic tradition with a proletarian culture. The stories in *Lévy* (1912) include penetrating studies of Jewish psychology, and his Balzacian novel . . . *et Cie* (1918; . . . *& Company*) deals with a family of Jewish cloth manufacturers who leave Alsace in 1870 and create a flourishing business in Normandy. Bloch, one of the "Clarté" group of Socialist writers, spent most of World War II in Moscow.

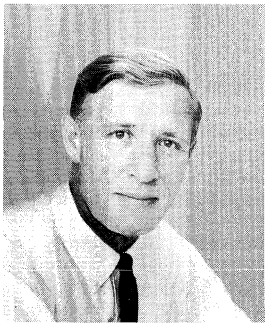
Bloch, Joseph Samuel (b. Nov. 20, 1850, Dukla, Galicia, Austrian Empire—d. Oct. 1, 1923, Vienna), Austrian rabbi, politician, journalist, and crusader against anti-Semitism, particularly the so-called blood accusation, or blood libel—the allegation that Jews use the blood of Christians in the Passover ritual.

After serving as a rabbi in several small communities, he settled in Florisdorf, a suburb of Vienna. At the time, anti-Semitism was gaining momentum in Austria. It culminated in the notorious trial, in 1882, of 15 Jews living in Tiszaeszlár who were accused of murdering a 14-year-old girl named Esther Solymosi to use her blood for the coming Passover ceremonies. When August Rohling, of the Catholic theological faculty at the University of Prague, claimed that he could prove under oath the actuality of the blood ritual, Bloch retaliated. In a series of articles, he accused Rohling of ignorance and deceit, and Rohling was compelled to sue for libel. He withdrew his suit, however. Nevertheless, Bloch published a compendium of the expert evidence he had prepared for the trial in his work *Israel und die Voelker* (1922; *Israel and the Nations,* 1927).

He left the rabbinate and from 1884 to 1921 published *Österreichische Wochenschrift* ("Austrian Weekly"), financed by a Christian, Baron Scher, in which anti-Semitism was uncompromisingly attacked. Bloch carried on the fight in the Austrian parliament, of which he was a member three times during the years 1883–85 and 1891–95. In 1893 he instituted criminal proceedings against three men who had accused a group of rabbis of the blood ritual. The men were found guilty of conspiracy and imprisoned.

Bloch, Konrad (Emil) (b. Jan. 21, 1912, Neisse, Ger.), German-born U.S. biochemist who shared the 1964 Nobel Prize for Physiology or Medicine with Feodor Lynen for their discoveries concerning the natural synthesis of cholesterol and of fatty acids.

After receiving a chemical engineering degree at the Technische Hochschule, Munich, in 1934, Bloch went to Switzerland and then to the U.S. At Columbia University (Ph.D., 1938) he became a research associate of Rudolf Schoenheimer in the isotopic analysis of cell metabolism. After teaching at the University of Chicago (1946–54), Bloch became professor of biochemistry at Harvard, continuing his



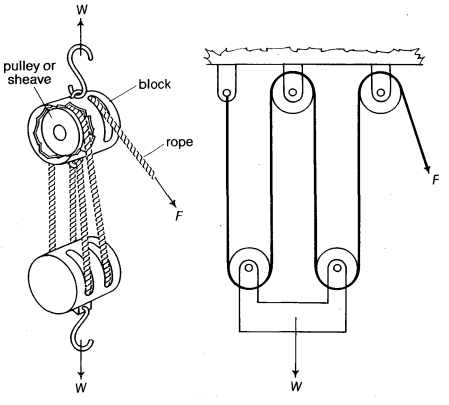
Konrad Bloch

research on lipids, especially the unsaturated fatty acid components.

In 1942 Bloch and David Rittenberg discovered that the two-carbon compound, acetic acid, was the major building block in the 30 or more steps in the biosynthesis (natural formation) of cholesterol, a waxlike alcohol found in animal cells. In his search to determine how acetic acid molecules combine in this process, Bloch was also joined by Feodor Lynen and his collaborators in Munich and J.W. Cornforth and G. Popjak in England. Their discovery facilitated medical research on the relation of blood cholesterol levels to atherosclerosis; research in physiology; and research on the chemistry of terpenes, rubber, and other isoprene derivatives.

Block, Herbert Lawrence: *see* Herblock.

block and tackle, combination of a flexible rope, or cable, and pulleys commonly used to



Block and tackle

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augment pulling force; it can be used to lift heavy weights or to exert large forces in any direction. In the Figure there are four freely rotating pulleys, two on the upper block, which remains fixed, and two on the lower block, which moves up as the load *W* is lifted; one end of the rope is anchored to the upper block.

If the load *W* is lifted one foot, each of the four rope links will shorten by one foot so that four feet of rope must be pulled off by the effort *F;* consequently the force magnification and the mechanical advantage, neglecting friction, is 4. With more pulleys higher force ratios may be obtained, but increased friction may offset any advantages. *See also* wheel and axle.

block book, book printed from wooden blocks on which the text and illustration for each page had to be painstakingly cut by hand. Such books were distinct from printed books after the invention of movable type, in which words were made up of individual letters each of which could be reused as often as necessary and in which only illustrations and special devices, such as initial letters in paragraphs, had to be carved individually in wooden blocks set in forms with metal letters.

The art of block-book printing is almost certainly of Chinese origin, probably of the 6th century AD. The first examples were produced by hand-rubbing impressions from the block. The method had spread to Europe at least by the 15th century, and early in the 15th century, simple presses were probably sometimes being used to impress the "printing" from more elaborate text-illustration blocks. Block books were tedious to produce since each letter had to be carved each time it appeared on a page; the method was used most often for short, simple works—largely religious—in which the length of the text could be subordinated to illustration. Hardly any European block books are known to have been executed after the early 16th century.

Block book, a page from the *Biblia Pauperum* illustrating the Resurrection and its Old Testament prototypes, *c.* 1470–80; in the British Library

Peter J. Davey

Block Island, pear-shaped island coextensive with the town of New Shoreham (inc. 1672), Washington County, southern Rhode Island, U.S., between Block Island Sound and the Atlantic Ocean. About 9 mi (14 km) south of the mainland, it is approximately 7 mi long and 3½ mi wide. Originally called Manisses, or Manasses (Manitou's Little Island), by Narraganset Indians, it was sighted by the Italian navigator Giovanni da Verrazano in 1524 and later named for Dutch explorer Adriaen Block, who visited there in 1614. He was followed in 1661 by settlers from Massachusetts. The island was admitted to the colony of Rhode Island in 1664.

The economy, once dependent on fishing and farming, is now based mainly on resort activities. The Mohegan Bluffs, spectacular chalk cliffs (185 ft [56 m] high), are on the southern shore. The Old Harbor (eastern side) was formed in 1878 with the construction of a breakwater; the New Harbor (western side) was formed (1900) by building a channel to Great Salt Pond. The Palatine Graves site, on the island's southern side, is believed to be the burial place of a group of 16 Dutch immigrants (18th century) who survived the wreck of the ship "Palatine," the subject of a poem by John Greenleaf Whittier. There are ferry services from Point Judith, Newport, and New London. The biennial Block Island Regatta is a notable event. Pop. (1980) 620.

blockade, an act of war by which a belligerent prevents access to or departure from a defined part of the enemy's coasts.

Blockades are regulated by international customary law and by international treaty law. A blockade must be declared in advance by notification of all neutral powers, and it must be applied impartially against ships of all states. Mere declarations of a blockade or "paper blockades," common in the 18th and early 19th centuries, have no legal effect; the blockading state must make the blockade effective by maintaining naval or air forces in the area of sufficient strength to prevent ingress or egress from the enemy's ports. Once the blockade ceases to be effectively maintained the legal state of blockade lapses and can only be reestablished by due notification and enforcement.

Penalties for breach of blockade are seizure of ship and cargo and their possible condemnation as lawful prize. Neutral ships may not be destroyed for blockade running.

The law of blockade, in common with other laws of war, has evolved historically to meet the needs of major powers. The development of submarines and aircraft, in particular, made it impossible to station blockading warships in constant positions off an enemy's coasts to maintain close blockades, and it has subsequently been accepted that long-range blockades (maintained by naval forces out of sight of the enemy's coast) are legal if they effectively prevent ingress and egress.

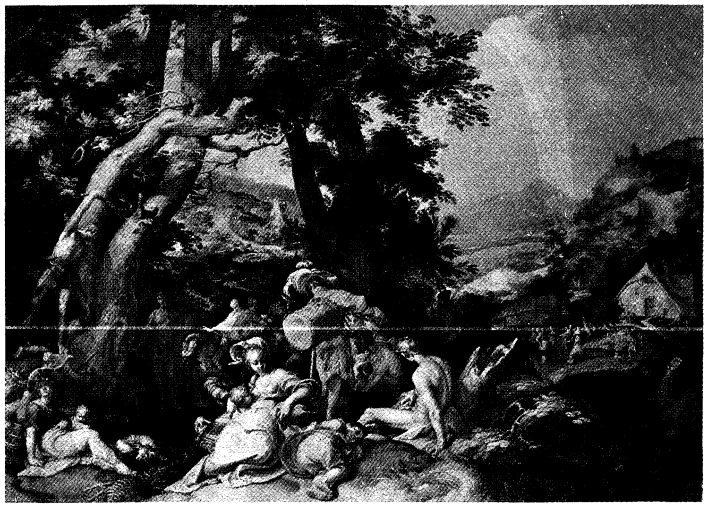
There is little legal authority, however, by which the meaning of "effective blockade" may be precisely defined under conditions of modern naval warfare. There is authority for the view that risk of seizure for ships running the blockade must be substantial, entailing the presence of patrolling ships.

Blocksberg (East Germany): *see* Brocken.

Blocksidge, Charles William: *see* Baylebridge, William.

Bloemaert, Abraham (b. Dec. 25, 1564, Gorinchem, Neth.—d. Jan. 27, 1651, Utrecht), influential Dutch Mannerist painter and engraver.

The son of an architect Bloemaert studied at Utrecht under eminent painters, spent three years in Paris, and returned to settle finally at Utrecht, where he became dean of the Guild of St. Luke. He painted and etched historical and allegorical pictures, landscapes, still lifes, animal pictures, and flower pieces. His four sons—Hendrick, Frederick, Cornelis, and Adriaen—all achieved considerable reputations as painters and engravers. He was influenced by Caravaggio, and he in turn influenced Both, Cuyp, Honthorst, Terbrugghen, and Weenix.



"The Preaching of St. John the Baptist," painting on canvas by Abraham Bloemaert; in the Rijksmuseum, Amsterdam

By courtesy of the Rijksmuseum, Amsterdam

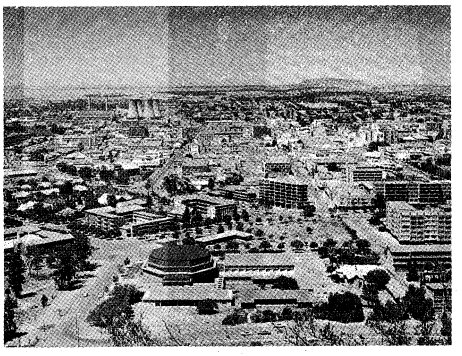
Bloembergen, Nicolaas (b. March 11, 1920, Dordrecht, Neth.), Dutch-born U.S. physicist, co-recipient with Arthur Leonard Schawlow of the United States and Kai Manne Börje Siegbahn of Sweden (*qq.v.*) of the 1981 Nobel Prize for Physics for their revolutionary spectroscopic studies of the interaction of electromagnetic radiation with matter. Bloembergen and Schawlow earned their share of the prize by investigating phenomena that are not detectable without lasers.

Bloembergen received bachelor's and master's degrees from the University of Utrecht. In 1946 he accepted a research appointment at Harvard University, where he undertook the studies for his doctorate. His Ph.D. was granted by the University of Leiden in 1948. Returning to Harvard, he became an associate professor in 1951 and Gerhard Gade university professor in 1980. He became a U.S. citizen in 1958.

Bloembergen became involved with the fundamental principles of masers and lasers during his doctoral research at Harvard in the late 1940s. Within two years after Charles Townes had demonstrated the maser in 1953, Bloembergen provided the specifications for an improved version that has become the most widely used microwave amplifier.

Bloemfontein, city, capital of the Orange Free State and judicial capital of the Republic of South Africa. Founded by Maj. Douglas Warden in 1846 as a fort and residency, it became the seat of the British-administered Orange River Sovereignty (1848–54) and of the Orange Free State (an independent Boer republic formed in 1854). Failure of the Bloemfontein Conference (May–June 1899) led to the outbreak of the South African War. In the 20th century the city became a geographical hub of South Africa's transportation (particularly, railroad) systems. The area's economic development was spurred after 1948 by exploitation of the Free State goldfields 100 mi (160 km) northeast and after 1962 by the Orange River multipurpose (irrigation–power) project.

The city lies on a high plateau at an altitude of 4,568 ft (1,392 m). Unusually clear atmospheric conditions prompted the establishment of two astronomical observatories—Lamont-Hussey (built by the University of Michigan in 1928; closed 1972) and Boyden (built in 1927; administered by Harvard University until 1955). Spacious and sprawling over hills and kopjes (hillocks), Bloemfontein (meaning "fountain of flowers") is known for its natural and manmade beauties, including the 300-ac (120-ha) King's Park and the Franklin Game Reserve. The city contains the national Court of Appeal, the state's oldest Dutch Reformed Church (Moeder Kerk), the Raadsaal (provincial council seat), and the



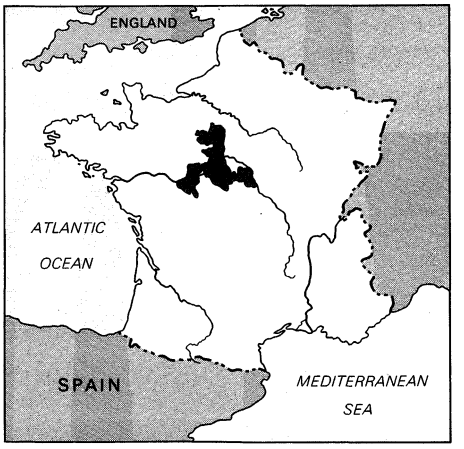
Bloemfontein, S.Af., from Naval Hill

J. Allan Cash—EB Inc.

Old Raadsaal (1849), a one-room house now a national monument. Bloemfontein is the seat of the University of the Orange Free State (founded 1855). Pop. (1980 prelim.) mun., 198,343; metropolitan area, 230,688.

Bloemfontein Convention: *see* Sand River and Bloemfontein conventions.

Blois, feudal countship that rose to great importance in medieval France as its holders



The county of Blois, *c.* 1035

From W. Shepherd, *Historical Atlas*, Harper & Row, Publishers (Barnes & Noble Books), New York; revision Copyright © 1964 by Barnes & Noble, Inc.

came to possess not only the city of Blois itself and its immediate vicinity, the Blésois, but also other domains.

The following article summarizes the political history of Blois. For additional treatment of its geography and history, *see* MACROPAEDIA: France.

The countship appears at first to have been appointive, for under Robert the Strong (died 866), duke of the entire region between the Seine and the Loire and ancestor of the house of Capet, Blois was an appointive viscounty. About 940 the title of count was assumed by Thibaut I the Old or the Cheat (died *c.* 977), who founded the hereditary House of Blois. He enlarged his domain until it extended from the Indre to the Eure rivers.

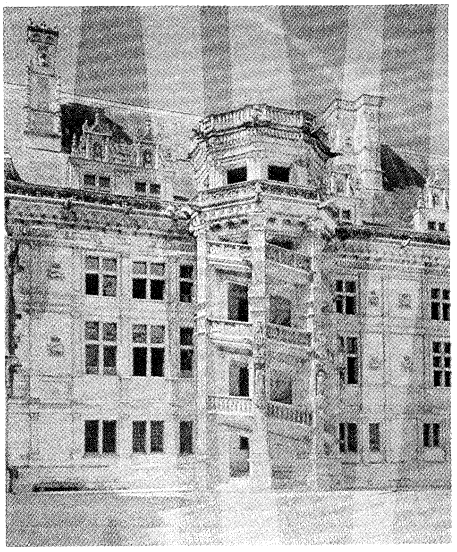
From 987, when the accession of the Capetians to the French throne was firmly established, the counts of Blois were the king's immediate vassals; but they were also his most dangerous rivals. The immediate successors of Thibaut I continued to enlarge their domain, sometimes at the expense of the Capetians. When Eudes II (died 1037) acquired Champagne (*c.* 1023), the Capetian

domain was threatened both west and east by Blois–Champagne power. After the death of Eudes, however, his territories were gradually divided among his descendants, until Thibaut IV the Great (died 1152) reunited Champagne (as Thibaut II) with Blois in 1125.

Thibaut (whose brothers Henry and Stephen became, respectively, the bishop of Winchester and the king of England) was considered the second most powerful person in France; he was alternately the ally and the enemy of Louis VI and Louis VII. The countship was then at the zenith of its power. When Blois and Champagne were finally divided between Thibaut's sons in 1152, the countship began to decline. In 1230 it passed to the House of Châtillon and was further divided.

In the late 14th century Blois was sold to Louis de France, duc d'Orléans. In 1498 his grandson became king of France as Louis XII, and Blois passed to the crown. Gaston de France, duc d'Orléans, held Blois as an appanage from 1626 to 1660. Subsequently, Louis XIV gave it to his brother Philippe I, duc d'Orléans, with whose descendants it remained until the French Revolution.

Blois, city, capital of Loir-et-Cher *département,* Centre region, central France, on the Loire River, northeast of Tours. First mentioned in the 6th century by Gregory of Tours, it was by the early Middle Ages seat of the powerful counts of Blois, from whom descended the Capetian kings of France. At the end of the 14th century, Blois was acquired by Louis de France, duc d'Orléans. Joan of Arc set out from Blois in 1429 to raise the siege of Orléans. In 1498 the son of Duke Charles and grandson of Duke Louis succeeded to the French throne as Louis XII. He had been born in the château, and from his coronation until the end of the 16th century, Blois was almost a second capital of France. Under Henry III, the States-General twice met there. At the second of the two meetings most of the deputies supported the Catholic League and its leader, Henri de Guise, who had been plotting with Spain to take the throne. Henry III, fearing deposition, had Guise murdered on the second floor of the château, Dec. 23, 1588. The queen mother, Catherine de Médicis, died a few days later in a room just below. Marie de Médicis was imprisoned there by her son, Louis XIII, but escaped after two years of luxurious confinement. In 1626 the same Louis sent his brother, Gaston de France, duc d'Orléans, to Blois, inviting him to redesign the château. The classical wing designed by François Mansart was the result.



The château at Blois, Fr., with the Francis I exterior staircase
Club Iris

The château, begun as a feudal castle, displays splendid work of all the architectural periods from the 13th to the 17th century. The main hall, where the States-General met, is 13th century; the Charles d'Orléans Gallery is mid-15th, while the Chapelle Saint-Calais and the Louis XII Wing (1498–1503) mark the transition between Gothic and Renaissance. The Francis I facade (1515–24) is pure Renaissance, and its extraordinary staircase spirals five stories upward in a sculptured octagonal case.

Many of the ancient buildings between the château and the river were destroyed in World War II; some have since been rebuilt. The town has some picturesque streets and many Gothic and Renaissance buildings. It is a major tourist centre of the Loire Valley and an important market for the corn (maize), asparagus, and wine produced in the surrounding countryside. Chocolate and footwear are also made. The policy of decentralizing industry in the Paris region has promoted recent growth in Blois and other cities of the Loire Valley. Pop. (1982) 46,925.

Consult the INDEX *first*

Blois, François-Louis de: *see* Blosius, Franciscus Ludovicus.

Blok, Aleksandr Aleksandrovich (b. Nov. 28 [Nov. 16, old style], 1880, St. Petersburg, Russia—d. Aug. 7, 1921, Petrograd), poet and dramatist, the principal representative of Russian Symbolism, a modernist literary movement that was influenced by its European counterpart but was strongly imbued with indigenous Eastern Orthodox religious and mystical elements.

Born into a sheltered, intellectual environment, Blok was reared from the age of three in an atmosphere of artistic refinement at the manor of his aristocratic maternal grandparents, since his father, a law professor, and his mother, the cultured daughter of the rector of St. Petersburg University, had separated. In 1903 Blok married Liubov Mendeleyeva, daughter of the famous chemist D.I. Mendeleyev. To Blok, who began to write at the age of five, poetic expression came naturally, and his early verse communicates the exaltation and spiritual fulfillment his marriage brought.

Imbued with the early 19th-century Romantic poetry of Aleksandr Pushkin and the apocalyptic philosophy of the poet and mystic Vladimir Solovyov (1853–1900), Blok developed their concepts into an original poetic expression by a creative use of rhythmic innovations. For Blok, sound was paramount, and musicality is the primary characteristic of his verse.

His first collection of poems, the cycle *Stikhi o prekrasnoy dame* (1904; "Verses About the Lady Beautiful"), portrays his initial phase of Platonic idealism, personifying divine wisdom (Greek *sophia*) as the feminine world soul (eternal womanhood). But by 1904 Blok's romantic expectation of otherworldly fulfillment had been transformed into a concern for the human suffering surrounding him, and he began to dissipate himself in a frantic search for truth through sensual experience.

Thus, to the consternation of his earlier admirers, in his next collections of poems, *Gorod* (1904–08; "The City") and *Snezhnaya Maska* (1907; "Mask of Snow"), he sublimated his religious themes to images of sordid urban culture and transfigured his mystical woman into the "unknown courtesan." Blok exhibited the final phase of his tragic dilemma by rejecting what he termed the sterile intellectualism of the bourgeois Symbolists and embracing the Bolshevik movement as the change essential for the redemption of the Russian people. He felt doubly betrayed, however, first by the desertion of his literary colleagues and then by the Bolsheviks, who scorned his work and aesthetic aspirations. The consequent alienation plunged him into a melancholy withdrawal that contributed to his premature death.

Blok
Novosti Press Agency

His late poems are testaments of his alternate moods of hope and despair. The unfinished narrative poem *Vozmezdiye* (1910–21; "Retribution") reveals his disillusionment with the new regime, while *Rodina* (1907–16; "Homeland") and *Skify* (1918; "Scythians") exalts Russia's messianic role in the new world order. A rhetorical ode, "Scythians" is the prime example of Blok's dramatic verse, rooted in gypsy folk ballad, with its lilting rhythms, uneven beat, and abrupt alternations of passion and melancholy. Exhorting and threatening in turn, it expresses Blok's Slavophilic love–hate relationship to the West, warning Europe that, should it interfere with Russia, the wave of the future, it would be scourged by a Russian-Asiatic horde.

Blok's preeminent work of impressionistic verse was his final composition, done amidst the chaos of the Revolution, the enigmatic ballad *Dvenadtsat* (1918; *The Twelve,* 1920). The poem is notable for its mood-creating sounds, polyphonic rhythms, and harsh, slangy language. It is a description of the march of a disreputable band of 12 Red Army men, looting and killing, through a fierce blizzard during the 1917–18 St. Petersburg uprising, with a Christ figure at their head. Though critics thought *The Twelve* obscure, it and others of Blok's works have endured. He is believed to have initiated the post-Revolutionary era of Russian literature.

Blom, Frans Ferdinand (b. Aug. 9, 1893, Copenhagen—d. June 23, 1963, San Cristóbal, Mex.) Danish archaeologist who was an authority on Mayan culture. He spent much of his life in the jungles of Chiapas state (adjoining Guatemala), where his explorations led to the discovery of several long-lost cities attributed to the "classical period" (AD 300–900) in the history of the central Maya lowlands.

After graduating from the University of Copenhagen, Blom immigrated to the United States in 1919 and received his M.A. from Harvard University in 1925. As a Mexican government archaeologist (1922–23) and subsequently as a member of American and joint Danish-American expeditions, he uncovered priceless examples of Mayan art and architecture at Palenque, Uaxactún (Guatemala), and Veracruz.

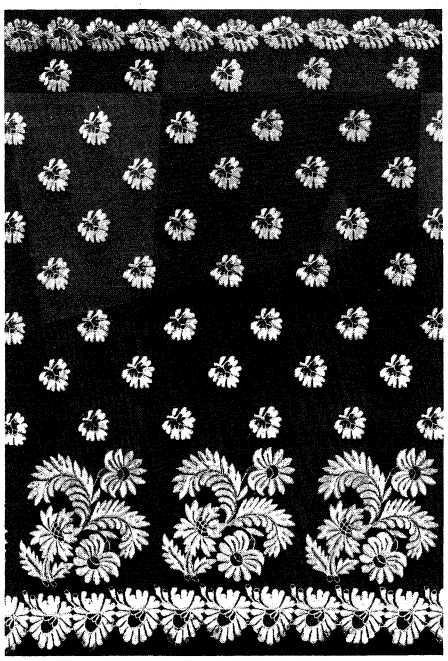
While exploring the Lacandon jungle in 1948 he discovered the last remnants of the Lacandon people, descendants of the original Mayans. From 1925 to 1941 Blom was director of the Middle American Research Institute of Tulane University, New Orleans. After settling in Mexico in 1950, he and his wife, Gertrude, established in San Cristóbal de Las Casas a research centre, museum, and library devoted to Mayan culture, about which

he wrote several books, including *Tribes and Temples* (1926–27; with Olivier La Farge) and *Conquest of Yucatán* (1936).

Blomberg, Werner (Eduard Fritz) von (b. Sept. 2, 1878, Stargard, Ger.—d. March 22, 1946, Nürnberg), German general and minister of war (1933–38) in the National Socialist government of Adolf Hitler. He was one of Hitler's most willing collaborators among the old-line officer corps.

A general staff officer during World War I, Blomberg was named chief of staff of the Stuttgart army area (1921), head of the department of military training (1925), and military commander in chief in East Prussia (1929). In January 1933 he was appointed German minister of defense in the new Hitler government and retained office until early 1938—as minister of war after 1935 and, concurrently, commander in chief of the *Wehrmacht* (German armed forces). An unquestioning follower of Hitler, so compliant as to be given the nickname "Rubber Lion," he played a consenting role in the purge of the SA (storm troopers) of 1934, and in August 1934 imposed on the army an oath of personal allegiance to Hitler. In 1936 he was created field marshal. A personal domestic scandal was the immediate cause of his resignation as war minister in January 1938.

blonde lace, originally, bobbin lace made in France in the 18th century from unbleached pale beige Chinese silk. Subsequently, the term blonde was extended to cover lace made of bleached silk (white blonde) and black-dyed silk (black blonde). Blonde lace was made in France at Bayeux, Caen, and Chantilly in the mid-18th century and also in England (Dorset) *c.* 1754–80. Just before the Revolution of 1789, blonde lace was light and decorated with flowers. This style later gave way to a heavier "Spanish" style. A revival of blonde, including earlier styles, took place in France in the 19th century. Much blonde lace was imported by Spain for mantillas; for, although the Spanish made their own blonde from silk spun near Barcelona, it was inferior to the French.



Blonde lace from Caen, Fr., mid-19th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

Blondel DE NESLE (fl. late 12th century), early lyric poet-musician, or trouvère, of northern France.

Nothing is known about Blondel outside of his poetry. He was probably from Nesle, in Picardy; but the name Blondel may be a nickname, and it is uncertain how many of the 25 songs attributed to him are actually his. His poetry is conventional in its complaints to an unknown lady but contains no references to Blondel's relationship to her or to events of the time. Blondel's popularity is apparent in the widespread use by contemporaries of his melodies, which are extant in various manuscripts, and in the dubious but widespread legend, first narrated in the 13th century romance *Récits d'un ménestrel de Reims* ("Narrative of a Minstrel of Reims"), that he played a part in the discovery and release of King Richard I of England from his imprisonment (1192–94) by the Holy Roman emperor Henry VI.

Blondel, André-Eugenè (b. Aug. 28, 1863, Chaumont, Fr.—d. Nov. 15, 1938, Paris), French physicist known for the invention of the oscillograph and for developments in photometry.

Blondel became a professor of electrotechnology at the École des Ponts et Chaussées and the École des Mines in Paris. In 1893 he invented the electromagnetic oscillograph, a device that allowed electrical researchers to observe the intensity of alternating currents. In 1894 he proposed new measurement units for use in photometry, based on the metre and the Violle candle; his system was endorsed in 1896 by the International Electrical Congress and remained in use for many years.

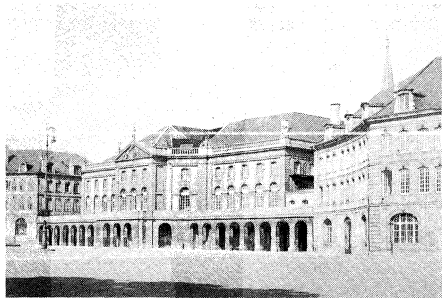
Blondel also contributed to developments in wireless telegraphy, acoustics, and mechanics and proposed theories for induction motors and for the coupling of alternating-current generators.

Blondel, Georges (b. March 8, 1856, Dijon, Fr.—d. July 31, 1948, Paris), historian and juridical scholar, the leading French authority on Germany and Austria before 1914.

After receiving his doctorate in 1881 and the rank of agrégé (highest teaching degree) in 1883, he was appointed to a chair of law at Lyon in 1884 and 10 years later was named professor of letters at Lille. He later taught at the École des Hautes Études Commerciales and the Collège de France in Paris.

A specialist in German and Austrian questions of pedagogy and labour organizations, Blondel participated in many academic societies, contributed to scholarly journals, and conducted lecture tours around Europe. Among his works are *L'Ouvrier allemand* (1899; "The German Worker"); *L'Essor industriel et commercial du peuple allemand* (1898; "The Industrial and Commercial Ascent of the German People"); *L'Éducation économique du peuple allemand* (1908; "The Economic Education of the German People"); and *Le Triomphe du germanisme* (1934; "The Triumph of Pan-Germanism").

Blondel, Jacques-François (b. Jan. 17, 1705, Rouen, Fr.—d. Jan. 9, 1774, Paris), architect best known for his teaching and writing, which contributed greatly to architectural theory and the taste of his time. His art school in Paris was the first such institution to teach architecture.



Hôtel de Ville, Metz, Fr., by Jacques-François Blondel

Giraudon—Art Resource/EB Inc.

Of a famous architectural family, Blondel was reared by an uncle. Though the nephew early went along with the Rococo ornamentation of the preceding age, he eventually turned against it. In 1737 he executed some plates for Pierre-Jean Mariette's edition of Augustin Daviler's 17th-century treatise on architecture, taking the opportunity to refine some designs of the Rococo woodcarver Nicolas Pineau, who had earlier collaborated with his uncle. In the same year Blondel's *De la distribution des maisons de plaisance et de la décoration des édifices en général* (2 vol., 1737–38; "On the Designing of Country Seats and on the Decoration of Buildings in General"), began to appear. The work, while not original, expressed an ideal of the taste that continued through the Enlightenment. Blondel's own buildings of the 1730s included an orangery near Florence, the terraces of a château near Brittany, and his town house, Petit dâ Marivat, at Besançon.

As a teacher, first in his own school (1743–54) and later at the Académie Royale d'Architecture, Blondel influenced such students as the Scottish architect William (later Sir William) Chambers, best known for his Somerset House for the Royal Academy of Arts in London (1776; later replaced); the French architect Richard Mique, who did much work for Marie-Antoinette at Versailles; the Dutch architect Pieter de Swart, who designed the only remaining Rotterdam gate, the Gate of Delft; and the German architect Christian Weinlig, a member of the Dresden Neoclassical school. In this period Blondel designed a comprehensive plan for the decoration of the centre of Metz (1764), including the Hôtel de Ville (1765).

Blondel, Maurice (Édouard) (b. Nov. 2, 1861, Dijon, Fr.—d. June 4, 1949, Aix-en-Provence), French dialectical philosopher who formulated a "philosophy of action" that integrated classical Neoplatonic thought with modern Pragmatism in the context of a Christian philosophy of religion.

He studied at the École Normale Supérieure under Léon Ollé-Laprune and first formulated his philosophy in *L'action* (1893). Blondel was influenced by the theory that belief is a matter of will as well as logical demonstration. For him, the term action was comprehensive and meant the dynamism of life in all its manifestations; it includes all the conditions that contribute to the gestation, birth, and expansion of the free act. He argued that proving that God exists is not the question; it is determining what attitude a man should take regarding the possibility of his receiving eternal life with God.

Among Blondel's principal writings are *La Pensée,* 2 vol. (1934; "Thought"), and *Exigences philosophiques du Christianisme* (1950; "Philosophical Demands of Christianity").

Blondin, pseudonym of JEAN-FRANÇOIS GRAVELET (b. Feb. 28, 1824, Saint-Omer, Fr.—d. Feb. 19, 1897, London), tightrope walker and acrobat who owed his celebrity and fortune to his feat of crossing Niagara Falls on a tightrope 1,100 feet (335 metres) long, 160 feet above the water.

When he was five years old he was sent to the École de Gymnase at Lyon, and after six months' training as an acrobat he made his first public appearance as "the Little Wonder." He crossed Niagara Falls a number of times, first in 1859, always with different theatrical variations: blindfolded, in a sack, trundling a wheelbarrow, on stilts, carrying a man on his back, and sitting down midway to make and eat an omelette. In 1861 he appeared in London at the Crystal Palace, turning somersaults

on stilts on a rope stretched across the central transept, 170 feet from the ground. His final performance was given at Belfast in 1896.

Blondus, Flavius: *see* Biondo, Flavio.

blood, fluid in multicellular animals that transports oxygen and nutrients to the cells and carries away waste products. In many species it also conveys hormones and disease-fighting substances.

A brief treatment of blood follows. For full treatment, *see* MACROPAEDIA: Tissues and Fluids; Blood, Human.

Technically, blood is a transport liquid pumped by the heart (or an equivalent structure) to all parts of the body, after which it is returned to the heart to repeat the process. Blood is both a tissue and a fluid. It is a tissue because it is a collection of similar cells that serve a particular function. These cells are suspended in a liquid matrix—called plasma—which makes the blood a fluid.

In single-celled animals and the smallest multicellular invertebrates there is no blood system. Because of their small size, these animals can absorb oxygen and nutrients and can discharge wastes directly into their surrounding medium. Sponges and coelenterates (*e.g.*, jellyfish and hydras) also lack a blood system; the means to transport foodstuffs and oxygen to all the cells of these larger multicellular animals is provided by water, sea or fresh, pumped through spaces inside the organisms.

In animals of increasing size and complexity, contact with the surrounding medium is no longer sufficient to supply the metabolic needs of internal body cells. Such animals possess a true blood system in which a specialized fluid—*i.e.*, blood—is pumped around the body. In most such animals the blood passes through a respiratory exchange membrane, which lies in the gills, lungs, or even the skin. There the blood picks up oxygen, which is necessary for cellular metabolism, and disposes of carbon dioxide, which is a waste product of metabolism. The blood also absorbs nutrients from the intestines or from various storage tissues and carries them to cells throughout the body. Another function of blood is the transport of water-soluble toxic wastes to excretory organs for elimination from the body.

Blood evolved from seawater, which in primitive organisms was the source of elements essential for growth. Thus, the basic chemical composition of plasma resembles that of seawater, consisting of water and dissolved salts. However, plasma also contains dissolved nutrients, wastes, and—in many species—hormones.

The cellular composition of blood varies from group to group in the animal kingdom. Most invertebrates have various large blood cells capable of amoeboid movement. Some of these aid in transporting substances; others are capable of surrounding and digesting foreign particles or debris (phagocytosis). Compared with vertebrate blood, however, that of the invertebrates has relatively few cells. Among the vertebrates, there are several classes of amoeboid cells (white cells, or leukocytes), special oxygen-carrying cells (red cells, or erythrocytes), and cells that help stop bleeding (thrombocytes, or platelets).

Oxygen requirements have played a major role in determining both the composition of the blood and the architecture of the blood circulatory system. In some of the smallest invertebrates, including certain worms and mollusks, transported oxygen is merely dissolved in the plasma. Larger and more complex animals, which have greater oxygen needs, have evolved respiratory pigments. These specialized compounds are able to carry larger amounts of oxygen because of the ability of metal atoms in the pigments to react with and transport several atoms of oxygen. The red pigment hemoglobin, containing iron, is found in all vertebrates and some invertebrates. The blue pigment hemocyanin, containing copper, is found in some crustaceans, such as crabs and in some mollusks. Some annelids have the iron-containing green pigment chlorocruorin, others the iron-containing red pigment hemerythrin.

In many invertebrates the respiratory pigments are carried in solution in the plasma, but in higher animals, including all vertebrates, the pigments are enclosed in cells; if the pigments were freely in solution the pigment concentrations required would cause the blood to be so viscous as to impede circulation.

There are two basic types of blood circulatory systems—open and closed. In an open system, the blood flows out of vessels and directly bathes the internal body tissues. In a closed system, the blood never leaves its network of vessels; exchange of materials between the blood and tissues occurs across the walls of the capillaries, the tiniest blood vessels. Arthropods (insects, spiders, and crustaceans) have an open system, as do most mollusks. The cephalopod mollusks (squids and octopuses), however, have a closed system, as do the annelid worms and all vertebrates.

An open system is less efficient in delivering oxygen rapidly. It suffices for less active mollusks such as clams and snails, but the active cephalopods need the greater efficiency of a closed system. The fact that insects, most of which are highly active, have an open system might seem unusual; however, insects do not rely on the blood for delivery of oxygen. An elaborate network of air tubules (tracheae) performs this function in insects.

Among the vertebrates, the fishes have a circulation in which blood is pumped out of the heart, through the gills (where oxygen is loaded and carbon dioxide is unloaded), and then on to the body as a whole, without first returning to the heart. All other vertebrates—*i.e.*, amphibians, reptiles, birds, and mammals—have a double circulation in which, after travelling through the lungs and becoming oxygenated, the blood returns to the heart to be pumped out again through the body. For maximum efficiency, this double circulation requires the separation of the heart into two discrete pumps, so that oxygenated and deoxygenated blood do not become mixed in its chambers. This separation of the heart is achieved only partially in amphibians and reptiles, but it is complete in birds and mammals.

Content of mammalian blood. Mammalian blood consists of plasma, as well as the red and white cells and platelets (thrombocytes). In man, plasma is a straw-coloured liquid the chief components of which are water (90 to 92 percent) and proteins (6 to 8 percent). Plasma also contains various dissolved substances, including salts, nutrients (glucose, fats, and amino acids), carbon dioxide, nitrogen wastes, and hormones. Plasma has several functions, inluding: (1) serving as transport system and medium for nutrients, waste products, and blood cells; (2) helping to maintain blood pressure; (3) distributing heat equally throughout the body; (4) keeping a steady acid–base balance in the bloodstream and body.

One of the main functions of the plasma proteins is to prevent excess fluid loss from the capillaries. The water and most of the dissolved substances of the plasma can freely pass through the capillary walls, but the plasma proteins cannot. The proteins, therefore, provide osmotic pressure (*see* osmosis) that prevents the leakage of fluids. Albumin, which makes up more than half of all the proteins in the plasma of mammals, is the chief mediator of osmotic pressure.

Fibrinogen, another abundant mammalian blood protein, plays a vital role in the process by which bleeding is halted by the formation of a clot. A complex series of chemical reactions, involving a number of clotting factors, takes place when a blood vessel is torn. As a result of these reactions, fibrinogen is converted into a sticky, threadlike compound called fibrin. Fibrin threads form a mesh that is the basic structure of a clot. Plasma from which the fibrinogen has been removed is called serum; it cannot clot.

A third major class of plasma proteins are the globulins. The gamma globulins are antibodies, substances that protect the body against microorganisms and toxins. Alpha and beta globulins are molecules that specialize in transport of lipids (*e.g.*, cholesterol), steroids, sugars, iron (*see* transferrin), copper, and other minerals, and free hemoglobin (*see* haptoglobin). Certain blood-clotting factors are also found among the alpha and beta globulins.

The red cells of mammals, like those of all vertebrates, contain hemoglobin; they are the oxygen carriers of the blood. Unlike those of other vertebrates, however, mammalian red cells lack nuclei, an adaptation that makes them even more efficient in oxygen transport. The red cells vary in size from species to species, with no apparent connection between the size of the cell and the size of the mammal. Red cells are formed in the bone marrow.

The mammal's white cells function primarily in body defense and repair. There are three main classes of white cells: granulocytes, which engulf and digest microorganisms; monocytes, which also digest microorganisms as well as cellular debris; and lymphocytes, which provide immunity to diseases by the production of antibodies and sensitized cells. Granulocytes and monocytes are produced in the bone marrow. Lymphocytes are formed in the marrow and in the lymph tissues, such as the spleen, lymph nodes, and thymus.

Platelets are cell fragments derived from megakarocytes, large cells formed in the bone marrow. Platelets are vital in preventing blood loss from damaged vessels. Upon contact with a torn vessel wall, platelets stick to the wound and thus form a plug in the opening. For a small opening, this plug may stop the bleeding by itself. Larger breaks must be sealed by a clot; the platelets release chemicals that initiate clot formation, and the platelets themselves become an important part of the clot meshwork.

Human blood groups. The red blood cells of all normal human beings have an identical appearance. Protruding from their surface, however, are molecules, called antigens, that vary in type in different individuals and to some extent in different races. The red-cell antigens are probably of carbohydrate structure. When introduced by transfusion, red cells with antigens different from those of the recipient may be attacked by antibodies. The antibodies cause the donor red cells to clump together (agglutinate) like bunches of grapes. Like a lock and its specific key, each antigen on a red cell can be acted upon only by a specific antibody.

In 1900 and later, Karl Landsteiner found by studying these reactions that human beings could be divided into four large classes according to the type of antigen found on their red cells; those with antigen A (type A), those with antigen B (type B), those with both A and B (type AB), and those with neither A nor B (type O). In addition, it was found that the plasma of each person invariably had preformed antibodies against the antigens (A, B, or both) not found on his own red cells.

Following the discovery of the ABO blood-group system, several other systems were found, chief among them being the MN and Rh groups. Unlike the ABO system, these groups do not involve preformed antibodies in the plasma; antibodies form only after exposure to the foreign red cells.

Blood diseases and disorders. The disorders of the human blood are pathological

conditions that involve the cellular elements of the blood and the tissues in which they are formed.

The quantity of red blood cells in normal human beings varies with age and sex as well as with external conditions, but there can be pathological increases in the number of red cells, called polycythemia, or pathological decreases, called anemia (*q.v.*). In essence, anemia is not a disease but a symptom of disease. There are many different types of anemia, each of which is treated according to its cause.

Variations in the number of white cells occur normally from hour to hour, the highest counts being recorded in the afternoon and the lowest in the early morning. Temporary increases also normally occur during muscular exercise, menstruation, pregnancy, and childbirth, as well as in various emotional states. Abnormal changes in the count, appearance, or proportion of the various white cells are indicative of pathological conditions in the body. The condition in which white cells are present in greater numbers than normal is termed leukocytosis. It is usually due to an increase in the number of granulocytic leukocytes, most often as the result of the presence of an infection. An increase in the number of lymphocytes—many of which are abnormal—characterizes infectious mononucleosis, a viral disease seen frequently in young persons. It is accompanied by fever, sore throat, enlargement of the spleen, grippe-like symptoms, and enlargement of the lymph glands.

Leukemia (*q.v.*) is a very serious disorder of the blood-forming tissues that is characterized by unrestrained, morbid new (neoplastic) growth of white blood cells and ultimately by changes in various tissues, such as in the spleen and lymph glands, as well as by the development of anemia and a reduction in the number of blood platelets. The course of leukemia varies greatly, ranging from the acute type, which may cause the untreated patient to die in a few weeks or months, to the chronic type, which may produce little or no ill-health for 10 or more years. Disorders related to leukemia, *i.e.*, associated with neoplastic growth of cells formed in the blood-forming organs, lymph glands, and elsewhere, are reticulum-cell sarcoma, lymphosarcoma, and Hodgkin's disease.

Several different agents keep blood from flowing out of the blood vessels and into the tissues: the lining of the blood vessels, the blood platelets (thrombocytes), and the clotting factors in the plasma. A pathological disruption of any of these processes can cause various bleeding disorders. In cases of vitamin C deficiency (*see* scurvy), capillary integrity is lost and blood oozes into the tissues. With widespread capillary injury, the normal number of platelets (which tend to plug small breaks in blood vessels) is not sufficient to prevent bleeding. Absolute reduction in the number of platelets is termed thrombocytopenia; it is characterized by bleeding into the skin and from the mucous membranes that line the digestive and genitourinary tracts. Thrombocytopenia may result from a variety of causes.

Deficiencies in any of the clotting factors result in hemorrhages following minor injuries. In some of these disorders a specific deficiency is due to a hereditary defect (*e.g.*, classic hemophilia and Christmas disease, which are transmitted by females but are manifested only in males; and von Willebrand's disease, which affects both sexes). In other cases the deficiencies are acquired, often as a result of a shortage of vitamin K, which is necessary for the synthesis of many of the clotting factors.

Blood, Council of: *see* Troubles, Council of.

blood analysis, laboratory examination of a sample of blood to obtain information on its physical and chemical properties and on its components. Hundreds of hematological tests and procedures have been developed, and many can be carried out simultaneously on one sample of blood with such instruments as autoanalyzers. Blood analysis includes the following areas of study: (1) determination of the number of red and white blood cells in the blood, together with the volume, sedimentation rate, and hemoglobin concentration of the red blood cells (*see* blood count); (2) classification of the blood according to specific red-blood-cell antigens, or blood groups (*see* blood typing); (3) elucidation of the shape and structural details of blood cells; (4) study of the structure of hemoglobin and other blood proteins; (5) determination of the activity of various enzymes, or protein catalysts, that are either associated with the blood cells or are found free in the blood plasma; (6) study of blood chemistry.

Other properties of blood that may be included in an analysis are total volume, circulation time, viscosity, clotting time and clotting abnormalities, acidity (pH), and clearance rate of various substances (*see* kidney function test). Blood analysis is commonly carried out on a sample of blood drawn from the vein of the arm, the finger, or the earlobe; in some cases, the blood cells of the bone marrow may also be examined (*see* bone marrow aspiration). In addition to the wide variety of procedures devised for the study of normal blood constituents, there are also special tests based on the presence in the blood of substances characteristic of specific infections, such as the Wassermann reaction in the case of syphilis (*see* syphilis test). *See also* serological test.

blood bank, organization that collects, stores, processes, and transfuses blood. The fact that stored blood could safely be used was demonstrated in World War I. Before the first blood banks came into operation, the physician determined the blood types of the patient's relatives and friends until the proper type was found, performed the crossmatch, bled the donor, and gave the transfusion to the patient.

The discovery of many new blood types important in transfusions, and of several new crossmatching techniques, led in the 1940s to the rapid development of blood banking as a specialized field and to a gradual shift of responsibility for the technical aspects of transfusion from practicing physicians to technicians and clinical pathologists.

The practicality of storing fresh blood and blood components for future needs made possible such innovations as artificial kidneys, heart-lung pumps for open-heart surgery, and exchange transfusions for infants suffering from erythroblastosis fetalis.

Whole blood can be stored only for a limited time, but various components (*e.g.*, red blood cells and plasma) can be frozen and stored for a year or longer. Therefore, most blood donations are separated and stored as components by the blood bank. These components include platelets to control bleeding; concentrated red blood cells to correct anemia; and plasma fractions, such as fibrinogen to aid clotting, gamma globulin to prevent or modify a number of infectious diseases, and albumin to augment the blood volume in cases of shock. Thus it is possible to serve the varying needs of five or more patients with a single blood donation.

In some areas blood replacement programs have been established whereby persons can donate a unit (450 ml) of blood (or an equivalent monetary payment) and become enrolled in a blood bank cooperative from which they can draw unlimited blood benefits over a specified period of time, in case of future need.

Despite such replacement programs, many blood banks face continual problems in obtaining sufficient donations. The chronic shortage of donors has been alleviated somewhat by the development of hemapheresis, a technique by which only a desired blood component is taken from the donor's blood, with the remaining fluid and blood cells immediately transfused back into the donor. This technique allows the collection of large amounts of a particular component, such as platelets, from a single donor. *See also* blood transfusion.

blood brotherhood, special alliance or tie that binds persons together in a fashion analogous to, but distinct from, kinship ties. The relationship derives its name from the ritual commingling of the blood of the participants. The nature of the alliance thus formed typically enjoins the members to mutual support, loyalty, or affection. When practiced between groups, blood brotherhood most frequently serves to bind together potentially hostile groups, to form an alliance in war, or to conclude a peace. References to blood brotherhood occur in the works of many classical writers, beginning with Herodotus (5th century BC). Other accounts of blood brotherhood occur in myths and sagas from central Europe, Scandinavia, and Asia. In recent times, the custom has appeared and been described most frequently in Africa and, rarely, among North American Indians.

blood cell formation, also called HEMATOPOIESIS, or HEMOPOIESIS, continuous process by which the cellular constituents of blood are replenished as needed. Blood cells are divided into three groups: the red blood cells (erythrocytes), the white blood cells (leukocytes), and the blood platelets (thrombocytes). The white blood cells are subdivided into three broad groups: granulocytes, lymphocytes, and monocytes.

Blood cells do not originate in the bloodstream itself but in specific blood-forming organs, notably the marrow of certain bones. In the human adult, the bone marrow produces all of the red blood cells, 60–70 percent of the white cells (*i.e.*, the granulocytes), and all of the platelets. The lymphatic tissues, particularly the thymus, the spleen, and the lymph nodes, produce the lymphocytes (comprising 20–30 percent of the white cells). The reticuloendothelial tissues of the spleen, liver, lymph nodes, and other organs produce the monocytes (4–8 percent of the white cells). The platelets, which are small cellular fragments rather than complete cells, are formed from bits of the cytoplasm of the giant cells (megakaryocytes) of the bone marrow.

In the human embryo, the first site of blood formation is the yolk sac. Later in embryonic life, the liver becomes the most important red blood cell-forming organ, but it is soon succeeded by the bone marrow, which in adult life is the only source of both red blood cells and the granulocytes. Both the red and white blood cells arise through a series of complex, gradual, and successive transformations from primitive stem cells, which have the ability to form any of the precursors of a blood cell. Precursor cells are stem cells that have developed to the stage where they are committed to forming a particular kind of new blood cell.

In a normal adult the red cells of about half a litre (almost one pint) of blood are produced by the bone marrow every week. Almost 1 percent of the body's red cells are generated each day, and the balance between red cell production and the removal of aging red cells from the circulation is precisely maintained. The rate of blood cell formation varies depending on the individual, but a typical production might average 200,000,000,000 red cells per day, 10,000,000,000 white cells per day, and 400,000,000,000 platelets per day.

blood count, determination of the number of red blood cells (RBC's, or erythrocytes) and white blood cells (WBC's, or leukocytes) in a given volume of blood. The readings vary with sex, age, physiological state, and general

health, but a cubic millimetre of blood of a normal individual contains approximately 5,000,000 red cells and 7,000 white cells. A differential blood count is the enumeration of the number, or percent, of each type of white blood cell per 100 white cells counted; normally the white cells are about 55 percent neutrophils, 30 percent lymphocytes, and small percentages of eosinophils, basophils, and monocytes. A decrease in the number of red blood cells is usually associated with anemia, and an increase in the number of white blood cells with most infections or with leukemia. A blood count may also include a determination of the number of platelets, the volume by percent of red blood cells in whole blood (known as a hematocrit reading), the sedimentation rate of the red blood cells, and the hemoglobin concentration of the red cells.

blood feud: *see* feud.

blood fluke, any of certain parasitic flatworms that live in the veins of the host organism. *See* fluke.

blood money, compensation paid by an offender (usually a murderer) or his kin group to the kin group of the victim. In many societies blood money functions to prevent the continuation of hostilities in the form of a feud (*q.v.*). Some customs allow the injured party the choice of punishing the murder by blood vengeance or by blood money.

Among the Anglo-Saxon tribes, members of the killer's kin group contributed to pay *wergild,* or blood money, to the kin of the victim. Kinsmen contributed according to the distance of the relationship to the murderer; the sum was divided among the victim's kin on the same basis. Among many Indians of the northern Pacific coast of North America, blood payment was mandatory after killings in order to make peace possible, even when actual blood vengeance was also required. In most places there was no fixed standard, each group demanding as large an amount as possible. If agreement was not reached, feud might result.

Blood of Isis (Egyptian religion): *see* girdle tie.

blood pressure, force originating in the pumping action of the heart, exerted by the blood against the walls of the blood vessels; the stretching of the vessels in response to this force and their subsequent contraction are important in maintaining blood flow through the vascular system. In man, blood pressure is usually measured indirectly over the brachial or femoral artery: the highest (systolic) pressure, normally about 120 (100 to 140) millimetres of mercury, occurs during contraction of the ventricles; the lowest (diastolic) pressure, normally about 80 (60 to 100) millimetres, occurs during ventricular relaxation. Blood pressure in the capillaries is usually about 20 to 30 millimetres, while the pressure in the large veins may become negative (lower than atmospheric pressure).

Arterial blood pressure varies among individuals and in the same individual from time to time. It is lower in children than in adults and increases gradually with age. It tends to be higher in those who are overweight. During sleep it decreases slightly, and during exercise and emotional excitement it increases. *See also* hypertension; hypotension.

Blood River, Battle of (Dec. 16, 1838), South African battle between the Zulu and the Voortrekkers (the Boers who made the Great Trek from Cape Colony to Transvaal). It was fought on the banks of a tributary of the Buffalo River, which became known as Blood River after its water reddened with the slaughter of about 3,000 Zulu. Four Boers were wounded. This battle turned Voortrekker fortunes in Natal, at a low ebb as a result of successive earlier defeats at the hands of the Zulu. The power of the Zulu king, Dingane (Dingaan), was effectively undermined, and the Voortrekkers established themselves in Natal until its annexation by the British in 1843. Their victory is annually celebrated by white South Africans as the Day of the Covenant, or Dingaan's Day.

blood serum, the part of blood plasma remaining after coagulation, during which process the plasma protein fibrinogen is converted to fibrin and remains behind in the clot. Immune serum or antitoxin, serum prepared from the blood of animals or humans that have been exposed to a disease and have developed specific antibodies, is used to protect persons against diseases to which they have been exposed.

blood transfusion, therapeutic measure used to restore blood volume after extensive hemorrhage, burns, or trauma; to improve the oxygen-carrying capacity of the blood when hemoglobin levels are low in anemia; and to combat shock. Transfusion, now a frequent and lifesaving procedure, could not become useful or safe until the blood-group antigens and antibodies were discovered (the first system to be identified was ABO in 1900); thereafter, routine blood typing of donors and recipients permitted successful transfusion.

Attempts at transfusion were made in Europe from at least 1628 by the Italian physician Giovanni Colle, but so many patients died from incompatibility reactions that the process was banned in France, England, and Italy after the late 17th century. The Incas apparently practiced blood transfusion successfully much earlier—nearly all South American Indians are of blood type O-Rh-positive, and incompatibility reactions must have been few.

Blood can be kept in a state satisfactory for use in transfusion by the addition of special preservatives and refrigeration for up to 35 days, and methods of fractionating the blood have allowed its use in specialized form. Transfusions of whole blood or of blood fractions are used to treat at least 10 different conditions: (1) whole blood for acute blood loss; (2) packed red cells for chronic anemia; (3) washed red cells for allergies induced in frequently transfused patients by other elements in the blood; (4) platelets for bleeding caused by platelet deficiency; (5) white cells for low white-cell count in patients with infections; (6) plasma for shock without blood loss; (7) fresh-frozen plasma, freshly drawn plasma, or concentrates of the antihemophilic factor of plasma for bleeding in hemophilia; (8) albumin, concentrated from the plasma, for shock or for chronic low-albumin disorders and malnutrition; (9) gamma globulin, the antibody component of the plasma, concentrated for prevention of viral hepatitis and protection against or modification of measles after exposure; (10) fibrinogen, an important clotting factor in the blood, easily concentrated for bleeding conditions brought about by deficiency or absence of fibrinogen.

Exchange transfusion, in which all or most of the patient's blood is removed while new blood is simultaneously transfused, is of use in combatting erythroblastosis fetalis, removing certain poisons, and producing transient improvement in leukemics.

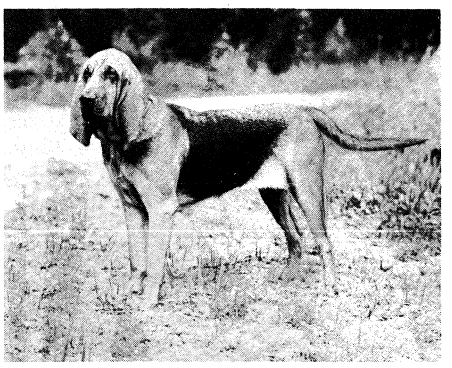
Undesirable reactions to transfusion are not uncommon and may occur for many reasons, such as allergy, sensitivity to donor leukocytes, or undetected red-cell incompatibility. Unexplained reactions are also fairly common. Rare causes of transfusion reaction include contaminated blood, air bubbles in the blood, overloading of the circulatory system through administration of excess blood, or sensitivity to donor plasma or platelets.

blood typing, classification of an individual's blood in terms of specific, distinctive antigenic characteristics that are inherited and are associated with the red blood cells. The ABO and the Rh blood groups (*qq.v.*) are among those most commonly considered. Identification of these determinants has become indispensable in connection with blood transfusion, because recipient and donor must have the same, or compatible, blood groups. Otherwise, hemolysis or clotting results from interaction of an antigen in the red blood cells of one with an antibody in the serum of the other. In addition, blood typing serves to identify promptly the cause of such disorders as erythroblastosis fetalis (hemolytic disease of the newborn), which results from blood-group incompatibility between mother and fetus. Since blood-group determinants are inherited according to generally known mechanisms of heredity, blood typing sometimes provides a method for resolving cases of disputed fatherhood. It has also been postulated that certain blood-group combinations may have a greater survival value than others; such conditions as repeated infertility, premature births, and stillbirths might be partly the result of some yet-undefined forms of blood-group incompatibility between the mating individuals.

blood vessel, a vessel in the human or animal body in which blood circulates. The vessels that carry blood away from the heart are called arteries, and their very small branches are arterioles. Very small branches that collect the blood from the various organs and parts are called venules, and they unite to form veins, which return the blood to the heart. Capillaries are minute, thin-walled vessels that connect the arterioles and venules; it is through the capillaries that nutrients and wastes are exchanged between the blood and body tissues. *See* artery; capillary; vein.

bloodfin, freshwater fish, a species of characin (*q.v.*).

bloodhound, breed of dog unsurpassed by any other in scenting ability and from which most of the scent-hunting hounds have been derived. It was known, although not in its present form, in the Mediterranean area in pre-Christian times. Typically calm and affectionate, it has been used in tracking animals and in trailing persons. A large, strong dog, it stands 23 to 27 inches (58 to 69 centimetres) and weighs 80 to 110 pounds (36 to 50 kilograms). It has short hair and long ears; its loose skin falls into folds and wrinkles about the head and neck. The coat is black-and-tan, red-brown and tan, or tawny.



Bloodhound
Sally Anne Thompson—EB Inc.

Bloodless Revolution (England): *see* 1688, Revolution of.

bloodlily: *see* Cape tulip.

bloodroot, also called RED PUCCOON (*Sanguinaria canadensis*), plant of the poppy family (Papaveraceae), native throughout eastern and

midwestern North America. It grows mainly in deciduous woodlands, where it blooms in early spring. Bloodroot has a shining white, eight-petalled, cup-shaped flower with bright yellow stamens (male reproductive structures) in the centre. The 4- to 6-centimetre (2-inch)

Bloodroot (*Sanguinaria canadensis*)
Walter Chandoha

flower is borne on a 20-cm reddish stalk. Large, veiny, half-opened leaves on red stalks enfold the flower stem; after the flower has bloomed, these open into much-lobed, blue-green, round leaves. The orange-red sap, formerly used by the Indians for dye, is found in the horizontal rootstocks (rhizomes), which also contain the medical alkaloid sanguinarine.

The species and a variety *S. canadensis* "Multiplex," which has showy double flowers, can be planted in the wild garden.

bloodstone, also called HELIOTROPE, dark-green variety of the silica mineral chalcedony that has nodules of bright-red jasper distributed throughout its mass. Polished sections therefore show red spots on a dark-green background, and from the resemblance of these to drops of blood it derives its name. Bloodstone was greatly prized in the Middle Ages and was used in sculptures representing flagellation and martyrdom; it later became of small importance. Notable occurrences include the Kāthiāwār Peninsula, India. Its physical properties are those of quartz (*see* silica mineral [table]).

bloodworm, any of certain bright red, segmented, aquatic worms of the phylum Annelida. Included are worms of the genus *Tubifex,* also known as sludge worms (class Oligochaeta, family Tubificidae), which are used as a tropical-fish food. The proboscis

Proboscis worm (*Glycera dibranchiata*)
Runk/Schoenberger from Grant Heilman—EB Inc.

worm *Glycera* (class Polychaeta, family Glyceridae) is sometimes called bloodworm. *G. dibranchiata* is found along the eastern coast of North America. It grows to 37 centimetres (about 15 inches) in length.

The bloodred aquatic larvae of some species of the midge *Chironomus* of the insect family Chironomidae are also called bloodworms.

Bloody Assizes (1685), in English history, the trials conducted in the west of England by the chief justice, George Jeffreys, 1st Baron Jeffreys of Wem, and four other judges after the abortive rebellion (June 1685) of the Duke of Monmouth, illegitimate son of King Charles II, against his Roman Catholic uncle King James II. About 320 persons were hanged and more than 800 transported to Barbados; hundreds more were fined, flogged, or imprisoned. Although modern research has acquitted Jeffreys, in certain cases, of any technical irregularity, the trials were conducted with a ferocity that has made his name notorious.

Bloody Mary: *see* Mary I *under* Mary (England and Great Britain).

bloody shirt, in U.S. history, the post-Civil War political strategy of appealing to voters by recalling the passions and hardships of the recent war. This technique of "waving the bloody shirt" was most often employed by Radical Republicans in their efforts to focus public attention on Reconstruction issues still facing the country. Used in the presidential elections of 1868, 1872, and 1876, the strategy was particularly effective in the North in attracting veterans' votes.

Bloody Sunday, Russian KROVAVOYE VOSKRESENYE (Jan. 22 [Jan. 9, old style], 1905), massacre of peaceful demonstrators in St. Petersburg, Russia, marking the beginning of the violent phase of the Russian Revolution of 1905. At the end of the 19th century, industrial workers in Russia had begun to organize; police agents, anxious to prevent the Labour Movement from being dominated by revolutionary influences, formed legal labour unions and encouraged the workers to concentrate their energies on making economic gains and to disregard broader social and political problems.

In January 1905 a wave of strikes, partly planned by one of the legal organizations of workers—the Assembly of Russian Workingmen—broke out in St. Petersburg. The leader of the assembly, the priest Georgy Gapon, hoping to present the workers' request for reforms directly to Emperor Nicholas II, arranged a mass demonstration. Having told the authorities of his plan, he led the workers—who were peacefully carrying religious icons, pictures of Nicholas, and petitions citing their grievances and desired reforms—toward the square before the Winter Palace.

Nicholas was not in the city. The chief of the security police—Nicholas' uncle, Grand Duke Vladimir—tried to stop the march, then ordered his police to fire upon the demonstrators. More than 100 marchers were killed and several hundred more were wounded. The massacre was followed by a series of strikes in other cities, peasant uprisings in the country, and mutinies in the armed forces, which seriously threatened the tsarist regime and became known as the Revolution of 1905.

Bloom, Claire, original name CLAIRE BLUME (b. Feb. 15, 1931, London), English dramatic actress noted for her moving portrayals of Shakespearean heroines; she also played on stage, in television, and in motion pictures.

She studied at the Guildhall School of Music and Drama in London. At the age of 14 she tried out for the part of Juliet with the company of the Shakespeare Memorial Theatre (later the Royal Shakespeare Theatre) in Stratford-upon-Avon; in 1948 at Stratford she was cast as Ophelia in *Hamlet,* Blanche in *King John,* and Perdita in *A Winter's Tale.* She won praise for her early motion-picture role as a ballet dancer, playing opposite Charles Chaplin in the film *Limelight* (1952). She performed with the Old Vic company (1952–53) and subsequently successfully combined a stage career with films. Some of her more notable movies include *Richard III* (1955), *The Spy Who Came In From the Cold* (1965), and *Charly* (1968). An autobiography, *Limelight and After,* appeared in 1982.

bloom, marine (biology): *see* water bloom.

Bloomer, Amelia Jenks (b. May 27, 1818, Homer, N.Y., U.S.—d. Dec. 30, 1894, Council Bluffs, Iowa), U.S. reformer who campaigned for temperance and women's rights.

From 1849 to 1854 Bloomer published the *Lily,* a biweekly devoted to her aims. Among her interests was dress reform, and her name came to be associated with the full trousers (bloomers; *q.v.*) she wore; the publicity attracted large crowds to her lectures in New York, where she shared the platform with such figures as Susan B. Anthony and the Rev. Antoinette L. Brown.

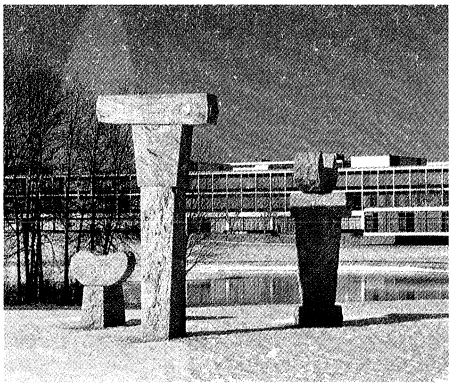
bloomers, lower part of a "rational dress" for women advocated by Amelia Jenks Bloomer (*q.v.*) in 1850. The entire costume consisted of a short jacket, a skirt extending below the knee, and the bloomers, or loose "Turkish" trousers, gathered at the ankles.

Woman wearing bloomers, lithograph on a music cover by P.S. Duval, *c.* 1850; in the Library of Congress, Washington, D.C.
By courtesy of the Library of Congress, Washington, D.C.

The innovation failed and was much mocked. The name survived, however, to be used for divided skirts, for the knickerbockers that women wore while riding bicycles in the craze for cycling of the 1890s, and for women's loose, baggy underwear.

Bloomfield, town (township), Hartford County, northwestern Connecticut, U.S., just northwest of Hartford. The site, drained by Wash Brook and the Farmington River, was settled about 1660, and the Parish of Wintonbury was organized in 1736 from parts of Windsor, Farmington, and Simsbury. In 1835 Wintonbury was renamed Bloomfield, possibly for a Hartford family, and was incorporated as a town. Until industries developed in the late 1940s the town was essentially a residential and farming community. Manufactures now include tools, screw machine

products, aircraft parts, and helicopters. The headquarters building of the Connecticut General Life Insurance Company, a fine example of contemporary office architecture, is in Bloomfield. Pop. (1980) 18,608.



Monoliths by Isamu Noguchi, with the Connecticut General Life Insurance Building in the background, Bloomfield, Conn.
Mark Sexton

Bloomfield, town, Essex County, northern New Jersey, U.S., northwestern suburb of Newark. Settled in 1660 by Puritans, it was known as Wardsesson (a ward of Newark) until 1796, when it was renamed for Revolutionary Gen. Joseph Bloomfield. During the Revolutionary War it served as a supply point for both sides. Large quantities of cloth for Union uniforms were produced there during the Civil War.

Diversified modern industries include automobile assembly and the manufacture of textiles, drugs, chemicals, aluminum, and electrical products. Bloomfield College (Presbyterian) was founded in 1868. Inc. 1812. Pop. (1980) 47,792.

Bloomfield, Leonard (b. April 1, 1887, Chicago—d. April 18, 1949, New Haven, Conn., U.S.), linguist whose book *Language* (1933) was one of the most important general treatments of linguistic science in the first half of the 20th century and almost alone determined the subsequent course of linguistics in the United States.

Bloomfield was educated at Harvard University and the universities of Wisconsin and Chicago and, from 1909 to 1927, taught in several universities before becoming professor of Germanic philology at the University of Chicago (1927–40) and professor of linguistics at Yale University (1940–49).

Concerned at first with the details of Indo-European—particularly Germanic—speech sounds and word formation, he turned to larger, more general, and wider ranging considerations of language science in *An Introduction to the Study of Language* (1914). He then began (1917) pioneer studies of the Malayo-Polynesian (Austronesian) languages, especially Tagalog. In the early 1920s he began his classic work on North American Indian languages, contributing the first of many descriptive and comparative studies of the Algonkian family.

In the writing of *Language,* Bloomfield claimed that linguistic phenomena could properly and successfully be studied when isolated from their nonlinguistic environment. Adhering to behaviourist principles, he avoided all but empirical description.

A Leonard Bloomfield Anthology (1970) was edited by Charles F. Hackett.

Bloomfield, Robert (b. Dec. 3, 1766, Honington, Suffolk, Eng.—d. Aug. 9, 1823, Shefford, Bedfordshire), shoemaker-poet who achieved brief fame with poems describing the English countryside.

Robert Bloomfield, miniature by Henry Bone; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

His first poem, *The Farmer's Boy* (1800), written after he had left the land to become a London shoemaker, owed its popularity to its blend of late 18th-century pastoralism with an early Romantic feeling for nature. The works that followed, from *Rural Tales, Ballads, and Songs* (1802) to *The Banks of Wye* (1811), were almost equally successful.

Bloomfield Hills, city, Oakland County, southeastern Michigan, U.S., just southeast of Pontiac and northwest of Detroit. The site was settled in 1819 by Amasa Bagley and was known as Bagley's Corners and Bloomfield Center until the present name was adopted in the 1890s. A farming community until Detroit residents began purchasing estates, it then became a restricted residential community. The Cranbrook Foundation, established in 1927 by Ellen Scripps Booth and George C. Booth (president of the *Detroit News*) on their 300-ac (121-ha) estate, includes the Cranbrook Academy of Art and Museum, the Cranbrook Institute of Science, Cranbrook Gardens (40 ac of groves, trails, and fountains), the Tudor-style Cranbrook House, and the Gothic-style Christ Church (Episcopalian); four of the buildings were designed by the architect Eliel Saarinen, and the statuary and landscaping include the work of sculptor Carl Milles. The Stake Center (1959) of the Church of Jesus Christ of Latter-day Saints (Mormon) is located there. Oakland Community College was opened in 1964. Inc. village, 1927; city, 1932. Pop. (1980) 3,985.

Bloomgarden, Kermit (b. Dec. 15, 1904, Brooklyn, N.Y., U.S.—d. Sept. 20, 1976, New York City), U.S. producer of dramatic and musical plays that have been commercially and critically successful.

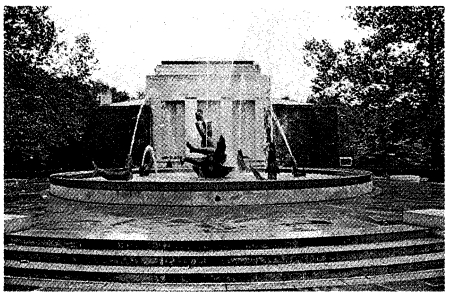
He graduated in 1926 from New York University and practiced as a certified public accountant for several years before assuming a managerial position with the theatrical producer Arthur Beckhardt. His first independent production was *Deep Are the Roots* (by Arnaud d'Usseau and James Gow), which opened in 1945 and ran for 477 performances. There followed Lillian Hellman's *Another Part of the Forest* (1946), *Command Decision* (1947), by William Wister Haines, and *Death of a Salesman* (1949) by Arthur Miller, which ran for 742 performances.

Bloomgarden's other award-winning productions included *The Crucible* (1953), by Arthur Miller; *The Diary of Anne Frank* (1955), by Frances Goodrich and Albert Hackett; *The Most Happy Fella* (1956), a musical by Frank Loesser; *Look Homeward, Angel* (1957), by Ketti Frings; *The Music Man* (1957), a musical by Meredith Willson; Lillian Hellman's *Toys in the Attic* (1960); *The Hot L Baltimore* (1973) by Lanford Wilson; and *Equus* (1975) by Peter Shaffer.

Bloomington, city, seat of McLean County, central Illinois, U.S., adjacent (south) to Normal (*q.v.*). The site, settled in 1822, was known as Keg Grove and later as Blooming Grove, and in 1831, when the town was laid out, it was renamed Bloomington. In 1856 at Old Majors Hall, Lincoln delivered his famous "lost speech." The city is in a rich agricultural region, and its economy is based mainly on farming (chiefly corn [maize]), livestock raising, and the manufacture and development of agricultural equipment and farm-related products, including farm seeds. The manufacture of electrical equipment and vacuum cleaners is also significant.

Illinois Wesleyan University (1850) is in Bloomington, and Illinois State University (1857) is in Normal. An annual spring event is the production of the American Passion Play. Adlai E. Stevenson, vice president (1893–97) of the United States, is buried in Evergreen City Cemetery, as is his grandson, Adlai E. Stevenson II, statesman and Illinois governor. Inc. city, 1850. Pop. (1980) city, 44,189; metropolitan area (SMSA) 119,149.

Bloomington, city, seat (1818) of Monroe County, southern Indiana, U.S., 51 mi (82 km) south-southwest of Indianapolis. Laid out in 1818, it is in the centre of the Indiana limestone belt, and extensive quarries and mills are nearby. Bloomington is the site of Indiana University (1820), which played an important part in the development of the city. The economy is based on diversified industry, especially production of refrigerators, electronic equipment, and television sets. Monroe Reservoir recreation area is 4 mi southeast. Inc. 1877. Pop. (1980) 51,646.



Lilly Library, Indiana University, Bloomington
Brian D. Palormo—EB Inc.

Bloomington, city, Hennepin County, southeastern Minnesota, U.S., near the Minnesota River. A suburb of Minneapolis, it was settled in 1843, became a township in 1858, and was named for the Illinois city. A population increase after World War II was accompanied by an expansion of diversified industry. It is adjoined by the Minneapolis–St. Paul International Airport. The Metropolitan Stadium (home of the Minnesota Twins baseball and the Minnesota Vikings football teams) and Normandale Community College (1965) are in Bloomington. Inc. village, 1953; city, 1960. Pop. (1980) 81,831.

Bloomsburg, town, seat (1846) of Columbia County, east central Pennsylvania, U.S., on the Susquehanna River and Fishing Creek, 40 mi (64 km) southwest of Wilkes-Barre. Laid out in 1802 by Ludwig Eyer and originally known as Eyersburg and Eyertown, it was renamed in 1870 for its location in Bloom Township. It gained the distinction of being the only incorporated town (1870) in the state (all other incorporated communities are boroughs or cities). During the Civil War, Union troops vainly sought an alleged confederacy in the town of draft evaders who had reputedly built a fort in Fishing Creek Valley. In the 1870s Bloomsburg was the scene of one of the murder trials that ended a siege of violence in Pennsylvania coalfields carried

out by the Molly Maguires, an Irish miners' society seeking improved working conditions. The town's industries consist of textiles, architectural aluminum, processed foods, and electronic products. The Bloomsburg State College was founded in 1839. The Carroll Park and Western Railroad and the Magee Transportation Museum are nearby. Pop. (1980) 11,717.

Bloomsbury, residential and academic area, inner borough of Camden, London, north of the Thames. It is the site of the main buildings of the University of London, the British Museum, and the British Medical Association. The district has a reputation, enhanced by the Bloomsbury group, which gathered there, as an artistic and intellectual centre, and includes several squares and gardens bordered by elegant Georgian town houses, notably Bedford Square.

Bloomsbury group, name given to a number of English writers, philosophers, and artists who frequently met between about 1907 and 1930 at the houses of Clive and Vanessa Bell and of Vanessa's brother and sister Adrian and Virginia Stephen (later Virginia Woolf) in the Bloomsbury district of London, the area around the British Museum. They discussed aesthetic and philosophical questions in a spirit of agnosticism and were strongly influenced by G.E. Moore's *Principia Ethica* (1903) and by A.N. Whitehead's and Bertrand Russell's *Principia Mathematica* (1910–13), in the light of which they searched for definitions of the good, the true, and the beautiful and questioned accepted ideas with a "comprehensive irreverence" for all kinds of sham.

Nearly all the "Bloomsberries," as they were nicknamed, had been at Trinity or King's College, Cambridge, with Leslie Stephen's son Thoby, who had introduced them to his sisters Vanessa and Virginia. Most of them had been "Apostles"; *i.e.,* members of the "society," a select, semisecret university club for the discussion of serious questions, founded at Cambridge in the late 1820s by J.F.D. Maurice and John Sterling. Tennyson, Arthur Hallam, Edward Fitzgerald, and Leslie Stephen had all been Apostles. In the early 1900s, when those who later formed the core of the Bloomsbury group were elected to the society, the literary critic Lowes Dickinson, the philosophers Henry Sidgwick, J.M.E. McTaggart, A.N. Whitehead, G.E. Moore, and the art critic Roger Fry, who became one of the Bloomsbury group himself, were members.

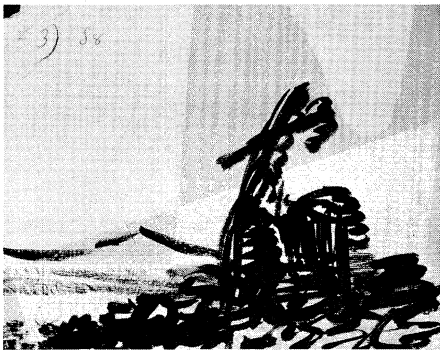
The group included the novelist E.M. Forster, the biographer Lytton Strachey, the art critic Clive Bell, the painters Vanessa Bell and Duncan Grant, the economist John Maynard Keynes, the Fabian writer Leonard Woolf, and the novelist and critic Virginia Woolf. Other members were Desmond Macarthy, Arthur Waley, Saxon Sidney-Turner, Robert Trevelyan, Francis Birrell, J.T. Sheppard (later provost of King's College), and the critic Raymond Mortimer and the sculptor Stephen Tomlin, both Oxford men. Bertrand Russell, Aldous Huxley, and T.S. Eliot were sometimes associated with the group, as was the economist Gerald Shove. The group survived World War I but by the early 1930s had ceased to exist in its original form, having by that time merged with the general intellectual life of London, Oxford, and Cambridge. Although its members shared certain ideas and values, the Bloomsbury group did not constitute a school. Its significance lies in the extraordinary number of talented persons associated with it.

Blosius, Franciscus Ludovicus (Latin), French FRANÇOIS-LOUIS DE BLOIS (b. 1506, Don-Étienne, Neth.—d. 1566, Liessies, Fr.), Benedictine monastic reformer and mystical writer.

Of noble birth, he was a page at the court of the future emperor Charles V and received his early education from the future pope Adrian VI. In 1520 he entered the Benedictine Order at Liessies, becoming abbot in 1530. During the invasion of King Francis I of France, Blosius, accompanied by three monks, retired (*c.* 1537) to Ath. He returned to Liessies (1545), remaining there rather than accepting the archbishopric of Cambrai offered by Charles V in 1556.

His concern for the renewal of the monastic spirit inspired his writings, which for a time rivalled in popularity the *Imitation of Christ,* a Christian devotional work of uncertain authorship written between 1390 and 1440. Doctrinally, Blosius was a successor to the earlier Lowlands mystics, but without their speculative interests, and a forerunner of St. Francis of Sales, patron of all writers. Blosius' more important treatises are translated in the series *Spiritual Works* by B. Wilberforce and D.R. Huddleston.

blot drawing, technique in the visual arts of using accidental blots or other aleatory stains on paper as the basis for a drawing. Leonardo da Vinci was one of the first to expound the value of such accidental marks (in his case he referred specifically to marks on walls) as a means of stimulating the artist's imagination and providing him with the foundation of a composition.



"Imaginary Landscape of Tree with Distant Mountains," ink and brush blot drawing by Alexander Cozens, from his sketchbook of instruction for his son, 1785–86; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

In 1786 the English drawing master Alexander Cozens published an instructional manual, *A New Method for Assisting the Invention in Drawing Original Compositions of Landscape,* entirely based on the development of blot drawing. In more recent times, the technique has been exploited by the Surrealists, as in the Automatic drawings of Max Ernst.

blotch (plant disease): *see* sooty mold.

Blount, Charles: *see* Mountjoy, Charles Blount, 8th Lord.

Blount, Edward, Blount also spelled BLUNT (b. *c.* 1565—d. after 1632), publisher and translator who, with Isaac and William Jaggard, printed the First Folio of Shakespeare's plays (1623).

After serving as an apprentice to London publisher William Ponsonby, Blount in 1588 became a freeman of the Stationers' Company and opened a bookshop in London. His early publications include Giovanni Florio's Italian-English dictionary (1595) and Florio's translation of Montaigne's essays (1603), and Marlowe's *Hero and Leander* (1598), containing a dedication by Blount in which he speaks of his close friendship with the late poet. In 1612 he published Thomas Shelton's translation of *Don Quixote,* the first English version. The First Folio of Shakespeare's plays, entitled *Mr. William Shakespeares Comedies, Histories and Tragedies. Published According to the True Originall Copies,* appeared in 1632. It had been produced by Shakespeare's colleagues at the Globe theatre, Henry Condell and John Heming, but Blount presumably also acted as editor.

Blount, William (b. March 26, 1749, Bertie County, N.C.—d. March 21, 1800, Knoxville, Tenn., U.S.), first territorial governor of (1790–96) and later one of first two U.S. senators from Tennessee (1796–97).

Blount served in the North Carolina militia during the Revolutionary War. During the 1780s he was elected to six terms in the North Carolina legislature, represented his state in Congress under the Articles of Confederation, and was a delegate to the 1787 Constitutional Convention in Philadelphia. Later he was a member of the North Carolina convention that ratified the Constitution. Disappointed in his defeat for election to the U.S. Senate in 1789, Blount secured appointment as territorial governor of the lands west of the Alleghenies ceded to the U.S. in 1789 by North Carolina. When this territory became the state of Tennessee, Blount was elected one of its first two senators.

Shortly thereafter, in financial difficulties arising from his speculations in Western lands, Blount became involved in a plan whose apparent aim was to organize an armed force of frontiersmen and Indians, and, with the help of the British fleet, to expel the Spanish from Florida and Louisiana and transfer control to Great Britain. When the plot came to the attention of Pres. John Adams, Blount was expelled from the Senate, and impeachment proceedings were begun, although they were dropped the following year. Blount returned to Tennessee, where his popularity was undiminished, and was elected in 1798 to the Tennessee senate, serving as speaker until his death..

Blountian orogeny, a mid-Ordovician episode of mountain building about 460,000,-000 years ago in the central Appalachians; evidence of this event consists of a clastic wedge of sediments of mid-Ordovician age in eastern Tennessee. The Blountian probably is an event marking an early phase of the Taconic orogeny.

Blow, John (baptized Feb. 23, 1649, Newark-on-Trent, Nottinghamshire, Eng.—d. Oct. 1, 1708, Westminster, London), organist and composer, remembered for his church music and for *Venus and Adonis,* which is regarded as the first true English opera.

He was probably educated at the Magnus Song School in Nottinghamshire and in 1660 became a chorister at the Chapel Royal. He was appointed organist of Westminster Abbey (1668), and in 1669 he became one of the king's musicians for virginals. In March 1674

Blow, engraving by R. White, 1700

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

he was sworn in as a gentleman of the Chapel Royal and became master of the children, a position he held until his death. He had great influence on the choristers under him and also on his student, Henry Purcell. In 1676 or 1677 he became one of the Chapel Royal organists, and in 1677 the dean and chapter of Canterbury conferred on him a doctorate of music—the first instance of what became known as a Lambeth Degree in music.

In 1679 Blow was succeeded as organist at Westminster Abbey by Purcell; he was reappointed after Purcell's death in 1695. The years 1680–1700 were the most productive and prosperous of his life. In 1687 he became master of the children of St. Paul's, a position he held for 16 years; and in 1699 he received his last appointment, as first composer to the Chapel Royal.

Blow's official positions entailed the writing of much religious and secular ceremonial music. Fourteen services and more than 100 anthems are extant, and many remain in regular use. He was at his best in the writing of full anthems in a simple chordal or contrapuntal style with melodies of great strength and sweetness developed over a ground bass. He excelled also in the writing of services; outstanding is his *Service in G Major*. His *Venus and Adonis*, written between 1680 and 1685 for performance at court and called by him *A Masque for the Entertainment of the King*, was important in the development of English opera. It is the first dramatic work in which the whole text is set to music without either dialogue or extraneous musical entertainment. His songs for one, two, three, and four voices, which appear in many contemporary collections and in his own *Amphion Anglicus* (1700), are notable for their charm of melody.

Blow, Susan Elizabeth (b. June 7, 1843, St. Louis, Mo., U.S.—d. March 26, 1916, New York City), ardent advocate of German educational ideas who launched the first public kindergarten in the United States.

Raised in a deeply religious home, Blow took easily to the mystical philosophy of the German Idealists, particularly the educational precepts of Freidrich Froebel. She spent some time in Germany and returned to the United States with the idea of opening a kindergarten in St. Louis.

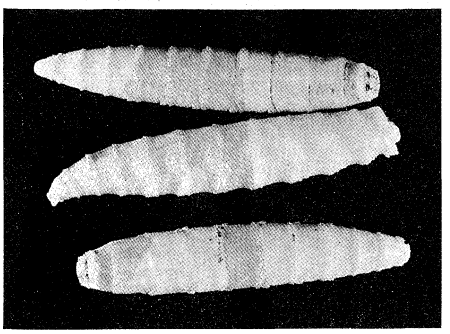
In 1872 Blow went to New York City to study with Maria Kraus-Boelte, a Froebel disciple. She returned to St. Louis in 1873 and set up her kindergarten. In a short time, St. Louis became the focal point of the U.S. kindergarten movement, and in 1874 Blow established a training school for kindergarten teachers. In addition, she translated Froebel's *Mutter- und Kose-lieder* (1844) as *Mother Play*, which contained songs and games for weekly use in the kindergarten.

In 1884 Blow retired temporarily because of ill health. During the following decade she found herself in opposition to liberals in the kindergarten movement who advocated revisions of Froebel's concepts.

In 1895, having moved from St. Louis to the eastern United States, Blow began lecturing on the Bible and classical literature. During the final phase of her career she was associated with the New York Kindergarten Association and the International Kindergarten Union, and she spent a good deal of her time writing. Among her works were: *A Study of Dante* (1877), *Symbolic Education* (1894), *Poems and Pictures* (1895), *Letters to a Mother on the Philosophy of Froebel* (1899), *Kindergarten Education* (1900), and *Educational Issues in the Kindergarten* (1908). In addition, she published translations of the works of Froebel: *The Mottoes and Commentaries of Friedrich Froebel's Mother Play* (1895) and *The Songs and Music of Friedrich Froebel's Mother Play* (1895).

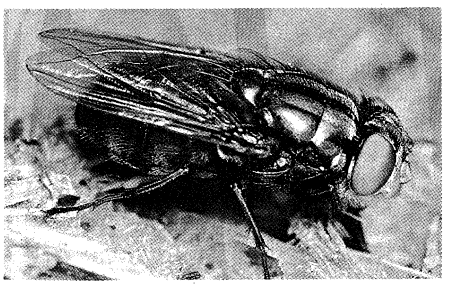
blow fly, any member of the insect family Calliphoridae (order Diptera), metallic blue, green, or bronze in colour, and noisy in flight. They resemble the housefly in size and habits. Among the important members of this group are the screwworm, bluebottle fly, greenbottle fly, and cluster fly. Larvae (maggots) usually feed on decaying meat and sometimes infest open wounds (*e.g.*, *Calliphora, Cochliomyia*). Although they may assist in preventing infection by cleaning away dead flesh, they may also destroy healthy tissue. During World War I, sterile blow fly larvae were put in open wounds to remove decaying tissue and to prevent bacterial growth. They were also used in the past to treat human osteomyelitis, a bone disease, and gangrene.

The screwworm (the name for the larvae of several North and South American blow



Screwworm (*Callitroga*)
William E. Ferguson

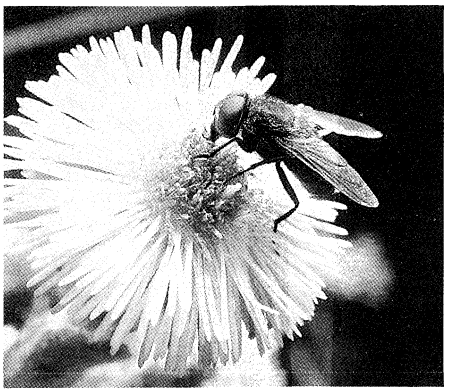
fly species, so called because of the screw-like appearance of the body, which is ringed with small spines) attacks livestock and other animals including man. The true screwworm (*Cochliomyia hominivorax*; formerly, *Callitroga americana*) and the secondary screwworm (*Callitroga macellaria*) develop in decaying flesh of surface wounds of domestic animals and occasionally of humans; larvae may attack living tissue as well. Each female deposits about 200 to 400 eggs near an open wound. The larvae burrow into the tissue, drop to the ground when mature, and pupate before emerging as adults. Severe infestations (myiasis) may lead to the death of the animal affected. Sterilization of male flies has been used in attempts to control screwworms. Greenbottles (*Lucilia*) commonly infest sheep; several species of bluebottles (*Calliphora*) are serious pests in Australia and frequently kill sheep. *Chrysomyia megacephala*, which breeds in excrement and decaying material in Pacific and Oriental regions, is an important carrier not only of dysentery but also possibly of



Bluebottle fly (*Calliphora*)
E.S. Ross

jaundice and anthrax. *Protocalliphora* sucks blood from nestling birds.

Larvae of the cluster fly (*Pollenia rudis*) of Europe and North America, the adults of which are large, sluggish, and dark brown, are parasites of earthworms. The cluster fly usually breeds on animal carcasses or carrion and



Cluster fly (*Pollenia rudis*)
Ingmar Holmasen

is a carrier of anthrax, a disease of mammals including man. Infestation of living tissues produces severe irritation. In autumn huge buzzing clusters of the flies gather in sheltered places (*e.g.*, attics) to hibernate.

blow molding, in glass production, method of forming an article of glass by blowing molten glass into a mold. This operation is performed with the aid of a hollow metal tube that has a mouthpiece at one end. A gob of molten glass gathered onto the opposite end of the tube is enlarged by a bubble of air blown into it through the tube. This preliminary shape is then lowered into a mold and inflated by blowing until it has assumed the desired shape and pattern. The mold may be constructed of one piece, in which case it is sheared off the glass article, or it may be an open-and-shut device comprised of two parts, which allows the mold to be removed and reused.

Syrian glassworkers appear to have developed blow molding in the 1st century BC. The first known mold-blown glass vessels bear the signature of Syrian masters, who used a ductile variety of soda glass that was particularly suitable for this method of shaping glassware. Roman glassmakers adopted the procedure between the 1st and 3rd centuries AD, using it to manufacture both luxury and domestic glass vessels. This technique of shaping glass made possible the low-cost production of fine decorative glassware, often with slogans molded in. Today much blow-molded glass is produced by machines that use compressed air for blowing the glass into molds. *See also* glassblowing.

blowfish: *see* puffer.

blowgun, tubular weapon from which projectiles are forcefully propelled by human breath. Primarily for hunting, it is rarely used in warfare. Employed by Malaysians and other Southeast Asian aboriginals, in southern India and Sri Lanka, in Madagascar (Malagasy Republic), in northwestern South America, in Central America north to central Mexico, among southeastern American Indians, and in Melanesia (rarely), it also may have been used prehistorically in the Antilles. Apparently invented by Malaysians, blowguns were Pre-Columbian in both hemispheres; whether their occurrence in the New World represents reinvention or introduction remains uncertain.

Blowguns vary in length from 18 inches to more than 23 feet (45 centimetres to 7 metres). The simplest of the four basic types is a single tube, usually a section of cane or bamboo. If the bamboo internodes are short, the septa may be burned or punched out and the interior polished. Single-tube bamboo blowguns occur widely, often in peripheral regions of use or where the weapon serves as a toy. Another variety has an inner and an outer tube. In the Old World (notably Malaya) these are usually bamboo, the inner tube commonly being made of two sections fitted into a short

length of bamboo; the outer tube also may be composite. In northernmost South America, a palm stem (pith removed) is the usual outer tube; occasionally another serves as the inner tube. A third major variety is made by splitting a length of wood, carving half the bore on each face, and binding the halves together. This split type is found in scattered locations including Malaya, Borneo, the Philippines, Japan, south India, and South America on the Pacific Coast and between the Negro and the Madeira rivers and has also been reported from Louisiana. Apparently unknown to New World artisans, the most difficult type of blowgun to construct is made from a single block of wood about 8 feet (2.5 m) long. After the bore is carefully drilled with a chisel on the end of a long rod, the block is trimmed to a cylinder. This type is most common in Borneo, with a spear usually attached. Single-piece wooden guns are known from Bali and the Celebes; in Madagascar the bore is burned out with a heated iron rod.

Darts are the most common blowgun missiles. They are usually made from palm-leaf midribs or from wood or bamboo splinters, and they may vary from 1½ to nearly 40 inches (4 to 100 cm) in length. A conelike bit of pith or a twist of fibre at the base of the dart makes it fit the tube snugly, ensuring that it will fly out of the tube from a puff of human breath. Clay pellets or bits of bone are also used as darts by some peoples. A hunter usually carries his darts in a quiver made of bamboo, basketry, wood, or leaves.

To be effective against quarry larger than small birds, blowgun darts require poison. The darts often are notched so that the poisoned tip will break off in the victim. The most common Old World poison is made from the sap of the upas tree (*Antiaris toxicaria*) and kills by cardiac effects; also used are the lianas *Strychnos strychnos* and *Strophanthus*. In South America, curare, whose action is paralytic, is widely used, though obtained from relatively few tribes, who prepare it largely from the *Strychnos toxifera* vine. Other poisons are made from snake venom, insect poisons, and decaying flesh. Dart poisons are not recorded for North American peoples.

blowpipe, a small tubular instrument for directing a jet of air or other gas into a flame in order to concentrate and increase the flame's heat. A blowpipe is usually operated directly by mouth, but a small bellows may also be used.

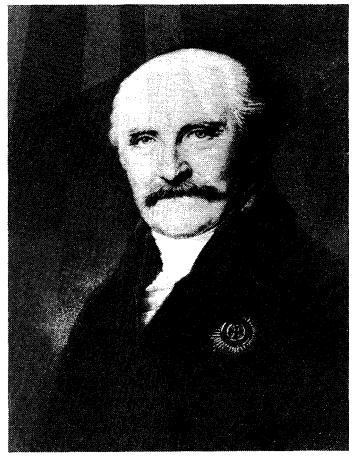
In mineralogy, the blowpipe technique for analyzing ores was developed by the Swedish mineralogist Baron Axel Fredrik Cronstedt; its application in qualitative analysis was due to the work of the Swedish chemist Jöns Jacob Berzelius and the German mineralogist Johann Hausmann. By placing a substance in the flame of a blowpipe, information may be obtained as to its general nature by the changes it undergoes during heating and by the residue that remains. By treating the residue with certain reagents and again heating, specific information as to certain elements may be obtained.

Bloy, Léon (b. July 11, 1846, Périgueux, Fr.—d. Nov. 2, 1917, Bourg-la-Reine), French novelist, critic, polemicist, a fervent Roman Catholic convert who preached spiritual revival through suffering and poverty.

As spiritual mentor to a group of friends that included writer Joris-Karl Huysmans, philosopher Jacques Maritain, and painter Georges Rouault, Bloy influenced their reconciliation with the Catholic Church. Bloy's works are extremely varied in form (novels, pamphlets, a *Journal,* exegesis), but they reveal a powerful unity of thought: through pain and destitution man is redeemed by the Holy Spirit and is awakened to the hidden language of the universe. His autobiographical novels, *Le Désespéré* (1886) and *La Femme pauvre* (1897; *The Woman Who Was Poor*), express his mystical conception of woman as the Holy Spirit and of love as a devouring fire. The eight volumes of his *Journal* (written 1892–1917; complete edition published 1939) reveal him as a crusader of the absolute, launching onslaughts against lukewarm Christians. A number of volumes of his letters—to his wife and daughters, to Pierre Termier, and to Jacques Maritain, among others—have been published.

Blücher, Gebhard Leberecht von, FÜRST (prince) VON WAHLSTATT, byname MARSCHALL VORWÄRTS ("Marshal Forward") (b. Dec. 16, 1742, Rostock, Mecklenburg [now in E.Ger.]—d. Sept. 12, 1819, Krieblowitz, near Kanth, Silesia, Prussia [now Katy Wrocławskie, Pol.]), Prussian field marshal, a commander during the Napoleonic Wars, who played an important role in the victory of Waterloo.

Blücher entered the Swedish cavalry in 1756 and then joined the Prussian Army in 1760. He distinguished himself against the French in 1793–94 and commanded the Prussian rear guard at the Battle of Jena (1806). Around this time he met Gerhard Johann David von Scharnhorst, who served as one of his principal staff officers until Scharnhorst's death in June 1813. After the Peace of Tilsit (1807) Blücher was employed for a time in the War Department and then went into retirement.



Blücher, detail from an oil painting by Friedrich Carl Gröger, 1817
Archiv fur Kunst und Geschichte, West Berlin

In 1813, when war between France and Prussia broke out again, Blücher, then 71 years old, returned to active service. He took part in the battles of Lützen and Bautzen in May 1813, and three months later at Wahlstatt (Legnickie Pole), on the Katzbach (Kaczawa) River, he decisively defeated the French under Marshal Jacques-Alexandre Macdonald, capturing 18,000 prisoners and more than 100 guns. For his part in the Battle of Leipzig (October 1813) he was made a field marshal. After hard fighting he entered Paris with other victorious Allied commanders in May 1814. He then received his title of prince of Wahlstatt and retired to his estates.

After Napoleon's return in 1815, Blücher again assumed command of the Prussian troops in Belgium, with August von Gneisenau as his invaluable chief of staff. Blücher immediately set about coordinating his force with that of the British and Allied forces under the duke of Wellington. At Ligny (June 16, 1815) he was defeated by Napoleon; but, in order to ensure cooperation with Wellington later, he withdrew his army toward Wavre, although by so doing he endangered his own communications. His troops took no part in the early stages of the Battle of Waterloo (June 18, 1815); but, urged on by Gneisenau, they made an exhausting countermarch and appeared on the French right flank at a critical stage of the battle. This action, together with a general advance by the British, completed Napoleon's defeat. Blücher's cavalry continued the pursuit of the French toward Paris throughout the night.

Blücher was described by a contemporary as a rough, ill-educated man, but he was endowed with common sense and fiery energy. He knew little of the higher art and science of war, and he required a good chief of staff to guide him. On the battlefield, however, his determination and personal courage and example proved invaluable.

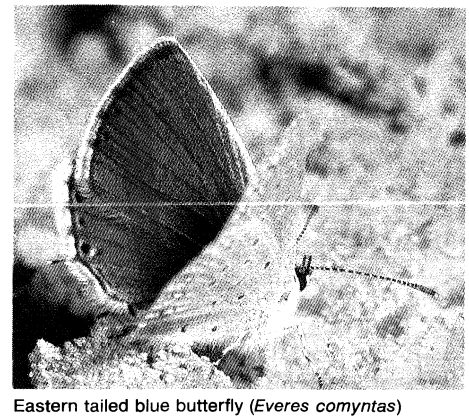
Bludenz, town, *Bundesland* (federal province) Vorarlberg, western Austria. It lies along the Ill River about 60 miles (100 km) east-southeast of Zürich. First mentioned in 830, it was fortified in the 13th century and had received town rights by 1296. It passed to the Habsburgs in 1394. Notable landmarks include St. Laurentius parish church (1514); the 15th-century Spitalskirche, with a fine Baroque altar; and the Gayenhofen Castle (1228–45; converted 1746). An international summer resort and Alpine winter-sports centre, Bludenz produces textiles, watches, chocolate, building materials, and chemicals. Pop. (1981) 12,893.

blue-and-white ware, white porcelain decorated with blue painted under the glaze. At least as early as the 9th century, underglaze blue had been used in the Middle East, whence it was introduced to China in the Yüan dynasty (1279–1368). Particularly notable are the blue-and-white wares produced in China during the Ming (1368–1644) and Ch'ing (1644–1911) dynasties. From China, underglaze blue was introduced to Europe.

blue asbestos: *see* crocidolite.

Blue Book, The, annually revised publication listing notable persons in the United Kingdom, Ireland, Australia, New Zealand, Canada, and the United States; those listed are considered leaders of the English-speaking world in the arts and sciences, business, government, and the professions. It is published in London. Listings emphasize the individuals' current status, both personal and professional. Each entry also contains honours and awards, academic degrees (doctorate), nationality, age, names of immediate family members, immediate past career, extraprofessional activities, and cultural and civic appointments. Current personal and/or professional addresses are included, with the entrant's permission. For artists, musicians, authors, etc., an entry indicates designs, compositions, and collections in which their works appear. Also included are the orders of chivalry and a list of obituaries of entrants who were in the previous edition.

blue butterfly, any member of the insect subfamily Plebeiinae of the widely distributed



Eastern tailed blue butterfly (*Everes comyntas*)
Robert P. Carr—Bruce Coleman Inc.

Lycaenidae family of common butterflies (order Lepidoptera). Adult lycaenids, sometimes known as gossamer-winged butterflies, are small and delicate, with an 18 to 38 millimetre (3/4 to 1 1/4 inch) wingspan. They are rapid fliers and are usually distinguished by iridescent wings. The male's forelegs are reduced, but the female's are fully developed.

Lycaenid larvae are short, broad, and slug-like. Some species secrete honeydew, a sweet by-product of digestion that attracts ants. The ants stroke, or "milk," the larva with their legs to stimulate honeydew secretion. The fragile adults of most blue species have brilliant blue wing surfaces, generally much darker in the females than in the males; a few species have white or brown coloration. The pigmy blue (*Brephidium exilis*), the smallest blue, has a wingspan of less than 12 mm; the tailed blues (*Everes*) have a taillike extension on the hindwings. The European blue (*Maculinea arion*) spends its larval and pupal stages in an ant nest, emerging in the spring as an adult.

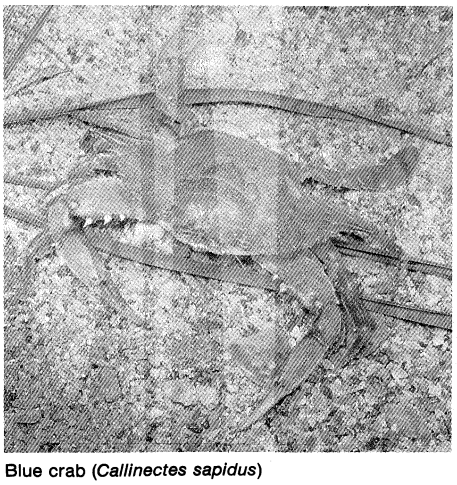
blue cheese, any of several cheeses marbled with bluish or greenish veins of mold; important trademarked varieties include English Stilton, French Roquefort, and Italian Gorgonzola. Most blue cheeses are made from cow's milk, but Roquefort is made from the milk of the ewe. Spores of *Penicillium roquefortii* are mixed with either the milk or the curd. The mold, during the three to six months of ripening, grows both in small, irregular, natural openings in the cheese and in machine-made perforations. Roquefort and some Gorgonzolas are ripened in caves, the stable, moist atmosphere of which imparts a distinctive character to the cheeses.

Blue cheeses may be soft and creamy or crumbly in texture, with a characteristically sharp, piquant flavour; they are often quite salty but should not be overly so, nor bitter. Well-known blue cheeses in addition to those mentioned above include Bleu de Bresse and Bleu d'Auvergne (France), Danablu (Denmark), Blue Cheshire (England), and several produced in the United States.

Blue Coat school: *see* charity school.

blue crab (*Callinectes*), any of a genus of crustaceans of the order Decapoda, particularly *Callinectes sapidus* and *C. hastatus*, common edible crabs of the western Atlantic coast that are prized as delicacies. Their usual habitat is muddy shores, bays, and estuaries.

The shell, greenish on top and dingy white below, is about 7.5 centimetres (3 inches) long and 15 to 18 cm wide; the legs are bluish. A distinctive, large, sharp spine projects from each side. Eight short spines occur on each side between the large spine and the eyes. The chelae, or pincers, are large and somewhat unequal in size. The fifth pair of legs is flattened for swimming. The crabs are scavengers, feeding on the bodies of dead animals. At spawning time the female's abdomen swells with eggs. Larvae hatch two weeks after fertilization and remain attached to the female for a short time.



Blue crab (*Callinectes sapidus*)
John H. Gerard

blue-eyed grass, any of the more than 75 species of *Sisyrinchium,* native to the Americas and the Caribbean. These grasslike members of the iris family (Iridaceae) bear starry, yellow, white, or blue to violet flowers with six petallike segments and wiry, fibrous rootstalks.

Two species, *S. bermudiana,* from the West Indies, and *S. angustifolium,* from North America, have been naturalized in parts of Europe. The West Indian species has tall (50-centimetre [20-inch]) flower stems that bear 2-cm yellow-eyed blooms; *S. angustifolium* has smaller flowers. A Chilean plant, *S. striatum,* bears a spike up to 90 cm tall with clusters of creamy white blooms.

blue-green algae, also called CYANOPHYTES, or CYANOBACTERIA, primitive photosynthetic organisms comprising 1,500 or fewer species. Some species are unicellular, and others are colonial aggregates in which each cell functions independently. Still other species grow as multicellular filaments; some of these filamentous species show a degree of cellular differentiation, with certain cells specialized for attachment of the filament to a substrate, for reproduction, or for other functions.

In many ways, blue-green algae are intermediate between the bacteria and the higher plants. Like bacteria, and unlike all higher plants, cyanophytes are composed of prokaryotic cells—*i.e.*, their cells lack a membrane-bound nucleus, mitochondria, Golgi apparatus, chloroplasts, and endoplasmic reticulum. In terms of nutrition, however, the cyanophytes resemble the green plants. Like the higher plants, and unlike the photosynthetic bacteria, blue-green algae possess the photosynthetic pigment chlorophyll a, and they produce molecular oxygen as a by-product of photosynthesis.

In addition to being photosynthetic, many species of cyanophytes can also "fix" atmospheric nitrogen—that is, they can transform the gaseous nitrogen of the air into compounds that can be used by living cells. Particularly efficient nitrogen fixers are found among the filamentous species that have specialized cells called heterocysts. The heterocysts are thick-walled cells that are impermeable to oxygen; they provide the anaerobic (oxygen-free) environment necessary for the operation of the nitrogen-fixing enzymes of the blue-green algae. In Southeast Asia, nitrogen-fixing cyanophytes often are grown in rice paddies, thereby eliminating the need to apply nitrogen fertilizers.

Blue-green algae contain a variety of pigments in addition to chlorophyll. These additional pigments include various yellowish carotenoids, the blue pigment phycocyanin, and, in some species, the red pigment phycoerythrin. The combination of phycocyanin and chlorophyll produces the characteristic blue-green colour for which these organisms are named. Because of other pigments, however, many species are actually green, brown, yellow, black, or red.

Cyanophytes are widely distributed. They are extremely common in fresh water, where they occur as members of both the plankton and the benthos. They are also abundantly represented in such habitats as tide pools, coral reefs, and tidal spray zones; a few species also occur in the ocean plankton. On land, blue-green algae are common in soil down to a depth of one metre (39 inches) or more; they also grow on moist surfaces of rocks and trees, where they appear in the form of cushions or layers.

Blue-green algae live in some of the most inhospitable environments known. They can be found in hot springs, in cold lakes beneath 5 metres of ice pack, and on the lower surfaces of many rocks in deserts. Cyanophytes are frequently among the first colonizers of bare rock and soil. Various types of associations occur between blue-green algae and other organisms. Certain species, for example, grow in a mutualistic relationship with fungi, forming composite organisms called lichens.

Cyanophytes reproduce asexually, either by means of binary cell division in unicellular and colonial forms or by fragmentation and spore formation in filamentous species. Under favourable conditions, blue-green algae can reproduce at explosive rates, forming dense concentrations called blooms. Cyanophyte blooms can colour a body of water. For example, many ponds take on an opaque shade of green as a result of overgrowths of blue-green algae, and blooms of phycoerythrin-rich species cause the occasional red colour of the Red Sea. Cyanophyte blooms are especially common in waters that have been polluted by nitrogen wastes; in such cases, the overgrowths of blue-green algae can consume so much of the water's dissolved oxygen that fish and other aquatic organisms perish.

Traditionally, blue-green algae have been classified as members of the plant kingdom, comprising the division (or phylum) Myxophyta or Cyanophyta. Since the 1970s, the trend has been to group them with the other prokaryotic organisms (the bacteria and the prochlorophytes) in the kingdom Monera. Within this kingdom, they are classified as division Cyanophyta (or Cyanophycota) or as division Cyanobacteria.

blue ground: *see* kimberlite.

blue jay, North American species of jay (*q.v.*).

blue jeans (apparel): *see* jeans.

Blue Lake (China): *see* Koko Nor.

blue law, in U.S. history, a law forbidding certain secular activities on Sunday. The name may derive from Samuel A. Peters' *General History of Connecticut* (1781), which purported to list the stiff Sabbath regulations at New Haven, Conn.; the work was printed on blue paper. A more probable derivation is based on an 18th-century usage of the word blue meaning "rigidly moral" in a disparaging sense. Strictest in Puritan, Bible-oriented communities, blue laws usually forbade regular work on Sunday, plus any buying, selling, traveling, public entertainment, or sports. Peters' account of the New Haven Puritan government's codes has been proved unreliable. Among the 45 blue laws he listed in his *History* (1781) that were wholly or substantially true, however, are the following: "The judges shall determine controversies without a jury"; "married persons must live together or be imprisoned"; "a wife shall be good evidence against her husband"; and "the selectmen, on finding children ignorant, may take them away from their parents and put them into better hands, at the expense of their parents." To some degree, similar laws existed in all the American colonies. In general, they lapsed after the U.S. War of Independence. As late as the 1980s, however, blue laws remained on the statutes in some states, and their influence has persisted wherever public activity on Sunday is regulated.

Blue Mountains, section of the Eastern Highlands (Great Dividing Range), New South Wales, Australia. The range comprises a well-dissected sandstone plateau that rises from an eastern escarpment (1,200–1,800 ft [370–550 m]) to 3,871 ft in a western scarp at Bird Rock. Its slopes are generally precipitous. The first Europeans to cross the range were the explorers Gregory Blaxland, William C. Wentworth, and William Lawson in 1813. The range was

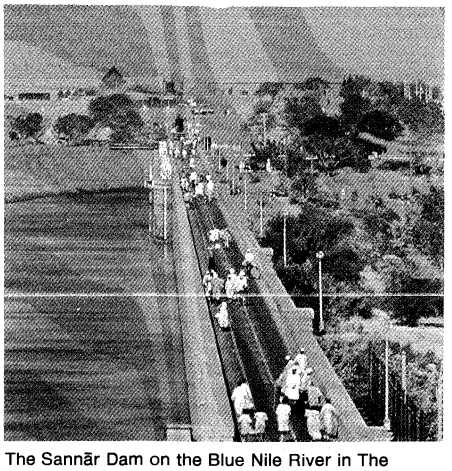
used as a retreat for wealthy Sydney residents; it is now accessible by good roads and forms a popular tourist area with many scenic attractions, including Jenolan Caves and the Zig Zag (an abandoned railway providing a route over the mountains). Blue Mountains National Park, a 768-sq-mi (1,989-sq-km) nature reserve centred on the Grose River Valley, lies within the region. The mountains are named for their bluish colour, which apparently is caused by light rays diffusing through droplets of oil dispersed into the air by the many types of indigenous eucalyptus trees.

The City of Blue Mountains is a confederation of more than 20 townships, formed in 1947. The principal centres are Katoomba, Leura, Mount Victoria, Blackheath, Springwood, Wentworth Falls, and Hazelbrook, all of which lie on both the rail line and Great Western Highway between Sydney (40 mi [60 km] east) and Lithgow on the western slopes of the mountains. Urban growth has been rapid, as the area is a popular vacation centre. Pop. (1981) 55,877.

Blue Mountains, range in eastern Jamaica, that extends for about 30 mi (50 km) from Stony Hill, 8 mi north of Kingston, eastward to the Caribbean Sea. The highest point in the range is Blue Mountain Peak (7,402 ft [2,256 m]). The Blue Mountains are thickly covered with tree ferns. The slopes facing the trade winds receive an average of 200 in. (5,000 mm) of rain annually, resulting in much topsoil erosion and a network of streams. Winter temperatures may fall to 45° F (7° C), while frost and even sleet have been experienced on Blue Mountain Peak. Coffee, formerly grown on large plantations, is cultivated in the valleys by peasants.

Blue Mountains, range curving northeastward for 190 mi (310 km) from central Oregon to southeastern Washington, U.S. The range reaches a width of 68 mi and an average elevation of about 6,500 ft (2,000 m); it comprises an uplifted, warped, and dissected lava plateau, above which rise several higher mountain ridges, including Aldrich, Strawberry, and Elkhorn. The highest peak is Rock Creek Butte (9,105 ft), on the Elkhorn Ridge. The mountains are drained by tributaries of the Columbia River. At lower elevations, the basins or flats are cultivated, some with irrigation. The slopes are heavily forested with pine and Douglas fir. Stock grazing and outdoor recreation are the main activities in the region since the decline of mining. The mountains are within parts of the Umatilla, Whitman, and Malheur national forests and probably received their name from the dark-blue appearance of the pine trees.

Blue Nile River, Arabic AL-BAḤR AL-AZRAQ, Amharic ABĀY, headstream of the Nile River (*q.v.*) and source of almost 70 percent of its floodwater at Khartoum. It reputedly rises as the Abāy from a spring 6,000 ft (1,800 m) above sea level, near Lake Tana in northwestern Ethiopia. The river flows into and out of the lake, runs through a series of rapids, and then drops into a gorge. It flows through a deep canyon southeast and west around the Choke Mountains and then turns northwest through The Sudan to join the White Nile at Khartoum. Its length is about 907 mi (1,460 km). By far the greater part of the Blue Nile's waters come from such tributaries as the Dinder and the Rahad rivers, which rise in the Ethiopian highlands. Dams at er Roseires (ar-Ruṣayriṣ) and Sannār, in The Sudan, irrigate 1,000,000 ac (400,000 ha) in the plain of al-Jazīrah (Gezira) between the Blue and White Nile rivers; the Sannār Dam also produces hydroelectric power.



The Sannār Dam on the Blue Nile River in The Sudan

Tor Eigeland—Black Star

Blue Peter (foaled 1936), English racehorse (Thoroughbred), unbeaten during the 1939 racing season when he won two of the events comprising the British Triple Crown: the Two Thousand Guineas at Newmarket and the Derby at Epsom Downs. The beginning of World War II deprived him of the chance to race in the Saint Leger, the last of the Triple Crown events, at Doncaster. Foaled by Fancy Free and sired by Fairway, Blue Peter was bred and owned by Lord Rosebery and trained by Jack Jarvis. He raced only twice in 1938, but in 1939 he was unbeaten in four races. Blue Peter sired Ocean Swell, the 1944 Derby winner.

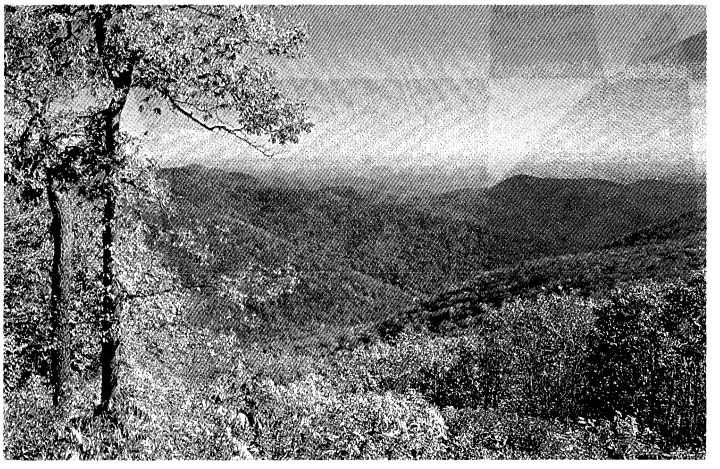
blue-ribbon jury, also called SPECIAL JURY, or STRUCK JURY, a group, chosen from the citizenry of a district, that has special qualifications to try a complex or important case. The blue-ribbon jury is intended to overcome the problems of ordinary juries in interpreting complex technical or commercial questions. If an antitrust suit involved merger, acquisition, holding companies, and restraint of trade, for example, a group of qualified economic experts might be summoned. In the United States blue-ribbon juries are provided for by statutes, the terms varying by jurisdiction. Under some statutes, the blue-ribbon jury is available only in civil cases; under others, in criminal cases, too. In either situation, this jury is ordered by the court on the motion of one of the litigants. Under some statutes the blue-ribbon jury is an absolute right.

The selection is similar to that for an ordinary trial jury, but the lists of potential jurors contain only specially qualified persons. Although the origin of the blue-ribbon jury is uncertain, it was clearly in use under William III of England (reigned 1689–1702). Complexity was not the only reason for the blue-ribbon jury. When the sheriff (who impanelled juries) was suspected of bias, this special jury was invoked as a safeguard. By placing important persons on the jury, the court prevented intimidation.

At present the blue-ribbon jury is seldom used. One problem in this form of trial is that the jurors' expertise may colour their perceptions. Medical experts trying a case involving a doctor, for example, may be biased, consciously or unconsciously, in his favour. The more common solutions to the increasing complexity of litigation have been greater use of expert witnesses and assignment of cases to quasi-judicial administrative agencies.

Blue Rider, The (group of artists): *see* Blaue Reiter, Der.

Blue Ridge, also called BLUE RIDGE MOUNTAINS, segment of the Appalachian Mountains in the United States, extending southwestward for 615 mi (990 km) from Carlisle, Pa., through parts of Maryland, Virginia, North Carolina, and South Carolina, to Mt. Oglethorpe, Georgia. The range, a relatively narrow ridge, is 5 to 65 mi wide, with average heights of 2,000 to 4,000 ft (600 to 1,200 m). Included in the Blue Ridge system are the Black Mountains, with Mt. Mitchell (6,684 ft), in North Carolina, the highest peak east of the Mississippi River; and the Great Smoky and the Unaka mountains. Notable Blue Ridge peaks are Mt. Rogers (5,729 ft; highest point in Virginia); Sassafras Mountain (3,560 ft; highest point in South Carolina); Brasstown Bald (4,784 ft; highest point in Georgia); Stony Man (4,010 ft) and Hawksbill (4,049 ft) in Virginia; and Grandfather Mountain (5,964 ft) in North Carolina.



Blue Ridge Mountains from Stony Man Overlook, Virginia

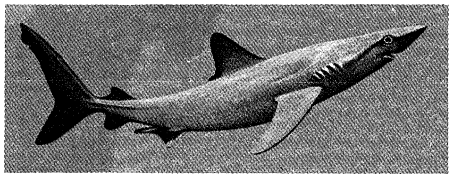
Eric Carle—Shostal/EB Inc.

The whole region has been intricately dissected by many small streams, and three major rivers have cut gaps through the ridge—the Roanoke, James, and Potomac, all in Virginia. Beginning south of Front Royal, Va., the Skyline Drive runs through the Shenandoah National Park and connects at Rockfish Gap, Va., with Blue Ridge Parkway, a scenic motor route that runs south to the Great Smoky Mountains National Park.

The mountains lie within Chattahoochee, Cherokee, Nantahala, Pisgah, Jefferson, and George Washington national forests, and more than 700 varieties of trees and plants have been catalogued. The region, although known for its isolation, contains numerous small farms with picturesque log cabins. Intensive truck farming, tobacco production, and cattle raising are important activities. The hardwood forests of the Blue Ridge are a source of timber, and some minerals are worked.

Blue Ridge Parkway, noncommercial motor route established in 1936 and administered by the U.S. National Park Service, extending for 469 mi (755 km) through the Appalachian Mountains in Virginia and North Carolina. Following along mountain crests (elevations varying from 600 to 6,000 ft [180–1,800 m]), it links the Shenandoah National Park (north) with the Great Smoky Mountains National Park (south) and probes the George Washington, Jefferson, and Pisgah national forests. It traverses colourful mountain scenery with facilities for outdoor recreation (camping, hiking, picnicking) along its route.

blue shark, also called GREAT BLUE SHARK (*Prionace glauca*), abundant shark of the family Carcharhinidae found in all oceans, from warm temperate to tropical waters. Also



Blue shark (*Prionace glauca*)
Painting by Richard Ellis

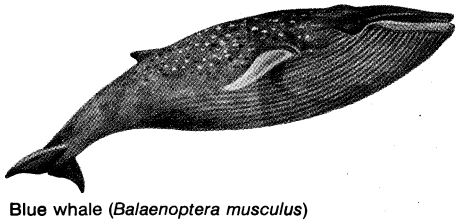
known as the blue whaler, the blue shark is noted for its attractive, deep-blue colouring contrasting with a pure-white belly. It is a slim shark, with a pointed snout, saw-edged teeth, and long, slim pectoral fins. Maximum length is about 4 metres (12 feet).

Fish form the main part of its diet, but the blue shark is also a scavenger and sometimes follows ships for extended periods. It is noted for the speed with which it appears near slaughtered whales and its avidity in feeding on the carcasses. It is generally considered potentially dangerous to man.

Blue Shirt, Spanish CAMISA AZUL, member of a 20th-century Irish fascist movement founded by the former Irish president William Cosgrave. Gen. Eoin O'Duffy, former commissioner of the Irish National guards, took the movement's group of 600 men to Spain in 1936. There the Blue Shirts trained at Cáceres and fought with the Nationalist forces during the Spanish Civil War.

blue vitriol, hydrated cupric sulfate, a compound of copper occurring as large, blue-bright crystals (*see* copper).

blue whale, also called SULFUR-BOTTOM, or SULFUR-BOTTOM WHALE (*Balaenoptera, or Sibbaldus, musculus*), mottled, blue-gray baleen whale, belonging to the family Balaenopteridae; the name "sulfur-bottom" comes from the colour of the yellowish diatoms (algae) found on the bodies of some individuals. The largest of all known animals, the blue whale attains a maximum length and weight of about 30 metres (100 feet) and 150 tons. It has a small dorsal fin near its tail,



Blue whale (*Balaenoptera musculus*)
Painting by Richard Ellis

and 80 to 100 long grooves running lengthwise on its throat and chest. It also has short, black baleen, or whalebone, numerous horny fringed plates on the sides of the upper jaw that act as a sieve, removing plankton, on which the animal feeds, from water expelled from its mouth.

The blue whale is found alone or in small groups in all oceans. It spends the summer in polar waters, feeding on shrimplike crustaceans (krill), and in winter moves toward the Equator to breed. Once the most important of the commercially hunted baleen whales, the blue whale was greatly reduced in numbers during the late 19th and the first half of the 20th century. It is now protected but is listed as critically endangered in the *Red Data Book.*

blue wren (bird): *see* fairy wren.

blueback, common name for a number of blue-coloured fishes, particularly the lake herring, or cisco, a whitefish (*q.v.*); the summer, or glut, herring (*see* herring); and the sockeye salmon (*q.v.*).

Bluebeard, murderous husband in a story, "La Barbe bleue," in Charles Perrault's collection of fairy tales, *Contes de ma mère l'oye* (1697; *Tales of Mother Goose*). Similar stories exist in European, African, and Eastern folklore; the essentials are the locked and forbidden room, the wife's curiosity, and her 11th-hour rescue. Perrault's version probably derived from Brittany and may have been based on the career of the 15th-century marshal of France Gilles de Rais and that of Comorre the Cursed, a 6th-century Breton chief, each of whom committed crimes similar to those in the Bluebeard stories.

In an Estonian version, the wife is rescued by a gooseherd (or a page), a childhood friend who slays her husband and marries her. In

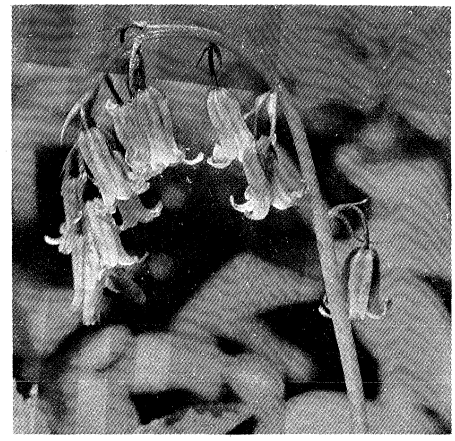
Bluebeard, illustration by Gustave Doré
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co., Ltd.

the story "Feather-bird" in *Grimms' Fairy Tales* (1812–15), three sisters are the intended victims.

The identification in some stories of Bluebeard with the devil and of the locked door as the gate of hell are probably later additions. Andrew Lang's translation (1888) of Perrault's *Conte* includes a close comparison with other folktales and details of the careers of Gilles de Rais and Comorre.

bluebell, any plant of the genus *Endymion* of the family Liliaceae, native to Eurasia. The bell-shaped blue flower clusters of bluebell, or wild hyacinth (*E. nonscriptus*), and Spanish bluebell (*E. hispanicus*) are borne on plants about 30 centimetres (1 foot) tall. Both species are cultivated as garden ornamentals. Some authorities consider them as belonging to the related genus *Scilla* of the same family.

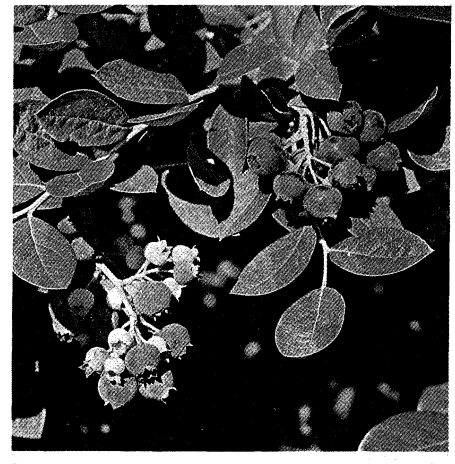
Many other plants are commonly known as bluebells, including species of the genera *Campanula, Eustoma, Polemonium,* and *Clematis.*



Wild hyacinth (*Endymion nonscriptus*)
M.T. Tanton—The National Audubon Society Collection/Photo Researchers

In the United States the name bluebell is usually reserved for *Mertensia virginica.*

blueberry, North American shrub of the species *Vaccinium australe* (family Ericaceae), prized for its sweet edible fruits, which provide



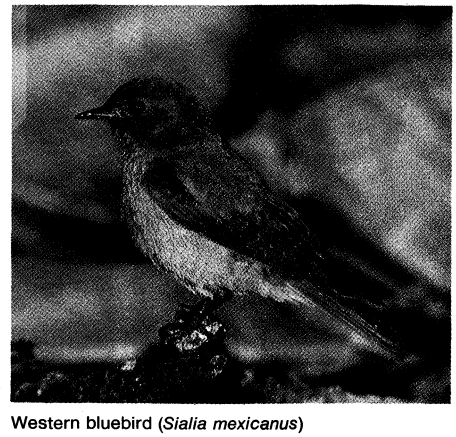
Blueberry
Grant Heilman—EB Inc.

a source of vitamin C and iron. Blueberries are eaten fresh, often with cream, as a dessert fruit, or baked in a variety of pastries.

Blueberries grow only in highly acidic and well-drained but moist soils. About 36,000 acres (14,500 hectares) of the high-bush blueberry are cultivated, primarily in Maine, New Jersey, southwestern Michigan, and eastern North Carolina. *See also* bilberry.

bluebill (duck): *see* scaup.

bluebird, any of the three species of the North American genus *Sialia* of the chat-thrush



Western bluebird (*Sialia mexicanus*)
Herbert Clarke

group (family Turdidae, order Passeriformes). The eastern bluebird (*S. sialis*), 14 centimetres (5½ inches) long, and the western bluebird (*S. mexicana*) are red-breasted forms found east and west of the Rockies, respectively; the mountain bluebird (*S. currucoides*), also of the west, is all blue. Bluebirds arrive from the south in earliest spring, uttering soft, blurry notes. They live in open country and woodland glades; they nest in holes in trees or in fenceposts—and in bird boxes, if they are not driven away by starlings or house sparrows.

bluebonnet, any of several flowering plants, including the Texas bluebonnet (*Lupinus subcarnosus*), a North American annual plant of the pea family (Fabaceae), native to the plains of Texas. It grows about 0.3 metre (1 foot) tall, has silky-haired leaves composed of five leaflets, and bears clusters of purplish-blue flowers that are marked in the centre with white or yellow. In the spring the plants cover immense areas in southern and western Texas like a blue carpet. The bluebonnet is one of the most popular wild flowers of Texas.

In Scotland the name bluebonnet is given to the bluebottle (*Centaurea cyanus*) and also to the blue scabious or devil's bit (*Succisa pratensis*).

bluebuck: *see* nilgai.

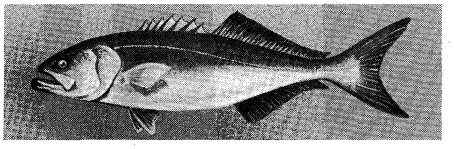
bluecap, species of fairy wren (*q.v.*).

Bluefield, city, Mercer County, extreme southwest tip of West Virginia, U.S., lying in the Blue Ridge Mountains, and contiguous with Bluefield (Tazewell County, Va.). Situated at the foot of East River Mountain (3,480 ft [1,061 m]), it is one of the highest cities (altitude 2,612 ft) in the country east of the Rocky Mountains. First settled in 1777, Bluefield took its name from the bluish chicory plants and bluegrass of the region. The nearby Pocahontas Coal Field brought an influx of miners to the area, and in 1889 the Norfolk and Western Railway established yards, shops, and a division point in the town. The railroad and coal are still the economic mainstays. Other assets include iron, limestone, silica, and lumber. Bluefield sponsors the biennial Southern Appalachian Industrial Exhibition centred on coal mining. Bluefield State College was founded in 1895, and Bluefield College (1922) is in Bluefield, Va. Inc. city, 1889. Pop. (1982 est.) 15,926.

Bluefields, capital, Zelaya department, eastern Nicaragua, just south of the mouth of the Escondido River, behind its outer port of El Bluff. Named after the Dutch pirate Blewfeldt, who used it as a base in the 17th century, it was the capital of the British Mosquito Coast protectorate until returned to Nicaragua in 1850. U.S. Marines were stationed there (1912–25; 1927–32) at the request of the Nicaraguan president to quell revolutionary activity. The town's populace, long accustomed to limited local autonomy, rioted against Sandinista military control in the early 1980s.

Bluefields is the nation's most important Caribbean port, handling mainly cabinet woods, frozen fish, shrimp, lobsters, and bananas. The city is also a commercial centre and has some light manufacturing. The Escondido is navigable for 60 mi (100 km) inland; from the river port of Rama a road leads westward over the central highlands to Managua, the national capital. Bluefields is also served by a domestic airline. Pop. (1980 est.) 20,800.

bluefish, also called TAILORS, or SNAPPER (*Pomatomus saltatrix*), swift-moving marine food and game fish, the only member of the family Pomatomidae (order Perciformes). The bluefish ranges through warm and tropical regions of the Atlantic and Indian oceans, living in schools and preying with voracity on other, smaller animals, especially fishes. Elongated in form, it has two dorsal fins, a forked tail, and a large mouth with strong, pointed teeth.



Bluefish (*Pomatomus saltatrix*)
Painting by Richard Ellis

It is blue or greenish and grows to a length of about 1.2 metres (4 feet) and weight of 11.5 kilograms (25 pounds).

bluegill (*Lepomis macrochirus*), popular game fish in the sunfish family, Centrarchidae (order Perciformes). It is one of the best known sunfishes throughout its original range in the freshwater habitats of the central and southern United States. Bluegills have been introduced into numerous freshwater habitats throughout the western United States as well as in other parts of the world.

Bluegills are one of the smallest popular game fishes, normally reaching lengths of only 15–23 centimetres (6–9 inches) and usually weighing less than ½ kilogram (1 pound). A dark spot at the rear of the dorsal fin and a dark flap at the rear of the gill cover are characteristic. The body colour of bluegills is variable but is basically bluish or greenish. Despite their small size, bluegills are highly spirited fighters when on the end of a fishing line and are among the most popular hook-and-line-caught fishes in North America. They are frequently stocked with largemouth bass in small farm ponds.

bluegrass, any of many lawn, pasture, and forage grasses of the genus *Poa* (family Poaceae). About 250 species are found in temperate and cool climates. They are slender annuals and perennials, usually with small spikelets lacking bristles and arranged in open clusters. The narrow leaf blades have boat-shaped tips.

Of the more than 50 species found in the United States, Kentucky bluegrass (*P. pratensis*) is the best known. It was introduced from Eurasia and is a popular lawn and pasture grass in the northern states and is common in open areas and along roadsides. It is 30 to 100 centimetres (12 to 40 inches) tall, with soft, blue-green leaves; its creeping rootstalks form a good sod. Canada bluegrass (*P. compressa*), native to Europe and now common in North America, is a wiry plant with flat stems, similar to Kentucky bluegrass in appearance and use. Texas bluegrass (*P. arachnifera*), mutton grass (*P. fendleriana*), and plains bluegrass (*P. arida*) are important western forage grasses. Annual bluegrass (*P. annua*), a small, light-green species, is a European introduction that has spread throughout North America; it is considered a pest in lawns.

Kentucky bluegrass (*Poa pratensis*)
J.W. Wilburn

bluegrass, style of music that emerged in the United States after World War II, a direct descendant of the old-time string-band music (*see* Carter Family) that had been widely played and recorded from the late 1920s. Bluegrass is distinguished from the older string-band music by its more syncopated (off-beat) rhythm, its relatively high-pitched strident vocals, and a strong influence of jazz and blues. It differs from country and western music in a normal absence of electronically amplified instruments and in the very prominent place given to the banjo, always played in the three-finger Scruggs style, which is unique to bluegrass. Mandolin and fiddle are generally featured considerably more in bluegrass than in country and western music, and traditional square dance tunes and ballads furnish a much larger part of the repertory.

The bluegrass style was originated by Bill Monroe (b. 1911), who by the mid-1940s had experimented considerably with new methods of presenting string-band music. He began to evolve a highly distinctive mandolin style while playing with his brothers Birch and Charlie; and after their group broke up, he formed his own group, the Blue Grass Boys. The band already showed many of the distinctive features of modern bluegrass when in 1945 Earl Scruggs (b. 1924), originator of the revolutionary banjo technique mentioned above, joined it. The bluegrass style emerged fully in the years 1945–48, and by the late 1940s a number of bands were playing the music; the most successful were usually led by musicians who had at one time or another played with the Blue Grass Boys and learned the style directly from Monroe. Other leading practitioners of the style include Ralph and Carter Stanley and the Clinch Mountain Boys, the Osborne Brothers, and Jim and Jesse Reynolds.

Bluegrass moved from performances on the radio in small Southern communities in the 1940s to television and hillbilly bars in the 1950s, to college concerts, coffee houses, and festivals in the 1960s; and in the 1970s new groups added rock repertoire and techniques.

blueprint, a type of print used for copying engineering drawings and similar material. The name is popularly applied to two separate methods, more exactly designated as the blueprint and the whiteprint, or diazotype. In blueprinting, the older method, the drawing to be copied, made on translucent tracing cloth or paper, is placed in contact with paper sensitized with a mixture of ferric ammonium citrate and potassium ferricyanide, which is then exposed to light. In the areas of the sensitized paper not obscured by the lines of the drawing, the light reduces the ferric salt to the ferrous state, in which it reacts with the potassium ferricyanide to form insoluble prussian blue. The exposed paper is then washed in water, producing a negative in which the lines of the drawing appear in white against a dark blue background.

In the whiteprinting method, the paper is sensitized with a mixture of a diazonium salt, a coupler that reacts with the diazonium salt to form an azo dye, and an acid that prevents coupling. Exposure to light destroys the diazonium salt. Final treatment with an alkaline agent, such as ammonia gas, neutralizes the acid, thereby bringing about the coupling reaction. Because it produces dark lines on

a "white" or light background, whiteprinting has become the favoured method.

blues, secular folk music of American blacks. From its obscure origins among Southern blacks in the early 20th century, the blues' simple but expressive forms had become in the 1960s one of the most important influences on the development of popular music in the United States.

As a musical style the blues are characterized by expressive pitch inflections (blue notes), a three-line textual stanza of the form AAB, and a 12-measure form. Typically the first two and a half measures of each line are devoted to singing, the last measure and a half consisting of an instrumental "break" that repeats, answers, or complements the vocal line. In terms of functional (*i.e.,* traditional European) harmony, the simplest blues harmonic progression is described as follows (I, IV, and V refer respectively to the first or tonic, fourth or subdominant, and fifth or dominant notes of the scale):

Phrase 1 (measures 1–4) I–I–I–I
Phrase 2 (measures 5–8) IV–IV–I–I
Phrase 3 (measures 9–12) V–V–I–I.

African influences are apparent in the blues tonality; the call and response pattern of the repeated refrain structure of the blues stanza; the falsetto break in the vocal style; and the imitation of vocal idioms by instruments, especially the guitar and harmonica.

Although instrumental accompaniment is almost universal in the blues, the blues are essentially vocal. Blues songs are lyrical rather than narrative; the singer expresses his feelings rather than tells a story. The emotion expressed is generally one of sadness or melancholy, often due to problems in love. To express this musically, blues performers use vocal techniques such as melisma and syncopation and instrumental techniques such as "choking" or bending guitar strings on the neck or applying a metal slide or bottleneck to the guitar strings to create a whining, voice-like sound.

The origins of the blues are poorly documented. Blues developed in the southern United States after the American Civil War. It was influenced by work songs and field hollers, minstrel-show music, ragtime, church music, and the folk and popular music of whites. Blues derived from and was largely played by southern black men, most of whom came from the milieu of agricultural workers. The earliest references to blues date back to the 1890s and early 1900s. In 1912 black bandleader W.C. Handy's composition "Memphis Blues" was published. It became very popular, and thereafter many other Tin Pan Alley songs entitled blues began to appear.

The rural blues developed in three principal regions, Georgia and the Carolinas, Texas, and Mississippi. The blues of Georgia and the Carolinas are noted for their clarity of enunciation and regularity of rhythm. Influenced by ragtime and white folk music, they are more melodic than the Texas and Mississippi styles. Blind Willie McTell and Blind Boy Fuller were representative of this style. The Texas blues are characterized by high, clear singing accompanied by supple guitar lines that consist typically of single-string picked arpeggios rather than strummed chords. Blind Lemon Jefferson (*q.v.*) was by far the most influential Texas bluesman. Mississippi Delta blues are the most intense of the three styles and have been the most influential. Vocally they are the most speech-like, and the guitar accompaniment is rhythmic and percussive; a slide or bottleneck is often used. The Mississippi style is represented by Charley Patton, Willie Brown, Eddie "Son" House, Robert Johnson (*q.v.*), and Johnny Shines.

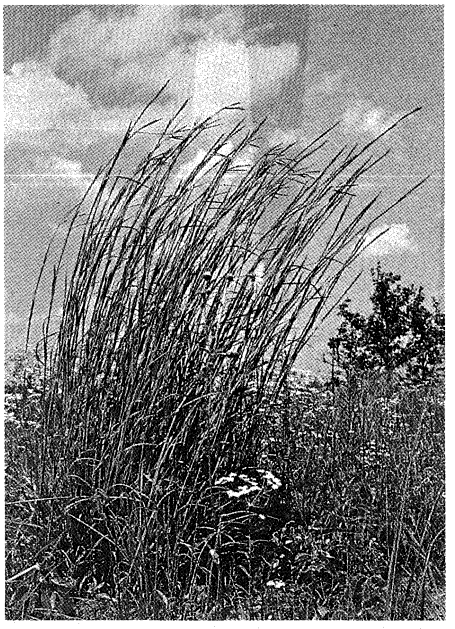
The first blues recordings were made in the 1920s by black women such as Mamie Smith, Ma Rainey (*q.v.*), Ida Cox, and Bessie Smith (*q.v.*). These performers were primarily stage singers backed by jazz bands; their style is known as classic blues.

The Great Depression and the world wars caused the geographic dispersal of the blues as millions of blacks left the South for the cities of the North. The blues became adapted to the more sophisticated urban environment. Lyrics took up urban themes, and the blues ensemble developed as the solo bluesman was joined by a pianist or harmonica player and then by a rhythm section consisting of bass and drums. The electric guitar and the amplified harmonica created a driving sound of great rhythmic and emotional intensity.

Among the cities in which the blues initially took root were Atlanta, Memphis, and St. Louis. John Lee Hooker settled in Detroit, and on the West Coast Aaron "T-Bone" Walker developed a style later adopted by Riley "B.B." King. It was Chicago, however, that played the greatest role in the development of urban blues. In the 1920s and 1930s Memphis Minnie, Tampa Red, Big Bill Broonzy, and John Lee "Sonny Boy" Williamson were popular Chicago performers. After World War II they were supplanted by a new generation of bluesmen that included Muddy Waters (*q.v.*), Howling Wolf, Elmore James, Little Walter Jacobs, and Otis Spann.

The blues have influenced many other musical styles. Blues and jazz are closely related; such seminal jazzmen as Jelly Roll Morton and Louis Armstrong employed blues elements in their music. Soul music and rhythm and blues also show obvious blues tonalities and forms. The blues have had their greatest influence on rock music. Early rock singers such as Elvis Presley often used blues material. British rock musicians in the 1960s, especially the Rolling Stones, Eric Clapton, and John Mayall, were strongly influenced by the blues, as were such American rock musicians as Mike Bloomfield, Paul Butterfield, and the Allman Brothers Band.

bluestem, also called BEARD GRASS, any of the approximately 200 species of perennial, sometimes tufted grasses in the genus *Andropogon* (family Poaceae), distributed throughout the temperate and tropical zones. The coarse plants have flat or folded leaf blades, solid or pithy stems, and flower spikelets clustered at the stem tips or in the leaf axils. The stems are often hairy, sometimes reddish or greenish in appearance. Several species have underground stems.



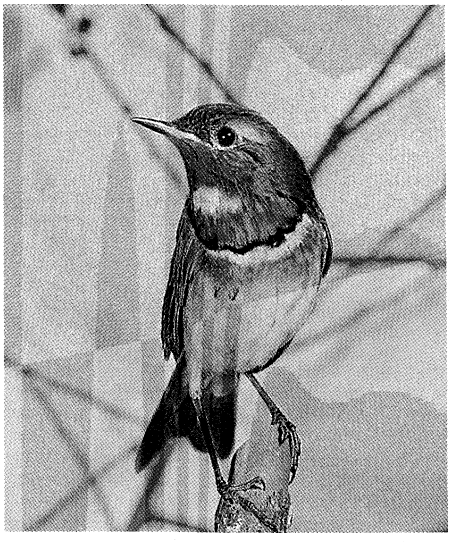
Big bluestem (*Andropogon gerardii*)
Louise K. Broman from Root Resources—EB Inc.

Big bluestem (*A. gerardii*), often more than 2 metres (6½ feet) tall, is the characteristic plant species of the North American tall-grass prairie. It is sometimes known as turkeyfoot, in reference to its forked flower cluster. Little bluestem (*A. scoparius*), 0.5 to 1.5 m tall, is found in drier prairie areas. Both species are good hay and pasture plants. Sand bluestem (*A. hallii*), with yellowish spikelets, grows on sand hills in the central and western United States. Broom sedge (*A. virginicus*) and bushy beard grass (*A. glomeratus*) are coarse grasses, unsuitable for forage, that grow in poor soils in eastern and southern North America. Silver beard grass (*A. saccharoides*), 0.6 to 1.3 m tall, has silvery white flower clusters 7 to 15 centimetres long; it is a forage grass in the southwestern United States.

Bluestocking, any of a group of ladies who in mid-18th-century England held "conversations" to which they invited men of letters and members of the aristocracy with literary interests. The word has come to be applied derisively to a woman who affects literary or learned interests. The Bluestockings attempted to replace social evenings spent playing cards with something more intellectual. The term probably originated when one of the ladies, Mrs. Vesey, invited the learned Benjamin Stillingfleet to one of her parties; he declined because he lacked appropriate dress, whereupon she told him to come "in his blue stockings"—the ordinary worsted stockings he was wearing at the time. He did so, and Bluestocking (or Bas Bleu) society became a nickname for the group. This anecdote was later recounted by Madame d'Arblay (the diarist and novelist better known as Fanny Burney), one of the most famous of the Bluestockings.

The group was never a society in any formal sense. Mrs. Vesey seems to have given the first party, in Bath. After she moved to London, a rivalry developed with Mrs. Elizabeth Montagu, who became the leader of the literary ladies. Others included Mrs. Hester Chapone, Mrs. Elizabeth Carter, Miss Mary Monckton, and Miss Hannah More, whose poem "The Bas Bleu, or Conversation," supplies valuable inside information about them. Guests included Dr. Johnson, David Garrick, the Earl of Bath, Lord Lyttleton, and Horace Walpole (who called them "petticoteries"). For additional information, W.S. Scott's *The Bluestocking Ladies* (1947) is of interest.

bluethroat (*Erithacus svecicus* or *Luscinia svecica*), Eurasian chat-thrush of the thrush



Bluethroat (*Erithacus svecicus*)
H. Schrempp—Bruce Coleman Inc.

family, Turdidae (order Passeriformes). The bluethroat is aobut 14 centimetres (5½ inches) long and has a bright blue throat, incorporating a crescentic spot of red or white, depending on the subspecies. Found from western Europe eastward to western Alaska, the bluethroat is essentially a bird of damp thickets in mountains, but in western Europe it occurs in lowlands also. It has a rich, varied, warbling song.

Blum, Léon (b. April 9, 1872, Paris—d. March 30, 1950, Jouy-en-Josas, Fr.), the first Socialist (and the first Jewish) premier of France, presiding over the Popular Front coalition government in 1936–37.

Blum was born into an Alsatian Jewish family. Educated at the École Normale Supérieure, he proceeded to study law at the Sorbonne, graduating in 1894 with the highest honours, and thereafter he made his name as a brilliant literary and dramatic critic. The Dreyfus affair brought him into active politics on the side of the republican Dreyfusards, and his close

Blum
By courtesy of the Bibliotheque Nationale, Paris

association with Jean Jaurès, whom he greatly admired, eventually led to his joining Jaurès's French Socialist Party in 1904.

Blum was first elected to the Chamber of Deputies in 1919. His first task was to reconstruct the Socialist Party after the split of December 1920, when the Communist section of it won a majority at the party's Congress of Tours and so inherited the party machinery, funds, and press. Blum ranks in history as the maker of the modern French Socialist Party and of its chief journal, *Le Populaire.* He led the opposition to the governments of Alexandre Millerand and Raymond Poincaré and in 1924 supported Edouard Herriot's Cartel des Gauches (Radical coalition), though refusing to participate in the ministries of Herriot and Aristide Briand. In the elections of 1928 the Socialist Party won 104 seats in the Chamber of Deputies, but Blum himself was defeated. A year later he was returned for Narbonne, which also returned him in 1932 and again in 1936.

After the right-wing demonstrations in Paris of February 1934, Blum worked for solidarity between Socialists, Radicals, and all other opponents of Fascism. In 1932 he had developed a Socialist program of pacifism, nationalization of French industry, and measures against unemployment. These efforts contributed to the formation of the electoral alliance of the left known as the Popular Front which, in the elections of April and May 1936, won a large majority in the Chamber. Blum, its chief architect, became premier as leader of the Popular Front government of June 1936. He was the first Socialist and the first Jew to become premier of France. His government introduced, against considerable opposition, the 40-hour workweek and secured paid vacations and collective bargaining for many workers; it nationalized the chief war industries and the Bank of France, and carried other social reforms. Its most intractable problem was national defense against the growing power of the Rome-Berlin axis, and its policy of "nonintervention" in the Spanish Civil War was denounced as appeasement. Blum's plans to establish effective state controls over private industry and finance aroused bitter hostility among French business leaders, who refused to cooperate with his government, and it was at this time that sections of the right wing adopted the ominous slogan, "Better Hitler than Blum."

In June 1937 Blum resigned after the conservative majority in the Senate refused to grant him emergency decree powers to tackle the country's financial difficulties. Modified Popular Front governments were formed by Camille Chautemps, in which Blum served as vice-premier, and by Blum again in March 1938. He refused office under his successor, Edouard Daladier. In October 1940, after the French collapse in World War II, Blum was indicted by the Vichy government on charges of war guilt, and in February 1942 was brought to trial at the court of Riom. The powerful defense put up by Blum and his codefendants so greatly discomfited the Vichy authorities and so irritated the Germans that in April the hearings were suspended indefinitely, and Blum was returned to prison. He was freed by U.S. forces from a German concentration camp in May 1945.

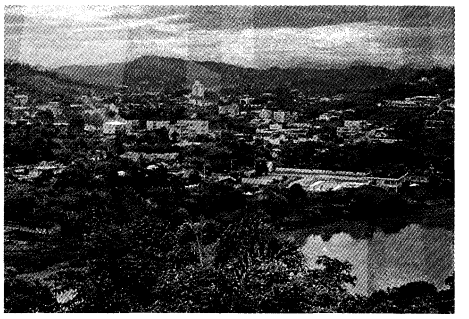
After the liberation of France, Blum emerged as one of France's leading veteran statesmen, and in the spring of 1946 he negotiated a U.S. loan to France of $1,370,000,000 for postwar reconstruction. In December 1946 he formed a month-long "caretaker government," the first all-Socialist French ministry, pending the election of the first president of the new Fourth Republic. Blum retired from public life in January 1947, but served as vice-premier in André Marie's ministry of August 1948. He lived in retirement thereafter at his estate at Jouy-en-Josas.

Blumberg, Baruch S(amuel) (b. July 28, 1925, New York City), American research physician whose discovery of an antigen that provokes antibody response against hepatitis B led to the development by other researchers of a successful vaccine against the disease. He shared the Nobel Prize in Physiology or Medicine in 1976 with D. Carleton Gajdusek for their work on the origins and spread of infectious viral diseases.

Blumberg received his M.D. degree from Columbia University's College of Physicians and Surgeons and his Ph.D. degree in biochemistry from Oxford University in 1957. In 1960 he became chief of the Geographic Medicine and Genetics Section of the U.S. National Institutes for Health, in Maryland. In 1964 he was appointed associate director for clinical research at the Institute for Cancer Research, Philadelphia, and he served as professor of medicine, human genetics, and anthropology at the University of Pennsylvania during the 1960s and '70s.

In the early 1960s Blumberg was examining blood samples from widely diverse populations in an attempt to determine why the members of different ethnic and national groups vary widely in their responses and susceptibility to disease. In 1963 he discovered in the blood serum of an Australian aborigine an antigen that he later (1967) determined to be part of a virus that causes hepatitis B, the most severe form of hepatitis. The discovery of this so-called Australian antigen, which causes the body to produce antibody responses to the virus, made it possible to screen blood donors for possible hepatitis B transmission. Further research indicated that the body's development of antibody against the Australian antigen was protective against further infection with the virus itself. In 1982 a safe and effective vaccine utilizing Australian antigen was made commercially available in the U.S.

Blumenau, city, eastern Santa Catarina state, southern Brazil, on the Rio Itajaí, at 46 ft (14 m) above sea level. It was founded in 1852 by German colonists. The city's economy is based on the manufacture of textiles (especially towels) from cotton grown in the hinterland. The Universidade Regional de Blumenau (1968)



Blumenau on the Rio Itajaí, Brazil
Ernst Jahn

is located in the city. Roads and air service link Blumenau with Florianópolis, the state capital. It can also be reached by riverboat, train, or automobile from Itajaí, a port at the mouth of the Rio Itajaí. Pop. (1980 prelim.) 144,819.

Blumenbach, Johann Friedrich (b. May 11, 1752, Gotha, Ger.—d. Jan. 22, 1840, Göttingen), German physiologist and comparative anatomist, frequently called the father of physical anthropology, who proposed one of the earliest classifications of the races of mankind.

He joined the faculty of the University of Göttingen in 1776, publishing *Institutiones Physiologicae* (1787; *Institutes of Physiology*) and a handbook of comparative anatomy and physiology (1824). Blumenbach was the first to show the value of comparative anatomy in

Blumenbach, detail of a lithograph, 1892
Bavaria-Verlag

the study of man's history. His research in the measurement of craniums led him to divide mankind into five great families—Caucasian, Mongolian, Malayan, Ethiopian, and American. His most important anthropological work was a collection of 60 human craniums described in his *Collectionis suae Craniorum Diversarum Gentium Illustratae Decades* (1790–1828; "Illustrated Parts of His Collection of Craniums of Various Races").

Blumenthal, Leonhard, Graf von (count of) (b. July 30, 1810, Schwedt an der Oder, Brandenburg—d. Dec. 22, 1900, Quellendorf, Anhalt, Ger.), Prussian field marshal active in the wars that founded the German Empire.

He entered the guards as second lieutenant in 1827 and took part in 1848 in the suppression of the Berlin riots. In 1849 he served on the staff of General von Bonin in the Schleswig-Holstein campaign and so distinguished himself, particularly at Fredericia, that he was appointed chief of staff of the Schleswig-Holstein army. In 1858 he was appointed personal adjutant to Prince Frederick Charles. He was chief of staff of the 3rd army

corps in 1864 when, on the outbreak of the Danish War of 1864, he was made chief of the general staff of the army against Denmark and distinguished himself at Düppel and the passage to Alsen Island.

In the Seven Weeks' War with Austria in 1866 Blumenthal was chief of the general staff to the crown prince of Prussia, commanding the 2nd army. From 1866 to 1870 he commanded the 14th division at Düsseldorf. In the Franco-German War of 1870–71 he was chief of staff of the 3rd army under Crown Prince Frederick William, whose victories owed much to Blumenthal's bold decisions. In 1873 he became a general of infantry, and 10 years later he was made a count. In 1888 he was made a general field marshal.

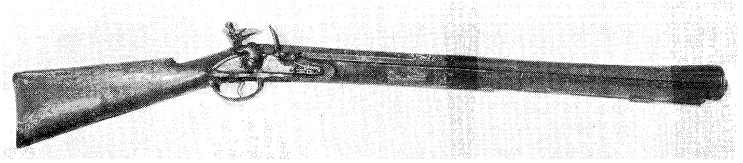
Articles are alphabetized word by word, not letter by letter

Blunden, Edmund Charles (b. Nov. 1, 1896, London—d. Jan. 20, 1974, Long Melford, Suffolk, Eng.), poet, critic, scholar, and man of letters, whose verses in the traditional mode are known for their rich and knowledgeable expression of rural English life.

Long a teacher in the Far East, he showed in his later poetry Oriental influences, as in *A Hong Kong House* (1962). His *Undertones of War* (1928; new ed. 1956), which established his international reputation, is one of the most moving books about World War I, all the more compelling for its restraint. The war interrupted his studies at Oxford, but he returned in 1919, moving the following year to London as associate editor of *The Athenaeum.* His poems began appearing in the 1920s.

Blunden taught in Japan throughout most of the 1920s and returned there in the late 1940s, after teaching at Oxford and serving on the staff of *The Times Literary Supplement.* He was professor of English at Hong Kong University (1953–64) and professor of poetry at Oxford (1966–68). His poetry is collected in *The Poems of Edmund Blunden, 1914–1930* (1930) and *Poems 1930–1940* (1940). *Poems of Many Years* appeared in 1957. One of the major results of his scholarship was the discovery and publication of unprinted poems by the 19th-century peasant-poet John Clare.

blunderbuss, short, muzzle-loading shoulder weapon, usually a flintlock, with a wide smooth bore flared at the muzzle to a maximum width of about 4 inches (10 centimetres). The flaring was intended to scatter the shot at very close range, an effect that later scientific experiments showed did not occur. The blunderbuss, forerunner of the shotgun, was common in the 18th century, though in use somewhat earlier and later.



Flintlock blunderbuss
Brown Brothers

Blundeville, Ranulf de, Ranulf also spelled RANDULF, or RALPH: *see* Chester, Ranulf de Blundeville, 6th earl of.

Blunt, Anthony (Frederick), also called (1956–79) SIR ANTHONY BLUNT (b. Sept. 26, 1907, Bournemouth, Hampshire, Eng.—d. March 26, 1983, London), British art historian who late in his life was revealed to have been a Soviet spy.

While a fellow of Trinity College, Cambridge, in the 1930s Blunt became a member of a circle of disaffected young men led by Guy Burgess (*q.v.*), under whose influence he was soon involved in espionage on behalf of the Soviet Union. His public career was brilliant. From 1937 he published scores of scholarly papers and books by which he largely established art history in Great Britain. He was an authority on 17th-century painting, particularly that of Nicolas Poussin. During World War II he served in MI-5, a military intelligence organization, and was able to supply secret information to the Soviets and, more importantly, to give warning to fellow agents of counterintelligence operations that might endanger them.

In 1945 Blunt was appointed surveyor of the king's (later the queen's) pictures, and in 1947 he became director of the Courtauld Institute, one of the world's leading centres of training and research in art history. His major publications in subsequent years included *Art and Architecture in France 1500–1700* (1953) and *Nicolas Poussin* (1966–67). Although his active intelligence work had apparently ceased in 1945, he maintained contacts with Soviet agents and in 1951 was able to arrange for the escape of Burgess and Donald Maclean from Britain. In 1964, after the defection of Kim Philby (*q.v.*), he was confronted by British authorities and secretly confessed his Soviet connections. Not until 1979, seven years after he retired from his posts, was his past made public. In the outcry that surrounded his being revealed as the long-sought "fourth man" in the spy ring he was stripped of the knighthood that had been awarded him in 1956.

Blunt, Edward: *see* Blount, Edward.

Blunt, Wilfrid Scawen (b. Aug. 17, 1840, Petworth House, Sussex, Eng.—d. Sept. 12, 1922, Newbuildings, Sussex), English poet best known for his expression of anti-imperialism based on sympathy for small or oppressed nations.

He entered the diplomatic service in 1858 but retired on his marriage with Lady Anne Noel in 1869. Later he established a famous stud for the breeding of Arabian horses and with his wife travelled frequently in North Africa, Asia Minor, and Arabia, seeking horses.

Blunt became known as an ardent sympathizer with Muslim aspirations, and in *The Future of Islam* (1882) he directed attention to the forces that produced the movements of Pan-Islāmism and Mahdism. He was a violent opponent of British policy in the Sudan and supported the national party in Egypt. *Ideas About India* (1885) was the result of two visits to that country, which confirmed his distrust of colonialism as exploitation. His best known volume of verse, *Love Sonnets of Proteus* (1880), reveals his real merits as an emotional poet. Blunt published a complete edition of his poetical works in 1914 and two volumes of *My Diaries* (1919 and 1920).

Bluntschli, Johann Kaspar (b. March 7, 1808, Zürich—d. Oct. 21, 1881, Karlsruhe, Ger.), writer on international law, whose book *Das moderne Kriegsrecht* (1866; "The Modern Law of War") was the basis of the codification of the laws of war that were enacted at the Hague conferences of 1899 and 1907. Bluntschli studied law at Zürich, Berlin, and Bonn and taught at Zürich, Munich (from 1848), and Heidelberg (from 1861). In 1873 he helped to found the Institute of International Law.

Bluntschli, engraving by C.H. Merz after a drawing by Wilhelm von Kaulbach
By courtesy of the Bibliotheque Nationale Suisse, Bern

Das moderne Kriegsrecht was largely taken from the code prepared by Francis Lieber (1863) for the Federal Army in the U.S. Civil War. Bluntschli's next major work, *Das moderne Völkerrecht* (1868; "Modern International Law"), presented an apparently comprehensive code that was translated into several languages and became a widely used reference book for diplomatists. *Lehre vom modernen Staat,* 3 vol. (1875–76; "Lessons of the Modern State"), which was translated into English and French, is considered by some to be his finest work.

Bly, Nellie, pseudonym of ELIZABETH COCHRANE (b. May 5, 1867, Cochran's Mills, Pa., U.S.—d. Jan. 27, 1922, New York City), U.S. newspaper writer whose around-the-world race against a theoretical record made the name celebrated and a synonym for the feminine star reporter.

She obtained a job at 18 as feature writer on *The Pittsburgh Dispatch,* whose managing editor suggested her pen name from a song by Stephen Foster. There she did a series of articles on such subjects as divorce, slum life, and conditions in Mexico. She was employed by the New York *World* in 1887. Feigning insanity to get into the asylum on Blackwell's Island, she wrote an exposé that brought about needed reforms. Later she exposed tenement conditions, the techniques of "mashers," the Albany lobby, and the like.

On Nov. 14, 1889, she sailed from New York to beat the record of Phileas Fogg, hero of Jules Verne's romance *Around the World in Eighty Days.* The *World* built up the story by daily articles and a guessing contest in which whoever came nearest to naming Nellie's time in circling the globe would get a trip to Europe. There were nearly 1,000,000 entries in the contest. Nellie rode on ships and trains, in jinrikishas and sampans, on horses and burros. On the final lap of her journey the *World*

Nellie Bly, 1890
By courtesy of the New-York Historical Society

brought her from San Francisco to New York by special train; she was greeted everywhere by brass bands, fireworks, and like panoply. Her time was 72 days, 6 hours, 11 minutes, and 14 seconds.

She married the millionaire Robert Seaman in 1895; but after his death she suffered financial reverses and returned to newspaper work on *The New York Journal* in 1920.

Blyth Valley, district (borough), county of Northumberland, England, on the North Sea coast northeast of Newcastle upon Tyne. It has an area of 27 sq mi (70 sq km).

The town of Blyth was an early centre of the salt industry, is now an exporting port for the declining Northumberland coalfield, and has shipbuilding and ship repairing.

Seaton Delaval, the regional administrative centre, had strong links with the landowning Delaval family, for whom the classical-style Seaton Delaval Hall was built (1720–29). Pop. (1982 prelim.) 77,900.

Blythe, Ethel (American actress): *see* Barrymore, Ethel.

Blythe, Herbert (actor): *see* Barrymore, Maurice.

Blythe, John (American actor): *see* Barrymore, John.

Blythe, Lionel (American actor): *see* Barrymore, Lionel.

Blytheville, city, northern seat of Mississippi County (the southern seat is Osceola), northeast Arkansas, U.S., in the Mississippi Valley. Laid out in 1880 by Henry T. Blythe, a Methodist minister, it had a lumber-oriented economy until the local alluvial soil, devoid of timber, was drained for crops. Blytheville annexed Chickasawba (1907) and developed as the service centre for a productive cotton area that also supports soybeans and wheat. Light industrialization followed. The population increased after 1962, when Blytheville Air Force Base (Strategic Air Command) was included within the city limits. The Mississippi County Community College (1974) is in Blytheville. Big Lake National Wildlife Refuge is 12 mi (19 km) west. Inc. town, 1891; city, 1915. Pop. (1980) 24,314.

Blytt–Sernander system, chronology of bog peat deposits in Scandinavia worked out by the 19th-century Swedish geologist Axel Blytt and later modified by the 20th-century Swedish botanist Johan Rutger Sernander; the Blytt–Sernander system divides the Holocene Epoch, roughly the last 10,000 years of Earth history, into smaller units. These units are based upon the sequence of plant fossils, such as remains of twigs and leaves, found preserved in bogs. The fossil sequence represents the climatic changes that have occurred since the prominent continental glaciers retreated about 10,000 years ago. Later studies have modified the Blytt–Sernander system and incorporated the results of studies on fossil pollen. To a large extent, the Blytt–Sernander system has been confirmed by these later studies as valid. Although first worked out for northern Europe, the Blytt–Sernander system has been applied to sequences throughout the world with modifications.

BMR: *see* basal metabolic rate.

BMW: *see* Bayerische Motoren Werke AG.

B'nai B'rith (Hebrew: Sons of the Covenant), oldest and largest Jewish service organization in the world, with men's lodges, women's chapters, and youth chapters in countries all over the world.

B'nai B'rith, founded in New York City in 1843, defends human rights, promotes intercultural relations, provides for the religious and cultural needs of Jewish college students (especially through the Hillel Foundation), sponsors Jewish education among adults and youth groups, supports hospitals and philanthropic institutions, provides vocational guidance, sponsors welfare projects in Israel, assists victims of natural disasters, and carries on a broad program of community service and welfare. It confers with government leaders on such issues as civil rights, immigration, abuses of freedom by totalitarian states, the position of Israel, and problems affecting Jews throughout the world. In 1913 it established the Anti-Defamation League. B'nai B'rith is represented at the United Nations through its membership in the Coordinating Board of Jewish Organizations.

The order is headed by a president elected at triennial meetings of the supreme lodge (made up of representatives of district grand lodges), a board of governors, and an administrative committee.

BND, abbreviation of BUNDESNACHRICHTENDIENST (German: Federal Intelligence Service), foreign intelligence agency of the West German government. Created in April 1956, it absorbed the "Gehlen Organization," a covert intelligence force which was created by Maj. Gen. Reinhard Gehlen after World War II and which cooperated with U.S. intelligence agencies. Gehlen had headed the Foreign Armies East section of the *Abwehr,* the intelligence service of the German general staff. He directed the BND until 1968, when he was succeeded by Gen. Gerhard Wessel, a noted specialist on Soviet affairs and organizations. The BND reports to the West German chancellor. It has divisions concerned with subversion, counterintelligence, and foreign intelligence, and it is headquartered at Pullach, West Germany. In addition to foreign intelligence the BND engages in communications intelligence and exchanges information with the intelligence services of NATO and other friendly countries.

Bo, town, headquarters of Southern Province, south central Sierra Leone, West Africa. Located near the intersection of roads from Freetown and Makeni, it became the largest town (capital, 1930–61) of the Sierra Leone Protectorate. The commercial hub of the interior, it trades in palm oil and kernels, ginger, coffee, cocoa, and rice, which are transported mainly by road to Freetown (108 mi [174 km] west-northwest). Bo has been the educational centre of the interior since the opening in 1906 of a secondary school for the sons of Mende and other chiefdoms; it now has government, Christian, and Muslim schools, a main library, and the Bo teacher-training colleges. Several periodicals are published locally. Bo also has the largest government hospital outside Freetown. Pop. (1974) 39,371.

Bo Hai (China): *see* Chihli, Gulf of.

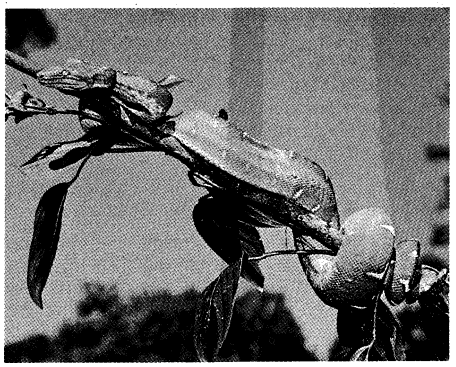
Bo Juyi (Chinese poet): *see* Po Chü-i.

Bo tree, also called BODHI TREE, according to Buddhist tradition, the pipal (*Ficus religiosa*) under which the Buddha sat when he attained Enlightenment (*bodhi*) at Buddh Gaya (near Gaya, Bihār state, India). In early Buddhist art the Bo tree was often used as an aniconic symbol of the Buddha. A living pipal at Anuradhapura, Ceylon (now Sri Lanka), is said to have grown from a cutting from the Bo tree sent to that city by King Aśoka in the 3rd century BC. *See also* Ficus.

Bo tree shrine worship, stone relief from Bhārhut, c. 2nd century BC; in the Indian Museum, Calcutta

Pramod Chandra

boa, any of about 60 species in more than a dozen genera of snakes comprising the subfamily Boinae of the family Boidae. Boas occur in both the Old and New World, chiefly in warm regions. They vary in length from about 20 centimetres (8 inches) to perhaps more than 7.6 metres (25 feet) and have stout bodies and rather short tails. Most are terrestrial or semiaquatic; some are arboreal. Most have disruptive patterns—blotches and diamonds—on their brown, green, or yellowish bodies. The young are born alive in the majority of the species, not in eggs. Boas bite their prey, then kill by constricting; a number have heat-sensitive lip pits for detecting warm-blooded prey. Folklore to the contrary, boas are not dangerous to man.



Emerald tree boa (*Boa canina*)

Tierbilder Okapia, Frankfurt am Main

The boa constrictor (*Boa constrictor*) occupies a variety of habitats from coastal northern Mexico and the Lesser Antilles to Argentina. (In popular usage any large snake of this kind is likely to be called a boa constrictor.) It is seldom more than 3.3 m (11 ft) long; the record is 5.55 m (18.2 ft).

Several boas are arboreal and long-toothed for catching birds. An example is the 1.8-m (6-ft) emerald tree boa (*Corallus caninus*) of tropical South America; the adult is green above, with white dorsal stripe and crossbars, and yellow below. The rainbow boa (*Epicrates cenchria*) of Costa Rica to Argentina is not strongly patterned but is markedly iridescent. The brown, 45-cm (18-in.) rubber boa (*Charina bottae*) of western North America is the most northerly boa and is a burrowing species that looks and feels rubbery. The 90-cm (35-in.) rosy boa (*Lichanura trivirgata*), ranging from southern California and Arizona into Mexico, usually is brown- or pink-striped.

The 10 species of sand boas (*Eryx*) of northern Africa to India and central Asia are burrowers in drylands. Often called wood snakes and separated as the subfamily Tropidophinae are the two species of *Trachyboa* of South America and more than 10 species of *Tropidophis,* chiefly of the West Indies. *See also* anaconda.

Boa Vista, town, capital of Roraima territory, northern Brazil, on the west bank of the Rio Branco, a tributary of the Rio Negro. Given city status in 1926, Boa Vista was made the capital when the territory was created in 1943. The city and its municipality are potentially rich but isolated. Diamonds, gold, bauxite, and cassiterite are mined in the area, which also derives income from forest and animal products. Manufactures include petroleum and alcohol fuels made from sug-

arcane and cassava, metallurgical products, and construction materials. A thermal electric plant serves the city, and an antenna was installed in 1975 for satellite telephone connections. Boa Vista is accessible by shallow-draft river vessels or by air; it is linked by road with the Caracaraí and Manaus river ports. Paved roads link Boa Vista, an important frontier military outpost, to the northeastern part of Roraima territory. The town has air service to Guyana. Pop. (1980 prelim.) 43,131.

Boa Vista Island, Portuguese ILHA DA BOA VISTA, easternmost island of Cape Verde, in the Atlantic Ocean, 300 mi (500 km) off the West African coast. It has an area of 239 sq mi (620 sq km) and rises to an altitude of 1,269 ft (387 m). The chief town is Sal Rei, on the northwest coast. Salt and archil (a plant yielding a violet dye) are produced. Pop. (1980 prelim.) 3,397.

Boabdil (sultan of Granada): *see* Muḥammad XI *under* Muḥammad (Spain: Granada).

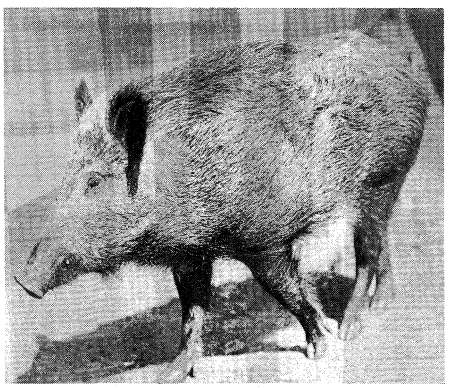
Boaco, department, central Nicaragua, bounded by the Río Grande de Matagalpa on the northeast and by Lake Nicaragua on the southwest; it lies almost entirely within the nation's central highlands. Despite the rugged relief, the 1,924-sq-mi (4,982-sq-km) department is important agriculturally, producing cattle, swine, hides and skins, dairy products, rice, corn (maize), and beans. The population is concentrated in highland valleys in the western third of the department, particularly in and around Boaco, the departmental capital. The department has no railroads, but Boaco city is connected to the Pan-American Highway. Pop. (1981 est.) 88,662.

Boaco, capital, Boaco department, central Nicaragua, situated on the western flanks of the central highlands. In addition to its administrative role, Boaco functions as the commercial and manufacturing centre for the agricultural and pastoral hinterland. Dairying and the processing of livestock products are the most important activities. Soap, bricks, mineral water, and Panama hats are also manufactured, and there is some sawmilling. Boaco is linked by road to Managua, the national capital. Pop. (1978 est.) mun., 22,279.

Boadicea (ancient British queen): *see* Boudicca.

boar, also called WILD BOAR, or WILD PIG, any of the wild pig species of the genus *Sus,* family Suidae; the term boar is also used to designate the male of the domestic pig, guinea pig, and various other mammals.

The European wild boar (*Sus scrofa*), largest of the wild pigs, is native to the forests of Eurasia and northern Africa and has been introduced into parts of the United States. It is bristly haired, grizzled, blackish or brown in colour, and stands up to 90 centimetres (35 inches) tall at the shoulder. Except for old males, which are solitary, wild boars live in groups. They are swift, nocturnal, omnivorous, and good swimmers. They have sharp tusks and, although normally unaggressive, can be dangerous.



European wild boar (*Sus scrofa*)
By courtesy of the New York Zoological Society

From earliest times, because of its great strength, speed, and ferocity, the wild boar has been one of the favourite beasts of the chase. In some parts of Europe and India it is still hunted with dogs, but the spear has mostly been replaced with the gun. The wild boar of India (*S. cristatus*) is slightly taller than *S. scrofa,* standing about 0.75 to 1 metre (30 to 40 inches) at the shoulder. It is found throughout India, Sri Lanka, and Burma, where the spear is used in hunting it.

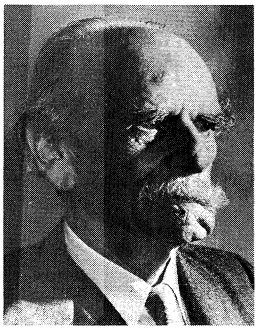
The boar is one of the four heraldic beasts of the chase and was the distinguishing mark of Richard III, king of England. As an article of food, the boar's head was long considered a special delicacy.

Board of Trade: *see* Trade, Board of.

boarfish, any of the fishes in the family Caproidae (order Zeiformes). They are characterized by red coloration and a laterally compressed body that is as high as it is long. All six species live in deep marine waters, occurring in the Atlantic, Pacific, and Indian oceans. The two genera, *Antigonia* and *Capros,* are placed in different subfamilies. A typical species, *A. rubescens,* reaches a length of about 18 centimetres (7 inches).

In addition to those of the Caproidae, some species in the marine family Pentacerotidae (order Perciformes) of the Indo-Pacific region may also be referred to as boarfish. The name also is applied, in Australia, to the family Histioptenidae.

Boas, Franz (b. July 9, 1858, Minden, Westphalia, Prussia—d. Dec. 22, 1942, New York City), German-born U.S. anthropologist of the early 20th century, founder of the relativistic, culture-centred anthropology that became dominant in the 20th century. During his tenure at Columbia University in New York City (1899–1942) he built up one of the foremost departments of anthropology in the United States. Boas was a specialist in the cultures and languages of North American Indians, but he was also the organizer of a profession and the great teacher of many scientists who developed anthropology in the United States.



Boas, 1941
AP/Wide World Photos

Life. Boas was the son of a merchant. He was of delicate health as a child and spent much of his time with books. His parents were free-thinking liberals who held to the ideals of the revolution of 1848. Although Jewish, he grew up feeling completely German. From the age of five he took an interest in the natural sciences—botany, geography, zoology, geology, and astronomy. While studying at the *Gymnasium* in Minden he became deeply interested in the history of culture, although this was not taught in the school. He followed his various intellectual bents at the universities of Heidelberg, Bonn, and Kiel, taking his Ph.D. in physics and geography at Kiel in 1881.

After a year's military service Boas continued his studies in Berlin, then undertook a year-long scientific expedition to Baffin Island in 1883–84. Firmly interested now in human cultures, he took posts in an ethnological museum in Berlin and on the faculty of geography at the University of Berlin.

On his way back from a study of the Indians of Vancouver Island in 1886, he stopped in New York and decided to stay. He found a position as an editor of the magazine *Science,* married Marie A.E. Krackowizer, and began his long academic career.

Boas' first teaching position was at the newly founded Clark University (Worcester, Mass.) in 1889. Next, he spent a period in Chicago, where he assisted in the preparation of the anthropological exhibitions at the 1893 Columbian Exposition and held a post at the Field Museum of Natural History. In 1896 he became lecturer in physical anthropology and in 1899 professor of anthropology at Columbia University. From 1896 to 1905 he was also curator of anthropology at the American Museum of Natural History in New York; in that capacity he directed and edited the reports submitted by the Jesup North Pacific Expedition, an investigation of the relationships between the aboriginal peoples of Siberia and of North America.

From his earliest years in America, Boas was an innovative and prodigiously productive scholar, contributing equally to statistical physical anthropology, descriptive and theoretical linguistics, and American Indian ethnology, including important studies of folklore and art. His personal research contributions alone would have given him an important place in the history of science, but he also exerted enormous influence as a teacher. By the turn of the century, national leadership in anthropology was firmly in Boas' hands. In 1906, at the age of 48, he was presented with the *Festschrift* usually awarded by his colleagues to a scholar nearing retirement. The 36 years that followed were no less productive, influential, or honoured. Boas established the *International Journal of American Linguistics,* was one of the founders of the American Anthropological Association, president (1931) of the American Association for the Advancement of Science, and a member of many other scientific societies.

In 1911 Boas published *The Mind of Primitive Man,* a series of lectures on culture and race. It was often referred to in the 1920s by those who were opposed to new U.S. immigration restrictions based on presumed racial differences. In the 1930s the Nazis in Germany burned the book and rescinded his Ph.D. degree, which Kiel University had in 1931 ceremonially reconfirmed. Boas updated and enlarged the book in 1937; the revision had an influence in the civil rights struggle that took place in the U.S. during the 1950s.

Influence. The revolutionary significance of Boas' work can only be understood in terms of the differing beliefs of anthropologists about man. Almost all anthropologists have almost always believed that the human species is one; but not as many of them believed in Boas' day that the races of mankind show equally the human capacity to develop cultural forms. It is partly because of Boas' influence that the proposition is now almost universally accepted that every surviving population large enough to have a distribution of individual differences shows equally the human capacity to develop cultural forms; and that differences in outcome are attributed by anthropologists to historic "cultural" rather than genetic factors.

Within this common framework there have sometimes been differences in view as to the actual attainments of particular peoples. Some anthropologists, often calling themselves "ev-

olutionary," argue that some peoples have achieved "higher" states of culture, leaving behind—at least temporarily—other peoples. They believe that the differences between "civilized" and "primitive" peoples are the result of environmental, cultural, and historical circumstances. Other anthropologists, frequently called cultural relativists, argue that the evolutionary view is ethnocentric, deriving from a human disposition to characterize groups other than one's own as inferior, and that all surviving human groups have evolved equally but in different ways.

Franz Boas was of the second persuasion. Since British and U.S. anthropologists in the last third of the 19th century were not particularly disposed to this view, Boas' success in making it overwhelmingly dominant was all the more remarkable. While he had originally assumed as a natural scientist that universal laws must exist that would explain how different peoples have wound up with their characteristic ways of life, he concluded that the problem was too complex for any general solution. Laws of cultural causation, he argued, had to be discovered rather than assumed.

Boas' view requires the anthropologist to be capable of understanding all factors that might influence the histories of peoples. Thus, to assert that cultural differences are not the result of biological differences, one must know something of biology; and to see the interrelations of man and his environment, the anthropologist must understand such things as migration, nutrition, child-raising customs, and disease, as well as the movements and interrelations of peoples and their cultures. Anthropology then becomes holistic and eclectic, involved in any field of science or scholarship that appears relevant to a particular problem.

(So.T.)

BIBLIOGRAPHY. Useful discussions of Boas, his life, and his work may be found in the following: George W. Stocking, *Race, Culture and Evolution* (1968); Walter R. Goldschmidt (ed.), *The Anthropology of Franz Boas: Essays on the Centennial of His Birth* (1959); June Helm (ed.), *Pioneers of American Anthropology: The Uses of Biography*, pp. 83–222 (1966); Melville J. Herskovits, *Franz Boas: The Science of Man in the Making* (1953); Abram Kardiner and Edward Preble, *They Studied Man*, pp. 134–159 (1961); Alexander Lesser in the *International Encyclopedia of the Social Sciences*, vol. 2 (1968); and *Dictionary of Scientific Biography*, vol. 2 (1970).

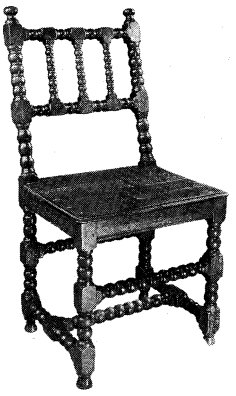
Bobadilla, Francisco de (d. June 1502, at sea near Hispaniola), Spanish soldier who arrested Christopher Columbus on Santo Domingo (the island of Hispaniola) after dissensions had arisen between Columbus and several of the Spanish adventurers who served under him.

Bobadilla was a noble who served the Spanish crown in the wars of reconquest against the Moors. He was thought to have been the knight commander of the Calatrava, a Spanish religious-military order of crusaders. In 1500 he was sent to Santo Domingo by Ferdinand and Isabella with the full powers of a royal commissioner and chief justice.

When Bobadilla landed and discovered that Columbus had hanged five Spaniards, he became so furious that he immediately ordered the arrest of Columbus' brother, Diego (in charge of the Spanish settlement in Columbus' absence), impounded Columbus' papers, and took possession of the town of Santo Domingo. Shortly thereafter, Columbus voluntarily gave himself up and was immediately placed in irons and sent back to Spain by Bobadilla.

Failing to restore order in Santo Domingo, Bobadilla was ordered back to Spain by the monarchs, while Columbus was given back all the honours and titles taken from him after his arrest. On the return voyage to Spain, a hurricane destroyed Bobadilla's fleet off the coast of Hispaniola, and all were lost.

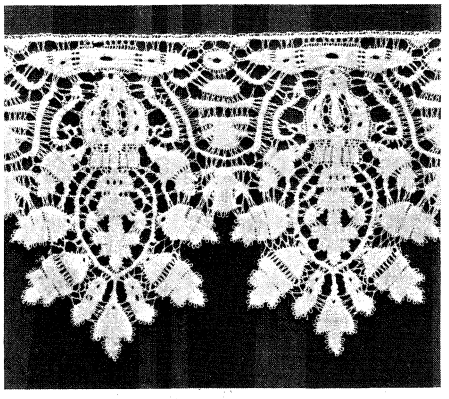
bobbin furniture, also called SPOOL FURNITURE, heavy furniture made in the late 17th century, whose legs and other parts were lathe-turned to ornamental shapes; also lighter, less boldly turned pieces made in 19th-century cottage style (*see* cottage furniture). Bobbin turning was a type of ornament consisting of a series of small knobs resembling spools, or bobbins, used on the legs and stretchers of chairs and tables, on the finials of the stiles (vertical posts) of chairbacks, and occasionally on the finials of the front arm supports.



Walnut bobbin chair, English, mid-17th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

bobbin lace, also called PILLOW LACE, or BONE LACE, with needle lace, one of two main kinds of lace. Bobbin lace is made with a number of threads, each fastened to an elongated spool (bobbin). A pattern is drawn on parchment or paper, and holes are pricked to indicate where pins will be placed to keep the threads in position while the lace is being made. The parchment is placed on a pillow or cushion, and the threads, with the bobbins hanging on them, are attached. The lace is worked with each hand holding a pair of bobbins, which are moved from side to side to form a twist, a braid, or a clothlike fabric called toile. The technique arose later than that of needle lace and derived from the practice of knotting fringes of material. The first bobbin lace probably originated in the early 16th century. The question of its place of origin—Italy or Flanders—has not been resolved, but most agree that it was probably developed in Flanders. The first weights were of lead, followed by other materials such as wood and bone (hence "bone lace"). Early bobbin lace consisted of rows of deep acute-angled points worked from a narrow band, and the patterns usually were similar to those of the needle laces. It was much used for ruffs and collars in the 16th and 17th centuries.



Bobbin lace from Flanders, first quarter of the 17th century; in the Museum Boymans-van Beuningen, Rotterdam

By courtesy of the Museum Boymans-van Beuningen, Rotterdam

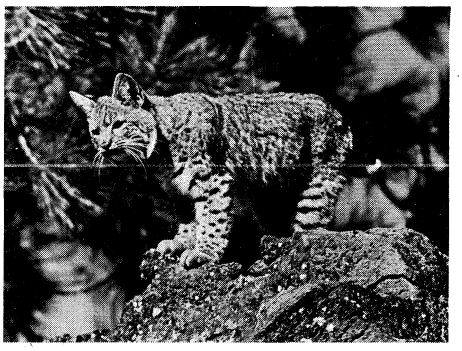
Bobbio, town, Piacenza province, Emilia-Romagna region, northern Italy, in the valley of the Trebbia River, southwest of Piacenza. The ancient Bobium, it became famous when the Irish missionary monk St. Columban (Colombano) founded a monastery there *c.* 612, after fleeing from what is now Switzerland. He died three years later, but the monastery flourished and became a centre of medieval culture and learning, especially renowned for its great library. The monastery declined in the 15th century, and the library, with its approximately 700 manuscripts from the 10th century, was subsequently dispersed, most of it going to the Vatican, Milan, and Turin. The monastery was suppressed in 1803 by the French, but its 15th- to 17th-century buildings survive, including the tomb of the saint, whose relics are preserved in the museum. During the medieval period the town was ruled by the Lombard kings and Frankish emperors. The bishopric was created in 1014. In 1176 the town fought against Emperor Frederick I Barbarossa at the Battle of Legnano, which ended his attempted invasion of northern Italy. In 1748 Bobbio became part of Savoy. Besides the abbey of S. Colombano, notable landmarks include the Romanesque and Baroque cathedral, the medieval Ponte Vecchio (Old Bridge) over the Trebbia, the 15th-century Casa di Teodolinda, the 14th-century Palazzo Malaspina, and the 17th-century church of Sta. Maria dell'Aiuto.

Bobbio is a commercial and tourist centre on a busy road between the Emilia plain and Genoa. Pop. (1981 prelim.) mun., 4,215.

bobcat, also called BAY LYNX, or WILDCAT (*Felis rufa*), bobtailed North American cat, family Felidae, found from southern Canada to southern Mexico. The bobcat is a close relative of the lynx and caracal, with which it was formerly classified in the genus *Lynx*.

A long-legged cat with large paws, a rather short body, and tufted ears, the bobcat is 60–100 centimetres (24–40 inches) long, excluding the 10–20-cm tail; stands 50–60 cm at the shoulder; and weighs 7–15 kilograms (15–33 pounds). Its fur, stiffer and less valuable than that of the lynx, is pale brown to reddish with black spots. The underparts are white; the tailtip is black above, white below.

Sometimes found in suburban areas, the bobcat is a nocturnal, generally solitary cat equally at home in forests and deserts; it is less inclined than the lynx to climb trees or swim. It feeds on rodents, rabbits, hares, and some birds. Breeding takes place in spring (sometimes a second time later in the year); a litter of one to six kittens is born after a gestation period of about 50 days. Economically, the bobcat is of some value as a fur bearer and is important in keeping the numbers of rodents and rabbits under control.



Bobcat (*Felis rufa*)

Joe Van Wormer—Photo Researchers

Bobo, people of Burkina Faso (formerly Upper Volta), who speak a language of the Gur branch of the Niger-Congo family.

The Bobo are a sedentary agricultural people growing such staples as millet and sorghum and a wide variety of other crops. Crop rotation and some irrigation are utilized, and small numbers of cattle and other animals are tended. Hunting, fishing, and the gathering of wild plants provide additional food.

The typical household contains an extended family that dwells in a rectangular house with mud walls, a beaten-earth roof, and, frequently, a defensive outer wall. Local lineages constitute clans that dominate a particular locality. There is a high incidence of polygyny, and the levirate (compulsory marriage of a widow to her dead husband's brother) and the sororate (compulsory marriage of a woman to her dead or barren sister's husband) are practiced. Social structure is otherwise relatively egalitarian, although slavery was once present and despised castes of smiths and leatherworkers persist. The Bobo are traditionally animist, although Islām and Christianity have claimed some converts.

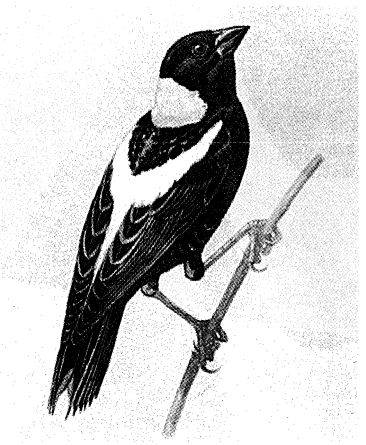
Bobo Dioulasso, city, southwestern Burkina Faso (formerly Upper Volta). Dating (according to tradition) from the 15th century, the city was engaged in continual conflict with Kong to the south, and in the 18th century it was occupied by the Kong prince Famara Wattara, who made it the capital of the surrounding region, Gwiriko. In the 19th century the Kong empire disbanded, Gwiriko was rent by revolts, and Bobo Dioulasso fell to French troops in 1897.

The country's second largest city and its chief trade and industrial centre, Bobo Dioulasso has bicycle assembly works, cigarette factories, cotton gins, and a variety of food-processing plants. The sale of ivory, bronze, and iron handicrafts as well as traditionally crafted jewelry is economically significant. Fruits and vegetables are sold in the large marketplace. Major roads radiate from the city, and it is a stop on the rail line between Abidjan (capital of the Côte d'Ivoire) and Ouagadougou, Burkina Faso's capital. Borgo International Airport is just to the west. Bobo Dioulasso is an Islāmic centre with a large clay mosque dramatically studded with wooden pikes. It has a college, the West African Centre for Economic and Social Studies, and it is the seat of government research institutes for geology and mines and for cotton and textiles. Pop. (1985 est.) 202,807.

Boboli Gardens, Italian GIARDINO DI BOBOLI, approximately 111 acres (45 hectares) of lavishly landscaped gardens behind the Pitti Palace, extending to modern Fort Belvedere, in Florence. Designed in a carefully structured and geometric Italian Renaissance style, the gardens were begun in 1550 by Niccolò di Raffaello de' Pericoli detto Tribolo, who had been commissioned by Eleanora de Toledo, wife of Cosimo I, to create a setting that would be appropriate for vast pageants and Medici court entertainments.

Lacking a natural water supply, the gardens relied on an elaborate system of water distribution, a special conduit being built to tap the river; this was further enlarged by Ferdinando I, Cosimo's son, and the garden waters are known as the Acqua Ferdinanda. The Boboli, preserved by the Italian monarchy and today a public park, displays statuary from various historical periods, and includes works by important Mannerist and Baroque sculptors. Among well-known features are the Artichoke Fountain, the Museum of Porcelain, a Rococo Kaffeehaus, and a much-copied, horseshoe-shaped amphitheatre with an Egyptian obelisk.

bobolink (*Dolichonyx oryzivorus*), American bird of the family Icteridae (order Passeriformes) that breeds in northern North America and winters chiefly in central South America. Migrating flocks may raid rice fields, and at one time the fat "ricebirds" were shot as a table delicacy. In the breeding season the 18-centimetre (7-inch) male bobolink—named for his bubbling song—has a black underside, yellow hindneck, white back and rump, and



Bobolink (*Dolichonyx oryzivorus*)
Painting by Richard Keane

white patches on the wings; in winter he resembles the brown female.

Bobone, Giacinto, also called GIACINTO BOBO-ORSINI: *see* Celestine III.

Bobriki (Russian S.F.S.R.): *see* Novomoskovsk.

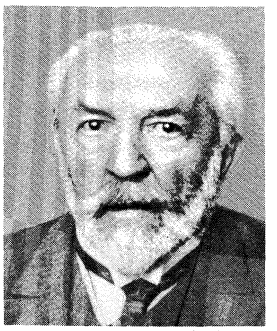
Bobrikov, Nikolay (Ivanovich) (b. Jan. 27 [Feb. 8, Old Style], 1839, Strelna, near St. Petersburg [Leningrad]—d. June 17 [June 4], 1904, Helsinki), ruthless ultranationalist Russian governor-general of Finland from 1898 until his assassination.

After a career in the Russian Army, which he left with the rank of general, Bobrikov was named governor-general of the grand duchy of Finland in 1898. Under his regime Finland experienced its first intense wave of Russification, including the forced introduction of Russian practices into many different areas of Finnish life, the abrogation of Finnish constitutional rights, and the abolition of the Finnish Army. Supported by Tsar Nicholas II, who granted him dictatorial powers in 1903, Bobrikov met the large-scale Finnish passive resistance campaign with arrests, banishments, press censorship, dismissal of officeholders, and personal close control of the Finnish government. He was assassinated by the son of a Finnish senator who also killed himself.

Bobruysk, also spelled BOBRUJSK, city, Mogilyov *oblast* (administrative region), Belorussian Soviet Socialist Republic, on the right bank of the Berezina River. Founded in the 16th century, it was held in turn by Lithuania, Poland, and Russia and was the scene of a major battle in World War II. The fortress of 1769 survives. Industries include engineering, machine building, chemicals, woodworking, and the manufacture of tires, clothing, and footwear. Pop. (1985 est.) 223,000.

Bobrzyński, Michał (b. Sept. 30, 1849, Kraków, Pol., Austrian Empire—d. July 3, 1935, Poznań, Pol.), Polish historian and Conservative politician who maintained that the weakening of the central government had been the main cause of the 18th-century partitions of Poland and, on that basis, inaugurated a reappraisal of Poland's history.

Professor of legal history at the University of Kraków (1877), Bobrzyński studied (1873–85) the social history of medieval Poland, published his politically influential *Dzieje Pol-*



Bobrzyński, *c.* 1920
By courtesy of the Panstwowe Wydawnictwo Naukowe, Warsaw

ski ("History of Poland") in 1879, and became the chief exponent of the "pessimistic" (or Kraków) school of Polish historiography, which sharply criticized Poland's former political and social institutions.

Entering politics in 1885, he served in the Galician Diet and in the Vienna Reichsrat (legislature). Galician viceroy (1908–13) and minister in Vienna (1917), he retired after 1918 but continued writing historical works and serving as a government adviser.

bobsledding, also called BOBSLEIGHING, the sport of sliding down an ice-covered natural or artificial incline on a four-runner sled, called a bobsled, bobsleigh, or bob, that carries either two or four persons.

Bobsledding originated as a sport distinct from tobogganing in Switzerland about 1890, and the first organized competition was held in 1898 on the Cresta Run at Sankt Moritz, Switz. In 1923 bobsledding became an internationally recognized sport with the organization of the Fédération Internationale de Bobsleigh et de Tobogganing (FIBT). The Fédération Internationale de Luge de Course (FIL), once a section of FIBT, split off from the parent organization in 1957. Bobsledding was included

A four-man bobsled rounding a steeply banked turn
Paul Almasy

in the first Olympic Winter Games at Chamonix, Fr., in 1924.

The bob run used in international competition is at least 1,500 m (1,640 yards) long with an average slope of between 8 percent and 15 percent. There are generally from 15 to 20 turns per course ranging in size up to huge hairpins of more than 180°. Most bob runs have permanent foundations of concrete or stone set into the earth. The foundation is covered with several inches of wet snow, which is then saturated with water and allowed to freeze. The straightaways have sidewalls of reinforced

ice about 46 centimetres (18 inches) high. The large turns are banked very steeply, built up as high as 6 metres (20 feet), and may have an overhanging lip of ice to prevent the fast-travelling bobsleds from flying out of the turn.

Early bobsleds were built mostly of wood. Steel runners were adopted within a few years, and, by the mid-20th century, steel and aluminum were used throughout. The four runners are generally mounted in pairs on two axles. Steering is accomplished by turning the front axle either with ropes or by a wheel linked to the axle by cables. The brake is a toothed bar that is pressed against the ice between the rear runners.

Racing bobsleds have a streamlined cowling in front of the driver to reduce wind resistance. Two types are used: two-man boblets, as they often are called in Europe, and four-man bobsleighs. Rules limit combined team-and-sled weights to 375 kilograms (827 pounds) and 630 kilograms, respectively. Other sled dimensions are also specified.

Since 1931, both two-man and four-man world-championship competitions have been held each year, except during World War II. A race consists of four descents by each team, the total time for the four heats determining the winner. Electrical timing equipment measures elapsed time to 1/100 of a second. A running start is used from a fixed position a few feet behind the start line. The heavier four-man sleds attain speeds approaching 160 kilometres (100 miles) per hour, while the smaller and lighter two-man sleds are only slightly slower.

The technique that a racing team must master involves pushing the sled at the start to attain maximum starting velocity and balancing its members' weight to prevent the sled from skidding. Members of many early teams used a technique of bobbing their bodies back and forth with a sudden snap (hence the name) to increase the speed of the sled. It is doubtful, however, whether bobbing accomplished this result, and it was discontinued as higher speeds were attained through improvements in sled design. The driver, who is the captain and most critical team member, must learn to sense the stability of the sled and to react quickly to prevent skids and to manoeuvre properly on the turns.

bobwhite, North American quail species. *See* quail.

Boca Raton, city, Palm Beach County, southeastern Florida, U.S., just north of Fort Lauderdale on the Atlantic coast. The Boca Raton Inlet and its lakes were once mariners' refuges, and *boca de ratones,* a Spanish nautical term meaning "mouse's mouth," appeared on early 16th-century maps and referred to hidden, sharp-pointed rocks that gnawed or fretted ships' cables. The town of Boca Raton was incorporated in 1925 after the architect Addison Mizner promoted a luxury resort centring on the Cloister Inn, a Spanish architectural extravaganza that the financier Clarence H. Geist turned into an exclusive club in 1928. Arthur Vining Davis, an aluminum magnate, purchased the property in 1956. As the Boca Raton Hotel and Club it prospered with the convention trade, and a resort–retirement community of expensive homes entwined with waterways developed around it. Boca Raton became a city in 1957.

Since 1960 there has been planned light industry. Florida Atlantic University (1961) occupies a former air base, and the conference grounds of Bibletown U.S.A. are nearby. The College of Boca Raton was founded as Marymount College in 1963. Pop. (1980) city, 49,505, metropolitan area (SMSA), 573,125.

bocage, in western France (*e.g.,* Bocage Normand, Bocage Vendéen), a well-timbered district in distinction to the *campagne,* a hedgeless tract of farmland characteristic of old, established areas of open-field agriculture. The fields of bocage country are small, irregular, and enclosed by hedges and groves of trees. There have been attempts to cut down the hedges and trees to promote agriculture, but the results were disappointing, serving only to confirm the traditional richness of the bocage in the raising of cattle for dairying and meat.

Bocage, Manuel Maria Barbosa du (b. Sept. 15, 1765, Setúbal, Port.—d. Dec. 21, 1805, Lisbon), Neoclassical Portuguese lyric poet who aspired to be a second Camões but who dissipated his energies in a stormy life.

The son of a lawyer, he left school at 14 to join the army, then transferred to the navy at 16. At the Royal Navy Academy in Lisbon, he devoted his time to love affairs, poetry, and bohemianism. In 1786 he was sent, like his hero Camões, to India and also like him was disillusioned by the Orient. He deserted to Macau, returning to Lisbon in 1790. He then joined the New Arcadia, a literary society with vaguely egalitarian and libertarian sympathies, but his satires on his fellow members resulted in his expulsion, and a long verse war ensued, engaging most of the poets of Lisbon.

In 1797 he was accused of propagating republicanism and atheism and was imprisoned. During his imprisonment he undertook translations of Virgil and Ovid. Translations provided him with a livelihood during the few years that he lived after his release. He also translated Tasso, Rousseau, Racine, and Voltaire. Bocage employed various verse forms, but he is at his best in the sonnet. Despite the Neoclassical framework of his poetry, his intensely personal accent, frequent violence of expression, and self-dramatizing obsession with fate and death anticipate Romanticism. His collected poems were published as *Rimas,* 3 vol. (1791, 1799, 1804).

Bocas del Dragón (Caribbean Sea): *see* Dragon's Mouths.

Bocas del Toro, province and town, western Panama, bounded by the Caribbean Sea to the northeast and by Costa Rica to the west. The 3,443-sq-mi (8,917-sq-km) territory descends from the Serranía de Tabasará to the coast and includes the Bocas del Toro archipelago. Most of the bananas exported from Panama between 1900 and the late 1930s were grown in Bocas del Toro. Since this crop was destroyed by disease, cacao, abacá (manila hemp), and rubber have become the chief exports. Major towns include Changuinola, Almirante, and Bocas del Toro, the capital, a small port in Colón Island in Almirante Bay that was founded by Negro immigrants in the early 19th century. Pop. (1980) town, 2,515; (1983 est.) province, 69,200.

Boccaccio, Giovanni (b. 1313, Paris—d. Dec. 21, 1375, Certaldo, Tuscany), Italian poet and scholar, best remembered as the author of the earthy tales in the *Decameron.* With Petrarch he laid the foundations for the Humanism of the Renaissance and raised vernacular literature to the level and status of the classics of antiquity.

Youth. The son of a Tuscan merchant, Boccaccio di Chellino (called Boccaccino), and a mother who was probably French, Giovanni Boccaccio passed his early childhood rather unhappily in Florence. His father had no sympathy for Boccaccio's literary inclinations and sent him, not later than 1328, to Naples to learn business, probably in an office of the Bardi, who dominated the court of Naples by means of their loans. In this milieu Boccaccio experienced the aristocracy of the commercial world as well as all that survived of the splendours of courtly chivalry and feudalism. He also studied canon law and mixed with the learned men of the court and the friends and admirers of Petrarch, through whom he came to know the work of Petrarch himself.

These years in Naples, moreover, were the years of Boccaccio's love for Fiammetta, whose person dominates all his literary activity up to the *Decameron,* in which there also appears a Fiammetta whose character somewhat resembles that of the Fiammetta of his earlier works. Attempts to use passages from Boccaccio's writings to identify Fiammetta with a supposedly historical Maria, natural daughter of King Robert and wife of a count of Aquino, are untrustworthy—the more so since there is no documentary proof that this Maria ever existed.

It was probably in 1340 that Boccaccio was recalled to Florence by his father, involved in the bankruptcy of the Bardi. The sheltered period of his life thus came to an end, and thenceforward there were to be only difficulties and occasional periods of poverty. From Naples, however, the young Boccaccio brought with him a store of literary work already completed, including the short poem "La caccia di Diana" ("Diana's Hunt"), the prose work *Il filocolo* (*c.* 1336) in five books, and "Il filostrato" (*c.* 1338), a short poem in ottava rima, telling the story of Troilus and the faithless Criseida. The themes of chivalry and love in these works had long been familiar in courtly circles and were already in favour also with the bourgeoisie and even with the lower classes. These early works had immediate effect outside Italy: Chaucer drew inspiration from "Il filostrato" for his own *Troilus and Criseyde* (as Shakespeare was later to do for *Troilus and Cressida*) and from Boccaccio's *Teseida* for his "Knight's Tale" in *The Canterbury Tales.*

Florentine years: The Decameron. The 10 or 12 years following Boccaccio's return to Florence are the period of his full maturity, culminating in the *Decameron.* From 1341 to 1345 he worked on *Il ninfale d'Ameto* ("Ameto's Story of the Nymphs"), in prose and terza rima; *L'amorosa visione* ("The Amorous Vision"; 1342–43), a mediocre allegorical poem of 50 short cantos in terza rima; the prose *Ele-*

Boccaccio, detail of a fresco by Andrea del Castagno; in the Cenacolo di Sant' Apollonia, Florence

Alinari—Mansell

gia di Madonna Fiammetta (1343–44); and the poem *Il ninfale fiesolano* (perhaps 1344–45), in ottava rima, on the love of the shepherd Africo for the nymph Mensola.

Boccaccio, meanwhile, was trying continually to put his financial affairs in order, though he never succeeded in doing so. Little is known, however, of the detail of his life in the period following his return to Florence. He was at Ravenna between 1345 and 1346, at Forlì in 1347, in Florence during the ravages of the Black Death in 1348, and in Florence again in 1349.

It was probably in the years 1348–53 that Boccaccio composed the *Decameron* in the form in which it is read today. In the broad sweep of its range and its alternately tragic and comic views of life, it is rightly regarded as his masterpiece. Stylistically, it is the most perfect example of Italian classical prose, and its influence on Renaissance literature throughout Europe was enormous.

The *Decameron* begins with the flight of 10 young people (7 women and 3 men) from plague-stricken Florence in 1348. They retire to a rich, well-watered countryside, where, in the course of a fortnight, each member of the party has a turn as king or queen over the others, deciding in detail how their day shall be spent and directing their leisurely walks, their outdoor conversations, their dances and songs, and, above all, their alternate storytelling. This storytelling occupies 10 days of the fortnight (the rest being set aside for personal adornment or for religious devotions); hence the title of the book itself, *Decameron,* or "Ten Days' Work." The stories thus amount to 100 in all. Each of the days, moreover, ends with a canzone (song) for dancing sung by one of the storytellers, and these canzoni include some of Boccaccio's finest lyric poetry.

The sombre tones of the opening passages of the book, in which the plague and the moral and social chaos that accompanies it are described in the grand manner, are in sharp contrast to the scintillating liveliness of Day I, which is spent almost entirely in witty disputation, and to the playful atmosphere of intrigue that characterizes the tales of adventure or deception related on Days II and III. With Day IV and its stories of unhappy love, the gloomy note returns; but Day V brings some relief, though it does not entirely dissipate the echo of solemnity, by giving happy endings to stories of love that does not at first run smoothly. Day VI reintroduces the gaiety of Day I and constitutes the overture to the great comic score, Days VII, VIII, and IX, which are given over to laughter, trickery, and license. Finally, in Day X, all the themes of the preceding days are brought to a high pitch, the impure made pure and the common made heroic. In these tales Boccaccio demonstrated that he was a master of the spoken word and of a swift, vivid, tense narrative free from the proliferation of ornament.

Although the whole corpus of Boccaccio's work is basically medieval in subject matter, form, and taste, at least in its point of departure, the spirit in which Boccaccio treats his subjects and his forms is new. Boccaccio in the *Decameron* for the first time deliberately shows man striving with fortune and learning to overcome it and even, when possible, to exploit it. This marked dualism of virtue and fortune lies at the root of the feeling and thought of the Renaissance. To be truly noble, according to the *Decameron,* man must accept life as it is, without bitterness, must accept, above all, the consequences of his own action, however contrary to his expectation or even tragic they may be. To realize his own earthly happiness, he must confine his desire to what is humanly possible and renounce the absolute without regret. Thus Boccaccio insists both on man's powers and on their inescapable limitations. A sense of spiritual realities and an affirmation of moral values underlying the frivolity even in the most licentious passages of the *Decameron* are features of Boccaccio's work that modern criticism has brought to light and that make it no longer possible to regard him only as an obscene mocker or sensual cynic.

During the years in which Boccaccio is believed to have written the *Decameron,* the Florentines appointed him ambassador to the lords of Romagna in 1350; municipal councillor and also ambassador to Louis, duke of Bavaria, in the Tirol in 1351; and ambassador to Pope Innocent VI in 1354.

Petrarch and Boccaccio's mature years. Of far more lasting importance than official honours was Boccaccio's first meeting with Petrarch, in Florence in 1350, which helped to bring about decisive change in Boccaccio's literary activity. After the *Decameron,* of which Petrarch remained in ignorance until the very last years of his life, Boccaccio wrote nothing in Italian except *Il Corbaccio* (a satire on a widow who had jilted him), his late writings on Dante, and perhaps an occasional lyric. Turning instead to Latin, he devoted himself to Humanist scholarship rather than to imaginative or poetic creation. His encyclopaedic *De genealogia deorum gentilium* ("On the Genealogy of the Gods of the Gentiles"), medieval in structure but Humanist in spirit, was probably begun in the very year of his meeting with Petrarch but was continuously corrected and revised until his death. His *Bucolicum carmen* (1351–66), a series of allegorical eclogues (short pastoral poems) on contemporary events, follows classical models on lines already indicated by Dante and Petrarch. His *De claris mulieribus* (1360–74), a collection of biographies of famous women, is the complement of Petrarch's *De viris illustribus* ("On Famous Men"), just as his *De casibus virorum illustrium* (1355–74; "On the Fates of Famous Men"), on the inevitable catastrophe awaiting all who are too fortunate, reflects Petrarch's *De remediis utriusque fortunae* ("On the Relief of Each Man's Lot"). Finally, there is his compilation of classical geographic names, *De montibus, silvis, fontibus, lacubus, fluminibus, stagnis seu paludibus, et de nominibus maris* (1355–74; "On Mountains, Forests, Springs, Lakes, Rivers, Swamps or Marshes, and on the Names of the Sea").

The meeting with Petrarch, however, was not the only cause of the change in Boccaccio's writing. A premature weakening of his physical powers and disappointments in love may also have contributed to it. Some such occurrence would explain how Boccaccio, having previously written always in praise of women and love, came suddenly to write the bitterly misogynistic *Corbaccio* and then turn his genius elsewhere. Furthermore, there are signs that he may have begun to feel religious scruples. Petrarch describes how the Carthusian monk Pietro Petrone, on his deathbed in 1362, sent another Carthusian, Gioacchino Ciani, to exhort Boccaccio to renounce his worldly studies; and it was Petrarch who then dissuaded Boccaccio from burning his own works and selling his library. As early as 1360, moreover, Boccaccio's way of life was regarded as austere enough to justify his being entrusted with a pastoral cure of souls in a cathedral. He had taken minor orders many years earlier, perhaps at first only in the hope of being given benefices.

Boccaccio's circle in Florence was of vital importance as a nucleus of early Humanism. Leonzio Pilato, whom Boccaccio housed from 1360 to 1362 and whose nomination as reader in Greek at the Studio (the old University of Florence) he procured, made the rough Latin translation through which Petrarch and Boccaccio became acquainted with Homer's poems—the starting point of Greek studies by the Humanists. The recovery of Latin classical texts—Varro, Martial, Apuleius, Seneca, Ovid, and, above all, Tacitus—likewise occupied Boccaccio's admiring attention. Even so, he did not neglect Italian poetry, his enthusiasm for his immediate predecessors, especially Dante, being one of the characteristics that distinguish him from Petrarch. His *Vita di Dante Alighieri* or *Trattatello in laude di Dante* ("Little Tractate in Praise of Dante") and the two abridged editions of it that he made show his devotion to Dante's memory.

Last years. All these studies were pursued in poverty, sometimes almost in destitution, and Boccaccio had to earn most of his income by transcribing his own works or those of others. In 1362, on the invitation of Niccolò Acciaiuoli, a Florentine banker and statesman who served as chief adviser to Joanna, queen of Naples, Boccaccio went to Naples in some hope but was disappointed and returned at once to Florence. Then, in 1363, he retired to Certaldo. He was twice sent as ambassador to Pope Urban V, at Avignon in 1365 and in Rome in 1367. In 1370–71 he paid another visit to Naples with no better success than in 1362. In October 1373 he began public readings of Dante's *Divina commedia* in the church of S. Stefano di Badia in Florence. A revised text of the commentary that he gave with these readings is still extant but breaks off in the 17th canto of the *Inferno,* at the point that he had reached when, early in 1374, ill health and the criticisms of those who disapproved of his explaining Dante to the multitude made him lose heart. Petrarch's death in July 1374 was another grief to him, and he retired again to Certaldo. There Boccaccio died the following year and was buried in the church of SS. Michele e Jacopo.

MAJOR WORKS. *In Italian.* "La caccia di Diana" (earliest known work), short poem in terza rima; *Il filocolo,* 5 bks. (*c.* 1336; *A Pleasaunt Disport of Diuers Noble Personages* by Henry Grantham, 1567; with introduction by Edward Hutton, 1927; modernized with introduction by Thomas Bell, 1931), prose; "Il filostrato" (*c.* 1338; Eng. trans. by W.M. Rossetti, 1873; by N.E. Griffin and A.B. Myrick, 1929; by R.K. Gordon, 1934), short poem in ottava rima; *Teseida* (*c.* 1340–41), epic of 12 cantos in ottava rima; *Il ninfale d' Ameto,* or *Commedia delle Ninfe fiorentine* (1341–42), prose and terza rima; *L'amorosa visione* (1342–43), allegorical poem of 50 short cantos in terza rima; *Elegia di Madonna Fiammetta,* or *Fiammetta amorosa* (1343–44; *Amorous Fiammetta* by Bartholomew Young, 1587; rev. by Edward Hutton, 1926; new ed. by K.H. Josling, 1929), prose; *Il ninfale fiesolano* (perhaps 1344–45; in *Two Tracts,* Cyril H. Wilkinson's edition of John Goubourne's Elizabethan version in prose of A. Guercin du Donno, 1946), poem in ottava rima; *Decameron* (probably 1348–53; Eng. trans. 1620; by J.M. Rigg, 1903 and 1960; by Richard Aldington, 1930 and 1958), poem and 100 prose stories, each ending with a canzone of poetry; *Il Corbaccio,* or *Laberinto d'amore* (1354–55), prose; *Vita di Dante Alighieri,* or *Trattatello in laude di Dante* (1354–55; *Life of Dante* by P.H. Wicksteed, 1898), prose; *Esposizioni sopra la Commedia di Dante* (1373, incomplete at death), prose; *Rime* (composed throughout life, critical and purified text pub. 1914), poems.

In Latin. De vita et moribus Francisci Petrarchae (1343–45), prose; *De genealogia deorum gentilium* (probably begun 1350, but continuously corrected and rev. until death; *Boccaccio on Poetry: Being the Preface and the Fourteenth and Fifteenth Books of Boccaccio's "Genealogia . . .,"* by Charles G. Osgood, 1930), prose, general proem, and 15 books; *Bucolicum carmen* (1351–66; *Boccaccio's Olympia* by Israel Gollancz, 1913), allegorical ecologues; *De casibus virorum illustrium,* 9 bks. (1355–74; *Fall of Princes* by John Lydgate from a French version, 1431–38; ed. by Henry Bergen, 1923–27), prose; *De claris mulieribus* (*c.* 1360–74; *Forty-six Lives Translated from Boccaccio's De claris mulieribus,* by Henry Parker, Lord Morley, and ed. by Herbert G. Wright, 1943; *Concerning Famous Women* by Guido A. Guarino,

1964), prose; *De montibus, silvis, fontibus, lacubus, fluminibus, stagnis seu paludibus, et de nominibus maris* (1355–74), prose.

Letters. Epistola consolatoria a messer Pino de' Rossi; Eristulae rerum familiarum; Le lettere edite e inedite di Messer Giovanni Boccaccio (1877).

BIBLIOGRAPHY. *Editions.* Modern editions of Boccaccio's minor works in Italian include: *L'ameto, lettere, il Corbaccio,* ed. by N. Bruscoli (1940); *Il Corbaccio,* ed. by Tauno Nurmeela (1968); *Elegia di Madonna Fiammetta, con le chiose inedite,* ed. by F. Ageno (1954); *Le rime* ed. by V. Branca (1958); *Il commento alla Divina Commedia e altri scritti intorno a Dante,* ed. by D. Guerri, 4 vol. (1918–26). *Tutte le opere,* ed. by V. Branca (1964–), an edition of the complete works. Selections from *Il filocolo,* the *Ameto,* and the *Elegia di Madonna Fiammetta* are included in the selections from the *Decameron* by E. Bianchi, C. Salinari, and N. Sapegno, 6th ed. (1952). Of Boccaccio's Latin works *Bucolicum carmen* and some poems and letters, as well as some shorter poems, are printed in *Opere latine minori,* ed. by A.F. Massera (1928); there is an edition of the *Genealogia deorum gentilium libri* by V. Romano, 2 vol. (1951). There are editions of the *Decameron* by G. Petronio, with full commentary (1950); by V. Branca, with full commentary (1951–52); by C.S. Singleton (1955); by N. Sapegno (1956); and by M. Marti (1958).

Life. A. Della Torre, *La giovinezza di G. Boccaccio (1313–1341)* (1905); E. Hutton, *G. Boccaccio: A Biographical Study* (1910); F. Torraca, *Per la biografia di G. Boccaccio* (1912); H. Hauvette, *Boccace, étude biographique et littéraire* (1914); S. Battaglia, "Elementi autobiografici nell'arte del Boccaccio," *La Cultura,* vol. 9 (1930); G. Billanovich, *Restauri boccacceschi* (1945); F. MacManus, *Boccaccio* (1947); V. Branca, *Boccaccio medievale* (1956).

Studies. For general surveys of Boccaccio's work, see N. Sapegno, *Il trecento,* new ed. (1952), with full bibliography; C. Grabher, *Giovanni Boccaccio* (1941); J. Luchaire, *Boccace* (1951). On the *Decameron* see U. Foscolo, *Saggi e discorsi critici,* ed. by C. Foligno (1953); F. de Sanctis, *Storia della letteratura italiana,* ed. by B. Croce (1939); U. Bosco, *Il Decameron* (1929); B. Croce, *Poesia popolare e poesia d'arte* (1933); G. Petronio, *Il Decamerone: saggio critico* (1935); F. Neri, *Storia e poesia* (1944); G. Getto, *Vita di forme e forme di vita nel Decameron* (1958). See also E.H. Wilkens, "An Introductory Boccaccio Bibliography," *Philological Quarterly* (1927). On Boccaccio's language and style, see G.R. Silber, *The Influence of Dante and Petrarch on Certain of Boccaccio's Lyrics* (1940); A. Schiaffini, *Tradizione e poesia nella prosa d'arte italiana della latinità medievale a Giovanni Boccaccio,* new ed. (1943); E.G. Parodi, *Lingua e letteratura,* ed. by G. Folena (1957). On the development and history of criticism, see G. Petronio, "Giovanni Boccaccio," in *I classici italiani nella storia della critica,* ed. by W. Binni (1954).

Boccalini, Traiano (b. 1556, Loreto, Papal States—d. Nov. 29, 1613, Venice), prose satirist and anti-Spanish political writer, influential in the Europe of his time for a widely circulated satire, *Ragguagli di Parnaso* ("Reports from Parnassus").

Boccalini, son of an architect, was educated for the law and spent many years in Rome in the papal service (1584–1612), becoming acquainted with many eminent men of his day. After 1612 he lived in Venice, probably occupied with diplomatic activities.

Boccalini's political experience is mirrored particularly in *Ragguagli di Parnaso,* a light and fantastic satire on the actions and writings of his contemporaries, written in the form of 201 ironical newsletters in which the wise men of all centuries, presided over by Apollo, discuss art, literature, and politics. Another series appeared in *Pietra del paragone politico* (posthumously published, 1614), a vigorous denunciation of the Spanish domination of Europe. Henry Carey, 2nd earl of Monmouth, translated both works into English as *Advertisements from Parnassus in two centuries with the Politicke Touchstone* (1656). This and other European translations influenced Cervantes, Addison, and Swift.

A weightier work was *Commentarii sopra Cornelio Tacito* ("Comments upon Cornelius Tacitus"), a discussion of politics and government, offering Machiavellian advice to princes.

Consult the INDEX *first*

Boccanegra FAMILY, wealthy Genoese family that played an important role in two great "popular" (democratic) revolutions, one in 1257 and the other in 1339, and furnished several admirals to the Genoese republic and to Spain.

Guglielmo Boccanegra became virtual dictator in 1257, when an insurrection against the government of the old aristocracy made him captain of the people. The major accomplishment of his administration was the conclusion with the Byzantine emperor Michael VIII Palaeologus of the Treaty of Nymphaeum in 1261, an offensive–defensive alliance that opened up the Black Sea and the empire to Genoese commerce. Later the same year Guglielmo's brother Marino, commanding a Genoese fleet, helped the Byzantines to recover Constantinople from Venice. In 1262 Genoese nobles overthrew Guglielmo; his brother Lanfranco was killed in the insurrection, and Guglielmo was condemned to perpetual exile. The command of the fleet was taken from Marino and divided among the noble families. The lack of unified command caused disaffection with Constantinople, which retaliated by nullifying many of the advantages won by the Treaty of Nymphaeum.

In 1339 another popular revolution resulted in the election of Simone Boccanegra, descendant of Guglielmo's brother Lanfranco, as the first Genoese doge. Deposed in 1344, Simone fled with his family to Pisa, returning to office in 1356 with the aid of the Visconti, the rulers of Milan. According to tradition, he was poisoned at a banquet in 1363. An opera by Giuseppe Verdi, *Simon Boccanegra,* is based on his story.

Simone's brother Egidio, grand admiral in the service of Alfonso XI of Castile, inflicted a memorable defeat on a Moroccan fleet off Algeciras in 1344. He was succeeded by his son Ambrogio, who in 1371 won two naval victories, one against the Portuguese at the mouth of the Tagus and the other against an English fleet three times more numerous at the Battle of La Rochelle, in which the English admiral, the Earl of Pembroke, was taken prisoner.

Boccasini, Niccolò (pope): *see* Benedict XI.

Boccherini, Luigi (Rodolfo) (b. Feb. 19, 1743, Lucca, Italy—d. May 28, 1805, Madrid), Italian composer and cellist who influenced the development of the string quartet as a musical form and composed the first music for a quintet for strings, as well as a quintet with strings and piano. His approximately 500 works also include sacred music, symphonies, and concerti.

Early life. Luigi Rodolfo, the third child of a double-bass player, Leopoldo Boccherini, and Maria Santa Prosperi, was at an early age put under the care of the musical director of the local cathedral. When he reached the age of 13, there was nothing more he could learn there; consequently, he was sent to Rome to study with the renowned cellist Giovanni Battista Costanzi, musical director at St. Peter's. In Rome he was influenced by the polyphonic tradition—*i.e.,* music with two or more interweaving melodic parts—stemming from the works of Giovanni da Palestrina and the instrumental music of Arcangelo Corelli. At the vespers in Rome's churches, he was attracted by those symphonies that ended with a minuet—the dance that he later loved to idealize rather than stylize.

In 1757 Boccherini and his father were invited to play in the Imperial Theatre orchestra in Vienna; there young Boccherini had the chance to absorb the musical classicism, dominated by the personality of Christoph Willibald Gluck, which was rising in the Austrian capital. On his second journey to Vienna (1760), Boccherini, at 17, made his debut as a composer with his *Six Trios for Two Violins and Cello,* G. 77–82 (Opus 1 in Boccherini's autograph catalog), which were appreciated by the renowned Gluck. During his third stay in that city (1764), a public concert by Boccherini was enthusiastically received.

In spite of his success, Boccherini grew homesick for Lucca, to which he returned (August 1764), having obtained a permanent position with the local church and theatre orchestras there. As a composer, he took part in the religious celebrations in the church of Sta. Croce and other festivities. Around 1765 he composed various oratorios at Lucca. Boccherini was also in Lombardy in 1765, in the orchestra of Giovanni Battista Sammartini. Through his association with this Milanese composer, the 22-year-old Boccherini strengthened the new "conversational" style of the quartet: the cello's line was now as important as the counterpoint (*i.e.,* the intertwining of independent melodic lines) of the violin and viola. Boccherini had a chance to put into practice this conquest with an extraordinary string quartet made up of outstanding Tuscan virtuosi.

Boccherini, 1790

By courtesy of the Istituto Musicale Boccherini, Lucca

After his father's death (1766), he decided to leave Lucca for good. His destination, agreed upon with the violinist Manfredi, one of the Tuscan virtuosi, was Paris—a happy choice since France welcomed Italian musicians. The French publishers Grangé, Venier, and Chevardière published Boccherini's compositions of the previous years (*Six String Quartets,* G. 159–164 [Boccherini's Opus 2], and *Six Duets for Two Violins,* G. 56–61 [Boccherini's Opus 3], of 1761) and the new ones (*Six Trios for Two Violins and Cello,* G. 83–88 [Boccherini's Opus 4], and *Symphony in D Major,* G. 500, of 1766 and *c.* 1766?), and musical Paris competed for the young man from Lucca. From his contact with Mme Brillon de Jouy, the harpsichord player, were born the wonderful *Six Sonatas for Harpsichord and Violin,* G. 25–30 (Boccherini's Opus 5). Boccherini's style spread throughout Europe, and his *Cello Concerto No. 6 in D Major,* G. 479 (*c.* 1768?),

became the model for Mozart's *Violin Concerto in D Major,* K. 218 (1775).

Later life. Such vital contact and enthusiasm were interrupted when the Spanish ambassador to Paris persuaded Boccherini to move to Madrid. Attracted by this hopeful and flattering offer, he began his long segregation at the intrigue-ridden court of Charles III. The King's brother, Infante Don Luis, conferred on him a yearly endowment of 30,000 reals as a cellist and composer and wanted to keep Boccherini with him even when, after a marriage that met with opposition, he was forced to renounce the throne and retire to the Las Arenas castle, several miles from Madrid. Far away from the intrigues of the scornful prince of Asturias (afterward Charles IV) and from jealous court musicians, Boccherini worked in tranquillity and also performed in a quartet formed by members of the aristocracy. During this period he wrote his well-known *Six String Quartets,* G. 177–182 (Boccherini's Opus 15, Opus 11 in some editions, composed 1772).

Madrid became Boccherini's second home. There he married Clementina Pelicho, who bore him five children. At the Infante's death (1785), the King granted him a pension of 12,000 reals. He received another pension from Frederick William II of Prussia, who was an amateur cellist. Boccherini had a long, friendly relationship with Frederick and dedicated to him a symphony and dozens of trios, quartets, and quintets. Lastly, the Duchess of Osuna appointed him conductor of her private orchestra at the Puerta de la Vega Palace in Madrid. To his prodigious instrumental production, Boccherini added vocal compositions: the *Stabat Mater,* G. 532 (1781), the zarzuela (a form of comic opera) *La Clementina,* G. 540 (composed 1786), with libretto by Ramon de la Cruz, and the Christmas *Villancicos,* G. 539 (1783). Though faithful to traditional classical musical forms, Boccherini was also receptive to Spanish popular music. He became, in fact, the musical representative of the "Goya epoch," the age of the great Spanish painter Francisco Goya (1746–1828), who was one of Boccherini's friends.

Having lost his first wife, Boccherini married Joaquina Porreti (1787). From 1787 to 1797 he was probably in Berlin, at a post provided by Frederick William II, but historical evidence for his stay there is lacking. In 1798 the new king of Prussia withdrew Boccherini's pension, the Duchess of Osuna moved to Paris, and Boccherini's financial stress was aggravated by poor health. His trusting nature was shaken by the greed of the Parisian publisher Pleyel, and his life was saddened by the death of his second wife and two daughters during an epidemic. After he lived for some years in straitened circumstances, his situation was improved briefly by the patronage of Lucien Bonaparte, who had been appointed in 1800 as ambassador of the French Republic in Madrid. After 1801 he fell into greater poverty, and in 1804 he was forced to live in one room with his three surviving children. His last complete work, the *String Quartet No. 90 in F Major,* G. 248, was composed that year. Shortly thereafter he died and was buried in the church of San Justo in Madrid. In 1927 Boccherini's remains were moved to the church of S. Francesco in Lucca.

In 1969 the French scholar Yves Gérard published his *Thematic, Bibliographical, and Critical Catalogue of the Works of Luigi Boccherini.* Numbers preceded by "G." are the numbers assigned by Gérard according to type of composition, not chronological order.

Both forceful and gentle, Boccherini's power of musical expression dissolved the previous generation's musical formalism into beauty and gracefulness. The Spanish theoretician Antonio Eximeno called him "the delight of Europe." Although Boccherini's work has frequently been compared to that of Joseph Haydn, his music often lacks his contemporary's characteristic forward drive and virility. Gentle warmth, often with a hint of melancholy, and superlative elegance are perhaps the qualities that best distinguish Boccherini's music. (Gu.B.)

MAJOR WORKS. *Opera. La Clementina,* G. 540 (composed 1786).

Orchestral music. 20 symphonies; 4 cello concerti.

Chamber music. 125 string quintets; 12 quintets for piano and strings; 18 quintets for flute or oboe and strings; 102 string quartets; 60 string trios; 27 violin sonatas; 6 cello sonatas.

Church music. Stabat Mater, G. 532, for three voices and strings (first version completed 1781, second version 1800); mass sections for four voices and instruments; *Christmas Cantata,* G. 535 (Boccherini's Opus 63, composed 1802); various motets.

BIBLIOGRAPHY. G. de Rothschild, *Luigi Boccherini* (1962; Eng. trans. 1965), a biography incorporating much new information: L. Picquot, *Notice sur la vie et les ouvrages de Luigi Boccherini* (1851; new ed. 1930); A. Bonaventura, *Boccherini* (1931), a standard biography in Italian; Y. Gérard, *Thematic, Bibliographical, and Critical Catalogue of the Works of Luigi Boccherini* (1969), with 580 compositions.

Bocchus I (fl. late 2nd and early 1st centuries BC), king of Mauretania from *c.* 118 to 91 BC and father-in-law of Jugurtha, king of Numidia, directly to the east of Mauretania. At the beginning of the war between Jugurtha and the Romans (111–105), Bocchus attempted unsuccessfully to make a treaty with Rome. In 106 the Mauretanian king entered the conflict to provide half-hearted assistance to Jugurtha. But, after suffering heavy losses, Bocchus was persuaded by the Roman officer Lucius Cornelius Sulla to betray his ally. He helped the Romans to capture Jugurtha and was rewarded for his treachery with some Numidian territory. Thereafter Bocchus remained a loyal dependent of Rome and a supporter of Sulla (dictator of Rome in 82–81).

Bocchus II (fl. 1st century BC), king of the eastern half of Mauretania in North Africa from 49 to *c.* 38 BC, when he became ruler of all Mauretania. At the time Bocchus succeeded to power, he ruled that part of Mauretania east of the Mulucha River (Moulouya River in northeastern Morocco), while his brother, Bogud, controlled western Mauretania. Both kings backed the Roman general Julius Caesar in his struggle against the supporters of Gnaeus Pompeius (Pompey the Great) in Africa (49–45), and, on Caesar's victory over Pompey at Thapsus (on the coast of modern Tunisia) in 46, Bocchus was given control of much of Numidia. After Caesar had been assassinated in 44, the two Mauretanian rulers took opposite sides in the split that developed in the Caesarian forces. Bogud supported Mark Antony, while Bocchus stood by Octavian (later the emperor Augustus). About 38, Bocchus seized Bogud's territory while Bogud was campaigning in Spain and forced him to flee to Antony in the East. Bocchus then became sole ruler of Mauretania.

boccie, also spelled BOCCI, or BOCCE, Italian bowling game, especially popular in Piedmont and Liguria, also played in Italian communities in the United States, Australia, and South America. The governing organization is the Unione Federazione Italiane Bocce. The first world championships were held at Genoa, Italy, in 1951.

The boccie court, or *campo,* is about 75 feet long and 8 feet wide (23 by 2.4 metres), with a level surface of sand or clay, enclosed with boarded ends and sides about 18 inches (45 centimetres) and 12 inches high, respectively. Each player or team in turn rolls or tosses four wooden, metal, or composition balls, called *bocce,* each 4–5 inches in diameter, toward a smaller ball, called the *boccino,* or *pallino.* The object, as in the game of lawn bowls, is to bring the ball to rest nearer the *pallino* than an opponent's ball, to protect a well-placed ball, or to knock aside an opponent's ball. Rebounds from the side walls are permitted. At the end of a round, a side receives a point for every ball nearer the *pallino* than the nearest opposing ball. The game usually proceeds until one side has 12 points.

Boccioni, Umberto (b. Oct. 19, 1882, Reggio di Calabria, Italy—d. Aug. 16, 1916, Verona), sculptor, painter, and important theorist of the Futurist movement in art. He was trained from 1898 to 1902 in the studio of the painter Giacomo Balla, where he learned to paint in the manner of the Pointillists, late 19th-century painters who attempted to depict light according to scientific laws. In 1907 he settled in Milan and gradually came under the influence of the poet Filippo Marinetti, who launched the literary movement Futurism (*q.v.*) that glorified the coming dynamic age of modern technology. Boccioni adapted Marinetti's ideas to the visual arts and became the leading theoretician of Futurist art. In 1910 he and other painters drew up and published the "Technical Manifesto of the Futurist Painters," promoting the representation of the symbols of modern technology—violence, power, and speed.

Boccioni's first major Futurist painting, "Riot in the Gallery" (1909; Emilio Jesi Collection,

"Self-portrait," painting on canvas by Umberto Boccioni, 1908; in the Pinacoteca di Brera, Milan

By courtesy of the Pinacoteca di Brera, Milano, Italy

Milan), remained close to Pointillism and showed an affiliation with Futurism mainly in its violent subject matter and dynamic composition. "The City Rises" (1910–11; Museum of Modern Art, New York City), however, is an exemplary Futurist painting, achieving perhaps the first effective realization of the Futurist ideal—the representation of dynamism, motion, speed, and the new technology of the machine.

In 1912 Boccioni framed the "Manifesto of Futurist Sculpture," advocating the use in sculpture of such materials as glass, wood, cement, cloth, and electric lights. He also urged that electric motors be used to move parts of sculptures and that environments be created for sculptures to unify the aesthetic object with its surroundings. In practice, however, Boccioni's sculpture was much more traditional than his theories. Only "Development of a Bottle in Space" (1912; Museum of Modern Art, New York City) successfully creates a sculptural environment. His most famous sculpture, "Unique Forms of Continuity in Space" (1913; Museum of Modern Art, New York City), is virtually a relief. Boccioni's career was cut short when he was killed in an accident in World War I.

Bôcher, Maxime (b. Aug. 28, 1867, Boston—d. Sept. 12, 1918, Cambridge, Mass., U.S.), American mathematician and educator whose teachings and writings influenced many mathematical researchers.

Bôcher graduated from Harvard University in 1888 and received his doctorate from the University of Göttingen in 1891. Within months of acquiring his Ph.D., Bôcher was asked to join the faculty at Harvard as an instructor in mathematics; this association lasted until his death. He became an assistant professor in 1894 and, 10 years later, professor. By combining teaching with his research in differential equations, series, and higher algebra, he developed a considerable reputation. Bôcher published nearly a hundred papers and reviews, of which his work on algebra, published in 1907, provided new insights. His Harvard seminars were fully attended and served as a seminal training ground for many who went on to become mathematical leaders in teaching and research.

Bochner, Salomon (b. Aug. 20, 1899, Kraków, Austria-Hungary—d. May 2, 1982, Houston, Texas, U.S.), Galician-born American mathematician and educator responsible for the development of the Bochner theorem of positive-definite functions and the Bochner integral.

He graduated from the University of Berlin, receiving his Ph.D. from that institution in 1921. After lecturing for several years at the University of Munich, where he wrote his first book on Fourier integrals, Bochner received an invitation in 1933 to join the faculty at Princeton University as an assistant professor. Bochner immediately applied for U.S. citizenship, which was granted him in 1938. In 1946 he became a full professor and taught at Princeton until 1968, when he left to become professor of mathematics at Rice University. Bochner is the author of *Several Complex Variables* (1948); *Fourier Transforms* (1949); *Harmonic Analysis and the Theory of Probability* (1956); *Fourier Integrals* (1959), which contains the theorem on positive-definite functions; and *The Role of Mathematics in the Rise of Science* (1966).

Bocholt, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, on the Aa, a stream near the Dutch border, just north of Wesel. Chartered in 1222 by the bishop of Münster, Bocholt derives its name from Buchenholz, the "beech wood" of its surroundings. Historic buildings include the Gothic Church of St. George (1415–86), the Dutch Renaissance town hall (1618–21, restored 1928–34), and the nearby castles of Anholt and Gemen. A centre of the textile industry, it also has iron foundries and machine works. Annexations during the 1970s enlarged the city by more than a third. Pop. (1984 est.) 65,600.

Bochum, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, in the heart of the industrial Ruhr district. Chartered in 1298 and 1321, it passed to the duchy of Cleves (Kleve) in 1461 and to Brandenburg in 1609. A small agricultural town until the development of its iron, coal, and steel industries in the mid-19th century, it is now a commercial and cultural centre for the Ruhr. Its Propsteikirche (1599) is the only historic building intact after the destruction of the city centre in World War II. In the suburbs, however, the 13th-century Blankenstein Castle and an 11th-century church at Bochum-Stiepel still stand.

Bochum is the seat of Ruhr University (1965) and has an institute for satellite and space research, a planetarium (1964), and a college of administration, industry, and foreign trade. The city presents a modern appearance with new schools, housing estates, sports facilities, and a theatre (1953); it supports a municipal orchestra and a zoo. In 1975 Wattenscheid, a neighbouring city, was united with Bochum and serves, to some extent, as a dormitory suburb for the surrounding industrial complexes of Gelsenkirchen and Essen.

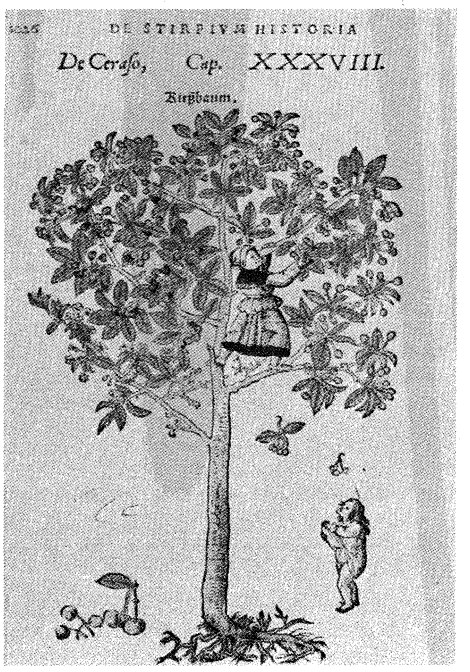
Until the late 1950s, mining was the city's economic mainstay; its importance is shown by the mining college, geological and mining museums, the mining research institute, and the headquarters building of the miners' trade union, insurance, and cooperative organizations. The closure of the last mine in 1973 marked a new pattern in Bochum's economy. New industries have grown, particularly car factories. Metallurgy and allied industries are important; chemicals, textiles, beer, tobacco products, and electrical items are also manufactured. Pop. (1984 est.) 387,100.

Bock, Fedor von (b. Dec. 3, 1880, Küstrin, near Berlin—d. May 1945, Lensahn, Holstein, Ger.), German army officer and field marshal (from 1940), who participated in the German occupation of Austria and the invasions of Poland, France, and Russia.

Educated at the Potsdam military school, Bock was assigned to an infantry guards regiment in 1897 and advanced to a captaincy by 1914. Emerging from World War I as a major, he became commander of the III Army group in 1920 and remained in that post until 1938, when Hitler made him commander of the I Army group. During the invasion of Belgium and France in May and June 1940 he commanded the lower Somme army group. He was one of the 12 German generals whom Hitler created field marshals of the Reich on July 19, 1940.

In 1941 Bock took command of the central German armies in the Russian campaign. He dealt the Russians some of their severest defeats in the early part of the campaign, notably at Bialystok and Minsk and also, later, at Smolensk and Vyazma. He unleashed six separate major offensives against Moscow in the fall of 1941 but failed to take the city. Then Bock began his series of "orderly retreats" and "defensive actions." He was later shifted to the southern front and led the columns that bludgeoned their way to Stalingrad in the big German summer offensive of 1942. He was relieved of his command when he complained of the strategic impracticality of operating massive German offensives simultaneously against Stalingrad and in the Caucasus. Bock was killed along with his wife and daughter in an air raid.

Bock, Hieronymus (Tragus) (b. 1498, Heidersbach, Ger.—d. Feb. 21, 1554, Hornbach), German priest, physician, and botanist who helped lead the transition from the philological scholasticism of medieval botany to the modern science based on observation and description from nature.



Cherry tree (*Prunus avium*), woodcut by David Kandel from *De stirpium historia* (1552), Latin translation of *New Kreuterbuch* by Hieronymus Bock

By courtesy of the Lindley Library of the Royal Horticultural Society, London; photograph, The Cooper-Bridgeman Library, London

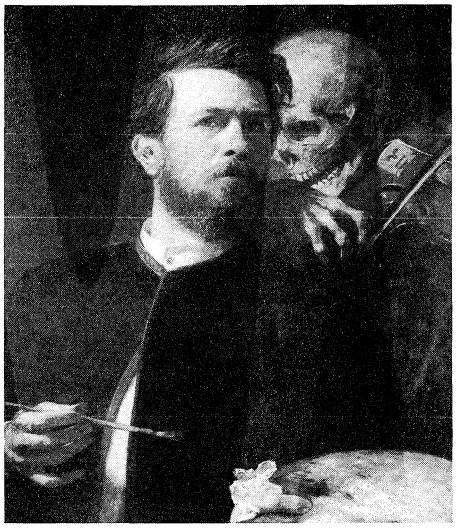
Little is known of Bock's life and career. He worked from 1523 to 1533 in Zweibrücken and then accepted a canonry in Hornbach. He became a follower of Martin Luther and was forced to leave Hornbach in 1550. He then served briefly as personal physician to the Duke of Nassau, returning to Hornbach in 1551.

Bock's major work, the *New Kreuterbuch* (1539), broke from the past by providing detailed descriptions and (in the 1546 edition) careful illustrations of approximately 700 plants, which he classified on the basis of structural similarity.

Böcklin, Arnold (b. Oct. 16, 1827, Basel, Switz.—d. Jan. 16, 1901, Fiesole, Italy), painter whose moody landscapes and sinister allegories greatly influenced late 19th-century German artists and presaged the symbolism of the 20th-century Metaphysical and Surrealistic artists. Although he studied and worked throughout much of northern Europe, he found his real inspiration in the landscape of Italy, where he returned from time to time and where the last years of his life were spent.

Böcklin first won a reputation with the large mural "Pan in the Bulrushes" (*c.* 1857; Neue Pinakothek, Munich), which brought him the patronage of the King of Bavaria. From 1858 to 1861, he taught at the Weimar Kunstschule, but his nostalgia for the Italian landscape pursued him. After an interval during which he completed his mythological frescoes for the decoration of the Öffentliche Kunstsammlung, Basel, he settled in Italy and only occasionally returned to Germany, and then to experiment with flying machines. During his last two decades, Böcklin's work became increasingly subjective, often showing fabulous creatures or being based on dark allegorical themes, as in "Island of the Dead" (1880; Metropolitan Museum of Art, New York City), which provided the inspiration for the symphonic poem

The Isle of the Dead by the Russian composer Sergey Rachmaninoff. Such spectral scenes as



"Self-Portrait with Death as a Fiddler," oil on canvas by Arnold Böcklin, 1872; in the Nationalgalerie, Berlin

By courtesy of the Staatliche Museen Preussischer Kulturbesitz, Nationalgalerie, Berlin; photograph, Walter Steinkopf

his "Odysseus and Calypso" (1883) and "The Pest" (1898; both in the Öffentliche Kunstsammlung, Basel), among his final works, reveal the morbid symbolism that anticipated the so-called Freudian imagery of much 20th-century art.

Bocskay, István, German STEPHAN BOCSKAY (b. 1557, Kolozsvár, Transylvania—d. Dec. 29, 1606, Kassa, Slovakia), prince of

Bocskay, engraving

Interfoto MTI, Hungary

Transylvania, who defended Hungarian interests when Hungary was divided into Ottoman and Habsburg spheres of influence.

Brought up at the court of the Báthorys, Bocskay won the confidence of Sigismund Báthory, prince of Transylvania, whom he advised to form an alliance with the Holy Roman emperor (who was also the Habsburg king of Hungary) instead of with the Ottoman sultan. When in 1599 Báthory's successors deprived Bocskay of his estates, he fled to Vienna to seek protection and redress. He was alienated, however, by the emperor Rudolf II's attempts to deprive royal Hungary of its constitution and the Hungarian Protestants of their religious liberties. Bocskay, a devout Protestant, therefore sought Turkish aid and helped the Turkish armies in driving the Habsburg forces out of Transylvania. As a reward the Hungarian Diet elected him prince of Transylvania in 1605, and he was recognized as such by the sultan Ahmed I, who sent him a magnificent jeweled crown made in Persia.

Although Bocskay refused to assume the title of king, he made skillful use of the Turkish alliance. Rudolf, faced with the possible loss of Hungary and strongly urged by his brother the archduke Matthias, entered into negotiations with Bocskay and ultimately made peace with him by the Peace of Vienna (June 23, 1606). This treaty restored and guaranteed all constitutional and religious rights and privileges of the Hungarians in Transylvania and in royal Hungary. Bocskay was recognized as the prince of Transylvania, and the right of the Transylvanians to elect their own princes was affirmed. Soon afterward he concluded with the Turks the Treaty of Zsitvatorok, which confirmed the provisions of the Peace of Vienna. Bocskay's sudden death in 1606 was attributed to poison given him by his chancellor, Mihály Kátay, who was killed in the market-place of Kassa (Košice in Slovakia) by the enraged followers of Bocskay.

Bocuse, Paul (b. Feb. 11, 1926, Collonges-au-Mont-d'Or, Fr.), French chef and restaurateur known for introducing and championing a lighter style of cooking.

Scion of a long line of restaurateurs, Bocuse apprenticed under several prominent chefs before taking over the family's failing hotel-restaurant in Collonges in 1959. Before long he had attracted much attention with his innovative *nouvelle cuisine,* a style of cooking that emphasized lightly cooked vegetables, sparing use of dressings and sauces made from materials low in fats, and artfully simple presentation. Bocuse's abandonment of many conventions of traditional *grande cuisine* won many followers among younger chefs, and *nouvelle cuisine* soon appeared in many variants, especially in France and the United States. Bocuse's own restaurant was rated three stars by the influential *Guide Michelin.*

Among his books were *La Cuisine du marché* (1976; "The Cuisine of the Market"; Eng. trans. *Paul Bocuse's French Cooking,* 1977) and *La Journée du cuisinier* (1980; "The Day of a Chef").

BOD (biology): *see* biochemical oxygen demand.

Bodawpaya (b. 1740/41—d. 1819, Amarapura, Burma), king of Burma, sixth monarch of the Alaungpaya, or Konbaung, dynasty, in whose reign (1782–1819) the long conflict began with the British. A son of Alaungpaya (reigned 1752–60), the founder of the dynasty, Bodawpaya came to power after deposing and executing his grandnephew Maung Maung.

In 1784 Bodawpaya invaded Arakan, the maritime kingdom west of Lower Burma, captured its king, Thamada, and deported more than 20,000 people into Burma as slaves. When Arakan was made a Burmese province in 1785, the borders of Burma and British India were contiguous for the first time. The King's success in Arakan led him to invade Siam in 1785, but his army was defeated.

Bodawpaya's rule in Arakan was so oppressive that the people revolted in 1794. When the King sent an army to crush the revolt, thousands of refugees fled to British territory, with Burmese troops crossing the border in pursuit of the rebel leaders. Conditions on the border became so unsettled that in 1795 the British sent a representative to Amarapura, the Burmese capital, to negotiate with Bodawpaya. The disturbances continued, however, and Bodawpaya's campaigns in Assam added to the tension. Open conflict was narrowly avoided.

Bodawpaya was a fervent Buddhist who proclaimed himself *Arimittya* (*i.e.,* noble *maitreya*), the messianic Buddha destined to conquer the world. He persecuted heterodox sects; made drinking, smoking opium, and killing animals punishable by death; and built many pagodas. His most ambitious project was the Mingun pagoda, which, if completed, would have been 500 feet high. During his reign, he made a major economic survey of the entire kingdom (1784).

Bode, Boyd H(enry) (b. Oct. 4, 1873, Ridott, Ill., U.S.—d. March 29, 1953, Gainesville, Fla.), U.S. educational philosopher noted for his pragmatic approach.

He was raised in farm communities in Iowa and South Dakota and educated at the University of Michigan in Ann Arbor (A.B. 1897) and at Cornell University, Ithaca, N.Y. (Ph.D. 1900). He taught philosophy at the University of Wisconsin in Madison (1900–09) and the University of Illinois in Urbana-Champaign (1909–21).

In 1921 Bode became professor of education at Ohio State University in Columbus, where he remained until 1945. During that time he also taught occasionally at the Graduate Institute for Education in Cairo and other institutions. In 1946 he accepted the position of graduate lecturer in philosophy at the University of Florida, and he conducted weekly seminars at his Gainesville home until shortly before his death at the age of 79.

Bode's pragmatic approach to educational philosophy resembled that of John Dewey. He wrote several books—*An Outline of Logic* (1910), *Fundamentals of Education* (1921), *Modern Educational Theories* (1927), *Conflicting Psychologies of Learning* (1929), *Democracy as a Way of Life* (1937), *Progressive Education at the Crossroads* (1938), and *How We Learn* (1940)—explaining his ideas. On Nov. 10, 1947, Bode was awarded the Kilpatrick Medal by Teachers College, Columbia University, for distinguished work in the philosophy of education. Ohio State University honoured him posthumously by creating the Bode Memorial Lecture series.

Bode, Johann Elert (b. Jan. 19, 1747, Hamburg—d. Nov. 23, 1826, Berlin), German astronomer best known for his popularization of Bode's law, or the Titius–Bode rule, an empirical mathematical expression for the relative mean distances between the Sun and its planets. Bode was director (1786–1825) of the Berlin Observatory. Among his publications was *Uranographia* (1801), a collection of 20 star maps with a catalog of 17,240 stars and nebulae.

Bode, Wilhelm von (b. Dec. 10, 1845, Calvörde, Prussian Saxony—d. March 1, 1929, Berlin), art critic and museum director who helped bring Berlin's museums to a position of worldwide eminence.

Having studied art, Bode became an assistant at the Berlin Museum in 1872. In 1906 he was named general director of all the royal Prussian museums, a post he held until his retirement in 1920. He wrote books and essays on the decorative arts as well as on his particular specialties—Rembrandt, 17th-century Dutch and Flemish painting, and Italian Renaissance sculpture. He greatly influenced the U.S. collectors Morgan, Frick, and Widener. His memoirs, *Mein Leben,* appeared in 1930.

Bodel, Jehan, Jehan also spelled JEAN (b. *c.* 1167, Arras, Artois—d. 1210, Arras), jongleur, epic poet, author of fabliaux, and dramatist, whose *Jeu de Saint Nicolas* ("Play of St. Nicholas") is the first miracle play in French.

Bodel probably held public office in Arras and certainly belonged to one of its *puys,* or literary confraternities. He planned to go on the Fourth Crusade but, stricken with leprosy, was admitted to a lazar house, where he died. He wrote five *pastourelles* (four in 1190–94; one in 1199), nine fabliaux (1190–97), *La Chanson des Saisnes* (before 1200; "Song of the Saxons"), the *Jeu de Saint Nicolas* (performed 1200), and *Les Congés* (1202; "Leave-Takings"), his poignant farewell to his friends, a lyrical poem of 42 stanzas, each addressed to one person.

The *Jeu de Saint Nicolas* treats a theme presented in Latin, notably by Hilarius (flour-

ished 1125), giving it new form and dimensions by relating it to the Crusades. In Bodel's play the saint's image, to which the sole survivor of a Christian army is found praying, becomes the agent of a miracle. When placed upon the Saracen king's treasure it does not prevent its removal by thieves, who interrupt their dicing, drinking, and brawling (in tavern scenes given local colour by their portrayal of the people and manners of Arras) to carry it away. The saint himself appears, however, and compels them to return the image, and as a result the King and his people are converted.

In its crusading fervour, piety, and satirical wit, Bodel's *Jeu* is outstanding. It is also of importance because of the introduction of comic scenes based on contemporary life and for being possibly the first of the Latin college plays to be translated into vernacular verse. *La Chanson des Saisnes*, a successful late epic, adds *roman d'aventure* episodes to a historical narrative of Charlemagne's Saxon Wars.

Bodenheim, Maxwell, original name MAXWELL BODENHEIMER (b. May 26, 1893, Hermanville, Miss., U.S.—d. Feb. 6, 1954, New York City), poet who contributed to the development of the Modernist movement in U.S. poetry but is best remembered for his long career as a personality in literary bohemia.

Largely self-educated, Bodenheim appeared in Chicago around 1913, during the period of the Chicago Renaissance. He wrote plays with Ben Hecht and helped him edit the short-lived *Chicago Literary Times* (1923–24). Later they fell out, conducting a much-publicized feud and featuring each other as characters in their novels: Bodenheim appears as a character in Hecht's *Count Bruga* (1926), and Hecht appears in Bodenheim's *Ninth Avenue* (1926).

Bodenheim's poems were first published in *Poetry* magazine in 1914, and his first collection was *Minna and Myself* (1918). Several other volumes of poetry followed, his *Selected Poems, 1914–44* appearing in 1946. He employed many of the striking visual techniques of the Imagists and the new freedom of subject matter for which Naturalism had paved the way.

Bodenheim settled in New York's Greenwich Village in the latter part of the 1920s. Novels as well as poems appeared regularly during that decade and the next, but increasing dissipation curtailed his output after World War II. He had been reduced to peddling his poems in bars when he and his third wife were found murdered by a former mental patient in their sleazy lodgings. Ben Hecht helped with the funeral expenses and portrayed Bodenheim with affection in his play *Winkelberg* (1958). Bodenheim's unfinished autobiography, *My Life and Loves in Greenwich Village,* appeared in 1954, shortly after his death. Among the better of his largely forgotten novels are *Blackguard* (1923), *Crazy Man* (1924), *Georgie May* (1927), *Sixty Seconds* (1929), and *Naked on Roller Skates* (1930). Jack B. Moore's *Maxwell Bodenheim* (1970) is a critical biography.

Bodensee (Europe): *see* Constance, Lake.

Bodenstedt, Friedrich Martin von (b. April 22, 1819, Peine, Hanover—d. April 18, 1892, Wiesbaden, Ger.), German writer, translator, and critic whose poetry had great popularity during his lifetime.

As a young man Bodenstedt obtained an appointment as head of a school in Tiflis (now Tbilisi, Georgian S.S.R.), where he made a study of Persian literature. His *Lieder des Mirza Schaffy* (1851; *The Songs of Mirza Schaffy,* 1880), a collection of poems written in an Oriental style, was instantly successful. In 1854 he became professor of Slavic languages at the University of Munich. During this period he made numerous translations from Russian authors, notably Pushkin, Turgenev, and Lermontov. He relinquished his post (1858) to take up a professorship in early English literature and from that time devoted his attention primarily to Shakespeare. He collaborated with others in a translation of Shakespeare's works (1866–72), and he himself translated the sonnets. In 1866 he was made director of the court theatre at Meiningen. Among his other works are *Tausend und ein Tag im Orient* (1850; "One Thousand and One Days in the Orient"), *Shakespeares Zeitgenossen und ihre Werke* (1858–60; "Shakespeare's Contemporaries and Their Work"), and translations from Ḥāfiẓ Ibrāhīm and Omar Khayyam.

Bodenstedt, engraving, 1876, after a portrait by C. Kolb
Archiv fur Kunst und Geschichte, West Berlin

Bodenstein von Karlstadt, Andreas Rudolf: *see* Karlstadt, Andreas Rudolf Bodenstein von.

Bode's law, also called TITIUS-BODE LAW, empirical rule giving the approximate distances of planets from the Sun. It was first announced in 1766 by the German astronomer Johann Daniel Titius and only popularized, from 1772, by his fellow countryman Johann Elert Bode. The rule may be given as follows: Write down the sequence 0, 3, 6, 12, 24, etc. To each number add 4. Divide each result by 10. Of the first seven answers (0.4, 0.7, 1.0, 1.6, 2.8, 5.2, 10.0), six closely approximate the distances from the Sun, in astronomical units (a.u.; the distance between the Earth and the Sun), of the six planets known when Titius devised the rule: Mercury, Venus, Earth, Mars, Jupiter, and Saturn. At about 2.8 a.u. from the Sun, between Mars and Jupiter, the asteroids (sometimes called minor planets) were later discovered. The rule also holds for the seventh planet, Uranus, which lies at about 19 a.u. Bode's law fails for the eighth planet, Neptune. However, Pluto, the ninth planet from the Sun, is at a distance (39 a.u.) roughly equal to that given by the rule for the eighth planet.

Bodh Gayā (India): *see* Buddh Gayā.

bodhi (Sanskrit and Pāli: "awakening," "enlightenment"), in Buddhism, the final Enlightenment, which puts an end to the cycle of transmigration and leads to Nirvāṇa, or spiritual release; the experience is comparable to the Satori (*q.v.*) of Zen Buddhism in Japan. The accomplishment of this "awakening" transformed Siddhārtha Gautama into a Buddha (an Awakened One).

The final Enlightenment remains the ultimate ideal of all Buddhists, to be attained by ridding oneself of false beliefs and the hindrance of passions. This is achieved by following the course of spiritual discipline known as the Eightfold Path (*q.v.*). Mahāyāna Buddhism, while embracing this ideal, places a high valuation on the compassion of the *bodhisattva* (one whose essence is *bodhi*), who postpones his own entrance into Nirvāṇa in order to work for the salvation of all sentient beings.

bodhi tree (Buddhism): *see* Bo tree.

Bodhidharma, Chinese (Wade–Giles romanization) TA-MO, Japanese DARUMA (fl. 6th century AD), Indian monk who is credited with the establishment of the Ch'an (Japanese: Zen) sect of Buddhism.

A native of Conjeeveram, near Madras, Bodhidharma in 520 travelled to Kuang (modern Canton), China. He was granted an interview with the Liang emperor Wu Ti, noted for his good works. To the Emperor's dismay, he stated that merit applying to salvation could not be accumulated through good deeds. Soon afterward he went to a monastery in Lo-yang, China, where he is said to have spent nine years looking at a cave wall, a legend that some scholars believe refers simply to a lengthy period of deep meditation.

Considered the 28th Indian patriarch in a direct line from Gautama Buddha, Bodhidharma is regarded by the Ch'an as their first patriarch. Because he taught meditation as a return to the Buddha's spiritual precepts, his school was known as the Dhyana (meditation) sect. The word was converted in the Chinese to Ch'an and in the Japanese to Zen.

The accounts of his life are largely legendary. According to one such story, he cut off his eyelids in a fit of anger after falling asleep in meditation. On falling to the ground his eyelids grew up as the first tea plant. The legend serves as a traditional basis for the drinking of tea by Zen monks in order to keep wake during meditation.

bodhisattva (Sanskrit), Pāli BODHISATTA ("one whose essence is *bodhi* [enlightenment]"), in Buddhism, the historical Buddha, Gautama, prior to his Enlightenment; also, other individuals who are destined to become Buddhas in this or in another life.

In Mahāyāna Buddhism the decision of the *bodhisattva* to postpone his own final entrance into Nirvāṇa in order to alleviate the suffering of others is given special valuation. The ideal of the *bodhisattva* supplants the earlier, Theravāda goal of the *arhat,* or disciple, who perfects himself by following the Buddha's teachings, and of the *pratyeka-buddha,* or self-enlightened Buddha, both of whom are criticized by Mahāyāna as concerned solely with their own personal salvation. The *bodhisattva* concept elevates the virtue of compassion (*karuṇā*) to equality with wisdom (*prajñā*). The *bodhisattva* exercises his compassion by transferring his own merit (*puñña*) to his devotees.

Once the *bodhisattva* declares his intention, he enters the first of 10 spiritual stages (*bhūmi*) and henceforward is reborn only in the world of men or of gods. The aspirant *bodhisattva* must be a male but (according to Japanese schools) may live the life of a householder and need not be a monk.

Just as the number of Buddhas in the world is theoretically limitless, so also the number of possible *bodhisattva*s is infinite. The title has been frequently applied to great scholars and teachers and, in Southeast Asia, was a conventional title honouring Buddhist kings.

The celestial *bodhisattva*s, who are considered to be manifestations of the eternal Buddhas, are, however, the great saviour figures who—particularly in East Asia—often eclipse the historical Buddha in the personal devotion they inspire. Foremost among the celestial *bodhisattva*s is the compassionate and merciful Avalokiteśvara, who is associated with the eternal Buddha, Amitābha. In China the most widely worshipped *bodhisattva*s are Mañjuśrī (representing wisdom), Kṣitigarbha (the saviour of the dead), Samantabhadra (representing happiness), and Avalokiteśvara (known in China as Kuan-yin). In Tibet, Avalokiteśvara, Mañjuśrī, and Vajrapāṇi (who holds the thunderbolt) form a popular trinity.

Maitreya, represented both as a future Buddha and as a *bodhisattva,* is the only *bodhisattva* honoured by Theravādins (followers of the Way of the Elders and continuers of the early Hīnayāna teaching) as well as by Mahāyānists.

Bodin, Jean (b. 1530, Angers, Fr.—d. June 1596, Laon), French political philosopher best known for his theory of ideal government, under which a democratic monarchy balanced king and parliament, with absolute legislative authority based on divine right and limited only by natural law.

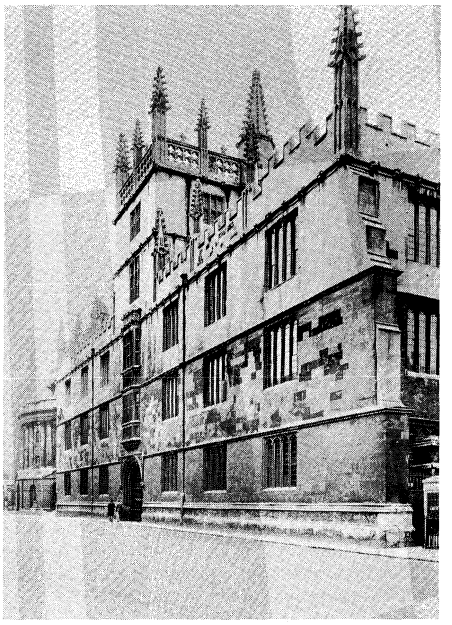
At the age of 15 or 16 he was received into the Carmelite house at Angers, and three years later he was sent to the house of his order in Paris to complete his education. In 1551, however, he was dispensed from his vows—the circumstances are a matter of conjecture—and went to the University of Toulouse to study civil law. There he remained, as student or teacher, until 1561. That year he abandoned the teaching of law for its practice and returned to Paris as *avocat du roi,* just as the civil wars between Roman Catholics and Huguenots were starting. In 1571 he entered the household of the King's brother, François, duc d'Alençon, as master of requests and councillor and was there brought into contact with persons in the inner circle of the administration and diplomatic service. He himself appeared only once on the public scene, and that was as deputy of the third estate for Vermandois at the Estates General of Blois in 1576. His disinterested conduct on that occasion lost him royal favour. He opposed the projected resumption of war on the Huguenots in favour of negotiation with them; he also opposed the suggested alienation of royal domains as damaging to the monarchy; and he defended the right of the third estate to dissent from the recommendations of the two privileged orders. When, therefore, the Duc d'Alençon died in 1583, Bodin retired to Laon as *procurateur* to the presidial court. He remained there until his death 13 years later, from the plague. His principal writing,

Bodin, engraving, 16th century
By courtesy of the Bibliotheque Nationale, Paris

Six Livres de la République (1576; *The six bookes of a Commonweale,* 1606), influenced the 17th-century English philosopher Thomas Hobbes. In his book, Bodin's political model emphasized a civic order founded on obedience to a sovereign ruler correctly informed of the citizens' needs. Government's decisions were to be respected fundamentally to avoid anarchy such as that experienced in the 16th-century wars of religion between Roman Catholics and Protestant Huguenots.

Bodin's other writings include a critical examination of history to determine the universal principles of law (1566) and a comparative study of religions that found them to be essentially an ethical norm for human behaviour and to be commonly grounded in the Decalogue (Ten Commandments).

Bodleian Library, library of Oxford University and one of the oldest and most important non-lending reference libraries in Great Britain. A legal deposit library entitled to free copies of all books printed in England, the Bodleian is particularly rich in Oriental manuscripts and collections of English literature, local history, and early printing. A library was established at the University of Oxford by Thomas de Cobham (died 1327), but it was not completely secured by the university until 1410. Then Humphrey, duke of Gloucester, endowed the institution with books and money for a room between 1411 and 1447. Completed in 1450, the room is still in existence.



The Bodleian Library, Oxford, 1613–36
Crown Copyright, Royal Commission on Historical Monuments

With the impoverishment of the university, the development of printing, and the growth of college libraries, the university library declined in importance; and in 1550, Edward VI's commissioners withdrew what books were left. Soon after, the shelves were also dismantled. About 50 years later the library was restored by Sir Thomas Bodley (a collector of medieval manuscripts) and reopened in 1602. Bodley added new buildings, surrounding university buildings were taken over, and additions were made at various times up to the 19th century. A new building, connected with the old buildings by an underground way and designed by Sir Giles Gilbert Scott, was opened in 1946.

By agreement with the Stationers' Company in 1610 and later by the Press Licencing Act of 1662, the Bodleian has been entitled to receive a free copy of all books printed in England. The library built up a collection of more than 4,200,000 printed volumes and 50,000 manuscripts. The Bodleian Library includes the Old Library, the Radcliffe Camera, the New Library, and four dependent libraries.

Bodmer, Johann Georg (b. Dec. 6, 1786, Zürich—d. May 30, 1864, Zürich), Swiss mechanic and prolific inventor of machine tools and textile-making machinery.

Information on Bodmer's life is scanty, but it is known that he lived in Switzerland, England, France, and Austria. Because many of his ideas were in advance of their time, his manufacturing ventures were not always successful. In 1803, at St. Blaise in the Black Forest, he established a small firearms factory, employing a special series of machines to make interchangeable parts.

Bodmer later made three visits to England, the first in 1816, when he visited ironworks, engineering shops, and textile mills. In 1824 he established a small factory at Bolton, Lancashire, to manufacture machinery that made the process from carding to spinning wool continuous. Though this machinery was widely adopted in England and later in the U.S. and is said to have revolutionized the industry, its inventor does not appear to have profited, for that venture also failed, and he returned for a time to the Continent.

In 1833 he set up a machine shop in Manchester, equipped with machine tools he had designed and constructed for himself. Between 1839 and 1841 he patented more than 40 specialized machine tools that he then set up in an ingenious factory-type arrangement to produce parts from iron and steel. One of the most important was a machine to make gears; it could cut teeth of predetermined pitch, form, and depth in a metal blank. Bodmer also patented various steam-engine devices and is credited with inventing the cylinder with opposed pistons.

Bodmer, Johann Jakob (b. July 19, 1698, Greifensee, Switz.—d. Jan. 2, 1783, near Zürich), Swiss historian, professor, and critical writer, who contributed to the development of an original German literature in Switzerland.

Professor of Helvetian history in Zürich from 1725 until 1775 and from 1737 a member of the Grosser Rat (cantonal legislature), Bodmer published (1721–23), in conjunction with others, *Die Diskurse der Mahlern,* a weekly journal after the model of *The Spectator.* His most important writings are the treatises *Von dem Einfluss und Gebrauche der Einbildungskraft*

Bodmer, engraving by H. Pfenninger after a portrait by F. Tischbein
Archiv fur Kunst und Geschichte, West Berlin

(1727), *Von dem Wunderbaren in der Poesie* (1740), and *Kritische Betrachtungen über die poetischen Gemälde der Dichter* (1741). Bodmer was also engaged in studies of Shakespeare, Tasso, Dante, and Cervantes; translated Homer (in hexameters); rediscovered the importance of medieval German poetry (*Minnesang, Nibelungenlied, Parzival*); espoused the causes of Montesquieu and Rousseau; and thus played a part in European literature as a precursor of Johann Gottfried von Herder. In his own country he was an influential national educator. As a poet he was unsuccessful.

Bodmin, parish (town), North Cornwall district, county of Cornwall, England. The county town (seat) shares its administrative functions—the most important of which is the holding of the judicial proceedings known as the assizes and quarter sessions—with the neighbouring town of Truro. The town lies on the edge of Bodmin Moor, a barren heathland covering an area of 80 sq mi (207 sq km). Bodmin has grown around the main road to Land's End. Trade in tin, which was mined locally from Roman times, led to Bodmin's medieval development as a "coinage," with the privilege of taxing tin bars. Most of the town is built of local stone. The Perpendicular-style church is named after St. Petroc, a Celtic missionary of the 6th century. Pop. (1981 prelim.) 12,148.

Bodo, group of peoples speaking Tibeto-Burman languages in the northeastern Indian

states of Assam and Meghalaya and in Bangladesh. Their western tribes include the Cūtiyā, Plains Kachārī, Rābhā, Gāro, Mech, Koch, Dhimāl, and Jaijong; the eastern tribes include the Dimasa (or Hill Kachārī), Galong (or Gallong), Hojai, Lalung, Tippera, and Moran. The number of speakers of Bodo languages in India was estimated at about 1,200,000 in the 1970s.

The Bodo tribes are not culturally uniform. The social system of some, such as the Gāro, is matrilineal (descent traced through the maternal line), while other tribes are patrilineal. Several of the Bodo tribes were so influenced by Hindu social and religious concepts that in modern times they have regarded themselves as Hindu castes. Thus the Koch (*q.v.*), who call themselves Rājbanśī (Of Royal Blood), lay claim to the high Hindu status of Kṣatriya; their claim is not generally admitted, however, and many of the subdivisions of the Koch rank very low in the caste hierarchy. The Rājbanśī are mainly agricultural, but some of them are carpenters, blacksmiths, and traders.

The Kachārī tribe is divided into clans named after aspects of nature (*e.g.*, heaven, earth, rivers, animals, and plants). Descent and succession to property are in the male line. They have a tribal religion, with an extensive pantheon of village and household gods. Marriage is usually arranged by the parents and involves the payment of a bride price. Such institutions as the community house for bachelors and many features of their religion link them with the Nāga and other hill tribes of Assam, but the growing influence of Hindu ideas and customs works toward assimilation into the caste society of the Assam plains.

Among the Gāro the village headman is usually the husband of the heiress, the senior woman of the landowning lineage. He transmits his headman's office to his sister's son, who marries the headman's daughter (the next heiress). The lineages of the male headmen and the female heiresses are thus in perpetual alliance. Political title and land title are both transmitted matrilineally, one through one lineage, the other through the other. There are a dozen subtribes, with varying customs and dialects, but all are divided into matrilineal clans. Marriages involve members of different clans. Polygamy is practiced. A man must marry his wife's father's widow, who is in such cases the husband's father's sister, actual or classificatory. Such a wife takes precedence over her daughter, to whom the husband is already married. A man's sister's son, called his *nokrom,* stands therefore in intimate relationship to him, as the husband of one of his daughters and ultimately of his widow and the vehicle through which his family's interest in the property of his wife is secured for the next generation, for no male can inherit property.

Bodø, town, port, and seat of Nordland *fylke* (county), north central Norway. Located at the end of a peninsula projecting into the Norwegian Sea, at the northern entrance to Saltfjorden, Bodø was founded by Trondheim merchants and chartered in 1816. A commercial fishing centre specializing in cod drying, it also has ship repair yards and a brewery. In World War II much of the town was destroyed by German air and ground action, but it has been completely rebuilt and enlarged. Reconstruction included a large airport and the extension of the North Norway Railway to Bodø from Lønsdal to the south. Places of interest include the 13th-century Bodin Church and the Bodø cathedral (Lutheran), a modern edifice (consecrated 1956). Bodø's far northern site enables the midnight sun to be seen for about a month (early June–early July). Pop. (1983 est.) mun., 33,646.

Bodø Affair (1818–21), a diplomatic scandal involving Sweden-Norway (then a dual monarchy) and Great Britain, which served to rally Norwegian separatists. The affair arose over the supposed illegal trading activities of an English company in the Norwegian port of Bodø, where Norwegian officials in 1818 seized a large cargo of the company and arrested one of its owners, who later escaped. The Stockholm foreign ministry, which handled the foreign affairs of Norway, seemed to the Norwegians to be unreasonably favourable to British claims over the Bodø incident, arousing Norwegian nationalism. In 1821 compensation was paid to the British company over Norwegian objections. While of minor importance in itself, the Bodø incident inflamed Norwegian separatists until the dissolution of the union in 1905.

Bodoni, Giambattista (b. Feb. 16, 1740, Saluzzo, Piedmont—d. Nov. 29, 1813, Parma, *département* of Taro, French Empire), printer who designed several modern typefaces, one of which bears his name and is in common use today.

Bodoni, engraving
BBC Hulton Picture Library

The son of a printer, Bodoni left home as a boy to go to Rome, where he served an apprenticeship at the press of the Congregatio de Propaganda Fide (Congregation for the Propagation of the Faith), the missionary arm of the Catholic Church. In 1768 he was asked to assume management of the Stamperia Reale, the press of the Duke of Parma. There he produced Italian, Greek, and Latin books and printed materials for court use.

Bodoni at first employed old-style typefaces with much decorative detail. He was gradually won over to the typographical theories of a French printer, Pierre Didot, however, and by 1787 was printing pages almost devoid of decoration and with modern typefaces of his own design. The typeface that retained the Bodoni name appeared in 1790. Of the many books he produced during this period, the best known is his *Manuale tipografico* (1788; "Inventory of Types"), a folio collection of 291 roman and italic typefaces, along with samples of Russian, Greek, and other types. A second edition of his book was published by his widow in 1818.

By 1790 Bodoni had become widely known; important travellers visited his press, and collectors sought his books. The Duke gave him a larger press and more independence; he no longer had to confine himself to the Duke's projects. Although his books were better known for their beauty and typographical excellence than for textual accuracy, he printed many important works, the most famous of which were his fine editions of the writings of Horace and Virgil in 1791 and 1793, respectively, and Homer's *Iliad* in 1808. The last years of his life brought Bodoni international fame. He corresponded with the U.S. statesman Benjamin Franklin, received compliments from the Pope, was given a medal by the city of Parma, and was honoured with a pension by Napoleon Bonaparte.

Bodrum, chief town of Bodrum *ilçe* (district), Muğla *il* (province), southwestern Turkey, at the northern end of the Kerme Körfezi (ancient Ceramic Gulf) on the Aegean Sea, opposite the Greek island of Cos. It was built on the ruins of ancient Halicarnassus (*q.v.*) by the Hospitallers, a crusading order who occupied the site in 1402. Their spectacular castle, the Petronium, or Castle of St. Peter, remained a Christian stronghold until Süleyman I the Magnificent captured it in 1522. The castle continues to be the town's major landmark. The town was briefly occupied by Italy between 1919 and 1921. Today, picturesquely situated before a backdrop of green hills, Bodrum is a growing tourist resort. Pop. (1980) town, 9,799; *ilçe,* 32,517.

body, human: *see* human body.

body building, a regimen of exercises designed to enhance the human body's muscular development. As a competitive activity, body building aims at displaying pronounced muscle tone and exaggerated physical features for overall aesthetic effect. Barbells and dumbbells and other devices are used in the exercises. For the use of similar exercises for sports training and conditioning, general conditioning, and rehabilitation therapy, *see* weight training.

Body building was practiced since the time of the ancient Babylonians, but the modern competitive form grew largely out of European strong-man theatrical and circus acts of the 19th century. The first U.S. physique contest, staged by physical culturist Bernarr Macfadden (1868–1955), took place in 1903 in New York, with the winner named "the most perfectly developed man in America." Thereafter many promoters staged body-building competitions , the most important annual events becoming the International Federation of Body Builders' Mr. Universe contest (founded in 1947) and its later and more prestigious Mr. Olympia contest. From the 1920s through the 1960s, Charles Atlas, the 1922 Macfadden title-winner, vigorously promoted the activity through a program of mail-order lessons advertised around the world.

The premier figure in the history of the sport, or art, was the Austrian-born U.S. body builder Arnold Schwarzenegger, who, before retirement in 1975, won the Mr. Universe title five times and the Mr. Olympia title six times. Competition for women began in the 1970s.

body heat, thermal energy that is a by-product of metabolism in higher animals, especially noticeable in birds and mammals, which exhibit a close control of their body temperature in the face of environmental fluctuation. Birds and mammals can conserve body heat by fluffing up feathers or erecting their hairs and by reducing blood flow to the exterior surface and extremities. They can increase body heat by shivering and exercise. Excessive body heat is dispelled chiefly by increasing blood flow to the surface and extremities, by sweating or panting, and by maximizing exposure of the body surface to the surroundings.

In humans, body heat is regulated to provide a normal temperature of 37° C (98.6° F). The brainstem, specifically the thermostatic region of the hypothalamus, is the centre of temperature regulation. When it becomes deranged, as during infections, heat is conserved unnecessarily and the temperature can exceed the normal range (*see* fever).

body modifications and mutilations, intentional permanent or semipermanent modifications of the living human body for religious, aesthetic, or social reasons. The methods of modification and mutilation used, either singly or in combination, are incision, perforation, complete or partial removal, cautery, abrasion, adhesion, insertion of foreign bodies or materials, compression, distention, diversion, enlargement, and staining.

Motives for intentional changes are varied. Modifications are frequently performed for magical and medical purposes, but cosmetic

(aesthetic) motives are perhaps equally common. The variability of the results in different cultures is an excellent indication of the relativity of ideals of beauty. Ritualistic motives for modification are concerned with religion (sacrifice, ascetic mortification), magical protection, mourning, the indication of status or rank or group membership, bravado, and punishment. The practice of ritual mutilation is generally used to modify the social position of an individual in a manner visible to and recognized by other members of the society. Mutilation may be performed as a part of initiation, marriage, or mourning rites, or it may be inflicted as a means of punishment, either for serious crimes or for social transgressions.

The head. Mutilation and modification of the head includes intentional alterations on the skull, lips, teeth, tongue, nose, eyes, or ears. Cephalic deformation is the best documented form of modification or mutilation, largely because archaeological skeletal remains clearly show its presence. Tabular deformations are produced by constant pressure of small boards or other flattened surfaces against the infant's head (*see* head flattening). Annular deformations are produced by a constricting band; each kind is subdivided according to the resulting head shape which are often strikingly different from the normal. Cranial deformation is known from all continents except Australia and from Oceania. It is rather rare in Africa south of the Sahara and apparently absent from south India.

Perforation of the lower lip (or less often the upper) for insertion of a decorative plug or other ornament is widespread in Africa and among lowland South American Indians and was formerly common among Indians of the northwest North American coast and the Eskimo. The most striking instance is that of the women of the Sara tribe of central Africa (commonly known as Ubangi after the name erroneously applied in P.T. Barnum's publicity), whose lips are slit and then stretched by saucer-shaped plugs. Perforations in the cheeks for insertion of ornaments are much rarer.

Dental mutilations take the form of removal, usually of one or more incisors (ancient Peru, most Australian Aborigines, some groups in Africa, Melanesia, and elsewhere); pointing in various patterns by chipping (Africa) or filing (ancient Mexico and Central America); filing of the surface, sometimes into relief designs (Indonesia); incrustation with precious stones or metal (Southeast Asia, India, ancient Mexico, and Ecuador); insertion of a peg between the teeth (India); and blackening (south India, hill peoples in Burma, some Malaysian groups.)

Ancient Aztec and Maya Indians drew a cord of thorns through the tongue as a form of sacrifice; some Australian tribes draw blood from gashes under the tongue at initiation rites.

For the insertion of decorative objects, perforation of the septum, or one or each of the nasal alae (or both procedures combined), is widespread among South American Indians, Melanesians, and inhabitants of India and Africa; it is sporadic elsewhere (*e.g.,* Polynesians, North American Indians).

The ancient Maya Indians considered crosseyes beautiful and induced the condition by hanging an object between a baby's eyes.

Perforation of the earlobe for insertion of an ornament is widespread. Sometimes the hole is gradually stretched to carry a larger ornament or to yield a greater distended pendant margin. More rarely, ornaments are inserted in holes along the auricular margin (eastern North American Indians and some African and tropical South American groups).

The genitalia. The best known and most widespread genital modification is circumcision (*q.v.*). Subincision (opening the urethra along the inferior surface of the penis for a varying distance between the urinary meatus and the scrotum) is a common practice at puberty initiations among Australian Aborigines and is recorded as a therapeutic measure among Fijians, Tongans, and Amazonian Indians. Customary unilateral castration (monorchy) is known in central Algeria, among the Beja (Egypt), Sidamo (Ethiopia), San and Khoikhoi (southern Africa), and some Australian Aborigines, and on Ponape Island (Micronesia). Bilateral castration was common to produce eunuchs for Muslim harem attendants and for several centuries (until prohibited by Pope Leo XIII in the late 19th century) to produce male sopranos or contraltos called castrati (*see* castrato) for ecclesiastical chants in the Roman Catholic Church. Bilateral castration is a mutilation mentioned as punishment for adultery among the Azande (central Africa), Babylonians, ancient Egyptians, ancient Chinese, and elsewhere.

Among the Toradja and Sadang (Celebes) and some Dayak groups (Borneo), many adult men wore a penis pin, knobbed on each end and averaging about one and a half inches (four centimetres) long, in a permanent perforation through the glans, to increase pleasure in their sexual partners. The Alfur (Celebes) inserted pebbles under the skin of the glans for the same purpose.

Female modifications include excision (of part or all of the clitoris—clitoridectomy, female circumcision—and sometimes also of the labia, mons, or both), in much of Africa, ancient Egypt, India, Malaysia, and Australia, and among the Skoptsy (a Russian Christian sect); incision (of the external genitalia, without removal of any part) among the Totonac (Mexico) and tropical South American Indians; infibulation (induced adhesion of the labia minora, leaving only a small orifice, to prevent sexual intercourse until the orifice is reopened by incision) in East Africa and among some Arabs; dilatation (of the vaginal orifice, often with incision) among some Australian Aborigines; elongation of the labia (*tablier*), recorded for southern Africa and the Caroline Islands; and artificial defloration (among Australian Aborigines and elsewhere).

The limbs. Constriction of the arms or legs by tight bands may cause permanent enlargement of the unconstricted area. The custom occurs among several East African and tropical South American peoples and also sporadically in Nigeria, Southeast Asia, and Melanesia.

From the T'ang dynasty (AD 618–907) until the 20th century, many Chinese women had their feet tightly bound in early childhood, forming the famous "golden lily" feet, much reduced in size and deformed to match the aesthetic ideal. A similar but much less severe practice is mentioned for the Kutchin Indians (Alaska).

Amputation of a phalanx or whole finger, usually as a form of sacrifice or in demonstration of mourning, was common among North American Indians, Australian Aborigines, Bushmen and Hottentots, Nicobarese, Tongans, Fijians, and some groups in New Guinea, South America, and elsewhere. Outlines of hands missing digits or parts of digits found among European Paleolithic cave paintings may indicate the presence of a similar custom at that period. Amputation of the toes is less common but occurred in Fijian mourning.

The skin. Mutilation and modification of the skin are accomplished primarily by tattooing and cicatrization or scarification (*see* tattoo). In the former, colour is introduced under the skin; in the latter, raised scars (keloids) are produced by incision or burning, usually in decorative patterns. Scarification occurs primarily among darker skinned peoples in much of Africa, among Australian and Tasmanian aborigines, and in many Melanesian and New Guinean groups; it is practiced both for aesthetic effect and to indicate status or lineage. Another form of skin modification is the introduction of objects under the skin: diamonds smuggled by South African miners; jewelry concealed under the skin of the chest or neck by Yünnanese travellers; and various magical protective amulets inserted under the skin by some Burmese.

The torso. Mutilation and modification of the torso focus on the neck, trunk, and breasts. The Padaung women of Burma are famous for necks stretched by a coiled brass neck ring to a length of about 15 inches (38 centimetres), with about four thoracic vertebrae pulled up into the neck.

The shape of the breasts has sometimes been customarily altered for aesthetic reasons by compression (*e.g.,* in the Caucasus, in 16th–17th century Spain) or distention (*e.g.,* among the Payaguá of Paraguay). Mutilations are also known: removal of the right breast by the Amazons of classical legend; removal of both nipples of both breasts for religious reasons by the Skoptsy; amputation of the breasts as punishment under Hammurabi's Code.

Among several African peoples (Efik, Ganda, Nyoro, and others) girls were secluded at puberty for several months and fattened with special diets. Women in Near Eastern harems were also artificially fattened for aesthetic reasons. The reverse effect was achieved in Europe by means of tight-fitting corsets that caused permanent and often deleterious deformations of the rib cage and internal organs.

Boé, formerly MADINA DO BOÉ, town, southeastern Guinea-Bissau, West Africa, on the Rio Corubal. It was the site of the declaration of independence put forth in 1973 by the Partido Africano da Independência da Guiné e Cabo Verde (PAIGC; African Independence Party for Guinea and Cape Verde). The Mayor of Bissau city, Juvencio Gomes, announced at the country's independence in 1974 that Boé would replace Bissau as the capital of Guinea-Bissau as a symbol of the struggle against Portugal; this plan was not implemented as it was economically impractical. The national government was considering the exploitation in the early 1980s of bauxite deposits in the nearby Boé Hills and the development of an aluminum industry contingent on the construction of a hydroelectric power station on the Rio Corubal in Bafatá region. Iron-ore deposits are also located in the Boé hills. Pop. (1979) mun., 9,010.

Boë, Franz de le: *see* Sylvius, Franciscus.

Boé, Jacques: *see* Jasmin, Jacques.

Boece, Hector, Latin BOETHIUS (b. *c.* 1465, Dundee, Angus, Scot.—d. *c.* 1536), historian and Humanist, author of an important Latin history of Scotland.

Boece was educated at Dundee and the University of Paris, where he was appointed regent (professor) of philosophy and became a friend of Desiderius Erasmus. He served as chief adviser of William Elphinstone, bishop of Aberdeen, in the foundation of the University of Aberdeen, and he was that institution's first principal and as such lectured on divinity. He received a small pension from the Scottish court (1527–34), was a canon of Aberdeen, vicar of Tullynessle, and then rector of Tyrie.

Boece's fame rests on his history of Scotland, *Scotorum historiae a prima gentis origine* (Paris, 1526; Scots trans., by John Bellenden, *The History and Chronicles of Scotland,* 1536). Boece's history is a glorification of the Scottish nation, based on legendary sources, and is more interesting as romance than as history. It had wide currency abroad in a French translation, and the plot of Shakespeare's *Macbeth* plot is ultimately traceable to it.

Boegoebergdam, concrete irrigation dam, on the middle Orange River, Cape of Good Hope

Province, South Africa. The Orange River flows through a hard quartzite outcrop at the dam site. Built in 1931, the Boegoebergdam irrigates about 42,000 acres (17,000 hectares) for about 150 miles (240 kilometres) on both sides of the river, an area where about one-half of South Africa's cotton crop is grown.

boehmite, white and relatively soft basic aluminum oxide [AlO(OH)] that is a common mineral in bauxite (*q.v.*), in which it forms disseminated grains or pealike masses. It is especially abundant in European bauxites, sometimes as the main constituent; bauxites from the Western Hemisphere commonly contain only a few percent boehmite. Deposits exist at Gánt and Baratka, Hung.; Stangenrode, E.Ger.; Ayr, Scot.; and Recoux, Péreille, and Cadarcet, Fr. Boehmite is dimorphous (identical in composition but differing in crystal structure) with diaspore (*q.v.*); its crystals have orthorhombic symmetry. For detailed physical properties, *see* oxide mineral (table).

Boeing Company, The, U.S. company first incorporated, as Pacific Aero Products Company, on July 15, 1916; it was renamed the Boeing Airplane Company in 1917, was newly incorporated on July 19, 1934, and assumed its current name in 1961 to reflect its expansion into fields beyond aircraft manufacture. It today designs and produces airplanes (both commercial and military), helicopters, space vehicles, missiles, hydrofoil boats, and municipal railway cars and provides various ground support services. It is also engaged in engineering and construction especially related to energy plants and water treatment and supply. Headquarters are in Seattle, Wash.

The company was founded by William E. Boeing (1881–1956) a few months after he and a U.S. Navy officer, G. Conrad Westervelt, had developed their "B & W seaplane," a two-seater with twin floats. During World War I the company turned out trainers and flying patrol boats and, during the 1920s and '30s, several military aircraft, including trainers, pursuits, observation craft, torpedo planes, and patrol bombers. In 1928 the company became a component of United Aircraft & Transport Corporation, which merged a number of aircraft manufacturers and airlines, under William E. Boeing's chairmanship. In 1934, under new federal antitrust guidelines, aircraft manufacture was divorced from air transport; and Boeing, newly incorporated, became one of three companies to emerge from the dissolution of United Aircraft & Transport (United Airlines and United Aircraft were the other two).

Prior to and during World War II, Boeing designed and developed several famous bomber aircraft, including the B-17 Flying Fortress (first produced in 1935) and the B-29 Superfortress (completed in 1942). In the postwar years the company, while continuing its military commitments, turned also to commercial aircraft, producing in 1954–55 America's first jet airliner, the Boeing 707, which first went into service in 1958 on a Pan American World Airways transatlantic route. The company also produced the nation's first wide-body superjet, the 747, put in service in 1970. In 1960 Boeing purchased Vertol Aircraft, then the world's largest independent manufacturer of helicopters.

In the 1960s Boeing designed and built the first stages of the Apollo/Saturn moon rockets and some of the major lunar orbiters. The company was also the weapon-system integrator for the Minuteman intercontinental ballistic missile.

Boémia, Martinho de: *see* Behaim, Martin.

Boémond (name of princes of Antioch and counts of Tripoli): *see under* Bohemond.

Boeotia, Modern Greek VOIOTÍA, district of ancient Greece with a distinctive military, artistic, and political history. It corresponds somewhat to the modern *nomós* (department) of Boeotia, the administrative centre of which is Levádhia. The *nomós,* with an area of 1,240 sq mi (3,211 sq km), extends farther to the northwest, however, to include part of ancient Phocis (Fokís). It is bounded by Attica (Attikí; southeast), the Gulf of Corinth (south), by Phocis (west), by the Gulf of Euboea (east), and by the *nomós* of Fthiótis (north).

Boeotia has two extensive fertile plains separated by a low ridge, an outlier of Mt. Helicon (5,735 ft [1,748 m]) on which Thebes (Thívai) stands. The northern plain is a drained basin that formerly contained Límni (lake) Kopaïs, once the largest lake in Greece, now a fertile plain growing cereals and cotton and supporting pedigreed cattle. The southern plain is watered by the Asopós Potamós.

In classical times the much reorganized Boeotian defensive league figured prominently in rivalry between Athens and Sparta. It led an uprising against Sparta during the Corinthian War (395–387 BC) and in the Battle of Chaeronea (338) was thoroughly decimated in the cause of Greek independence from Macedonia. When Boeotia rose again (335) against Alexander III the Great, it was destroyed and thereafter was of little consequence.

In spite of a harsh climate (the hills effectively block sea breezes), modern Boeotia's fertile plains produce wheat, corn (maize), tobacco, olives, and grapes. Bauxite is mined here and converted to alumina and aluminum at a large plant built by the French at Áspra Spítia, on the Gulf of Corinth. A highway and rail line enters Boeotia's northwest–southeast-trending valley east of Delphi, running southeast past Thebes; the highway then swings northward to Chalcis (Khalkis) while the rail line passes around the hills to Attica, paralleled by the new superhighway from Athens. Pop. (1981) *nomós,* 117,175.

Boeotian League, league first developed as an alliance of sovereign states in Boeotia, a district in east central Greece, *c.* 550 BC, under the leadership of Thebes. After the defeat of the Greeks at Thermopylae, Thebes and most of Boeotia sided with the Persians during the Persian invasions of 480 and 479. Subsequently, the victorious Greeks dissolved the Boeotian League as punishment. The Boeotians remained weak until 446, when they revolted against Athenian domination and reconstituted the league in alliance with Sparta. The league later opposed Sparta in the Corinthian War (395–387) and was defeated and again dissolved, Sparta having had Persian help.

Before the Corinthian War the league had developed into a close-knit confederacy, organized in 11 districts by 431. Each district, comprising one or more cities, sent a general (boeotarch), several judges, and 60 counsellors to a federal government; the federal council of 660 was probably divided into four panels, each in turn convening for one year. The vote was given only to the propertied classes. Thebes, where the council met, dominated the league since it controlled four districts and supplied the best contingent to the federal army.

In 379 Thebes joined Athens in a successful effort to overturn Spartan supremacy in Greece. The league was then reconstituted on an initially successful democratic basis: all Boeotians, whatever their property, were members of an assembly convened at Thebes; their vote decided all matters of policy. The seven-man executive (one from each of the then seven districts, of which Thebes controlled three) was directly responsible to the Assembly. Other districts under federal systems joined Boeotia: Euboea, Acarnania, Phocis, Thessaly, Arcadia, and Achaea. But this great block of military power was soon split by imperialist ambitions, and the Boeotian League itself destroyed Orchomenus (364) and intervened in the Achaean League (366) and Arcadian League (362).

Decline set in rapidly when Phocis hired mercenaries and ravaged Boeotia in the Sacred War (355–346), which Philip II of Macedon ended as an ally of Thebes. Thebes suffered defeat, however, along with Athens when Philip quelled their efforts to maintain Greek independence in 338 (*see* Chaeronea). The Boeotian League was dissolved again; after an abortive revolt against Alexander (335), Thebes and the rest of Boeotia fell permanently under external domination.

Boer (Dutch: "husbandman," or "farmer"), a South African of Dutch or Huguenot descent, especially one of the early settlers of the Transvaal and the Orange Free State. Today, descendants of the Boers are commonly referred to as Afrikaners.

In 1707, the white population of Cape Colony stood at 1,779, largely of Dutch and German stock, with some French Huguenot lines. For the most part, the modern Afrikaner people have descended from those enumerated in 1707. Afrikaners in the 1970s comprised roughly 60 percent of the white population, approximately 2,200,000 people.

In 1652, the Dutch East India Company sent out a party of soldiers and officials under Jan van Riebeeck to establish a shipping station on the Cape of Good Hope. In the early years, the company encouraged immigration, but, after the first decade of the 18th century, Cape Colony grew largely by natural increase. Though the colony prospered, over half the white population eventually turned to the life of the *trekboeren* (wandering farmers). With the Cape Town market for agricultural produce glutted and slaves doing the work of the colony, there was nothing to keep the increase of the white population in the southwestern Cape and much to encourage them to disperse and to become self-sufficient pastoral farmers. The Boers were hostile both toward Africans, with whom they fought frequent range wars, and toward the government of the Cape, which was attempting to restrain their movements and their commerce.

The Boers developed their own subculture, based on self-sufficient patriarchal communities. They were wandering pastoralists with little interest in sedentary agriculture, encumbered by few possessions. The Boers compared their way of life to that of the Hebrew patriarchs of the Old Testament. Staunch Calvinists, the Boers saw themselves as the children of God in the wilderness, a Christian elect divinely ordained to rule the land and the backward natives therein. Further, by the end of the 18th century, they, like the rest of the Cape Colony whites, spoke Afrikaans, a language deviating from Dutch.

As a result of the Napoleonic Wars, the Cape Colony became a British possession in 1806. Though at first they accepted British administration, the Boers soon grew disgruntled with the liberal policies of the British, especially in regard to the frontier and the freeing of the slaves. Between 1835 and 1843, about 12,000 Boers left the colony in the Great Trek, heading for the relatively empty spaces of the high veld and southern Natal. In 1852, the British government agreed to recognize the independence of the settlers in the Transvaal (later the South African Republic) and in 1854 of those in the Vaal–Orange rivers area (later the Orange Free State). Both countries committed themselves to apartheid, a policy of strict inequality in church and state between the black and white populations.

The discovery of diamonds and gold between 1867 and the end of the century set the stage for the South African War (1899–

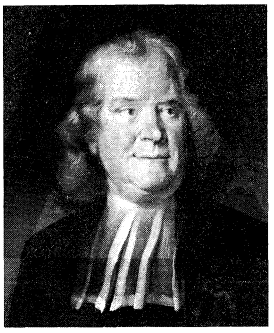
1902), which had its origins in British claims of suzerainty over the wealthy South African Republic and British concern over the Boer refusal to grant civic rights to the Uitlanders (immigrants, largely British, to the Transvaal gold fields and diamond fields).

Supported by the Orange Free State and some of the Cape Dutch, the South African Republic waged battle against the British Empire for more than two years. Though brilliant practitioners of guerrilla warfare, the Boers eventually surrendered to British forces in 1902, thus ending the independent existence of the Boer republics. The Afrikaners, however, retained their language and culture and eventually attained politically the power they had failed to establish militarily.

Boer War: *see* South African War.

Boerhaave, Hermann (b. Dec. 31, 1668, Voorhout, Neth.—d. Sept. 23, 1738, Leiden), Dutch physician and professor of medicine who was the first great clinical, or "bedside," teacher.

Boerhaave graduated in philosophy from the University of Leiden in 1684 and in medicine from the academy at Harderwijk in 1693. He spent the whole of his professional life at the University of Leiden, serving as professor of



Boerhaave, detail of a portrait by Cornelis Troost; in the Rijksmuseum, Amsterdam

By courtesy of the Rijksmuseum, Amsterdam

botany and of medicine, rector of the university, professor of practical medicine, and professor of chemistry. By his brilliant teaching he restored the prestige of the Faculty of Medicine at the University of Leiden, and students came from all parts of Europe to hear his lectures. Through his pupils Boerhaave exerted an influence on later medical teaching at Edinburgh, at Vienna, and in Germany, and he is often credited with founding the modern system of teaching medical students at the patient's bedside.

Boerhaave's principal works are textbooks that were widely used during and after his lifetime: *Institutiones Medicae* (1708; "Medical Principles"), *Aphorismi de Cognoscendis et Curandis Morbis* (1709; "Aphorisms on the Recognition and Treatment of Diseases"), and *Elementa Chemiae* (1724; "Elements of Chemistry"). Boerhaave's reputation as one of the greatest physicians of the 18th century lay partly in his attempts to collect, arrange, and systematize the mass of medical information that had accumulated up to that time.

Boerhaave Museum, byname of RIJKSMUSEUM VOOR DE GESCHIEDENIS VAN DER NATUURWETENSCHAPPEN EN VAN DE GENEESKUNDE (Dutch: Royal Museum of the History of the Natural Sciences and of the Medical Sciences), in Leiden, Neth., museum of the history of natural sciences and one of the foremost European museums of its type. It has a fine collection of old scientific instruments. There is a collection of microscopes belonging formerly to Antonie van Leeuwenhoek (1632–1723) and thermometers from the collection of G.D. Fahrenheit (1686–1736).

Boesmanland, also called BUSHMANLAND, historic region in northeastern South West Africa/Namibia traditionally inhabited by the San (Bushmen). A part of the northwestern Kalahari (Desert), Boesmanland is a semiarid region having deep, permeable sand beds with a vegetational cover consisting of perennial grasses, low-lying shrubs, and thorny woodlands. The San of Boesmanland (and of the Kalahari in general) were increasingly forced to congregate around boreholes and water storage basins at isolated settlements (such as Tsumkwe) as the water table of the Kalahari was lowered by the introduction of grazing cattle. The government has encouraged their instruction in rudimentary agricultural techniques and animal husbandry. By the early 1980s many San families had moved onto a South African military camp near the reserve where the men had joined South African patrols, obtaining work as trackers.

Boesak, Allan (Aubrey) (b. Feb. 23, 1946, Kakamas, S.Af.), South African clergyman who was one of South Africa's leading spokesmen against the country's policy of racial separation, or apartheid.

Boesak was born to Christian parents who were classified as Coloured (of mixed European and African ancestry) by the South African government. From an early age he had been interested in preaching, and at age 17 he entered the University of the Western Cape to begin his theological studies. Frustrated by the attitudes of his white teachers at the all-Coloured university, Boesak was eventually persuaded to remain in the Dutch Reformed Mission Church (Nederduitse Gereformeerde Sendingkerk, the Coloured branch of the Dutch Reformed Church) by Beyers Naudé, a white minister who had been cast out for his antiapartheid position. Boesak was ordained in the Dutch Reformed Church in 1968. From 1970 to 1976 he studied in The Netherlands and in the United States. After he returned to South Africa, he became politically active, teaching and preaching while organizing opposition to South African government policies. In 1982 he persuaded members of the World Alliance of Reformed Churches to declare apartheid a heresy and to suspend membership of the white South African churches; he was also elected president of the alliance. In 1983 he helped organize the United Democratic Front (UDF), a multiracial association of all manner of groups opposed to apartheid, and in 1984 he and others organized a massive boycott of the national elections. He was arrested three times in 1985 for his participation in demonstrations, and his movements and speech were restricted.

Boesak's doctoral dissertation, *Farewell to Innocence: A Socio-Ethical Study on Black Theology and Black Power,* was published in 1977. His other books included *The Finger of God: Sermons on Faith and Socio-Political Responsibility* (1982) and *Black and Reformed: Apartheid, Liberation, and the Calvinist Tradition* (1984).

Boethius, Anicius Manlius Severinus (b. AD 470–475?, Rome?—d. 524, Pavia?, Kingdom of the East Goths), Roman scholar, philosopher, and statesman, author of the celebrated *De consolatione philosophiae* (*Consolation of Philosophy*), a largely Neoplatonic work in which the pursuit of wisdom and the love of God are described as the true sources of human happiness.

The most succinct biography of Boethius and the oldest was written by Cassiodorus, his senatorial colleague, who cited him as an accomplished orator who delivered a fine eulogy of King Theodoric. Cassiodorus also mentioned that Boethius wrote on theology, composed a pastoral poem, and was most famous as a translator of works of Greek logic and mathematics.

Other ancient sources, including Boethius' own *De consolatione philosophiae,* give more details. He belonged to the ancient Roman family of the Anicii, which had been Christian for about a century and of which Emperor Olybrius had been a member. Boethius' father had been consul in 487 but died soon afterward, and Boethius was raised by Quintus Aurelius Memmius Symmachus, whose daughter Rusticiana he married. He became consul in 510 under the Ostrogothic king Theodoric, who had usurped the imperial rule of Italy. Although little of Boethius' education is known, he was evidently well trained in Greek. His early works on arithmetic and music are extant, both based on Greek handbooks by Nicomachus of Gerasa, a 1st-century-AD Palestinian mathematician. There is little that survives of Boethius' geometry, and there is nothing of his astronomy.

It was Boethius' scholarly aim to translate into Latin the complete works of Aristotle with commentary and all the works of Plato "perhaps with commentary," to be followed by a "restoration of their ideas into a single harmony." Boethius' dedicated Hellenism, modeled on Cicero's, supported his long labour of translating Aristotle's *Organon* (six treatises on logic) and the Greek glosses on the work.

Boethius had begun before 510 to translate Porphyry's *Eisagogē,* a 3rd-century Greek introduction to Aristotle's logic, and elaborated it in a double commentary. He then translated the *Katēgoriai;* wrote a commentary in 511, the year of his consulship; and also translated and wrote two commentaries on the second of Aristotle's six treatises, the *Peri hermeneias* ("On Interpretation"). A brief ancient commentary on Aristotle's *Analytika Protera* ("Prior Analytics") may be his too; he also wrote two short works on the syllogism.

About 520 Boethius put his close study of Aristotle to use in four short treatises in letter form on the ecclesiastical doctrines of the Trinity and the nature of Christ; these are basically an attempt to solve disputes that had resulted from the Arian heresy, which denied the divinity of Christ. Using the terminology of the Aristotelian categories, Boethius described the unity of God in terms of substance and the three divine persons in terms of relation. He also tried to solve dilemmas arising from the traditional description of Christ as

Boethius, detail of a miniature from a Boethius manuscript, 12th century; in the Cambridge University Library, England (MS li.3.12[D])

By courtesy of Cambridge University Library, England

both human and divine, by deploying precise definitions of "substance," "nature," and "person." Notwithstanding these works, doubt has at times been cast on Boethius' theological writings because in his logical works and in the later *Consolation,* the Christian idiom is nowhere apparent. The 19th-century discovery of the biography written by Cassiodorus, however, confirmed Boethius as a Christian writer, even if his philosophic sources were non-Christian.

In about 520 Boethius became *magister officiorum* (head of all the government and court services) under Theodoric. His two sons were consuls together in 522. Eventually Boethius fell out of favour with Theodoric. The *Consolation* contains the main extant evidence of his fall but does not clearly describe the actual accusation against him. After the healing of a schism between Rome and the church of Constantinople in 520, Boethius and other senators may have been suspected of communicating with the Byzantine emperor Justin I, who was orthodox in faith whereas Theodoric was Arian. Boethius openly defended the senator Albinus, who was accused of treason "for having written to the Emperor Justin against the rule of Theodoric." The charge of treason brought against Boethius was aggravated by a further accusation of the practice of magic, or of sacrilege, which the accused was at great pains to reject. Sentence was passed and was ratified by the Senate, probably under duress. In prison, while he was awaiting execution, Boethius wrote his masterwork, *De consolatione philosophiae.*

The *Consolation* is the most personal of Boethius' writings, the crown of his philosophic endeavours. Its style, a welcome change from the Aristotelian idiom that provided the basis for the jargon of medieval Scholasticism, seemed to the 18th-century English historian Edward Gibbon "not unworthy of the leisure of Plato or Tully." The argument of the *Consolation* is basically Platonic. Philosophy, personified as a woman, converts the prisoner Boethius to the Platonic notion of Good and so nurses him back to the recollection that, despite the apparent injustice of his enforced exile, there does exist a *summum bonum* ("highest good"), which "strongly and sweetly" controls and orders the universe. Fortune and misfortune must be subordinate to that central Providence, and the real existence of evil is excluded. Man has free will, but it is no obstacle to divine order and foreknowledge. Virtue, whatever the appearances, never goes unrewarded. The prisoner is finally consoled by the hope of reparation and reward beyond death. Through the five books of this argument, in which poetry alternates with prose, there is no specifically Christian tenet. It is the creed of a Platonist, though nowhere glaringly incongruous with Christian faith. The most widely read book in medieval times, after the Vulgate Bible, it transmitted the main doctrines of Platonism to the Middle Ages. The modern reader may not be so readily consoled by its ancient modes of argument, but he may be impressed by Boethius' emphasis on the possibility of other grades of Being beyond the one humanly known and of other dimensions to the human experience of time.

After his detention, probably at Pavia, he was executed in 524. His remains were later placed in the church of San Pietro in Ciel d'Oro in Pavia, where, possibly through a confusion with his namesake, St. Severinus of Noricum, they received the veneration due to a martyr and a memorable salute from Dante.

When Cassiodorus founded a monastery at Vivarium, in Campania, he installed there his Roman library and included Boethius' works on the liberal arts in the annotated reading list (Institutiones) that he composed for the education of his monks. Thus, some of the literary habits of the ancient aristocracy entered the monastic tradition. Boethian logic dominated the training of the medieval clergy and the work of the cloister and court schools. His translations and commentaries, particularly those of the *Katēgoriai* and *Peri hermeneias,* became basic texts in medieval Scholasticism. The great controversy over Nominalism (denial of the existence of universals) and Realism (belief in the existence of universals) was incited by a passage in his commentary on Porphyry. Translations of the *Consolation* appeared early in the great vernacular literatures, with King Alfred (9th century) and Chaucer (14th century) in English, Jean de Meun (a 13th-century poet) in French, and Notker Labeo (a monk of around the turn of the 11th century) in German. There was a Byzantine version in the 13th century by Planudes and a 16th-century English one by Elizabeth I.

Thus the resolute intellectual activity of Boethius in an age of change and catastrophe affected later, very different ages; and the subtle and precise terminology of Greek antiquity survived in Latin when Greek itself was little known. (J.Shi.)

Boethius, Hector: *see* Boece, Hector.

Boethusian, member of a Jewish sect that flourished for a century or so before the destruction of Jerusalem in AD 70. Their subsequent history is obscure, as is also the identity of Boethus, their founder. Because of evident similarities, some scholars tend to view the Boethusians as merely a branch of the Sadducees. Both parties, they point out, associated with the aristocracy and denied the immortality of the soul and the resurrection of the body, because neither of these doctrines was contained in the written Torah, or first five books of the Bible. The Boethusians testified to their disbelief in the "world to come" by living lives of luxury and by ridiculing the piety and asceticism of the Pharisees. The Talmud—the authoritative compendium of law, lore, and commentary—speaks of the Boethusians in derisive tones. Still other scholars have argued that the Boethusians should be identified with the Essenes and Dead Sea Sect and that the word *Boethusian* may not derive from the name Boethus but from *Beth Essaya,* or Essenes.

Boetoeng, also spelled BOETON (Indonesia): *see* Butung.

Boeuf River, also spelled BOEUFF, river rising in southeastern Arkansas, U.S., and flowing southwest between the Bartholomew and Mason bayous into Louisiana, entering the Ouachita River in Catahoula Parish. Part of the river's 230-mile (370-kilometre) course is navigable. The name Boeuf is derived from the French word for ox, or steer.

Boeyens, Adrian Florensz. (pope): *see* Adrian VI.

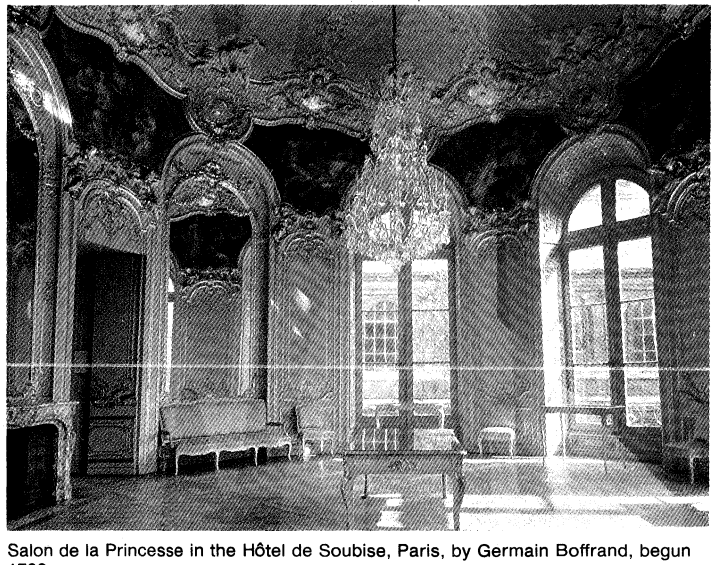
Boffa, town and fishing port, western Guinea, West Africa, on the Pongo Estuary formed by the Fatala River on the Atlantic coast. The surrounding region is drained by the Fatala River and is mainly inhabited by the Baga and Susu (Soussou) peoples. The town is the chief trading centre for fish, swamp rice, bananas, and palm oil and kernels. Once a collecting point for slaves, it became a French trading post in the 1860s and was an important exporter (1870–1914) of wild rubber. Its wharf, 10 miles (16 km) upstream, can accommodate vessels of 16-foot (5-metre) draft at high tide, but the development of Conakry's port (50 miles [80 km] south-southeast) and shifting sandbars and mangrove swamps in the Pongo Estuary greatly reduced Boffa's importance as a port. Boffa was the site of Guinea's first Catholic (Holy Ghost Fathers) mission (1877) and its first French school (1878). Pop. (1983 prelim.) 28,885.

Boffrand, (Gabriel-)Germain (b. May 7, 1667, Nantes, Fr.—d. March 18, 1754, Paris), French architect noted for the great variety, quantity, and quality of his work.

Boffrand went to Paris in 1681, where, after studying sculpture for a time under François Girardon, he entered the workshop of the architect Jules Hardouin Mansart. As early as 1690, he received a commission to design buildings for the king, and in 1709 he was placed in charge of the decoration of the apartments of the Hôtel de Soubise (begun 1732). In 1710 the princesse de Condé commissioned his enlargement of the Palais Bourbon, a project noted for the large staircase added by Boffrand.

Boffrand, best known for his *Livre d'architecture* . . . (1745; "Book of Architecture"), was instrumental in spreading French taste across 18th-century Europe. He was responsible for a multitude of works, great and small, including plans for the new palace of Nantes and construction of the great altar for Nantes cathedral. He also built several private houses in Nantes and Paris. Between 1718 and 1728 Boffrand directed the work on the Arsenal in Paris and in 1722 was asked to restore the chamber of the Palais de Justice.

Boffrand also worked abroad: he built a fountain in the gardens of the favourite château of



Salon de la Princesse in the Hôtel de Soubise, Paris, by Germain Boffrand, begun 1732

J.E. Bulloz

Maximilian II Emanuel, the elector of Bavaria, and assisted Balthasar Neumann in 1724 in designing the episcopal Residenz (1719–44) in Würzburg. Boffrand next restored the rose window of the transept of Notre-Dame de Paris (1725–27) and in 1727 constructed the Hospice des Enfants of the general hospital, for which he was appointed chief architect in 1728.

In 1732 he was appointed inspector general of roads and bridges of France. Boffrand's noted later achievements were his restoration (1746) of the Saint-Esprit chapel and the door he built (1748) for the cloister of Notre-Dame. In addition to his vast architectural accomplishments and the *Livre d 'architecture*, Boffrand left *Description de ce qui a été pratiqué pour fondre en bronze d 'un seul jet la figure équestre de Louis XIV. . .* (1743; "Description of What Was Done to Cast in a Single Jet the Equestrian Statue of Louis XIV").

bog, type of wetland ecosystem characterized by wet, spongy, poorly drained peaty soil. Bogs can be divided into three types: (1) typical bogs of cool regions, dominated by the growth of bog mosses, *Sphagnum,* and heaths, particularly *Chamaedaphne* (northern bogs with trees growing on them are often called muskegs); (2) fens, dominated by grasslike plants, grasses, sedges, and reeds; and (3) tropical tree bogs, in which the peat may be formed almost entirely from tree remains. Typical, or *Sphagnum,* bogs are highly acid with a pH (index of acidity–alkalinity) of less than five (seven being neutral) and are associated with waters containing no more minerals than are contained in rainwater, often the only source of water for a bog. Fens are watered with groundwater that has some dissolved minerals and that has a pH above five; that is, it is only moderately acid. Fens and bogs are often associated in one area that usually is called a bog. Tropical bogs occur only in areas where the water is very low in minerals. They are less common than swamps but still cover extensive areas in Malaya, Indonesia, tropical South America, and Africa.

Typical bogs have simple floras. Other than the *Sphagnums* and heaths, there are a few sedges and grasses, such as cotton grass; insectivorous sundews; pitcher plants; and many orchids. Desmids, a group of unicellular green algae divided into symmetrical halves, are characteristic of bogs. Animals are not common on bogs.

Sphagnums are large mosses with large empty cells with pores opening to the outside that lie between the chlorophyll-bearing cells of the leaves. These empty cells readily absorb and retain water, giving a spongelike quality to the moss. *Sphagnum* absorbs minerals (cations) from the water, replacing them with acid (hydrogen ions), and thus makes the water around itself more acid.

The saturation of the moss with water retards passage of air, so that parts of a mass of *Sphagnum* more than a few inches from the surface are usually anoxic. The combination of lack of oxygen, lack of minerals, and highly acid condition greatly retards the action of bacteria and fungi, the usual decay organisms. With the retardation of decomposition of the dead moss, a *Sphagnum* peat develops under the living plants. This is particularly the case in areas where there is a mean annual temperature of below 10° C (50° F), which also retards decay.

Bogs are most common in parts of the world glaciated during the Pleistocene Epoch (10,000 to 2,500,000 years ago). They cover vast areas in the tundra and boreal forest regions of Canada, northern Europe, and the Soviet Union. Areas of high rainfall farther to the south, such as the wetter parts of the British Isles, also contain extensive bogs. Glacial ice created many local depressions by scouring underlying rocks and spreading an uneven deposit of till on the ground. With the melting of the ice, these depressions filled with water. If the mineral content of the water was low, the ponds so formed were colonized by *Sphagnum,* which converted them to bogs.

Once bogs are formed, they retard the development of efficient drainage by inhibiting water movement and slowing erosion of the soil or rocks on which they rest. Thus, bogs tend to be long-lived if temperatures remain low and sufficient excess of rainfall over evaporation exists to prevent their drying out. If they do dry out, upland plants will colonize the former bog.

Small lakes in glaciated regions have also often developed into bogs if they were not drained by headward erosion of stream beds or completely filled with terrestrial sediments. The lake begins to fill by the development of a floating mat of vegetation next to the shore. This may become a fen, with grasses and sedges principally involved, if the lake water has sufficient mineral content. A lake on resistant rocks, poor in minerals, will develop a floating bog mat with *Sphagnum* and *Chamaedaphne.* In larger lakes, wave action will not allow such floating mats to develop.

As the mat grows into the water, it floats at the surface supported by air in the plant tissues. Upward growth shades the lower parts and these die, forming an increasingly thick floating mat, the top of which remains only a few inches above the level of the lake surface. Slow decay and mechanical disturbances break off waterlogged bits from the bottom of the mat. These sink and collect on the lake bottom so that the lake is filled from both the bottom up and the top down. The material collecting on the lake bottom is very fine, only a little denser than the water. It does not compact into a firm layer but forms a false bottom layer through which heavy objects fall to the solid original lake bottom.

From the surface down, the layers are (1) floating bog, (2) clear water, (3) false bottom, and (4) true bottom. With the continued thickening of the mat there is less influence of the lake water on plant growth, and *Sphagnum* usually begins to invade the surface of the mat even if it was previously dominated by grasses. With the growth of the moss a true bog is formed and various heaths invade the mat, especially *Chamaedaphne.* With continued thickening, trees may begin to grow, the first usually being larch (*Larix*). Black spruce may invade in the last stages of bog development. From a distance it may be difficult to detect the original boundary between the upland and the now filled lake.

During much of this process the vegetation is floating. The bog is called a quaking bog to indicate the instability of the surface, which will sink slightly beneath a weight. It is even possible to break through the vegetation into the water beneath. Both people and animals have drowned this way. Nonfloating bogs may also quake if the peat is thick and spongy.

Ultimately, by upward and centripetal growth, the bog fills the lake completely. The original glacial basin will then contain a bottom layer of inorganic sediment combined with organic debris derived both from lake production and from terrestrial sources surrounding the lake. On top of that, a layer of false-bottom material, compacted by the weight of overlying peat, may be visible. Bog peat fills the remainder of the basin. Growth of the bog does not necessarily stop at this stage for, if rainfall is sufficient, the water-retaining properties of *Sphagnum* are sufficient to maintain a wet, stagnant environment above the original water table represented by the lake surface. Thus, continued upward growth of the bog plants creates a raised bog. The raised bog is similar to the ordinary bog except that it does not lie in a depression but is raised above the surroundings. A moat containing some open water typically surrounds a raised bog where water drains from the raised bog and surrounding upland. Because the moat receives upland drainage it may be a fen. The raised bog itself receives only rainwater. Because rain is very low in mineral content, the raised bog is more completely dominated by the characteristics of *Sphagnum* than that of the floating bog. Heaths, larches, and black spruce, which grow fairly well on the floating bog, survive only as stunted specimens around the edges of the raised bog.

The peat underlying a *Sphagnum* bog is composed largely of partly decomposed moss. There may be some inclusion of windblown particles, pollen, and dust. The water content of peat may be as high as 90 percent. The ash content of dried peat varies from 2 to 20 percent, with lower values more usual because the higher ash amounts come from sand and clay blown into the peat when it was at the surface. Other chemical characteristics of peat underlying bogs are the absence of free oxygen; the presence of carbon dioxide at high pressure, though in small amounts; low electrolyte concentration; and high acidity.

In general, temperatures in lowland tropical areas are high enough for organic decay to be too fast for large quantities of peat to accumulate. But in areas with very high rainfall and with groundwater of very low mineral content, bogs may occur. As is the case in colder regions, the bogs may fill low basins, or they may develop into raised bogs. The plants of these bogs are mainly broad-leaved evergreen trees, which may be as tall as 100 feet (30 metres). Palms and screwpines may also occur. The number of kinds of plants of these bogs is very limited in comparison with the surrounding forests, just as is the case in colder bogs. Toward the centre of the raised bogs, trees are shorter or absent. Grasses and sedges cover more of the ground and open pools of water may occur. *Sphagnum* does not grow in tropical bogs to any extent, and the peat is composed of the remains of seed plants. The limited number of species is caused entirely by the lack of any groundwater supply of minerals and the rapid removal, by heavy rainfall, of those that arrive in dust.

bog iron ore: *see* goethite.

bog manganese: *see* wad.

bog moss: *see* peat moss.

bog pink (orchid): *see* dragon's-mouth.

bog rosemary, also called MOORWORT (*Andromeda polifolia*), low evergreen shrub, of the heath family (Ericaceae), native to bogs in northeastern North America, northern and central Europe, and northern Asia. The plant

Bog rosemary (*Andromeda polifolia*)
G.E. Hyde from the Natural History Photographic Agency—EB Inc.

grows 30 to 60 centimetres (1 to 2 feet) tall and has a creeping rootstock and green leaves about 3 cm long. The small white flowers grow in small terminal clusters.

Bogalusa, city, Washington Parish, southeastern Louisiana, U.S., at the northern terminus of the Pearl River Navigation Canal, 60 mi (97 km) north of New Orleans, near the Mississippi border. Founded in 1906 by the Great Southern Lumber Company and named after a local creek (Bogue Lusa: Choctaw for "dark" or "smoky" waters), it has through reforestation programs remained a major logging centre producing yellow-pine lumber, paper, and tung oil (from Chinese tung trees, first planted in 1902). It is the site of Louisiana State University Forestry School and state and federal agricultural experiment stations. Its basic forest economy is supplemented by light manufacturing and agriculture. Inc. 1914. Pop. (1980) 16,976.

Bogan, Louise (b. Aug. 11, 1897, Livermore Falls, Maine, U.S.—d. Feb. 4, 1970, New York City), poet and literary critic who served as poetry critic for *The New Yorker* from 1931 until 1969. Described by poet Marianne Moore as "compactedness compacted," Bogan's poetry resembles that of the English Metaphysical poets in its restrained, intellectual style and use of traditional techniques. Yet it is modern, both deeply personal and immediate.

Bogan's poems first appeared in the *New Republic. Body of This Death* was published in 1923. She later wrote verse and literary criticism for *The New Yorker, Poetry: A Magazine of Verse, Atlantic Monthly,* and *The Nation.* Among other honours, Bogan was awarded the John Reed Memorial Prize (in 1930) and two Guggenheim Fellowships, and her *Collected Poems 1923–1953* (1954) received the Bollingen Prize in Poetry. As a critic Bogan became known for fairness and generosity, because she focussed on the strengths of authors in such works as the survey *Achievement in American Poetry 1900–1950* (1955) and *Selected Criticism: Prose, Poetry* (1955). Other works include *The Sleeping Fury* (1937), *The Blue Estuaries: Poems 1923–1968* (1968), and *A Poet's Alphabet* (1970).

Boganda, Barthélémy (b. April 4, 1910, Bobangui, French Equatorial Africa—d. March 29, 1959, near Bangui), the major nationalist leader of the Central African Republic (formerly Oubangui-Chari) in the critical decolonization period of the 1950s. His strong popular support was unmatched by that of any other political figure in the four colonies of French Equatorial Africa. Stridently anti-colonial but pragmatic, he could (and did) make "deals" with the colonial administration and European businessmen to gain his ends.

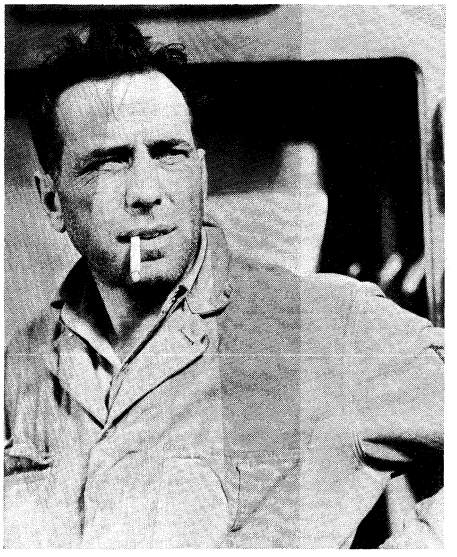
Born of a peasant family, Boganda became the first African Roman Catholic priest in Oubangui-Chari and was sponsored by the Catholic missions as a candidate in the November 1946 elections to the French National Assembly. He won against an administration-backed candidate but soon denounced the missions as well as the colonial administration and left the French Catholic party, Mouvement Républicain Populaire, and the priesthood. Around 1950 he founded his own party, Mouvement d'Évolution Sociale de l'Afrique Noire, which he dominated completely. In the 1951 campaign a French administrator briefly arrested him for "endangering the peace."

From then on Boganda's prestige was essentially unchallenged. Even the French realized it was useless to oppose him and in 1953 appointed a new governor to conciliate him. In 1956 he also came to an agreement with French businessmen, who offered him financial support in return for European representation on municipal and territorial election lists.

Secure at home, Boganda, in 1957 and 1958, turned his attention to French Equatorial Africa as a whole (which also included Chad, Gabon, and the French Congo). He hoped for a federation of these states under African rather than French control, and for the eventual creation of a "United States of Latin Africa" that would also include Angola, the Belgian Congo (now Zaire), and Cameroon. By late 1958 this dream was shattered, and he turned back to the future Central African Republic, where he was killed a few months later in an airplane crash.

Bogardus, James (b. March 14, 1800, Catskill, N.Y., U.S.—d. April 13, 1874, New York City), inventor and builder who popularized cast-iron construction, which was commonly used in American industrial and commercial building from 1850 to 1880. He did so by shipping prefabricated sections from his factory in New York City to construction sites, and he further popularized the new method of building by his authorship of *Cast Iron Buildings: Their Construction and Advantages* (1858). This method of supporting the weight of construction by columns, rather than the walls, was a significant step toward later development of skeleton framing and skyscrapers. Bogardus' first use of these methods (1848) was in his own five-story factory in New York City. His other inventions included a means of engraving postage stamps that was used by the British government, the ring flier used for many years in cotton spinning, and rubber cutting, glass pressing, and deep-sea sounding and drilling machines.

Bogart, Humphrey, original name HUMPHREY DEFOREST BOGART (b. Dec. 25, 1899, New York City—d. Jan. 14, 1957, Hollywood), actor who became a preeminent



Humphrey Bogart in *Sahara,* 1943

By courtesy of Columbia Pictures; photograph, from the Collection of Penguin Photo

motion picture "tough guy" and was a top box-office attraction during the 1940s and '50s. In his performances he created an image of a weather-beaten, individualistic adventurer with a touch of idealism hidden beneath a deadpan exterior. Offscreen he appeared to be a cynical loner, granting only minimal concessions to Hollywood conventions, and became a cult hero of the American cinema.

The son of a prominent surgeon and a famous illustrator, Bogart served in the United States Navy during World War I. A wood splinter accidentally penetrated his upper lip and stiffened it, giving him a physical characteristic that was later one of his screen trademarks. He began a stage career playing juvenile roles in drawing-room comedies and made his screen debut in *Broadway's Like That* (1930). Achieving little success in films, he returned to New York. His portrayal of the murderer Duke Mantee in the Broadway production of *The Petrified Forest* (1935) and later in the film version (1936) was a turning point in his career. Throughout the late 1930s he was a popular gangster figure in crime pictures starring Edward G. Robinson, James Cagney, and others. In 1941 Bogart attained stardom for his portrayals of Mad Dog Roy Earle, the aging gangster in *High Sierra* (1941), and then as Sam Spade, the hard-boiled private detective in *The Maltese Falcon* (1941). Other famous characterizations followed, *e.g.,* the expatriate cabaret proprietor Rick in *Casablanca* (1942); the greedy prospector Fred C. Dobbs in *The Treasure of the Sierra Madre* (1948); a gin-drinking boatman in *The African Queen* (1951), for which he won an Academy Award for best actor; the neurotic Captain Queeg in *The Caine Mutiny* (1954); a burnt-out journalist in *The Harder They Fall* (1956). Bogart formed a sensational screen partnership with Lauren Bacall, his fourth wife (whom he married in 1945), in a number of pictures: *To Have and Have Not* (1944), *The Big Sleep* (1946), *Dark Passage* (1947), and *Key Largo* (1948).

Boğaziçi (Turkey): *see* Bosporus.

Boğazköy (Turkish: Gorge Village), modern BOĞAZKALE, also spelled BOGHAZKEUI, village and *bucak* (sub-district) administrative centre, Sungurlu *ilçe* (district), Çorum *il* (province), north-central Turkey. Located 17 mi (27 km) northwest of Yozgat, it is the site of the archaeological remains of Hattusas (Hattusa, Hattusha, or Khattusas), the ancient capital of the Hittites, who established a powerful empire in Anatolia and northern Syria in the 2nd millennium BC.

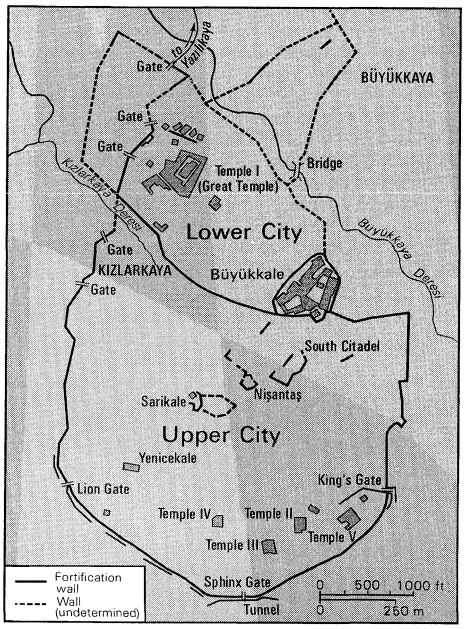
The ancient city. The ancient city occupies a section of a mountain slope at the southern end of a small fertile plain. It lies between two deeply cut streambeds, filling the angle between their converging courses. Their confluence at the level of the plain (elevation about 3,100 ft) marks the northernmost point of the city area, which rises toward the south by about 1,000 ft (300 m) on a length of 1 1/4 mi. The eastern valley narrows in some places to form a pronounced gorge.

The earliest settlement in the city area dates to the 3rd millennium BC, in the so-called Early Bronze Age. There are no written documents that would reveal the identity of the first settlers. Remains of this period were found on top and at the northwest foot of the high hill dominating the east side of the city, known as Büyükkale (Great Fortress), which later became the acropolis of the Hittite kings.

The earliest written sources found at Boğazköy are clay tablets inscribed in cuneiform writing in the Old Assyrian language. They attest the presence of Assyrian merchants on the site, which at that time was called Hattus. The largest Assyrian trade colony was at Kanesh (Kültepe, near Kayseri). Whereas the latter flourished from around 1950 to 1850 BC and, after a destruction, reemerged sometime around 1820 and lasted through another two generations, that of Boğazköy is contemporary with only this later period.

Hattus was the name of the city also in the language of the early inhabitants of the "Land of Hatti," a language still little understood and not belonging to any known family. Scholars call it Hattic to distinguish it from Hittite, the name of the Indo-European official language of the Hittite kingdom. Just as in other parts of the world, the Indo-European speakers must have been invaders who conquered

the older population, but the exact date and the details are unknown, except that individuals bearing Indo-European Hittite names are attested before 1850 in Kanesh in documents



Plan of Boğazköy

After *Hattusha: The Capital of the Hittites* by Kurt Bittel, copyright © 1970 by Oxford University Press, Inc.; reprinted by permission

of the older Assyrian colony. In Hattus the population or its rulers may still have been "Hattians" even during the later colony period, but there is no proof of it. The houses of the merchants were in the lower city. The town extended up to Büyükkale, probably culminating in the palace of the local king. Both this town and the merchants' houses were destroyed, probably by King Anittas of Kussara (after 1800). A Hittite text ascribed to Anittas tells of his conquests in Anatolia and how he defeated King Piyusti of Hattus, destroyed the city, and put a curse on the site.

The Indo-European speakers added the vowel *a* to the city name and declined it according to their language; thus the nominative case became Hattusas. The first mention of the name in the form of Hattusas is on a tablet from Mari, on the middle Euphrates, datable to the time of Hammurabi (or Hammurapi; 1792–50); possibly this refers to the city before its destruction by Anittas.

About the middle of the 17th century BC, another king of Kussara, disregarding Anittas' curse, made Hattusas his capital; while his own name was Labarnas, he became known as Hattusilis I, "The One from Hattusas." He is the first ruler of whom there are authentic texts in the Hittite language and one of the founders of the Old Hittite kingdom. One of his successors, Hantilis, is said to have fortified the city. The line of the Old Hittite city wall can be followed today: it surrounds the northern terraces and follows the edge of the eastern valley up to Büyükkale, which must then have been the acropolis; in the west it descends along a side valley to the lower terrace.

Hattusas remained the capital throughout Hittite history with few interruptions. The sources tell of one destruction of the city by enemies around 1380 BC. Soon afterward, King Suppiluliumas I not only restored the city but, by his conquest of most of Anatolia and of Syria to the Lebanon, made it the capital of a real empire. Scholars have wondered how this empire could be ruled from such a remote place. Apart from tradition, it must have been the natural advantages of the site—plentiful water and the protection provided by the terrain—that kept the dynasty at Hattusas. King Muwatallis (around 1300 BC) is said to have transferred the capital to the south "upon the command of the gods." The real reasons behind this move are not known, and his successor brought the government back to Hattusas where it remained to the end.

In the New Kingdom, or Empire, Period (*c.* 1400–*c.* 1190 BC) the city was extended toward the south: the wide arc of the city wall, running from Büyükkale up to the top and down along the western valley, dates from the New Kingdom. The inclusion of these southern hills strengthened the fortification system considerably, especially by the sophisticated construction of the highest section. Here a deep fosse, or moat, and a high earth rampart carrying the wall protected the city against the hills to the south, while a corbelled tunnel, called Yerkapu (Ground Gate), a paved glacis (or defensive slope), and flights of steps aided the defenders. The gates with sculptural decoration also belong to this period: the King's Gate in the southeast (whose relief of a warrior god has been removed to the Archaeological Museum in Ankara) and the Lion Gate in the southwest.

Although temples are mentioned in the Old Kingdom, the actual temple ruins all date from the New Kingdom. Four temples in the upper city belong to the extension just mentioned. Also the Great Temple in the lower city, in the shape revealed by excavation with its large complex of subsidiary buildings, is a work of the empire. The acropolis, Büyükkale, was completely rebuilt in a monumental manner during the same period.

A further extension of the city wall across the gorge so as to enclose the plateau of Büyükkaya (Great Rock), east of the valley, belongs to the 13th century, as do the reliefs and structures at the rock sanctuary, Yazılıkaya, about a mile from the city on the slope of the eastern mountains.

Residential quarters have been excavated only in small parts. Large sections of the city area are taken up by temples and other official buildings, while other parts are too precipitous for building. It is therefore not possible to estimate the population of the city.

With the downfall of the Hittite Empire (*c.* 1190 BC) the city was destroyed; traces of burning are found in all parts. The site, it seems, remained vacant for a long time. The next settlement, mainly on Büyükkale and in the lower city, was in size and layout much more modest than the Hittite capital. Through pottery and other finds, this settlement is linked to the Phrygians, to whose kingdom the region belonged in the 8th century BC. These post-Hittite settlements saw several rebuildings and lasted into the Hellenistic Age (3rd to 1st centuries BC), when a tribe of the Galatians, Celtic invaders from Europe, settled in the region. There are only scattered remains of Roman and early Christian times, after which the place was again uninhabited until the foundation of the village of Boğazköy in the 18th century AD.

Excavations. Boğazköy was discovered in 1834 by the French explorer Charles Texier, who saw Yazılıkaya and those remains of the ancient city that were above ground. After visits by British and German travellers, it was another Frenchman, Ernest Chantre, who in 1892–93 made the first soundings and found the first cuneiform tablets there. The language in which these texts were written was not known at the time, but its identity with that of the so-called Arzawa letters found in Tell el-Amarna in Egypt was soon recognized. This led the Berlin Assyriologist Hugo Winckler to undertake excavations in 1906 together with Theodore Makridi (Bey) of the Istanbul Museum. This first season yielded 2,500 fragments of tablets from the west side of Büyükkale, including some in Akkadian; these showed that Boğazköy was the capital of the kings of Hatti. Winckler and Makridi returned in 1907, 1911, and 1912. In 1907 another German expedition under Otto Puchstein excavated and surveyed the fortifications and temples. After World War I new excavations were started by the German Archaeological Institute and the German Orient Society, with Kurt Bittel as field director. They continued from 1931 to 1939 and again after World War II. These excavations established the stratigraphy and, thereby, the history of the site, besides yielding many more tablets from several locations on Büyükkale and the area of the Great Temple. The excavators had to remove the post-Hittite structures in order to reach the Hittite levels, and they covered all levels earlier than the Hittite Empire with earth again in order to present and preserve as much as possible of the remains of the city of the 13th century BC. Pop. (1975) Bogazkale, 2,097. (H.G.G.)

BIBLIOGRAPHY. Kurt Bittel, *Hattusha: The Capital of the Hittites* (1970), is a comprehensive description of the city and its history and remains, with an extensive bibliography. See also E. Akurgal, *The Art of the Hittites* (Eng. trans. 1962).

Bogdan: *see* Moldavia.

Bogdanovich, Peter (b. July 30, 1939, Kingston, N.Y., U.S.), U.S. film director noted for his attempts to revitalize film genres of the 1930s and '40s.

Bogdanovich gained experience as a writer, actor, and director in small theatrical productions while turning his lifelong passion for the movies to good effect by contributing criticism and scholarly articles to various periodicals. His first film was a low-budget thriller titled *Targets* (1968), which he wrote, produced, directed, and starred in. His second, *The Last Picture Show* (1971), was a box-office hit that won critical acclaim for its portrayal of sexual mores and social change in a drab Texas town in the 1950s. Later films included *What's Up, Doc?* (1972), *Paper Moon* (1973), *Daisy Miller* (1974), *At Long Last Love* (1975), and *They All Laughed* (1981).

Boghari (Algeria): *see* Ksar el-Boukhari.

Boghazkeui (Turkey): *see* Boğazköy.

boghead coal: *see* torbanite.

Bognor Regis, parish, Arun district, county of West Sussex, England, on the English Channel, south-southwest of London. Regis commemorates George V's convalescence there in 1929. The resort, which has sandy beaches, dates from the late 18th-century Regency period when Hotham House and Dome House (now a teacher-training college) were built, although a small fishing community had existed on the site since medieval times. Pop. (1981 prelim.) 39,536.

Bogolyubsky, Andrey Yuryevich: *see* Andrew I *under* Andrew (Vladimir).

Bogomil, member of a dualist religious sect that flourished in the Balkans between the 10th and 15th centuries. It arose in Bulgaria toward the middle of the 10th century from a fusion of dualistic, neo-Manichaean doctrines imported especially from the Paulicians, a sect of Armenia and Asia Minor, and a local Slavonic movement aimed at reforming, in the name of an evangelical Christianity, the recently established Bulgarian Orthodox Church. The Bogomils were so called after their founder, the priest Bogomil.

The Bogomils' central teaching, based on a dualistic cosmology, was that the visible, material world was created by the devil. Thus, they denied the doctrine of the incarnation and rejected the Christian conception of matter as a vehicle of grace. They rejected Baptism, the Eucharist, and the whole organization of the Orthodox Church. The moral teaching of the Bogomils was as consistently dualistic. They

condemned those functions of man that bring him into close contact with matter, especially marriage, the eating of meat, and the drinking of wine. In fact, the moral austerity of the Bogomils invariably was acknowledged by their fiercest opponents.

During the 11th and 12th centuries Bogomilism spread over many European and Asian provinces of the Byzantine Empire. Its growth in Constantinople resulted, about 1100, in the trial and imprisonment of prominent Bogomils in the city and in the public burning of their leader, Basil. In the second half of the 12th century it spread westward. The Serbian ruler Stephen Nemanya was obliged to summon a general assembly of his land to check it. More important still was its extension to Bosnia, where Bogomilism, modified and known as the Patarene, or Bosnian, faith, was embraced by the rulers and the nobility and developed into a national movement. By the early 13th century the dualistic communities of southern Europe formed a network stretching from the Black Sea to the Atlantic.

In the country of its birth Bogomilism remained a powerful force until the late 14th century. The Bulgarian authorities convened several church councils to condemn its teachings. After the Ottoman conquest of southeastern Europe, however, many Bogomils, especially in Bosnia, were converted to Islām, and obscurity descended upon the sect. Traces of a dualistic tradition in the folklore of the Southern Slavs and some curiously carved funeral monuments scattered in Bosnia and Hercegovina are all that remain today of the most powerful sectarian movement in the history of the Balkans.

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Bogong, Mount, highest peak (6,516 feet [1,986 m]) of Victoria, Australia, in the Australian Alps, 150 miles (240 km) northeast of Melbourne. Well-known for winter sports and, since 1981, part of the Mount Bogong National Park, the peak derived its name from an Aboriginal word meaning "high plains." Bogong township was established there during the construction of the Kiewa Hydro-Electric Scheme (completed 1958), near Albury.

Bogor, formerly BUITENZORG, *kotamadya* (city) and *kabupaten* (regency), Jawa Barat *propinsi* (West Java province), Java, Indonesia, 870 feet (265 m) above sea level in the foothills of Mount Gede and Mount Salak. The city, established by the Dutch in 1745, is famous for its botanical gardens (1817). The Bogor Agricultural Institute represents the agricultural faculties of the National University of Indonesia. There is also a forest research institute, a laboratory for chemical research, and an institute for rubber research. The former residence (1856) of the Dutch governor-general is now the occasional residence of the Indonesian president. Bogor (meaning "without care") is primarily a residential city, with a healthful climate. There is some manufacturing of tires, textiles, and machinery. The chief crops of the regency of Bogor (4,483 square miles [11,611 square km]) are rice, tea, cinchona, rubber, and coffee. Pop. (1984 est.) city, 274,000; (1980) regency, 2,493,909.

Typical houses with rice paddies in Bogor district, Java, Indonesia

W.H. Hodge

Bogoraz, Vladimir Germanovich, pseudonym N.A. TAN, or V.G. TAN (b. April 27 [April 15, Old Style], 1865, Ovruch, Russia—d. May 10, 1936, on the way to Rostov-na-Donu), Russian anthropologist whose study of the Mongoloid Chukchi people of northeastern Siberia ranks among the classic works of ethnography.

Arrested in 1886 for activities with the revolutionary Narodnaya Volya ("People's Will") political party, he was exiled to the Yakutia region of northeastern Siberia, where he studied the ethnography and linguistics of the area with an exiled colleague, Vladimir Jochelson. He continued research in northeastern Siberia for the Russian Geographical Society (1895–97). For the Jessup North Pacific Expedition of the American Museum of Natural History, New York City (1900–01), Bogoraz took charge of the Anadyr region of extreme northeastern Siberia, gathering materials for his Chukchi ethnography. Fleeing Russia for political reasons, he settled in New York City (1901–04), became a curator of the American Museum, and produced his great works *The Chukchee* (1904–09) and *Chukchee Mythology* (1910).

Returning to Russia (1904), Bogoraz helped to organize the first peasant congress and the Labour Group in the Duma (parliament). He continued scientific work and writing until his appointment as professor at the university at Petrograd [Leningrad] and curator of the Anthropological and Ethnographical Museum (1918). During the 1920s and '30s he directed Asian research for the Institute of the Peoples of the North, Leningrad. He published grammars, a dictionary, textbooks for Chukchi children, folklore collections, ethnographic and historical studies, and a novel about the Chukchis.

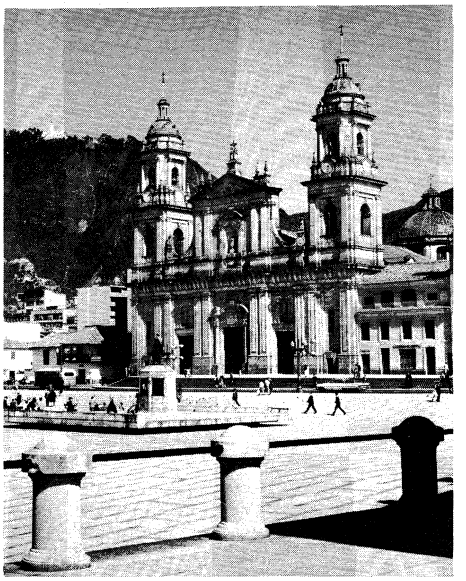
Bogotá, official Spanish SANTA FÉ DE BOGOTÁ, capital of Colombia. It lies in central Colombia on a fertile plateau 8,660 feet (2,640 m) above sea level in the Eastern Cordillera of the Andes Mountains.

European settlement in Bogotá began in 1538, when Gonzalo Jiménez de Quesada conquered Bacatá, the main seat of the Chibcha Indians. The settlement was christened Santa Fé de Bacatá: "Santa Fé" after Quesada's birthplace in Spain, and "Bacatá" for the original Indian name, which was soon corrupted to Bogotá. Bogotá's fate was closely allied to that of the viceroyalty of Nueva Granada, of which it was made the capital city, soon becoming a centre of Spanish colonial power in South America. Once the territory achieved independence from Spain in 1819, Bogotá was made capital of Gran Colombia, a confederation that included the present republics of Venezuela, Ecuador, Panama, and Colombia. When the confederation was dissolved, it remained the capital of Nueva Granada, which later became the Republic of Colombia.

Turbulent struggles for political power in the capital city, as well as its geographical isolation, stunted Bogotá's growth and prosperity in the 19th century. In April 1948 the city was severely damaged by riots, and a wave of violence, known as the *bogotazo,* swept the region. Undercurrents of unrest continued in Bogotá until 1958, when the Liberal and Conservative parties reached a settlement.

Bogotá is the home of the nation's tire, chemical, and pharmaceutical industries, but its chief activities are commercial. A stock exchange (1928) and the main banks are located in the city. It is the hub of air travel in Colombia and the home of Avianca (Aerovías Nacionales de Colombia), the first commercial airline in South America. Railroads connect Bogotá with the Caribbean coast and regions to the northeast, but any trip by rail to Colombia's western cities and the Pacific coast must be made via Puerto Berrío on the Magdalena River. Bogotá is on the Colombian section of the Pan-American and Simón Bolívar highways and has road connections with all major Colombian cities.

The Pontificia Universidad Javeriana (1622) and the Universidad de Santo Tomás (1580) are among the several excellent universities in Bogotá. Other cultural institutions include the Botanical Institute, the National Conservatory of Music, the National Museum, the National Astronomical Observatory, the National Library, and the Columbus Theatre. There are also a planetarium, a museum of natural history, several modern art galleries, and the Gold Museum, which houses the world's largest collection of pre-Columbian gold objects.



The cathedral on the Plaza Bolívar, Bogotá

Hector Acebes—Photo Researchers

Numerous parks adorn the city and its outskirts. Prime tourist attractions are the 515-foot (157-metre) Tequedama Falls, about 20 miles (32 km) south, and the tram and cable car that climb more than 1,800 feet (333 m) to the church and shrine atop Monserrate mountain. Soccer, bullfighting, and car, bicycle, and horse racing are popular activities. Pop. (1985 prelim.) city, 3,982,941; metropolitan area, 4,091,992.

Bogra, formerly BAGURA, city, northwestern Bangladesh, on the west bank of the Karatoya River, a tributary of the Jamuna. Easy accessibility by road and railway makes Bogra a commercial centre for the southern Bārind tract between the Ganges and the Jamuna. Incorporated as a municipality in 1876, it has a park, a theatre hall, and a nursery for sericultural development and is the seat of six colleges affiliated with the University of Rājshāhi.

The site of Mahāsthān, identified by inscriptions as Puṇḍravardhana, capital of the Puṇḍra dynasty, lies just north of the town; it dates from Mauryan times (300 BC) and also flourished during subsequent (Gupta, Pāla) periods.

The region surrounding Bogra is a level agricultural (rice) plain. To the east, in the area that lies between the Jamuna and Karatoya, is low-lying land that abounds in *khāl*s (gullies) and *bhil*s (marshes), while the area lying west of Bogra is above sea level and is less susceptible to flooding. Pop. (1981 prelim.) city, 68,237.

Bogusławski, Wojciech (b. April 9, 1757, Poznań, Pol.—d. July 23, 1829, Warsaw), actor, director, and leading playwright of the Polish Enlightenment. Considered by many the father of the Polish theatre, he wrote more than 80 plays, mostly comedies adapted from writers of western Europe, and greatly raised the status of the acting profession. His best-known and most popular original play is *Cud mniemany czyli Krakowiacy i górale* (1794; "The Pretended Miracle or Krakovians and Highlanders"), a patriotic comic opera based on national folklore. After studying singing and joining the court of the bishop of Kraków, he became a soldier and in 1778 an actor. Between 1783 and 1814, he directed the Polish National Theatre in Warsaw; later he worked in Lwów and toured with his company, performing both Polish and foreign plays.

Bohemia, Czech ČECHY, German BÖHMEN, a historical country of central Europe, bounded on the south by Austria, on the west by Bavaria, on the north by Saxony and Lusatia, and on the east by Silesia and Moravia. For centuries a kingdom, it was from 1918 to 1939 and from 1945 to 1949 the westernmost province of Czechoslovakia. On Jan. 1, 1949, however, the provincial organization was dissolved, and Bohemia lost its political identity, being divided among a number of new districts of the Czechoslovak state. In 1968 the Czech Socialist Republic was formed from Bohemia, Moravia, and the separately administered city of Prague.

The Slavic Czech people had firmly established themselves in the fertile region of Bohemia by the 5th or 6th century AD. Although early chronicles begin with semimythical events—such as Princess Libuše marrying the peasant Přemysl, whom she found plowing his field—it would appear that in the first few centuries the Czechs were able to consolidate their power without attracting much notice (or hostility) from the outside world. With the introduction of Christianity in the 9th century, history becomes less obscure for scholars and more turbulent for the Czechs. Earlier attempts at conversion of Slavic-speaking peoples by German priests made little progress, but when Cyril and Methodius arrived from neighbouring Moravia (now central Czechoslovakia), preaching in Slavic and introducing a Greek alphabet modified for Slavic sounds, they converted many, including Prince Bořivoj (*c.* AD 873). After Boleslav I murdered his brother Wenceslas (Václav) the Holy in 935, he and his son Boleslav II extended Bohemia's power to include Moravia in the east and Silesia and Galicia (both now in Poland) to the north.

These territories were soon lost and then regained, thus beginning the long history of external conflict and internal civil strife, as Bohemian rulers made alliances, often through political marriages, with German and Polish princes. Bohemian influence within the Holy Roman Empire also increased—in 1088 Emperor Henry IV crowned Vratislav II king of Bohemia; the Bohemian prince Soleslav was granted the influential title of cupbearer to the emperor; and in 1212 Emperor Frederick II issued the Golden Bull of Sicily, which increased the power of the king of Bohemia and reduced his obligations to the empire.

Bohemia reached a new peak of power under Přemysl Otakar II, who consolidated control over parts of Austria and waged wars for territory with Hungary, extending Bohemia's domain to the Adriatic Sea. After 1278, however, when Otakar was killed in an invasion of Austria, Bohemia was soon once again reduced in size and influence. After some lesser kings and some disputes over succession came Charles, Holy Roman emperor (as Charles IV) and king of Bohemia (as Charles I), who is remembered for founding the University of Prague (1348) and for greatly increasing that city's boundaries and importance. From this time on, Prague became a centre of intellectual and artistic activity, not only of the area under Bohemia's immediate control but also of all Europe. However, much of the peace achieved by Charles was destroyed by religious disputes between Roman Catholics and the followers of Jan Hus, who was burned as a heretic in 1415. Bohemia, both Hussite and Roman Catholic, was attacked repeatedly by German and English crusaders but managed to hold out for many years. In 1436 compacts were promulgated that granted Bohemia some degree of religious freedom, but there was no lasting peace.

In the disputes over succession that followed, the nobility gained power not only at the expense of the king but also over townspeople and peasants, on whom royalty had always depended for support. The people were deprived of much of their freedom, some being reduced to the level of serfs. By 1526 Bohemia was in a state of great disorder, the previous two kings having resided mainly in Hungary. Archduke Ferdinand I of Austria laid claim to the throne, thereby establishing the Habsburg dynasty in Bohemia. A Roman Catholic himself, Ferdinand demonstrated moderation in religious affairs for a time, but eventually he was forced into a confrontation with Protestant forces—as were his immediate successors.

In 1618, after the archbishop of Prague ordered the suppression of Protestant religious services—in direct violation of an agreement signed by Ferdinand I's grandson Rudolph II—two of the king's councillors were thrown from a window of Hradčany Castle. This event, known as the Defenestration of Prague, precipitated an unsuccessful uprising of Protestants, resulting in the expulsion of most Protestant noblemen and the near-complete absorption of Bohemia into the Austrian Empire—a state of affairs that lasted until the 19th century.

Throughout this period, in addition to the loss of Silesia to Prussia, feelings of Czech nationalism were seemingly suppressed as their new rulers instituted German as the language of instruction in grammar schools and the university. Czech was felt to be the language of the peasants, while German monopolized polite society and public life. National sentiment never died out completely, however; and after the revolutionary year of 1848, when serfdom was abolished, much power passed into the control of the middle classes. Czech sentiment was also intensified by the presence in Bohemia of many German-speaking citizens (the Sudeten Germans), many of whom could trace their ancestry back to the 13th century, when Otakar II had invited German craftsmen to live in Bohemia. By 1880 a decree placed the Czech language on the same footing as German, but the German population still retained its political predominance. Czechs felt more kinship with Slavs outside their borders than to Sudeten Germans within; they felt particularly close to the Slovaks of Moravia, as well as to the Russians.

During World War I, when the Sudeten Germans and Bohemia's Habsburg rulers were felt to be even more alien to Czech Pan-Slavism, Tomáš Masaryk gathered about himself a group of intellectuals at the University of Prague, who then publicized the ideals of Czech and Slovak nationalism. On Oct. 28, 1918, the republic of Czechoslovakia was proclaimed.

Bohemian Confession, Latin CONFESSIO BOHEMICA, doctrinal statement formulated by the Czech Utraquists in 1575 and subscribed to by the Unitas Fratrum, Lutherans, and Calvinists. The document was based on the Augsburg Confession; it upheld the Lutheran position on justification and the Calvinist interpretation of the Eucharist, and it led to the creation of a national Czech evangelical church. Though Emperor Maximilian II withheld formal approval, he orally guaranteed religious freedom to the Protestants. Eventually Emperor Rudolf II granted official recognition to the church with his Letter of Majesty (1609). Previously, the Unitas Confession (1535), introduced by Martin Luther and published by him at Wittenberg as a sign of agreement between Lutherans and Utraquists, had been presented to Emperor Ferdinand I for legal recognition, but without success.

Bohemian Forest, German BÖHMER WALD, Czech ŠUMAVA, forested southwestern highlands of the Bohemian Massif largely on the West German–Czechoslovakian frontier and extending from the upper valley of the Ohre River, in the northwest, to a section of the Danube River valley in Austria (between Melk and Krems), in the southeast. The nomenclature of the subranges that compose the highlands is intricate and confused. The main group, the Šumava in Czechoslovakia and Hinterer Wald in West Germany, averages 3,500 feet (1,067 m) and rises to the summits of Grosser Arber (Javor; 4,780 feet [1,457 m]) on the Bavarian (western) side and to Plechý (Plöckenstein; 4,521 feet [1,295 m]) on the Czechoslovakian (eastern) side. Bounded by the Vyšší Pass (2,320 feet [707 m]) on the southeast, the Šumava is the source for the Vltava (German: Moldau) River, which cuts a broad trough through part of the region and is a source of hydroelectric power. Forests, both coniferous and deciduous, cover more than a third of the range, and the population is sparse. There are some mineral deposits and stone quarries. To the northwest, the much lower range of the Český les (Oberpfälzer Wald) is separated from the main group by a depression that extends roughly between the towns of Cham–Furth im Wald–Domažlice (German Taus). The gradients are gentler and the hills largely cleared for upland farming. The Regen and Ilz rivers also rise in the Bohemian Forest. The parallel and lower ranges of the Bavarian Forest lie in German territory to the southwest. The Bohemian Forest is noted for its glass industry and its lumber-milling activities.

Bohemian garnet: *see* pyrope.

Bohemian glass, decorative glass made in Bohemia and Silesia from the 13th century. Especially notable is the cut and engraved glass in high Baroque style made from 1685 to 1750. Early in the 17th century, Caspar Lehmann, gem cutter to Emperor Rudolf II in Prague, adapted to glass the technique of gem engraving with copper and bronze wheels. Although intaglio (*Tiefschnitt,* "deep cut") and high relief (*Hochschnitt,* "high cut") engraving on glass were known to the ancients, Lehmann was the first modern glass engraver to perfect the technique and develop a personal style. He founded a school, but his most

Bohemian glass bowl produced by J. and L. Lobmeyr, Vienna, from designs by August Kühne and Josef von Storck, engraved by Karl Pietsch, Kamenický Šenov (Steinschönau), Bohemia, 1875; in the collection of J. and L. Lobmeyr, Vienna

By courtesy of J. and L. Lobmeyr, Vienna

gifted pupils—such as Georg Schwanhardt, originator of the famous Nürnberg school of engravers—moved out of Bohemia; and glass engraving did not flourish there until *c.* 1700, when a heavy, high-lustre, potash-lime glass (Bohemian crystal) was invented. Its original designs, profusion of motifs, and rich, ostentatious ornamentation made Bohemian glass the leading glass in the world. In the late 18th century English lead glass with cut decoration surpassed it in popularity after the introduction of the new Rococo style. Bohemian glass responded to competition with the invention of Hyalith glass, black with gold chinoiserie designs (Chinese-inspired designs), and Lithyalin glass, resembling semiprecious stones. An inexpensive ruby glass and an opaque white overlay glass, both carved and enamelled, were also produced. Artistic quality declined in the late 19th century but was revived by Ludwig Lobmeyr, a Viennese industrialist who founded a glass-designing studio at Kamenický Šenov (Steinschönau).

Bohemian language: *see* Czech language.

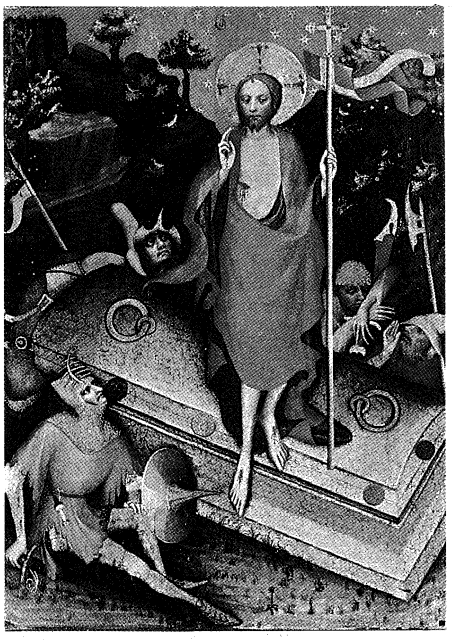
Bohemian Massif, dissected quadrangular plateau, with an area of about 60,000 sq mi (about 158,000 sq km), occupying Bohemia, Czechoslovakia. Centring on Prague, it reaches a maximum elevation of 5,256 ft (1,602 m) and is bounded by four ranges: the Ore Mountains (Krušné hory, or Erzhgebirge) in the northwest, the Giant Mountains (Krkonoše, or Riesengebirge) in the northeast, the Bohemian–Moravian Highlands (Českomoravská vysočina) in the southeast, and the Bohemian Forest (Šumava) in the southwest. The landscape is a rounded, forested, rather monotonous highland of crystalline rock.

Bohemian–Moravian Highlands, Czech ČESKOMORAVSKÁ VYSOČINA, or VRCHOVINA, plateau (125 mi [200 km] long and 35 to 50 mi wide) forming the southeastern boundary of the Bohemian Massif, which separates the former historic provinces of Bohemia and Moravia, now in Czechoslovakia. Roughly defined by the Lužnice River (west), the Dyje River (south), the Morava River (east), and the tributaries of the Elbe (Labe) River (north), the highlands form a rolling, densely forested, hilly country averaging from 2,000 to 2,500 ft (600 to 750 m) in height. There are two highland areas: the Jihlava Heights (Jihlavské vrchy) to the south rise to 2,746 ft at Javořice, and the Žd'ár Heights (Žd'árské vrchy) to the north rise to 2,743 ft at Devět skal. On the Moravian side, the Drahanská vrchovina group of limestone hills contains the famous Moravian Karst (*q.v.*). The highlands are part of a major watershed between the Elbe and the Danube river systems.

A bleak, inhospitable area, not favourable to agriculture, the Bohemian–Moravian Highlands began to develop after the late 1930s. New industries came to Žd'ár nad Sázavou and to Jihlava, the largest town. There are many historically interesting towns (Třebíč, Telč, Velké Meziříčí, Moravská Třebová, and Kunštát) and castles (Žd'ár nad Sázavou, Pernštejn, and Náměšt' nad Oslavou).

Bohemian school, school of the visual arts that flourished in and around Prague under the patronage of Charles IV, king of Bohemia from 1346 and Holy Roman emperor from 1355 to 1378. Prague, as Charles's principal residence, attracted many foreign artists and local masters. Although it was heavily exposed to the artistic traditions of France and northern Italy (mainly through the importation of illuminated manuscripts), Prague, nevertheless, produced a vital Bohemian tradition in architecture and a distinctive, independent style in painting that had an important influence on European 14th-century, late-Gothic art, especially that of Germany.

The major architectural monuments of the Bohemian school are Charles's palace (Karlštejn Castle) and the St. Vitus' Cathedral, both in Prague. The cathedral and parts of Karlštejn Castle were begun according to routine French design by the Flemish master mason Mathieu d'Arras; when Mathieu died in 1352 the work on both buildings was taken over by the influential German architect Petr Parléř, who, in his virtuoso experiments with decorative vault design in the cathedral, provided the starting point for late German Gothic architectural achievements in the 15th century.



"Resurrection," panel painting by the Master of Wittingau, *c.* 1380–90; in the Národní Galerie, Prague

Giraudon—Art Resource/EB Inc.

Although Charles seems not to have collected illuminated manuscripts, many members of his court did. Outstanding works were produced, mainly by foreign masters; they were close to contemporary Italian illumination in the use of bright, light colours and ostentatious foreshortening of forms in perspective, but also included native Bohemian decorative elements.

The most significant achievements of the Bohemian school, however, were in fresco and panel painting (*qq.v.*). Most of the painters of the school are anonymous, but a few distinct personalities can be discerned who seem to exemplify three fairly well-defined generations of artists. Before the emergence of the Bohemian school proper, impetus was given by the work of Tommaso da Modena, a northern Italian painter who created a number of panel paintings for Charles. His work was not directly influential on the first generation of Bohemian painters who, working in the 1350s and typified by the Master of the Hohenfurth Altarpiece (or Master of the Vyšší Brod Cycle), were strongly affected by the more elegant models of the Sienese school, though they already exhibited the dark intensity characteristic of Bohemian painting. Tommaso's style, however, was important in the formation of that of Theodoricus of Prague, a member of the second generation of Bohemian artists (working *c.* 1360–80) and perhaps the principal master of the Bohemian school. Commissioned by Charles to decorate the Chapel of Holy Cross at Karlštejn Castle (*c.* 1357–67), Theodoricus painted a crucifixion and a host of panel paintings of saints. Although these works show Sienese influence, they are also closely related to Tommaso da Modena's paintings in their naturalism, psychological penetration, and solid modelling. The emphasis on modelling manifests itself in Theodoricus' works in a solemn, massive rendering of heavily rounded faces and thick, heavy drapery, a consolidation of the so-called soft style that was to dominate German painting well into the 15th century.

Other artists, working in the Emmaus Monastery at Prague in about 1360, produced remarkably precocious frescoes of the life of Christ, with deep, crowded compositions, fluent lustrous draperies, substantial figures, and forceful characterization. The last major artist of the Bohemian school, who represented the third generation of artists (working between about 1380 and 1390), was the Master of Wittingau (or Master of the Třeboň Altarpiece). His major works are the Wittingau altar Passion scenes, originally painted in about 1380 for the town of Třeboň (German Wittingau). His style is evolved from that of Theodoricus: in their mystical quality and almost abstract emphasis on simple solid forms, projecting and receding with smooth surfaces, Theodoricus' paintings anticipate the expressive use of chiaroscuro (light and dark contrast) and the smoldering intensity of the Wittingau Passion. The Wittingau master, however, seems also to have been influenced much more strongly than his predecessors by contemporary French painting.

Charles's son Wenceslas, who succeeded his father as sole ruler of Germany and Bohemia in 1378, sponsored a flourishing school of manuscript illumination. Prague's role as a prominent artistic centre declined, however, in the early 15th century, largely as a result of severe political and religious conflicts within the empire.

Bohemond, also spelled BOHEMUND, French BOHÉMOND, or BOÉMOND, name of princes of Antioch and counts of Tripoli, grouped below chronologically and indicated by the symbol •.

• **Bohemond I,** byname BOHEMOND OF OTRANTO, French BOHÉMOND DE TARENTE, original name MARC (b. 1050–58—d. March 7, 1111, Canossa, Apulia), prince of Otranto (1089–1111) and prince of Antioch (1098–1101, 1103–04), one of the leaders of the First Crusade, who conquered Antioch (June 3, 1098).

Son of Robert Guiscard (the Astute) and his first wife, Alberada, Bohemond was christened Marc but nicknamed after a legendary giant named Bohemond. The nickname proved well taken because physically Bohemond was the ideally tall and strong knight—in the words of a contemporary, "a wonderful spectacle." His boyhood home was in southern Italy, where his Norman father, Robert, had gone as a mercenary and had risen to the rank of duke of Apulia and Calabria. Here Bohemond became involved in his father's wars and learned his trade as a fighter and leader. This early training must be inferred, however, as Bohemond's childhood is poorly recorded, and even his date of birth is unknown. In 1079 he was in command of a unit of his father's army. Meanwhile, his stepmother, Sigelgaita, bore his father's heir-to-be, Roger Borsa; thus, Bohemond no doubt felt early in life that he would have no patrimony because of his half brother and so would have to seek lands and fortune in the weakened condition of the Greek Empire.

In 1081 Bohemond, in command of his father's army, captured Avlona, a town south of Durazzo; but in this same year Alexius I Comnenus became ruler of the Byzantine Empire and challenged the Normans. For more than three decades Alexius and Bohemond were rivals. In the opening struggle, 1081–85, Bohemond and his father came close to dismembering the Greek Empire in the West. The Norman army won a few brilliant victories, but Alexius drove Bohemond from Larissa in Thessaly in 1083, and the death of Robert in

1085 left Bohemond without a patrimony and with little hope of success against Byzantium. In the next four years Roger Borsa allowed Bohemond to gain a foothold in Bari, where he awaited another chance to move against Alexius.

The chance came when Pope Urban II launched the First Crusade in November 1095 by offering rewards in both this world and the next for those who wrested the Holy Sepulchre from the Saracens. When the word reached Bohemond, he set off for the East. Bohemond and his small band of Normans crossed the Greek lands in the winter of 1096–97 with few incidents; and on passing through Constantinople, he made friendly, though cautious, terms with the emperor Alexius. The latter managed to extract oaths from most of the leaders, including Bohemond, and helped them cross the Bosporus, speeding them with promises of aid if they would return to the sovereignty of the Emperor the Byzantine lands recaptured from the Muslims. In the ensuing campaigns against the Turks, Bohemond distinguished himself at Nicaea, Dorylaeum, and Antioch, which was besieged from October 1097 until June 3, 1098. The city of Antioch fell to the crusaders through his cunning and his negotiations with a traitor. After a brief, unsuccessful countersiege by the Turks, during which Bohemond more or less assumed command, the crusaders dawdled away the summer and fall.

When the crusading army marched southward to Jerusalem in January 1099, Bohemond was left the de facto possessor of Antioch, although his claim was not openly supported for fear of violating the oath of Alexius. The Norman leader did not participate in the capture of Jerusalem but did, for the sake of appearances, journey later to the Holy Sepulchre. With the departure of many crusaders for their homelands, Bohemond was left with his city, hemmed in by Alexius to the north and the Muslim world to the east. Following sorties against Aleppo, Bohemond made the mistake of moving against the Emir of Sebastea (Sivas), north of Antioch. He fell into an ambush and was captured and held for months.

Released in 1103, he returned to Antioch and its problems. In 1105 Bohemond was in Bari to enlist reinforcements for his struggle with the Greeks. In September 1105 he went to Rome to interview the Pope and then journeyed, early in 1106, through France. There, babies were named for him, crowds heard him denounce the perfidious Alexius, and shrines received sacred relics from his hands. In the spring of 1106 Bohemond married Constance, the daughter of Philip I of France, in a brilliant ceremony at Chartres.

Bohemond, who 30 years before had been a landless young man, now stood at the pinnacle of his career. By September 1107 he was ready to launch his crusade against the Greeks and within a month had landed a large army at Avlona. In the months that followed, Durazzo held firm against the Normans, and Bohemond met with misfortune in Albania. In this impasse Alexius, anxious to end the war, offered Bohemond Antioch and other Greek cities in return for vassalage. In accepting these terms, Bohemond suffered humiliation even though he retained control of Antioch. He had used the crusade against Alexius, however, to further his ambition for an empire that stretched from Apulia to Antioch and had thereby cheapened the crusading idea.

The years following this peace of discord are poorly recorded. Constance bore Bohemond two sons, one of whom later became prince of Antioch. Bohemond probably sought to raise another army, but these efforts were curtailed by his death in 1111. His combat with the Greeks was ended, and his rival Alexius followed him in death in 1118. Nicknamed for a giant, Bohemond had fought against gigantic odds and at death bequeathed to his heirs one of the important crusader states, the Principality of Antioch. History records him as a handsome man, a warrior of genius, and a gifted diplomat. (J.H.Hi./L.L.H.)

BIBLIOGRAPHY. R.B. Yewdale, *Bohemond I: Prince of Antioch* (1917), offers the best biography of Bohemond; R.L. Nicholson, *Tancred: A Study of His Career and Work in Their Relation to the First Crusade and the Establishment of the Latin States in Syria and Palestine* (1940), supplements the work of Yewdale; K.M. Setton and M.W. Baldwin (eds.), *A History of the Crusades,* vol. 1 (1955), is the best general work on Bohemond.

• **Bohemond II** (b. 1107—d. February 1130), prince of Antioch from 1119 to 1130.

The son of Bohemond I and Constance of France, he went from Apulia to Antioch in 1126. Antioch had been under the regency of Baldwin II of Jerusalem since 1119, when the previous prince, Roger, had been killed. Soon after his arrival in Antioch, Bohemond married Alice, the younger daughter of Baldwin II. After joining with Baldwin in an attack on Damascus (1129), he was slain on the northern frontier by a Muslim army. The local *amīr* had his severed head embalmed and sent as a gift to the Caliph.

• **Bohemond III,** byname BOHEMOND THE CHILD, or THE STAMMERER, French dialect BOHÉMOND LE BAMBE, or LE BAUBE (b. 1145—d. 1201), prince of Antioch from 1163 to 1201.

The son of Constance (daughter of Bohemond II) by her first husband, Raymond of Poitiers, he succeeded to the principality upon attaining his majority and then exiled his mother. In the following year (1164) he suffered defeat and was captured by the Muslims, and thereafter the principality of Antioch was never again a power in the Levant. Until about 1180 it was a Byzantine protectorate, and it was the influence of Manuel I Comnenus that secured Bohemond's early release from captivity.

In 1180 he deserted his second wife, Irene, or Theodora Comnena, for a certain Sibyl, and he was in consequence excommunicated. By his first wife, the princess Orguilleuse, he had had two sons, Raymond and Bohemond (the future Bohemond IV). Raymond died in 1197, leaving a son, Raymond Ruben; and the problem that occupied the last years of Bohemond III was to determine whether his grandson, Raymond Ruben, or his younger son, Bohemond, should succeed him in Antioch. Leo II (the Great) of Armenia championed his grandnephew, Raymond Ruben (Raimond Roupên). Bohemond the younger, however, prosecuted his claim with vigour and even evicted his father from Antioch about 1199; but he was ousted through the efforts of Leo (then king of Armenia by the grace of the emperor Henry VI), and Bohemond III died in possession of his principality (1201).

• **Bohemond IV,** byname BOHEMOND THE ONE-EYED, French BOHEMOND LE BORGNE (b. *c.* 1175—d. 1233), count of Tripoli (1187–1233) and prince of Antioch (1201–16, 1220–33).

The younger son of Bohemond III and Orguilleuse, he became count of Tripoli in 1187 and succeeded his father in the principality of Antioch to the exclusion of his nephew Raymond Ruben in 1201. In 1216 Raymond seized control while Bohemond was off in Tripoli, but he was deposed in 1221 and died the following year. Bohemond reigned in Antioch and Tripoli until his own death.

• **Bohemond V** (b. *c.* 1198—d. January 1252), prince of Antioch and count of Tripoli from 1233 to 1252.

The son of Bohemond IV by his wife Plaisance, he succeeded his father in 1233 and carried on the struggle with Armenia until 1251, when the marriage of the future Bohemond VI to the sister of the Armenian king finally brought peace. By his first marriage (1225) with Alice, the widow of Hugh I of Cyprus, Bohemond V connected the history of Antioch for a time with that of Cyprus. He had resided chiefly at Tripoli, and under him Antioch was left to be governed by its commune, or town council.

• **Bohemond VI** (b. 1237—d. 1275), prince of Antioch (1252–68) and count of Tripoli (1252–75).

The son of Bohemond V by Luciana, he succeeded his father in 1252. His sister Plaisance had married in 1250 Henry I of Cyprus, the son of Hugh I; and the Cypriot connection of Antioch was thus maintained. In 1252 Bohemond VI established himself in Antioch, leaving Tripoli to itself, and in February 1258 he procured the recognition of his nephew, Hugh II of Cyprus, as king of Jerusalem. In 1268 he lost Antioch to the Mamlūks. Thus fell the richest and oldest of the Frankish Middle Eastern principalities.

• **Bohemond VII** (d. Oct. 19, 1287), count of Tripoli from 1275 to 1287.

The son of Bohemond VI by Sibyl, sister of Leo III of Armenia, he succeeded to the county of Tripoli in 1275, with his mother as regent. He had trouble with the Templars, who were established in Tripoli; and in the very year of his death he lost Laodicea to the Sultan of Egypt. He died without issue, and within two years Tripoli was captured by the Egyptians (1289).

Bohlen und Halbach, Alfried von: *see* Krupp von Bohlen und Halbach, Alfried.

Bohlen und Halbach, Gustav von: *see* Krupp von Bohlen und Halbach, Gustav.

Böhm, Georg (b. Sept. 2, 1661, Hohenkirchen, Thuringia—d. May 18, 1733, Lüneburg, Hanover), German composer known primarily for his keyboard music, which influenced J.S. Bach. After study at Jena University (1684–*c.* 1690), he spent the remainder of his life as a church organist in Lüneburg, where Bach doubtless heard him. Böhm's harpsichord suites are in the manner of J.J. Froberger, but his organ works are original and some are considered brilliant. His treatment of chorale melodies in his organ partitas and chorale preludes exerted a particularly strong influence on Bach.

Böhm, Karl (b. Aug. 28, 1894, Graz, Austria—d. Aug. 14, 1981, Salzburg), Austrian conductor who earned an international reputation for his concert performances and recordings of Richard Strauss, Wagner, Mozart, and other composers.

He studied law but also studied music in Vienna with Eusebius Mandyczewski and Guido Adler. His debut at the Graz Opera House in 1917 was followed three years later by his appointment there as its first conductor. In 1921 he joined the Munich Opera. Böhm became musical director at Darmstadt in 1927, at Hamburg in 1931, and at Dresden in 1934. He made his London debut at Covent Garden in 1936. Böhm came under public criticism for taking the Dresden position because he had replaced Fritz Busch, who had been forced to resign by the Nazis; Böhm replaced Bruno Walter at Salzburg in 1938 under similar circumstances.

After conducting at Dresden until 1943, Böhm directed the State Opera in Vienna from 1943 to 1945 and again from 1954 to 1956. In 1957 he conducted *Don Giovanni* in his debut at the Metropolitan Opera in New York City. From the early 1960s he was perhaps the best known interpreter of Wagner

through his work at the Bayreuth Festivals. He recorded the complete symphonies of Mozart. Böhm's recordings and performances elicited admirable qualities of warmth, subtlety, and lyricism.

Böhm, Theobald (b. April 9, 1794, Munich—d. Nov. 25, 1881, Munich), German flutist, composer for the flute, and flute maker whose key mechanism and fingering system were widely adopted by later makers.

The son of a goldsmith, Böhm studied flute and became a Munich court musician in 1818. In 1828 he opened a factory in which in 1832 he developed the first so-called Böhm flute, characterized by a system of levers (keys) and rings for controlling the opening and closing of the tone holes. The ring keys allow a finger to close a hole and at the same time, by means of a rod or axle attached to the ring, to activate another key distant from the finger. By using keys it is possible to place the holes where they are acoustically needed and to make them as large as necessary for proper intonation, without regard to the size of the hand.

Böhm's original system was improved by many makers, notably the Frenchman Auguste Buffet, through whose skill the Böhm system became widely used in the late 1830s. The flute system was accepted readily in France and England but more slowly in Germany. In 1847 Böhm designed and applied his keywork system to the cylindrical flute body and parabolic head joint; the new design was widely accepted and is essentially the modern orchestral flute. A Böhm-system clarinet was exhibited as early as 1839, and Böhm-system oboes are also found.

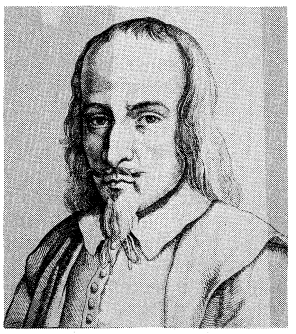
Böhm invented an iron-smelting process that bears his name, as well as an improved piano-stringing design, and he conducted extensive research in acoustics. The degree to which his flute improvements were completely innovative or represent refinements of contemporary developments is a matter of controversy.

Böhm-Bawerk, Eugen von, in full EUGEN, RITTER (Knight) VON BÖHM VON BAWERK (b. Feb. 12, 1851, Brünn, Moravia, Austrian Empire—d. Aug. 27, 1914, Kramsach, Tirol, Austria-Hungary), Austrian economist and statesman.

After graduating from the University of Vienna, Böhm-Bawerk worked in the Austrian Ministry of Finance (1872–75). He was allowed by the Ministry to study at several German universities. In 1880 he moved to Innsbruck, becoming a full professor at the University in 1884. In 1890 he returned to the Ministry of Finance and took part in the currency reform of 1892 and the adoption of the gold standard. He later held Cabinet office several times, resigning in 1904 and subsequently returning to the University of Vienna.

Böhm-Bawerk was, with Carl Menger and Friedrich von Wieser, one of the three pillars of the Austrian school of economists. Starting from Menger's work, Böhm-Bawerk developed a theory of the origin and determination of the rate of interest and the period of turnover of capital occurring with the attainment of the market clearing wage. This provided the capital theory of the Austrian school. Through its influence on later writers such as Knut Wicksell and Irving Fisher, it provided the basis for the modern treatment of interest, which is currently regarded as arising from the interaction of preference for present goods (which inhibits willingness to save and thus provide funds for investment) and the productivity of longer periods of turnover of capital (which causes investment funds to be demanded).

Böhme, Jakob (b. 1575, Altseidenberg, near Görlitz, Saxony—d. Nov. 21, 1624, Görlitz), German philosophical mystic who had a profound influence on such later intellectual movements as Idealism and Romanticism. *The Great Mystery* (1623) is his synthesis of Renaissance nature mysticism and biblical doctrine. *On the Election of Grace,* written



Böhme, woodcut by Hugo Bürkner
By courtesy of the Staatsbibliothek, West Berlin

the same year, examines the problem of freedom, made acute at the time by the spread of Calvinism.

Early life. Böhme was born at the end of the Reformation period. After receiving a rudimentary education, he went, in 1594 or 1595, to nearby Görlitz, a town where controversies over Reformation issues seethed. Here crypto-Calvinists (Lutherans charged with maintaining Calvinist views), Anabaptists (radical Protestants), Schwenkfeldians (followers of the Reformer Schwenkfeld), Paracelsian physicians (followers of the occultic physician Paracelsus), and humanists vied with orthodox Lutherans. Martin Möller, the Lutheran pastor of Görlitz, was "awakening" many in the conventicles that he had established. At these religious meetings traditional materials, both early Christian and medieval German, were studied by a varied group of persons.

In 1600, newly married and just established with a shoemaker's bench of his own, Böhme, probably stimulated by Möller, had a religious experience within the period of a quarter hour wherein he gained an empirical and speculative insight that helped him to resolve the tensions of his age. The strain between medieval and Renaissance cosmologies (dealing with the order of the universe), the perennial problem of evil, the collapse of feudal hierarchies, and the political and religious bifurcation of the time found resolution in Böhme's rediscovery, as he said, of the dialectical principle that "in Yes and No all things consist." Basically Lutheran ("we shall fear and love God," as Luther's Small Catechism states), this principle became with Böhme a *Realdialektik* ("real dialectic"), a wide-ranging polarization of empirical or natural reality.

Writings. Germinating for several years, the insight led him to commit his thoughts to paper, at first for his own use. The manuscript was entitled *The Aurora* (1612) and was written in stages. Called by Böhme a "childlike beginning" it was a conglomeration of theology, philosophy, and what then passed for astrology, all bound together by a common devotional theme. Circulating among Böhme's friends, a copy of *The Aurora* fell into the hands of Gregory Richter, successor to Martin Möller as pastor, who condemned the shoemaker's pretensions to theology. Richter brought the matter up with the Görlitz town council, which forbade further writing on Böhme's part.

A period of silence ensued during which Böhme's ideas matured and his outer affairs prospered. He read the "high masters" as well as other unnamed books that were lent to him by the circle of neighbours and friends who were awed by the book-writing intellectual cobbler. These friends—some physicians, and others of the nobility—introduced Böhme to speculative alchemy, especially to the writings of the Swiss physician Paracelsus (*c.* 1490–1541) that were then quite popular. The alchemical and mystical views of Paracelsus further inspired Böhme's interest in nature mysticism and gave him the terminology which, in a partly integrated way, dominated his next period.

Although he never worked in a laboratory himself, Böhme did use its alchemical terms to describe both his nature mysticism and his subjective experiences, which he sought to integrate into a common framework. During this period Böhme wrote at least six tracts that were circulated guardedly among his friends, creating an influential and respected reputation for him. This second period of writing activity began in 1619, the year when the Thirty Years' War (1618–48) was beginning to gain momentum; in fact, Böhme himself was in Prague when the Winter King, Frederick V of the Rhine Palatinate, entered. The various strident controversies of the age forced Böhme into a period of religious apologetics wherein he had to protest his orthodoxy against accusations, more implied than actual, of Calvinism (Reformed views), chiliasm (belief in the 1,000-year reign of God's people at the end of history), and rabid sectarianism. Reconstructing his theological views, he wrote a series of devotional tracts dealing with penitence, resignation, regeneration—traditional themes of German mysticism. In 1622 his friends had several of these devotional tracts printed in Görlitz under the title *The Way to Christ,* a small work joining nature mysticism with devotional fervour. Publication of this tract brought about the intense displeasure of Richter, who incited the populace against Böhme.

In 1623, the year of his maturity, he wrote two major works: *The Great Mystery* and *On the Election of Grace.* The former explained the creation of the universe as told in Genesis in terms of the Paracelsian three principles (including the mystical elements "salt," "sulfur," and "mercury"), thus joining Renaissance nature mysticism with biblical religion. The latter, more philosophical, gave exposition in terms of dialectical insight to the problem of freedom that Calvinist predestination (the view that man's destiny is foreknown by God) was then making acute. This theme later was taken up by the idealist philosopher Friedrich Schelling and by a German theologian, Franz von Baader, whose commentary for *On the Election of Grace* is still held in high regard by scholars.

Böhme continued his writing at hectic pace, perhaps freed from business obligations by financial help from his friends. Between 1619, when he defiantly renewed his writing, and 1624, when he died, he produced at least 30 works. His defiance of the town council of Görlitz brought him further difficulty, and he was banished, being cited to the Elector's court in Dresden, where, to all appearances, he found vindication because he returned to his home. Although vindicated by the theologians who had examined his views, he was not free from the rancorous moods of his neighbours who were instigated in their attacks by Richter. Esteemed by his friends among the nobility, physicians, and intellectuals, he fled to one of the neighbouring castles where he clearly was the central figure in some kind of secretive group. There he fell sick, and, sensing that his end was near, he was taken back home to Görlitz where, attended by his wife and sons, he began to weaken. He was examined by ecclesiastical authorities and found orthodox enough to be given the sacrament, and in a mood of charismatic expectancy, he died. (J.J.S.)

BIBLIOGRAPHY. The 17th-century translation of Böhme into English by J. Ellistone and J. Sparrow, *The Works of Jacob Behmen,* 4 vol., reprinted in the 20th century, is considered to have more grace

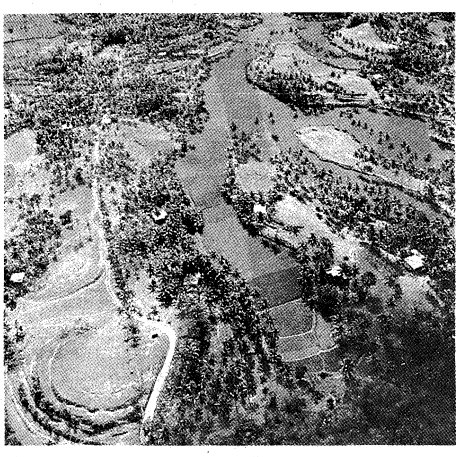
and elegance than modern translations of some tracts by J.R. Earle and J.J. Stoudt. The 1730 German edition of the collected works, edited by J.W. Ueberfeld and reprinted in facsimile during the 1950s by W.E. Peuckert, remains the best text, although in modernized German. The most serviceable English biography utilizing modern materials is J.J. Stoudt, *Jacob Boehme: His Life and Thought* (1968), based on the standard German biographical works by W.E. Peuckert, *Das Leben Jakob Böhmes* (1924); and R. Jecht, *Jakob Böhme, Gedenkgabe der Stadt Görlitz* (1924). The best modern interpretation is A. Koyre, *La Philosophie de Jacob Boehme* (1929).

Böhmer, Johann Friedrich (b. April 22, 1795, Frankfurt am Main—d. Oct. 22, 1863, Frankfurt am Main), historian known for his *Regesta,* an annotated collection of charters and imperial documents of medieval Germany.

After studying at the universities of Göttingen and Heidelberg, Böhmer journeyed to Italy, where he became interested in art history. Upon his return to Frankfurt (1822), he became an assistant librarian at the art institute but subsequently devoted himself to general history. Named archivist (1825) and then head librarian (1830) of the city of Frankfurt, Böhmer began publishing the *Regesta.* The first volume, *Urkunden der römischen Könige und Kaiser von Konrad I bis Heinrich VII, 911–1313* (1831; "Documents of the Roman Kings and Emperors from Conrad I to Henry VII"), contained extracts of documents with Böhmer's comments and historical introductions; it was followed by a more extensive treatment for the period 1198–1313. Other *Regesta* were *Urkunden sämtlicher Karolinger* (1833; "Documents of the Carolingian Kings") and a series of German imperial registers for the periods 1314–47 (1839), 1246–1313 (1844), and 1198–1254 (1849), with introductions and explanatory passages by Böhmer. He also published *Fontes Rerum Germanicarum* (1843–68), a valuable collection of original authorities for German history during the 13th and 14th centuries, and he edited many other collections. On his death he left many manuscripts, some of which were subsequently published.

Böhmer Wald (central Europe): *see* Bohemian Forest.

Bohol, island and province, Visayan group, south central Philippines. Roughly oval in shape, the island has an area of 1,492 sq mi (3,864 sq km) and lies between the Camotes Sea (north) and the Bohol Sea (south). Its volcanic core is mostly covered with coralline limestone. The rivers are short, and there are few good anchorages. Settlement is mainly coastal, except for a low central plateau that encircles the town of Carmen. The spectacular "chocolate hills," or "haycock" hills, in west central Bohol are named for their brown appearance in the dry season and their symmetrical, conical shapes. They are limestone remnants of an earlier erosion cycle, a phenomenon known to be present in only two or three other places in the world. The area has been developed for tourists.



"Chocolate hills" of Bohol, Philippines
Ted Spiegel—Rapho/Photo Researchers

Bohol's character is essentially rural. Rice, corn (maize), and coconuts are the principal crops. A secondary livestock industry is centred at Ubay, on rougher terrain near the east coast. Extensive, low-grade deposits of manganese are mined in the southeast. Loon and Talibon are important towns.

The province includes Panglao and Lapinin islands and numerous small coral islands off the north and west coasts. It has an area of 1,590 sq mi. Tagbilaran, a chartered city, is the provincial capital and the chief port and commercial centre. Pop. (1980) province, 763,330.

Bohomolec, Franciszek (b. Jan. 29, 1720, near Vitebsk, Pol.—d. April 24, 1784, Warsaw), Jesuit priest, editor, and linguist; a prominent dramatist of the Enlightenment in Poland.

After completing his studies in Rome for the Jesuit priesthood, Bohomolec taught in Warsaw and began to adapt comedies of Goldoni and Molière for performance by his pupils. His early works satirized the ignorance and folly of the Polish aristocracy. He wrote a number of other plays for a wider public, such as *Małżeństwo z kalendarza* (1766; "Marriage by the Calendar"), which ridicules ignorance and superstition and is usually considered his best work, and *Czary* ("Sorcery"), also satirizing superstition. *Pan dobry* ("The Good Lord") is a social commentary on the relationship between the peasants and gentry. For the last 20 years of his life Bohomolec edited the magazine *Monitor,* which greatly contributed to the Enlightenment in Poland. It was modelled on the famed *Tatler* and *Spectator* of England and was one of the first modern periodicals in Poland. His works in Latin include a study of the Polish colloquial tongue.

Bohr, Aage N(iels) (b. June 19, 1922, Copenhagen), Danish physicist who shared the 1975 Nobel Prize in physics with Ben R. Mottleson and James Rainwater for their work in determining the asymmetrical shapes of certain atomic nuclei and the reason for it.

Bohr was educated at the University of Copenhagen, where he received his doctorate in 1954. During the 1940s, he worked as assistant to his father Niels Bohr (1922 Nobel physics laureate) on the development of the atomic bomb at Los Alamos, N.M. From 1946 he was associated with the Niels Bohr Institute of Theoretical Physics, founded in Copenhagen by his father, whom he succeeded as director from 1963 to 1970. From experiments inspired by the theories of James Rainwater and conducted in collaboration with Ben R. Mottelson (*q.v.*) in the early 1950s, Bohr discovered that the motion of subatomic particles can distort the shape of the nucleus, thus challenging the widely accepted theory that all nuclei are perfectly spherical. This discovery was important for the understanding and development of nuclear fusion. Bohr's writings include *Rotational States of Atomic Nuclei* (1954) and *Nuclear Structure,* 2 vol. (1969, 1975).

Bohr, Harald August (b. April 22, 1887, Copenhagen—d. Jan. 22, 1951, Copenhagen), Danish mathematician who devised a theory that concerned generalizations of functions with periodic properties, the theory of almost periodic functions.

The brother of the noted physicist Niels Bohr, he became professor at the Polytechnic Institute in Copenhagen in 1915 and at the University of Copenhagen in 1930. His early mathematical research was mainly concerned with the Dirichlet series, a series introduced by Peter Dirichlet of Germany in the application of analysis to the theory of numbers. Later, in collaboration with Edmund Landau of Germany, Bohr concentrated his efforts on a study of the Riemann zeta function, a function of fundamental importance to the theory of prime numbers and also to the theory of analytic functions in general. In 1914 they formulated the theorem (now called the Bohr–Landau theorem), which concerns the conditions under which the zeta function is equal to zero (distribution of zeros).

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bohr, Niels (Henrik David) (b. Oct. 7, 1885, Copenhagen—d. Nov. 18, 1962, Copenhagen), Danish physicist and Nobel laureate, the major contributor to the development of quantum physics for almost 50 years. He is responsible for the Bohr theory of the atom and liquid-drop model of the atomic nucleus.

A brief account of the life and works of Niels Bohr follows; for a full biography, *see* MACROPAEDIA: Bohr.

Bohr, son of Christian Bohr, a professor of physiology at the University of Copenhagen, showed an interest and talent in the physical sciences early in life. At the age of 22 he won a gold medal from the Danish Scientific Society for his determination of the surface tension of water. He received a doctorate in physics from the University of Copenhagen in 1911 for a thesis on the electron theory of metals. He then went to England, and worked at Cambridge under J.J. Thomson and subsequently at Manchester with E. Rutherford's group studying the structure of the atom. Bohr stayed on at Manchester, with some interruptions, until 1916 and served on the university faculty for two years. He returned to Copenhagen in 1916 as professor, and in 1920 became director of the newly created Institute of Theoretical Physics, a position he held until his death. He was awarded the Nobel Prize for Physics in 1922.

When Denmark was occupied by the Germans in 1940, Bohr took an active part in the anti-Nazi resistance movement. In 1943, under threat of immediate arrest, he escaped to Sweden with his family by fishing boat. Although he participated in the atomic bomb project at Los Alamos, N.M., as early as 1944 his concern about such awesome weapons was clear. He was convinced that free exchange of people and ideas among countries was necessary to achieve control of nuclear weapons. Bohr received the first Atoms for Peace Award in 1957.

Bohr's works include *The Theory of Spectra and Atomic Constitution* (1922), *Atomic Theory and the Description of Nature* (1934), and *Atomic Physics and Human Knowledge* (1958). The last mentioned contains Bohr's incomparable account of his discussions with Albert Einstein on quantum theory over two decades.

Bohr atomic model, description of the structure of atoms, especially that of hydrogen, proposed (1913) by the Danish physicist Niels Bohr. The Bohr model of the atom, a radical departure from earlier, classical descriptions, was the first that incorporated quantum theory and was the predecessor of wholly quantum-mechanical models. The Bohr model and all of its successors describe the properties of atomic electrons in terms of a set of allowed (possible) values. Atoms absorb or emit radiation only when the electrons abruptly jump between allowed, or stationary, states. Direct experimental evidence for the existence of

such discrete states was obtained (1914) by the German-born physicists James Franck and Gustav Hertz.

Immediately before 1913, an atom was thought of as consisting of a tiny positively charged heavy core, called a nucleus, surrounded by light, planetary negative electrons revolving in circular orbits of arbitrary radii. Bohr amended that view of the motion of the planetary electrons to bring the model in line with the regular patterns (spectral series) of light emitted by real hydrogen atoms. By limiting the orbiting electrons to a series of circular orbits having discrete radii, Bohr could account for the series of discrete wavelengths in the emission spectrum of hydrogen. Light, he proposed, radiated from hydrogen atoms only when an electron made a transition from an outer orbit to one closer to the nucleus. The energy lost by the electron in the abrupt transition is precisely the same as the energy of the quantum of emitted light.

Bohrā, also spelled BOHORĀ, in general, any Shīʿī Ismaʿīlī Muslim of the Mustaʿlī sect, living in western India. The name is a corruption of a Gujarati word, *vahaurau,* meaning "to trade." The Bohrās include, in addition to this Shīʿī majority, often of the merchant class, a Sunnī minority who are usually peasant farmers. The Mustaʿlī sect (*see* Ismāʿīlīyah), which originated in Egypt and later moved its religious centre to Yemen, gained a foothold in India through missionaries of the 11th century. After 1539, by which time the Indian community had grown quite large, the seat of the sect was moved from Yemen to Sidhpur, India. A split resulted in 1588 in the Bohrā community between followers of Dāʾūd ibn Quṭb Shāh and Sulaymān, who both claimed leadership of the community. The followers of Dāʾūd and Sulaymān have since remained the two major groups within the Bohrās, with no significant dogmatic differences, the *dāʿī,* or leader, of the Dāʾūdīs residing in Bombay, the leader of the Sulaymānī in Yemen.

Böhtlingk, Otto von (b. June 11 [May 30, old style], 1815, St. Petersburg, Russian Empire—d. April 1, 1904, Leipzig), language scholar and lexicographer whose writings and seven-volume Sanskrit–German dictionary formed a notable contribution to 19th-century linguistic study.

While completing his education at the University of Bonn (1839–42), Böhtlingk published a two-volume edition (1839–40) of the earliest known grammar, that of Pāṇini, the 5th- or 6th-century-BC Indian Sanskrit grammarian. This edition served as a vehicle for criticizing the research methods of Franz Bopp, a major German Sanskritist of the time. Returning to St. Petersburg in 1842, he joined the Imperial Academy of Sciences and published a number of works on Sanskrit, including an edition and translation of the drama *Śakuntalā* by Kālidāsa (1842). He also explored one of the languages of Siberia in *Über die Sprache der Jakuten,* 3 vol. (1851; "Concerning the Language of the Yakuts"). His great work, the *Sanskrit-Wörterbuch* (1853–75; "Sanskrit Dictionary"), was prepared in collaboration with the Indic scholars Rudolf von Roth, Albrecht Weber, and others and appeared in a new edition in 1879–89. Late in his life, he published, in addition to other Sanskrit research, a new edition of the Pāṇini grammar along with a translation.

Bohuslän, *landskap* (province), southwestern Sweden, on the Norwegian border, with the *landskap* (provinces) of Dalsland and Västergötland to the east and the Kattegat to the west. Its land area of 1,717 sq mi (4,447 sq km) comprises most of the administrative *län* (county) of Göteborg och Bohus. A maritime province, it has a wild, steep coast fringed by rocky, bare islands and skerries.

Hällristningar, or rock carvings, especially notable in the parish of Tanum, near Grebbestad, and ancient burial grounds attest to the existence of Stone, Bronze, and Iron Age settlements in Bohuslän, which is also reputedly the scene of the second part of the Old English epic *Beowulf.* Because of its strategic location, the province was the object of numerous wars between the Scandinavian countries until it was finally ceded to Sweden by the Peace of Roskilde (1658). There is some agriculture, with potatoes, oats, and rye being the chief crops. The leading industries are fishing (which accounts for 60–70 percent of Sweden's marine catch), stone quarrying (especially granite), and tourism. Shipbuilding is also important. Principal towns, most of which are seaside resorts, include Kungälv, with its 14th-century Bohus Castle, which has given its name to the area; Marstrand; Lysekil; Uddevalla, the biggest municipality in the region; and Strömstad. Pop. (1983 est.) 231,343.

Boian, Neolithic culture (*c.* 7000 BC) centred in what is now southern Romania; it was characterized by terrace settlements, consisting at first of mud huts and later of fortified promontory settlements. The Boian phase was marked by the introduction of copper axes, the extension of agriculture, and the breeding of domestic animals. The distinctive Boian pottery was decorated by rippling, painting, and excised or incised linear designs. By spreading northward into Transylvania and northeastward to Moldavia, the Boian culture gradually assimilated earlier cultures of those areas.

Boiardo, Matteo Maria, CONTE (count) DI SCANDIANO (b. May 1440/41, Scandiano, Papal States—d. Dec. 19, 1494, Reggio nell'Emilia), poet whose *Orlando innamorato,* the first poem to combine elements of both Arthurian and Carolingian traditions of romance, gave new life to the chivalrous epic, which was declining in popularity. Boiardo spent much of his childhood at Ferrara, and served the dukes of Este. He was captain of the ducal forces at Modena from 1480 to 1482 and at Reggio from 1487 until his death.

His chief pleasures were in study and poetry, and he wrote numerous works, both in Latin and Italian. Of the Italian works, the *Amorum libri tres* (1499; "Three Books on Love") tells of his love for Antonia Caprara and is among the most personal and spontaneous collections of 15th-century lyrics, written at a time when most love poetry was a conventional exercise. *Orlando innamorato,* begun about 1476, was intended to consist of three parts, but only the first two (published 1483) and part of the third were completed at the poet's death. *Orlando innamorato* (to which Ariosto's *Orlando furioso* was conceived as a sequel) glorifies military honour, patriotism, and religion. The poem did not achieve popularity, partly because of its dialectical and erudite language, partly because of the careless construction of the episodes and characters, but chiefly because of its delineation of strong and primitive passions, which was not in tone with the tendencies of his time. Boiardo, however, breathed an intimate, personal strain into the stereotype of the epic that future generations emulated and expanded.

An English translation by Robert Tofte appeared in 1598 and one in prose by W.S. Rose in 1823.

boid, any member of the snake family Boidae, which includes boas and pythons. The more than 80 species occur chiefly in the tropics, worldwide. Almost all have two lungs, a pelvic girdle, and vestigial hindlimbs, which show as small spurs opposite the vent. Some have heat-sensitive lip pits. Boids tend to be iridescent, especially after shedding the skin.

Nonvenomous, they kill by biting and constricting. The family includes the world's largest snakes (reticulated python and anaconda) as well as small burrowing forms.

Boie, Heinrich Christian (b. July 19, 1744, Meldorf, Holstein—d. March 3, 1806, Meldorf), German poet and editor, chiefly noted as a founder of literary periodicals.

After studying theology and law at the University of Jena, with Christian W. von Dohm, Boie founded the literary journal *Deutsche Museum* (1776; in 1789 renamed *Neue Deutsche Museum*). In 1776 he began a career in government that was concurrent with his literary activities. He served in various local posts, finally as provincial governor of the rural district of Süderdithmarschen.

Boieldieu, François-Adrien (b. Dec. 16, 1775, Rouen, Fr.—d. Oct. 8, 1834, Jarsy), composer who developed the farcical French opéra comique into a more serious form of early romantic opera.

In Rouen he studied under the organist Charles Broche and composed two operas and numerous piano sonatas, remarkable for their form, which constitute the first important body of piano works by a French composer. In 1796 he settled in Paris, where he met Étienne Méhul and Luigi Cherubini. The following year he produced three comic operas. He became professor of piano at the conservatory in 1798 and composed his successful operas *Le Calife de Bagdad* (1800) and *Ma Tante Aurore* (1803). From 1804 to 1810 he directed the opera at St. Petersburg, Russia. In 1816

Boieldieu, detail of an oil painting by Louis-Léopold Boilly; in a private collection

The Andre Meyer Collection—J.P. Ziolo

he became director of music to Louis XVIII, in 1817 a member of the French Institute, and in 1820 professor of composition at the conservatory. His main operas of this period were *Jean de Paris* (1812), *Le Petit Chaperon rouge* (1818; "Little Red Riding Hood"), and his masterpiece, *La Dame blanche* (1825; "The White Lady"). Composed on a libretto by Eugène Scribe, derived from Sir Walter Scott's *The Lady of the Lake, Monastery,* and *Guy Mannering,* it had received 1,700 performances by 1914. Boieldieu's work illustrates the evolution of French operatic music in the generation following the French Revolution. In its lighter aspects, his style was compared to Rossini's. His scenes of mystery and romance, particularly in *La Dame blanche,* are akin to those of Carl Maria von Weber. He also composed numerous romances for voice and harp or piano and a harp concerto.

Boii, a Celtic tribe, one section of which settled in Cisalpine Gaul around Bononia (Bologna, Italy) and another in what was later Bohemia, to which it gave its name. The Cisalpine group, after struggling against the Romans throughout the 3rd century BC, was subdued and made a Latin colony in 191 BC. The second group, which joined with another Celtic tribe, the Helvetii, to invade Gaul, was defeated in 58 BC by Julius Caesar. He allowed the survivors to settle in Gaul between the

Liger (Loire) and Elaver (Allier) rivers. The remaining Boii south of the Danube River were exterminated by Burebistas of Dacia about 50 BC, and those in Bohemia were expelled by the Marcomanni tribe in 8 BC.

boil, also called FURUNCLE, or FURUNCULOSIS, a staphylococcus skin infection characterized by an inflamed nodular swelling filled with pus, located at the site of a hair follicle. The lesion is painful and feels hard to the touch; healing begins after the pus is discharged. Boils are usually located in hairy body areas exposed to friction and maceration, such as the back of the neck, the face, armpits, buttocks, and groin. A sty is a boil located at the base of an eyelash. A carbuncle is an aggregation of adjoining boils with several centers of pus collection.

Existing skin disorders that lead to scratching may favour the entrance of the staphylococci into hair follicles, with resulting boil formation. Any general lowered state of health may also predispose individuals to furunculosis, although the condition also affects healthy people. Some individuals seem more susceptible to boils than others, and in them the boils tend to recur. Ordinarily treatment is unnecessary, other than the use of measures to keep the affected area clean and protected from further infection. In more severe cases, antibiotics are usually effective. When boils occur in a patient at a hospital in which penicillin-resistant staphylococcal infections are endemic, they may constitute a serious medical problem, particularly when the patients are aged or debilitated.

Boileau(-Despréaux), Nicolas (b. Nov. 1, 1636, Paris—d. March 13, 1711, Paris), poet and leading literary critic in his day, known for his influence in upholding classical standards in both French and English literature.

He was the son of a government official who had started life as a clerk. Boileau made

Boileau, oil painting after Hyacinthe Rigaud; in the Musée National de Versailles et des Trianons, France

Cliche Musees Nationaux

good progress at the Collège d'Harcourt and was encouraged to take up literary work by his brother Gilles Boileau, who was already established as a man of letters.

He began by writing satires (*c.* 1658), attacking well-known public figures, which he read privately to his friends. After a printer who had managed to obtain the texts published them in 1666, Boileau brought out an authenticated version (March 1666) that he toned down considerably from the original. The following year he wrote one of the most successful of mock-heroic epics, *Le Lutrin,* dealing with a quarrel of two ecclesiastical dignitaries over where to place a lectern in a chapel.

In 1674 he published *L'Art poétique,* a didactic treatise in verse, setting out rules for the composition of poetry in the classical tradition. At the time, the work was considered of great importance, the definitive handbook of classical principles. It strongly influenced the English Augustan poets Dr. Johnson, John Dryden, and Alexander Pope. It is now valued more for the insight it provides into the literary controversies of the period.

In 1677 Boileau was appointed historiographer royal and for 15 years avoided literary controversy; he was elected to the Académie Française in 1684. Boileau resumed his disputatious role in 1692, when the literary world found itself divided between the so-called ancients and moderns (*see* ancients and moderns, the quarrel of). Seeing women as supporters of the moderns, Boileau wrote his antifeminist satire *Contre les femmes* ("Against Women," published as *Satire x,* 1694), followed notably by *Sur l'amour de Dieu* ("On the Love of God," published as *Epitre xii,* 1698).

Boileau did not create the rules of classical drama and poetry, although it was long assumed that he had—a misunderstanding he did little to dispel. They had already been formulated by previous French writers, but Boileau expressed them in striking and vigorous terms. He also translated the classical treatise *On the Sublime,* attributed to Longinus. Ironically, it became one of the key sources of the aesthetics of Romanticism.

boiler, also called STEAM GENERATOR, apparatus designed to convert a liquid to vapour. In a conventional steam power plant, a boiler consists of a furnace in which fuel is burned, surfaces to transmit heat from the combustion products to the water, and a space where steam can form and collect. A conventional boiler has a furnace that burns a fossil fuel or, in some installations, waste fuels. A nuclear reactor can also serve as a source of heat for generating steam under pressure.

Boilers were built as early as the 1st century AD by Hero of Alexandria but were used only as toys. Not until the 17th century was serious consideration given to the potential of steam power for practical work. The first boiler with a safety valve was designed by Denis Papin of France in 1679; boilers were made and used in England by the turn of the 18th century. Early boilers were made of wrought iron; as the advantages of high pressure and temperature were realized, manufacturers turned to steel. Modern boilers are made of alloy steel to withstand high pressures and extremely high temperatures.

Most conventional steam boilers are classed as either fire-tube or watertube types. In the fire-tube type, the water surrounds the steel tubes through which hot gases from the furnace flow. The steam generated collects above the water level in a cylindrically shaped drum. A safety valve is set to allow escape of steam at pressures above normal operating pressure; this device is necessary on all boilers, because continued addition of heat to water in a closed vessel without means of steam escape results in a rise in pressure and, ultimately, in explosion of the boiler. Fire-tube boilers have the advantage of being easy to install and operate. They are widely used in small installations to heat buildings and to provide power for factory processes. Fire-tube boilers are also used in steam locomotives.

In the watertube boiler, the water is inside tubes with the hot furnace gases circulating outside the tubes. When the steam turbogenerator was developed early in the 20th century, modern watertube boilers were developed in response to the demand for large quantities of steam at pressures and temperatures far exceeding those possible with fire-tube boilers. The tubes are outside the steam drum, which has no heating surface and is much smaller than in the fire-tube boiler. For this reason, the drum of the watertube boiler is better able to withstand higher pressures and temperatures. A wide variety of sizes and designs of watertube boilers are used in ships and factories. The express boiler is designed with small water tubes for quick generation of steam. The flash boiler may not require a steam drum, because the tubes operate at such high temperatures that the feed water flashes into steam and superheats before leaving the tubes. The largest units are found in the central-station power plants of public utilities. Units of substantial size are used in steel mills, paper mills, oil refineries, chemical plants, and other large manufacturing plants.

Boilermaker, The (boxer): *see* Jeffries, James Jackson.

boiling, the cooking of food by immersion in water that has been heated to near its boiling point (212° F [100° C] at sea level; at higher altitudes water boils at lower temperatures, the decrease in boiling temperature being approximately one degree centigrade for each 1,000 ft [300 m]). Water-soluble substances, such as sugar and salt, raise the boiling point of the water).

Boiling is used primarily to cook meats and vegetables. The extent of cooking varies according to individual taste and regional or traditional dictum; in the cookery of the U.S. South, for example, the boiling of vegetables is usually protracted, with a soft consistency and a blend of flavours in combined ingredients considered desirable. In the *nouvelle cuisine* of France, on the other hand, Chinese influence dictates minimal boiling or steaming to preserve fresh colour, texture, and flavour.

A number of specific terms apply to methods of cooking with hot water. Scalding is accomplished in water heated to around 185° F (85° C), usually in a double boiler, which conducts the heat of the water, contained in a bigger pan, to a smaller pan containing the food, thus avoiding contact between food and water. This technique is commonly used to prepare milk for breads and custards. At just above the scalding temperature, water begins to circulate visibly and to shiver; at this point, foods, notably eggs and fish, may be poached. At the simmering point, variously specified but generally approaching the boiling temperature, the surface of the water breaks into small bubbles; simmering, in a covered or open pan, is commonly used to prepare soups, stews, and pot roasts. In blanching, boiling water is poured over vegetables, fruits, or nutmeats in order to loosen the outer skin. Parblanching or parboiling consists in immersing the food in cold water and then bringing it slowly to a simmer or boil.

Steaming comprises two related techniques, both used primarily for the cooking of vegetables. In the first, the food is placed on a rack above a shallow portion of water, heated to the boil, in a covered pan; this method is valued for its preservation of colour, texture, flavour, and nutrients. The second technique, called pressure cooking, requires a tightly sealed, often latched, vessel, in which characteristically tough or long-cooking foods may be subjected to steam cooking under high pressure. The classic New England boiled dinner, consisting of corned beef cooked with cabbage, carrots, potatoes, and onions, is traditionally boiled in the conventional manner but may be adapted readily to pressure cooking.

boiling point, temperature at which the pressure exerted by the surroundings upon a liquid is equalled by the pressure exerted by the vapour of the liquid; under this condition, addition of heat results in the transformation of the liquid into its vapour without raising the temperature.

At any temperature a liquid partly vaporizes into the space above it until the pressure exerted by the vapour reaches a characteristic value called the vapour pressure of the liquid at that temperature. As the temperature is increased, the vapour pressure increases; at the boiling point, bubbles of vapour form within the liquid and rise to the surface. The boiling point of a liquid varies according to the applied pressure; the normal boiling point is the temperature at which the vapour pressure is equal to the standard sea-level atmospheric pressure (760 millimetres [29.92 inches] of mercury). At sea level, water boils at 100° C (212° F). At higher altitudes the temperature of the boiling point is lower. *See also* vaporization.

Boilly, Louis-Léopold (b. July 5, 1761, La Bassée, Fr.—d. Jan. 4, 1845, Paris), prolific

"Self-Portrait," oil on canvas by Louis-Léopold Boilly, 1795; in the Musée des Beaux-Arts, Lille, Fr.

By courtesy of the Musee des Beaux-Arts, Lille, France

painter known for his satirical portraits of Parisian life and manners during the Revolution and the French Empire. He is also noted for his pioneering use of the technique of lithography.

Boilly's artistic career began at age 11. In 1785 Boilly moved to Paris and began to paint the elegant scenes that were to make him famous. During the French Revolution he came under suspicion because of the subject matter of his works, which were satires of contemporary morals. He cleared himself by painting "Le Triomphe de Marat," a flattering view of the revolutionary leader Jean-Paul Marat; this work enabled the artist to be admitted to the Republican Society of the Arts. During the Directory and the Consulate regimes, he continued to paint scenes depicting manners. In 1804 he sent to the Salon (the official art exhibition) two works: "L'Arrivée d'une diligence dans la cour des Messageries" and "Le Sculpteur Houdon dans son atelier," both of which won awards. In 1823 he produced his first lithographs, his humorous series "Grimaces." He produced 5,000 portraits in his lifetime; approximately 500 of his works document the life of Paris.

Boina, strong but short-lived kingdom of the Sakalava people in western Madagascar. The Sakalava, who originated in southern Madagascar, migrated up the west coast in the mid-17th century under the leadership of Andriandahifotsy. When he died, one of his sons succeeded to the rule of southwestern Madagascar (the kingdom of Menabé).

The other son, Adriamandisoarivo, continued the migration northward and established his rule over a second Sakalava kingdom, Boina. At his death *c.* 1710, Boina covered the broad coastal plain between the Manambalo and Mahajamba rivers, and collected tribute from neighbouring states. Some disintegration followed his death, but Boina regained its cohesion under Queen Ravahiny (d. 1808). It allied with the French in opposition to the Sakalava's traditional rival, the Merina of the central plateau. Competition among Ravahiny's 12 sons divided the kingdom in the early 19th century and opened the path to conquest by the Merina before 1850.

Boineburg, Johann Christian, Freiherr von (baron of): *see* Boyneburg, Johann Christian, Freiherr von.

Bois-le-Duc (The Netherlands): *see* 's Hertogenbosch.

Boisbaudran, Paul-Émile Lecoq de: *see* Lecoq de Boisbaudran, Paul-Émile.

Boise, capital (since 1864) and largest city of Idaho, U.S., seat of Ada County, on the Boise River, in the southwestern part of the state. It was named by early 19th-century French-Canadian trappers for the tree-lined river (French *boisé:* "wooded") that provided relief for travellers crossing the desolate Snake River Plain. Following the 1862 gold rush to Boise Basin, Ft. Boise was established (July 4, 1863) on what is now Government Island, and a community developed to provide services for the nearby mines. Its location at the crossroads of the Oregon Trail and a primary mining route (Boise Basin to Owyhee) ensured an early growth, which by the turn of the century was sustained by agriculture and lumbering. After 1902 the Boise Irrigation Project made possible the construction of reservoirs and canals and the nearby Arrowrock Dam. Left off the main line of the Union Pacific until 1925, Boise made early use of commercial aviation (1926). Diversified industries, agriculture (fruit, sugar beets, and livestock), lumbering, and wholesale trade and trucking have developed. Federal and state agencies provide much local employment.

The city is the Pacific Northwest Region headquarters for the U.S. Water and Power Resources Service and is headquarters of the Boise National Forest (dotted with abandoned mines and ghost towns). Boise State University

State Capitol, Boise, Idaho

Alan Pitcairn from Grant Heilman—EB Inc.

was founded in 1932 as a junior college. Inc. 1864. Pop. (1980) city, 102,451; metropolitan area (SMSA), 173,036.

Boise National Forest, national forest in southwestern Idaho, U.S., divided into two segments. The principal part is roughly diamond shaped, with maximum dimensions of about 109 mi (175 km) north–south and 55 mi east–west. Separated from the main section by the valley of the North Fork of the Payette River is a narrow outlying part of the forest, 37 mi north–south and 12 mi east–west at its widest point; most of it, however, is much narrower.

The main portion of the forest is generally steep and mountainous, decreasing somewhat in elevation toward the Boise River Valley in the southwest. The rugged Sawtooth Range covers much of the eastern part; the highest elevation within the forest is Big Baldy, 9,722 ft (2,963 m) above sea level. Many regionally significant streams, including the Middle and South forks of the Salmon River, the Middle Fork of the Payette River, and all three forks of the Boise River, have their sources in the forest.

Following the discovery of gold north of Boise in 1862, numerous mining communities sprang up. As the deposits became depleted, many have become lumbering or grazing outposts; the cutting of Ponderosa pine and sheep ranching are important to the economy. Some of the mining towns, however, died out and are now "ghost towns" of interest to tourists.

Recreation remains the basic land use of the forest; fishing, hunting (bear, deer, elk, mountain goat), hiking, and float boating on the Middle Fork of the Salmon River are all popular. Parts of both the Idaho and the Sawtooth Primitive Areas are in the forest; these scenic wilderness areas, where commerical exploitation is forbidden, are kept roadless, except for a few unimproved roads that existed before the areas were set up. Bogus Basin Ski Area is a winter-sports centre, 10 mi north-northeast of Boise, capital of Idaho and forest headquarters. Set up in 1908, the forest has an area of 4,621 sq mi (11,968 sq km).

Boise River, river formed by confluence of the Middle Fork and North Fork branches, southeast of Idaho City in Boise National Forest, Idaho, U.S. It flows generally westward through Arrowrock and Lucky Peak reservoirs and through the city of Boise to join the Snake River at the Oregon line after a course of about 95 mi (150 km). Dams along the river include Lucky Peak, Arrowrock, and Anderson Ranch (on the South Fork). The name is from a French word meaning "wooded."

Boisguillebert, Pierre Le Pesant, sieur de (sire of) (b. 1646, Rouen, Fr.—d. 1714, Rouen), French economist, precursor of the Physiocrats, advocate of economic and fiscal reforms for France during the reign of Louis XIV. Boisguillebert was opposed to the economic policy of Jean-Baptiste Colbert, finance minister to Louis XIV, who attempted to increase the manufacturing potential of France by keeping agricultural prices at a low level in the hope that low-wage goods would be an incentive to industry. Like his physiocratic successors, Boisguillebert thought that national wealth was dependent on the prosperity of agriculture. He was an agricultural protectionist, but his belief in the natural order of economic and social relationships and his opposition to the medieval economic restrictions that had proliferated brought him close to a laissez-faire position. In fiscal reform he advocated direct rather than indirect taxes; reform of the taille, a direct tax from which the French kings derived the major part of their revenue; and a 10 percent income tax. For his views and his support of the disgraced Sébastien de Vauban, another advocate of reform, Boisguillebert was dishonoured and for a time exiled.

Boismorter, Joseph Bodin de (b. Dec. 23, 1689, Thionville, Fr.—d. Oct. 28, 1755, Roissy-en-Brie), prolific French composer of instrumental music in addition to cantatas, ballet-operas, and other vocal music. His first works appeared in Paris, in 1724, and by 1747 he had published more than 100 works in a variety of vocal and instrumental combinations.

His music, particularly for the voice, was extremely popular, and he became rich without the aid of patrons. Boismorter was the first French composer to use the Italian term concerto. He also wrote the first French solo

concerto for any instrument, a concerto for cello, viol, or bassoon (1729). Much of his music is for the flute, for which he also wrote an instruction method (now lost).

Boisrobert, François Le Metel, seigneur de (lord of) (b. 1589, Caen, Fr.—d. March 30, 1662, Paris), prolific dramatist, irreligious churchman, and practical benefactor of the French world of letters who was a founding member of the Académie Française.

A Norman Huguenot lawyer's son, he became a Catholic in the 1620s and began to take holy orders. His wit and effrontery won him the favour of Cardinal de Richelieu, and he was given a canonry at Rouen (1634) and an abbacy in Burgundy (1638)—posts in which he gave offense during his rare attendances. Meanwhile, he had published a paraphrase of the Psalms (1627); a novel, *Histoire indienne d'Anaxandre et d'Orazie* (1627; *History of Anaxander . . .*, 1657); and a tragicomedy, *Pyrandre et Zysimène* (1633); as well as anthologies of poems eulogizing King Louis XIII and Richelieu (1634–35). He used his influence with Richelieu not only to procure subsidies for other writers but also to promote the establishment of the Académie Française.

When Louis XIII heard from his own intriguing favourite, the Marquis de Cinq-Mars, that Boisrobert had made sexual advances to Richelieu's pages, he ordered Richelieu to dismiss him (1641). Under the next regime, Boisrobert's wit made little appeal to Cardinal Mazarin, and his blasphemies offended the Jesuit entourage of the queen mother, Anne of Austria. Hence, his last 20 years were mainly occupied with dramaturgy. His plays are largely forgotten except by students of the 17th-century French theatre.

Boito, Arrigo, original name ENRICO GIUSEPPE GIOVANNI BOITO, pseudonym TOBIA GORRIO (b. Feb. 24, 1842, Padua, Lombardy-Venetia—d. June 10, 1918, Milan), Italian

Boito, portrait by an unknown artist

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

poet and composer acclaimed for his opera *Mefistofele* and his librettos after Shakespeare for Giuseppe Verdi's *Otello* and *Falstaff*.

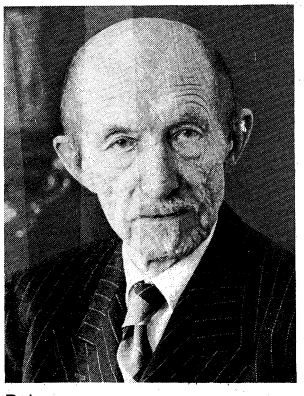
The son of an Italian painter of miniatures and a Polish countess, Boito attended the Milan Conservatory and travelled to Paris on a scholarship. There he met Verdi, for whom, in 1862, he wrote the text of the *Hymn of the Nations*. When war broke out in 1866, he joined Garibaldi's volunteers. While working on *Mefistofele*, he published articles championing German and vigorously attacking Italian music and musicians. Verdi was deeply offended by his remarks. By 1868, when *Mefistofele* was produced at Milan, Boito's polemics had provoked so much hostility that a near riot resulted, and the opera was withdrawn after two performances. A much-revised version, produced at Bologna in 1875, has remained in the Italian repertory. Of the several operas based on Goethe's *Faust*, Boito's *Mefistofele* is perhaps the most faithful to the spirit of the play. The libretto is of particularly high quality. Somewhat influenced by Beethoven and Wagner, the opera was unconventional for its day, both in its then unusual harmonies and in its rejection of some of the conventions of Italian opera. Boito's second opera, *Nerone*, occupied him for nearly 50 years; completed after his death by Vincenzo Tommasini and Arturo Toscanini, it was produced in Milan in 1924, but, despite its grand design and spectacle, it lacked the musical character that distinguished *Mefistofele*.

Boito and Verdi were reconciled in 1873, and Boito undertook the revision of the libretto of Verdi's *Simon Boccanegra*. His masterly versions of *Otello* and *The Merry Wives of Windsor* (the libretto for *Falstaff*) stimulated the imagination of the aged composer. Boito also wrote texts for several other composers, including Amilcare Ponchielli (*La gioconda*), and published a volume of verses (under the pseudonym Tobia Gorrio) and several novels.

Bojador, Cape, also spelled CAPE BOUJDOUR, extension of the West African coast into the Atlantic Ocean, now part of the Western Sahara. Located on a dangerous reef-lined stretch of the coast, its Arabic name, *Abū Khaṭar*, means "the father of danger." It was first successfully passed by the Portuguese navigator Captain Gil Eanes in 1434. Subsequently the Portuguese exploited the region, particularly for slaves. After 1450 the area was disputed by both Spain and Portugal. Spain finally gained the region in 1860 by the Treaty of Tetuan with Morocco, and in 1884 officially annexed it. A lighthouse was built on the cape in the early 20th century to aid shipping. After Spain withdrew from the Western Sahara in 1976, Morocco claimed the cape, built a desalination plant and barracks for a military garrison there, and made the settlement the capital of the newly created province of Boujdour. A paved road links Cape Bojador with El-Aaiún, to the north.

Bojer, Johan (b. March 6, 1872, Orkesdalsøren, near Trondheim, Nor.—d. July 3, 1959, Oslo), Norwegian novelist, internationally popular in the 1920s because his works dramatized topical problems of the day. He is best remembered in his own country for novels depicting folk life in the fishing-farming communities of the Lofoten Islands: *Den siste viking* (1921; *Last of the Vikings*, 1923) and *Folk ved sjøen* (1929; *Folk by the Sea*, 1931), perhaps his finest work. Both of these works are epic in conception and contain remarkable passages of description.

Born in a fisherman's hut, Bojer grew up in extreme poverty but enjoyed early success as a writer. For many years he lived abroad, in France, Italy, Germany, and England. His reputation in the English-speaking world was established with *Den store hunger* (1916; *The Great Hunger*, 1918). He also wrote an ambitious novel about America's Norwegian immigrants, *Vor egen stamme* (1924; *The Emigrants*, 1925). Bojer's international popularity survived into the 1940s.



Bojer

By courtesy of Norsk Telegrambyra

Bojo Guksa, secular name CHI-NUI (b. 1158, Korea—d. 1210, Korea), Buddhist priest who founded the Chogye-jong (Chogye Sect), now one of the largest Buddhist sects in Korea. It is derived from Ch'an, the Chinese form of Buddhism, known as Sŏn in Korea and as Zen in Japan.

Bojo became a Buddhist follower at the age of eight and entered the priesthood at 25, when he passed the Korean national service examination. He was much influenced by the doctrine of sudden enlightenment taught by the Chinese Ch'an Buddhist master Hui-neng (638–713); and in 1190 Bojo, together with several of his colleagues, set up a new organization to counter the elaborate ritualistic practices that had crept into Korean Buddhism. In 1200 he moved to the Songkwang-sa (Songkwang Temple) in Mt. Chiri, where he established the Chogye-jong. A form of Sŏn Buddhism, the Chogye-jong stressed the importance of studying the *Avataṃsaka-sūtra* (*Garland Sutra*) and of meditation. Bojo taught that the ultimate goal of Buddhism is to acquire the essential calmness of mind, free from external influence. He expressed this doctrine in his last and most famous writing, "A Commentary on the Fa-chi-pieh-hang-lu."

Bok, Bart J(an) (b. April 28, 1906, Hoorn, Neth.—d. Aug. 7, 1983, Tucson, Ariz., U.S.), Dutch-born American astronomer known for his work on the structure and evolution of the Milky Way Galaxy and for his study of "Bok globules," small dark clouds observable against the background of bright nebulae. Bok suggested that these globules may be condensed clouds of interstellar gas and dust in the process of contracting into stars.

Bok studied at the universities of Leiden and Groningen (Ph.D. 1932). He then pursued an academic career of research and teaching at Harvard University (1929–57), the Australian National University (1957–66), and the University of Arizona (1966–74), remaining at Arizona as professor emeritus; he had become a U.S. citizen in 1938. He served as director of the Mount Stromlo Observatory (1957–66) in Australia and as director of the Steward Observatory (1966–70) in Arizona. With his wife, Priscilla F. Bok, he wrote the classic work *The Milky Way* (1941; 5th ed., 1981). Bok served as vice president of the International Astronomical Union (1970–76) and as president of the American Astronomical Society (1972–74).

Bok, Edward (William) (b. Oct. 9, 1863, Den Helder, Neth.—d. Jan. 9, 1930, Lake Wales, Fla., U.S.), innovative American editor in the field of periodical journalism for women; during his 30-year stewardship of the *Ladies' Home Journal* (1889–1919), he effected important reforms and helped shape contemporary American culture.

Growing up in a poor immigrant family in Brooklyn, N.Y., Bok worked as an office boy for the Western Union Telegraph Co., attended night school, entered book publishing, and (at the age of 24) became advertising manager of *Scribner's Magazine*. In 1886 he established the Bok Syndicate Press, for which he developed, as a regular newspaper feature, a full page of reading material for women. The striking success of the "Bok page" led to his elevation to the editorship of the *Ladies' Home Journal* in Philadelphia. Bok devised magazine departments to inform and advise women on almost every subject: he campaigned for women's suffrage, sleeping-car improvement, wildlife conservation, and clean cities and towns; he opposed roadside billboards, public drinking cups, and power-company encroachment at Niagara Falls, N.Y. His announcement in 1892 that he would accept no more patent medicine advertising opened the way

Edward Bok, photograph by Pirie MacDonald, 1909

By courtesy of the Library of Congress, Washington, D.C.

for a crusade that enlisted other editors and culminated in the enactment of the Pure Food and Drug Act (1906). His boldest venture was to break the taboo against printed mention of venereal disease. By 1917 readers of the magazine were sending him nearly 1,000,000 queries annually for public reply.

Bok's autobiography, *The Americanization of Edward Bok* (1920), was awarded the Pulitzer Prize in 1921. He devoted the rest of his life to benefactions, particularly in behalf of civic improvement and world peace.

Bok Koŭ, also spelled BOKOR, or BOKKOR, town, southern Kampuchea (Cambodia). It is situated in the southern Dâmrei Mountains at 3,378 feet (1,030 m) above sea level. The town overlooks the narrow coastal plain and the Gulf of Thailand and is surrounded by forests that have supported teak cutting and big-game hunting. With its relatively cool temperatures, Bok Koŭ developed into a mountain resort. Pop. (1971 est.) 547.

Bokassa, Eddine Ahmed, original name JEAN-BÉDEL BOKASSA, also called BOKASSA I (b. Feb. 22, 1921, Bobangui, Oubangui-Chari, French Equatorial Africa [now in Central African Republic]), African military leader who was president of the Central African Republic (1966–77) and self-styled emperor of his Central African Empire (1977–79).

The son of a village chief and nephew of the nationalist leader Barthélémy Boganda, Bokassa attended local mission schools before joining the French Army in 1939. He distinguished himself in the French conflict in Indochina, was made a member of the Legion of Honour, and also received the Croix de Guerre. By 1961 he had achieved the rank of captain. At the request of President David Dacko, Bokassa left the French armed forces to head the army of the newly independent Central African Republic. In 1966 Bokassa used his position as supreme military commander to overthrow Dacko and declare himself president of the republic. In that capacity he became known for his autocratic and unpredictable policies, both foreign and domestic, and his government was characterized by periodic reshuffles in which the power of the presidency was gradually increased.

In 1977, emulating his hero, Napoleon I, Bokassa crowned himself Emperor Bokassa I in a lavish ceremony that cost about $200,000,000 and effectively bankrupted the already-impoverished Central African Republic. Bokassa renamed his country the Central African Empire. His reign was short-lived, however. Following the substantiation of international charges that Bokassa had personally participated in a massacre of 100 schoolchildren by his Imperial Guard, French paratroops carried out a military coup against him that reestablished the republic and reinstated Dacko as president (September 1979). Bokassa went into exile, first traveling to Côte d'Ivoire (Ivory Coast) but later settling in France.

Bokassa was sentenced to death in absentia in 1980, but he inexplicably chose to return to the Central African Republic in 1986. He was arrested and put on trial, and in 1987 he was found guilty of the murders of the schoolchildren and other crimes (although he was acquitted of charges of cannibalism). His death sentence was subsequently commuted to one of life imprisonment in solitary confinement.

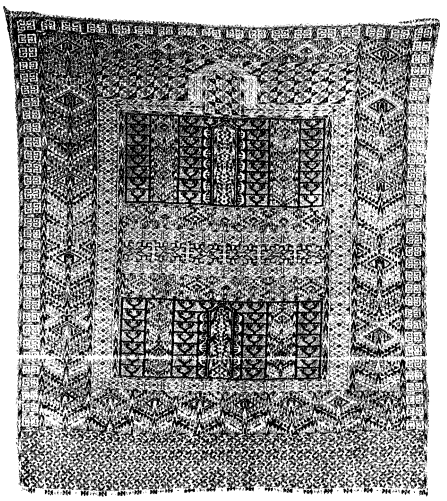
Boké, town and port, western Guinea, western Africa. It lies along the Nuñez River, near the Atlantic coast. The surrounding region is the nation's most important bauxite-producing area. The bauxite deposits were discovered in 1954 north of Sangarédi, 50 miles (80 km) east-northeast of Boké. Treated ore (alumina) was first exported in the early 1970s via rail from Sangarédi to the new deepwater Port-Kakandé (Dougoufissa) on the Nuñez River's estuary 34 miles (55 km) southwest of Boké.

Once a collecting point for slaves, the town of Boké became a French trading post in 1865 and exported peanuts (groundnuts), coffee, and wild rubber from about 1870 to 1914. Its wharf, 25 miles (40 km) upstream from Kanfarandé (Victoria) at the head of the Nuñez estuary, can accommodate vessels of 7-foot (2-metre) draft; but navigation impediments and the development of Conakry's port greatly reduced Boké's importance as a port. The town is now the chief market centre (rice, fish, cattle, oranges, and palm oil and kernels) for the region's Landuma, Fulani, Nalu, Mikifore, and Baga peoples. It has a hospital, a secondary school, a central mosque, and a Roman Catholic mission (1897). Pop. (1983 prelim.) 33,205.

Bokenam, Osbern, Bokenam also spelled BOKENHAM (b. Oct. 6, 1392?, Old Buckenham?, Norfolk, Eng.—d. ?1447), English poet, best-known as the author of *Legends of Holy Women,* a series of 13 legends of 12 women saints. The work comprises about 10,000 lines in all and is written mainly in seven- or eight-line decasyllabic stanzas. The prologues are more lively and interesting than the legends themselves, which are closely translated from Latin originals. The first of the legends, of St. Margaret, was written for his friend Thomas Burgh. The only surviving copy of the manuscript is in the British Museum. An edition of *Legends* by M.S. Serjeantson was published in 1938. Little is known of Bokenam's life. He was a student of John Lydgate, an English devotional poet, and was probably inspired by Geoffrey Chaucer's poem *Legend of Good Women.*

Bokhara: *see* Bukhara.

Bokhara rug, Bokhara also spelled BUKHARA, any of the predominantly red-coloured floor coverings handwoven by peoples of Russian Turkistan (Turkmen S.S.R. and Uzbek S.S.R.). Many of the rugs have been marketed through the city of Bukhara (Bokhara) in the Uzbek S.S.R. They are primarily the product of Tekke Turkmens but also are made by Salors, Sariqs, Yomuts, and Ersaris (*see* Ersari carpet; Tekke carpet; Salor rug; Yomut carpet). The prayer, or door, rugs of these tribes, known as Hatchlu rugs, used to be sold as Princess Bokharas, and high-quality Tekke carpets were sold as Royal Bokharas. The various tribes also produce pile-faced bags, panels of several sizes, door surrounds, extremely long and narrow ornamental tent bands, and flat-woven rugs and covers of several types. Bokhara rugs now come also from eastern Iran, Afghanistan, and Pakistan. They are fashioned in a variety of colours.



Princess Bokhara rug (Hatchlu) from Russian Turkistan, late 19th century; in a New York state private collection

In a New York state private collection; photograph, Otto E. Nelson—EB Inc.

Bokn Fjord, Norwegian BOKNAFJORDEN, inlet of the North Sea in Rogaland *fylke* (county), southwestern Norway. At its mouth between the southern tip of the island of Karmøy and the northern tip of the Tungenes Peninsula it is 12 miles (20 km) wide. Bokn Fjord proper extends inland for about 28 miles (45 km). Its principal branches include Skjold Fjord and Sandeid Fjord to the north, Sauda Fjord and Hyls Fjord to the northeast, and Lyse Fjord and Høgs Fjord to the southeast. It is dotted by many islands and islets. Among the more important are the Kvits Islands in the centre of the fjord's entrance; Bokn, inside the north entrance; Finn and Rennes islands, in the middle of the fjord; and Ombo, near its head. The city of Stavanger, on the west coast of the Tungenes Peninsula, is the only large settlement along Bokn Fjord.

Boksburg, town and diversified industrial and mining centre, Transvaal, South Africa, 5 miles (8 km) east of Johannesburg. Established in 1887 as the administrative centre of the East Rand with the discovery of gold and coal in the area, it has become one of the most important gold-producing towns on the Witwatersrand. Incorporated as a town in 1903, Boksburg has become a diversified industrial centre that manufactures a wide variety of industrial and consumer goods, among them electric motors, cranes, and glazed ceramics. Gold mining also continues, mostly as a result of the construction of extremely deep shafts. The town is surrounded by residential suburbs and is the focal point of a number of major roads. Pop. (1985) 110,832.

bokuseki (Japanese: "ink trace"), Chinese (Wade–Giles romanization) MO-CHI, Pinyin MOJI, calligraphy of the Buddhist sects known as Zen in Japan and Ch'an in China. This calligraphic form sprang directly from the transplantation during the 12th and 13th centuries of Ch'an Buddhism to Japan, in which country it became known as Zen. *Bokuseki* became a part of the major artistic flowering associated with Zen Buddhism during the Muromachi period (1338–1573), at which time calligraphy was regarded as an essential cultural accoutrement of a distinguished Zen monk. *Bokuseki* characters were written with the brush in a bold and assertive style. They often comprise a phrase or evocative saying written by a Zen master to educate his disciple or please an important visitor. Many such works eventually became highly valued collector's items, appreciated both for their aesthetic appeal and for their historical associations. The most admired *bokuseki* in Japan were produced by the Zen monks Musō Soseki (1275–1351), Sesson Yūbai (1290–1346), and Tesshū Tokusai (fl. 1342–66).

bola, also called BOLAS (Spanish: "balls"; from *boleadoras*), South American Indian weapon, primarily used for hunting, consisting of stone

balls, usually in a group of three, attached to long, slender ropes. In hunting rhea, guanaco, and other animals in open country, the bola is whirled like a sling, then thrown parallel to the ground to entwine the quarry's legs.

Bolama, region comprising the Bijagós Archipelago, western Guinea-Bissau, West Africa; it has an area of 608 sq mi (1,560 sq km). The archipelago extends southwestward into the Atlantic Ocean and contains the Ilha de Bolama (Bolama Island), which is located in the northeastern part of the region and is separated from Quinará region by a channel. Farther southwest, the islands of the region include Galinhas (northeast); Formosa (north central); Caravela and Caraxe (northwest); Uno and Unhocomo (southwest); Orango, Canogo, and Orangozinho (south); and Roxa, João Vieira, and Meio (far southeast). Caravela Island has phosphate deposits. Mangrove forests and swamps predominate on the islands. Oil palms and rice are the major crops on the islands of Bolama and Formosa. Bolama town is the regional capital. A road extends west across Bolama Island. The main ethnic group in the Bolama region is the Bijagós. Pop. (1979) 25,713.

Bolama, port town, capital, Bolama region, on the southeast side of the Ilha de Bolama, Guinea-Bissau, West Africa; it lies between mainland Guinea and the Bijagós Islands. It served as capital of the colony until 1941, when it was replaced by Bissau. In the late 1860s the island was claimed by Britain, but President Ulysses S. Grant of the United States, acting as arbitrator, awarded the island to Portugal. Since the 1940s the town has declined in importance and population. A footwear factory opened in the early 1980s. Pop. (1979 prelim.) 3,332.

Bolān Pass, important natural gateway through the Central Brāhui Range in Kalāt Division, Baluchistan Province, Pakistan, connecting Sibi with Quetta by road and railway. For centuries it has been a route for traders, invaders, and nomadic tribes between India and higher Asia. It comprises a series of long, narrow valleys or gorges and extends for 55 mi (89 km) from Rindli in the south (500 ft [150 m] above sea level) to Darwāza near Kolpur in the north (5,793 ft). Its widest point (16 mi) is in the Laleji Plain south of Mach. The Nāri-Bolān Canal Project provides for the irrigation of about 24,000 ac (9,700 ha) by means of damming the monsoon flow of the Bolān River in the Sibi Plain.

Bolāngir, town, administrative headquarters of Bolāngir district, western Orissa state, eastern India. The town was formerly the capital of the princely state of Patna. It is a marketplace for agricultural products and a handicraft centre. Rajendra College (established 1943) and Sailasri palace, the Patna ruler's residence, are located there.

Bolāngir district, 3,437 sq mi (8,903 sq km) in area, lies between the Mahānadi and Tel rivers and is mostly open country with few hills. Most of the people are farmers, mainly growing rice. There is some metalware manufacturing and weaving at Sonepur. Titlagarh and Vaidyanath have ancient temples and monuments. A major rail line passes through the district. The district was formed in 1948, after independence, by merging the princely states of Patna and Sonepur. Pop. (1981) town, 54,943; district, 1,459,113.

Bold Ruler (foaled 1954), U.S. racehorse (Thoroughbred), exceptional stallion, and sire of the famous Secretariat. Bold Ruler was sired by Nasrullah and foaled by Miss Disco at Claiborne Farm, where he later became a stud, and was bred and raced by Wheatly Stables. He was trained by James E. Fitzsimmons. A leggy horse, the dark bay who at maturity stood over 16 hands tall won the first five races he entered in 1957, and went on to win 23 out of 33 races, earning $764,204. He was injury-ridden: born with a hernia, he had rheumatism, a tongue injury as a yearling, and pulled a back muscle and injured his hock as a two-year-old. In 1957 he was Horse of the Year. He was retired from racing in 1958 and put to stud. Bold Ruler was the foremost Thoroughbred stallion from 1963 through 1969. By June 1971 his progeny had won 798 races with total winnings slightly less than $13,000,000. He sired Bold Bidder, who sired Spectacular Bid. Bold Ruler died in 1971 of cancer.

Bolden, Buddy, byname of CHARLES BOLDEN (b. 1868, New Orleans—d. Oct. 4, 1931, New Orleans), cornetist, semi-legendary founding father of jazz who was said by those veterans old enough to remember him, including the great trumpeter Louis Armstrong, to have been one of the most powerful musicians ever to play jazz.

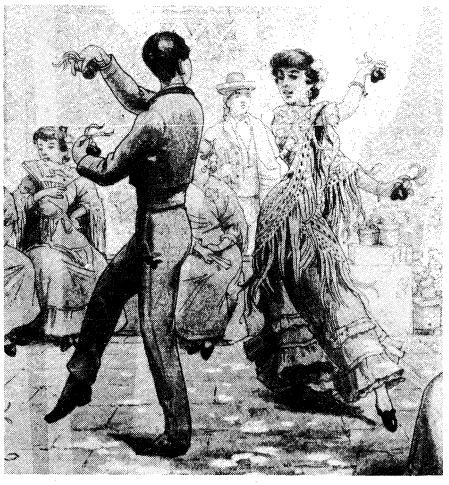
Little is known about the details of his career, but it is documented that he was a barber and that from 1895 to 1899 he led a band that included the cornetist Bunk Johnson. The acknowledged king of New Orleans lower musical life, Bolden often worked with six or seven different bands simultaneously. In 1906 his emotional stability began to crumble, and on June 5, 1907, he was committed to the East Louisiana State Hospital, from which he never emerged.

Boldrewood, Rolf, pseudonym of THOMAS (ALEXANDER) BROWNE (b. Aug. 6, 1826, London—d. March 11, 1915, Melbourne), romantic novelist best known for his *Robbery Under Arms* (1888) and *A Miner's Right* (1890), both exciting and realistic portrayals of pioneer life in Australia.

Taken to Australia as a small child, he was educated there and then operated a large farm in Victoria for some years. He later worked in the New South Wales and Victoria goldfields as a police magistrate and goldfields commissioner. Adopting a pseudonym, he first wrote short stories, then memoirs (*Old Melbourne Memories,* 1884), and finally wrote about 20 novels between 1878 and 1906. A biography by T.I. Moore was published in 1968.

Bolebroke (of Sussex), George Sackville Germain, Baron: *see* Sackville (of Drayton Manor), George Sackville Germain, 1st Viscount.

bolero, lively Spanish dance in $\frac{3}{4}$ time with a strongly marked rhythm. The dancers, either singly or as couples, execute brilliant and intricately difficult steps to the rhythmic accompaniment of their castanets. Distinctive features are the *paseo* ("walk"), *bien parado* ("sudden stop"), and various beating steps (battements). Outstanding among musical examples is Ravel's *Bolero* (1928) for orchestra. The Latin-American bolero is a slow, romantic rumba danced with simple steps.



Bolero, detail of an engraving by C. Llobet, 1929
By courtesy of the Biblioteca Nacional, Madrid

Boles, Charles E.: *see* Black Bart.

Boleslav (Czech), English BOLESLAV, BOLESLAS, or BOLESLAUS, name of Bohemian rulers grouped below chronologically and indicated by the symbol •.

• **Boleslav I,** byname BOLESLAV THE CRUEL, Czech BOLESLAV KRUTÝ (d. July 15, 967), Přemyslid prince of Bohemia from 929, who established the basis of the medieval Czech state.

After instigating the murder of his elder brother, Prince Wenceslas I (St. Wenceslas), Boleslav became ruler of Bohemia. He made Prague the effective administrative centre of his domain, promoted the spread of Christianity, and added the territories of Moravia, Slovakia, and Silesia to his domain. After being attacked by the emperor Otto I (950), he was forced to recognize the German king as his suzerain. His feudal ties remained largely formal, however, and Bohemia was able to retain its autonomy. Several years later, Boleslav cooperated with Otto in combatting the invasion of the Magyars and directed a Bohemian contingent against them at the Battle of Lechfeld (955).

• **Boleslav II,** byname BOLESLAV THE PIOUS, Czech BOLESLAV POBOŽNÝ (d. Feb. 7, 999), prince of Bohemia (967–999), son and successor of Boleslav I; he successfully continued his father's work by further consolidating the supremacy of the Czechs over the other Bohemian tribes and by founding monasteries, nunneries, and capitular churches.

He secured the establishment of the bishopric of Prague in 973 or 974, under the metropolitan authority of the archbishops of Mainz. He treacherously but completely destroyed the Slavnikovci, the only princely rivals of the Přemyslid dynasty in Bohemia, in 995. He was usually loyal to his suzerains, the emperors Otto I, II, and III, whom he helped in their conflicts with the Polish princes, though his support of the rebellious duke of Bavaria, Henry the Wrangler, caused Otto II to lead punitive expeditions against him in 975 and 977–978.

• **Boleslav III,** byname BOLESLAV THE RED, or THE BLIND, Czech BOLESLAV RYŠAVÝ, or SLEPÝ (d. 1035/37), prince of Bohemia 999 to 1002 and again in 1003, the eldest son and successor of Boleslav II.

Troubles in Bohemia drove him to flee in 1002 first to Germany and then to Poland. He made a brief return in 1003 with Polish help, murdered his enemies, and was again expelled. Falling into the hands of Bolesław I of Poland, he was blinded and kept in prison until his death.

Bolesław (Polish), English BOLESLAV, BOLESLAS, or BOLESLAUS, name of Polish rulers grouped below chronologically and indicated by the symbol •.

• **Bolesław I,** byname BOLESŁAW THE BRAVE, Polish BOLESŁAW CHROBRY (b. 966/967—d. June 17, 1025), duke (from 992) and then (from 1024) first king of Poland, who expanded his country's territory to include Pomerania, Lusatia, and, for a time, the Bohemian princely lands and made Poland a major European state; he also created a Polish Church independent of German control.

Son of Mieszko I, the first of the Piast dukes, and the Bohemian princess Dobrawa (Dubravka), Bolesław I inherited the principality of Great Poland (Wielkopolska, between the

Oder and the Warta rivers) upon his father's death (992). He conquered Pomerania (on the Baltic Sea) in 996 and seized Kraków (formerly a Bohemian possession) soon afterward. He ransomed the relics of the martyred St. Adalbert, bishop of Prague, from the pagan Prussians and buried the relics at Gniezno. The Holy Roman emperor Otto III, who had been Adalbert's student and Bolesław's ally since 992, attended the ceremony (March 1000) and marked the occasion by personally crowning Bolesław king of Poland. With Pope Sylvester II's approval, the emperor granted Poland its own archdiocese, with Gniezno as its seat. Bolesław then reorganized Poland's church structure, making it a national church directly under papal jurisdiction and independent of German ecclesiastical control.

After Emperor Otto III's death (1002), Bolesław seized the imperial lands of Lusatia and Misnia (Meissen) and the principality of Bohemia. These actions started a series of three wars between him and the German king Henry II; it lasted until 1018, when, by the Treaty of Bautzen, Bolesław retained Lusatia and Misnia and Henry II won Bohemia. Bolesław's expansionist policy continued. When he defeated Grand Prince Yaroslav I the Wise of Kiev in battle (July 21, 1018) and placed his own son-in-law (and Yaroslav's brother), Svyatopolk, on the Kievan throne, his control extended from the western tributaries of the middle Elbe to the eastern reach of the Western Bug River. Though recognized as king by Otto III in 1000, Bolesław sought to strengthen his position and his independence from imperial control by being crowned again by the archbishop of Gniezno (Dec. 25, 1024).

• **Bolesław II,** byname BOLESŁAW THE BOLD, or THE GENEROUS, Polish BOLESŁAW ŚMIAŁY, or SZCZODRY (b. 1039—d. 1081), king of Poland from 1058 to 1079.

Bolesław assumed the rule of Poland on the death of his father, Casimir I the Restorer, in 1058. During the struggle between the German kings and the papacy, Bolesław was able to restore the international position of Poland. He helped Béla I to obtain the Hungarian crown (1060) against the Germans' protégé and refused to pay the tribute for Silesia that his father had paid to the Czechs. In 1069 he intervened on behalf of a relative by marriage, Izyaslav, to give him the throne of the principality of Kiev. Bolesław and Pope Gregory VII had common interests both in Hungary and against the German king Henry IV, and Bolesław was recognized as king of Poland in the presence of papal legates in 1076. Catastrophe followed a second intervention in Kiev (1077); Polish nobles, with German and Czech support, rebelled; among them was the bishop of Kraków, Stanislaus, who was accused of treason against the sovereign. Bolesław had him put to death on April 11, 1079. The exact cause of the subsequent internal revolt is not clear, but the king had to flee from Poland, taking his son with him, and died in exile, traditionally at Ossiach in Carinthia or Wilten in Tirol. A modern biography is Tadeusz Grudziński's *Bolesław Szczodry* (1953 *et seq.*).

• **Bolesław III,** byname BOLESŁAW THE WRYMOUTHED, Polish BOLESŁAW KRZYWOUSTY (b. Aug. 20, 1085—d. Oct. 28, 1138), prince of Poland who introduced into his country the senioriate system, by which the eldest son received the major part of the royal inheritance. He also converted the Pomeranians to Christianity.

Son of Władysław I Herman, ruler of Poland, and Judith of Bohemia, Bolesław III and his illegitimate elder half brother, Zbigniew, each ruled a Polish province during their father's lifetime. Bolesław III succeeded to his father's princely title (no Polish ruler assumed the title of king from 1082 to 1296) in 1102 and spent the next several years fighting Zbigniew for control of the country. After repelling an invasion of Silesia (1109) by the German king Henry V, Bolesław, who had exiled Zbigniew in 1107, recalled him in 1112; soon, however, he accused Zbigniew of treason and had him blinded. Zbigniew died soon thereafter.

For the next 22 years (1113–35) Bolesław sought control of Poland's former province of Pomerania; he conquered Eastern Pomerania in 1122 but did not secure Western Pomerania until he had sworn fealty to the Holy Roman emperor Lothair II in 1135. Bolesław sent missionaries into Pomerania, converted the pagan tribes there to Christianity, and integrated the people into the Polish state. He then enacted legislation to secure Pomerania and Silesia for his eldest son and lesser provinces for his younger sons. The senioriate system, a halfway measure between primogeniture and equal distribution among all male heirs, was devised to satisfy all princely heirs; yet it caused dissension and eventually led to the disintegration of the state.

Bolesławski, Richard, Bolesławski also spelled BOLESLAVSKI, original name RYSARD ŚRZEDNICKI (b. Feb. 4, 1889, Warsaw—d. Jan. 17, 1937, Los Angeles), motion-picture and stage director, best-known for his work in such popular American films of the 1930s as *Rasputin and the Empress* (1932), *Clive of India* (1935), and *Les Misérables* (1935).

His stage career began in 1906 as an actor with the Moscow Art Theatre. In 1915, during World War I, he joined the 1st Polish Regiment of Lancers as a cavalry officer but left in 1918 to become a cameraman in the Polish war with the Bolsheviks. He emigrated to the United States and became stage director for the American Laboratory Theatre in New York City, staging such plays as *The Vagabond King* (1925), *White Eagle* (1927), *Ballyhoo* (1927), and *Mr. Moneypenny* (1928). In 1929 he went to Hollywood, where he directed many successful films, including the acclaimed 1935 production of *Les Misérables.*

Bolesławski described his experiences in World War I in his two autobiographical books, *Way of the Lancer* and *Lances Down* (both 1932). He also wrote *Acting: The First Six Lessons* (1933).

Boletaceae, a family of fungi (division Mycota) of the order Polyporales, in which the fruiting structures bear pores rather than gills (as in the Agaricales). Some edible mushrooms are included in the family's more than 250 cosmopolitan species. They usually can be found in the woods during hot, rainy periods.

(Top) *Boletus zelleri,* (bottom) *Suillus pictus*

(Top) Larry C. Moon—Tom Stack & Associates, (bottom) Charles Barrows

Several of the 50 species of the genus *Boletus* are edible. The undersurfaces range from red to brown in colour. *B. edulis,* cepe, is found in woods and groves of trees during July and August. The 50 species of *Suillus* form mycorrhizal associations (nutritional "partnerships") between the filaments of the fungus and the roots of certain trees.

Boleyn, Anne (queen of England): *see* Anne Boleyn.

Bolgary, formerly BOLGAR, BULGAR, or BOLGARY VELIKIE, ancient city and capital of the medieval state of Bolgariya Volga-Kama. The ruins of medieval Bolgary are near the present village of Bolgary, Tatar Autonomous Soviet Socialist Republic, Russian S.F.S.R. Excavations on the site of the city began in 1870. The earliest settlement on the site of Bolgary dates to about AD 500. In the second half of the 13th century, Bolgary became the most important trade and craft centre of the Golden Horde. In 1361 Bolgary was destroyed by the Golden Horde khan Bulak-Timur. A number of stone structures from the 13th and 14th centuries have been preserved.

Bolgatanga, town, northern Ghana, western Africa, on the Great North Road. The cultivation of staple crops and stock raising are the chief occupations. The busy market in Bolgatanga is noted for colourful basketry. The town is actually a dispersed settlement of mud-walled compounds, each surrounded by fields and spread over an area of about 160 square miles (410 square km). Pop. (1984 prelim.) 31,500.

Bolindian Stage, youngest time division of the Ordovician Period in Australia (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years). Rocks of the Bolindian Stage succeed deposits of the Eastonian Stage and are characterized by the occurrence of a distinctive fossil graptolite fauna; the genera *Dicellograptus* and *Pleurograptus* are notable. In the Tasman Geosyncline (depositional trough), Bolindian rocks consist of shales and limestones; volcanic deposits also occur and are related to the Benambran orogenic (mountain-building) episode.

Bolingbroke, Henry: *see* Henry IV *under* Henry (England).

Bolingbroke, Henry Saint John, 1st Viscount, BARON SAINT JOHN OF LYDIARD TREGOZE (b. Sept. 16, 1678, probably Wiltshire, Eng.—d. Dec. 12, 1751, Battersea, near London), prominent Tory politician in the reign of Queen Anne of England and, later, a major political propagandist in opposition to the Whig Party led by Sir Robert Walpole.

Early career. He was possibly educated at a Dissenting academy rather than at Eton and the University of Oxford, as has been claimed. In 1698–99 he traveled in Europe and in 1700 married Frances Winchcombe. In 1701 he entered Parliament, where he soon won a reputation by his superb oratory and his support of partisan Tory measures, including attacks on the previous Whig ministry and on the Protestant Dissenters, the Whigs' staunchest allies. His conduct soon brought him to the notice of the government, and, after he was made secretary at war (1704), he was converted, temporarily, to the moderate policies of Robert Harley, one of Queen Anne's principal ministers. For four years he worked hard to provide the Duke of Marlborough with troops and equipment for the War of the

Spanish Succession against France and then resigned with Harley (February 1708) when they failed to prevent the Whigs from dictating government policy. Failing to gain a seat in the 1708–10 Parliament, he urged Harley to ally with the Tory Party as the best means to defeat the Whigs.

Bolingbroke, oil painting attributed to Alexis-Simon Belle, probably 1712; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

In 1710 St. John became northern secretary of state in Harley's new ministry, but he soon emerged as an opponent of Harley's moderation and a rival to his authority. His efforts to control the government's policies and to supplant Harley (after 1711 the earl of Oxford) were largely unsuccessful. Oxford had initiated secret peace negotiations with France, but, even after he had learned of these and had forced his way into the discussions, St. John (after 1712 Viscount Bolingbroke) was not able to dictate the terms that were finally settled at the Treaty of Utrecht (1713). In Parliament, Bolingbroke was no more successful in leading a Tory rebellion against Oxford. He won over some Tories by such partisan measures as the Schism Act (1714), which aimed at depriving the Dissenters of their schools, but he failed to persuade the majority to support his leadership and was unable to give the Tories a clear lead on the disputed succession to Queen Anne. Oxford was eventually dismissed on July 27, 1714, but the Queen's death, on August 1, ruined Bolingbroke's hopes of replacing him.

Exile in France. Dismissed from office by George I and fearing impeachment because of his role in the peace negotiations with France and his intrigues with the Jacobites (the supporters of James III, the Old Pretender), Bolingbroke fled to France (March 1715) and became the Old Pretender's secretary of state in July. This enabled the British government to pass an act of attainder against him by which his property and civil liberties were taken away. As a result, Bolingbroke's political future depended upon a successful Jacobite rebellion. Despite Bolingbroke's hard work, the attempted Jacobite rising in 1715 was a dismal failure. Amidst bitter recriminations, Bolingbroke was dismissed by the Old Pretender and at once sought to ingratiate himself with the Whig government in England. In 1717 he wrote a *Letter to Sir William Wyndham* (not published until 1753) to defend his actions since 1710 and to persuade the Tories to abandon the Jacobite cause. Not surprisingly, he found it difficult to persuade men to forget his recent conduct.

Forced to remain in exile, Bolingbroke sought other outlets for his talents. Mixing with aristocrats and scholars, including Voltaire, he embarked on biblical, historical, and philosophical studies and wrote several works, including *Reflections upon Exile* and *Reflections Concerning Innate Moral Principles.* Shortly after the death of his first wife, he married a French widow, the Marquise de Villette (1719).

Return to England. After years of petitioning the British government and of trying to assist it with his limited influence at the French court, Bolingbroke was pardoned in 1723. He did not, however, resettle in England until 1725, when an act allowed him to buy a small estate at Dawley, near London; his attainder was never fully reversed, and he was unable to regain his peerage or reclaim his seat in the Lords. He imputed this exclusion from parliamentary life to the animosity of Sir Robert Walpole. Though his own frustrated ambition clearly motivated his long campaign against Walpole's political ascendancy, he was also concerned by the way Walpole appeared to monopolize power by the excessive use of bribery and corruption. While charges of such behaviour were exaggerated, there was enough truth in them to build up a formidable opposition to Walpole. At the centre of a literary circle that included Jonathan Swift, Alexander Pope, and John Gay, Bolingbroke waged an influential propaganda campaign. His major contributions to *The Craftsman,* an opposition journal, were the "Remarks on the History of England" (1730–31) and "A Dissertation upon Parties" (1733–34), both of which sought to end the old Whig–Tory disputes and to weld the disparate elements of the opposition to Walpole into a new Country Party, which would protect the independence of Parliament against the encroachments of a corrupt government.

Despite occasional successes, Bolingbroke was unable to bring down Walpole or create a united opposition party. In 1735 he retreated to France, where he continued his studies in philosophy and history, lamenting his countrymen's lack of patriotism in the struggle against Walpole. After he made a short visit to England in 1738, his hopes were revived when he learned of a new opposition party that was gathering at Leicester House around George II's son Frederick, prince of Wales. For this group, he wrote *The Idea of a Patriot King.* It was his most famous work, but it offered no real solution to the problems of defeating Walpole or of creating a "patriot" party. In any event, Prince Frederick did not live to become king, and Walpole's final defeat, in 1742, was not engineered by Bolingbroke.

In his last years, Bolingbroke lacked any real political influence, though he still made vain efforts to create a patriot ministry. He was further embittered by his discovery, in 1744, that Alexander Pope had secretly printed 1,500 copies of *The Idea of a Patriot King* for publication. When, in 1749, Bolingbroke published a corrected version of this work, he was bitterly attacked for taking the opportunity to reveal Pope's earlier breach of faith. Bolingbroke's failing health was further undermined by his distress at his wife's death (March 1750).

Bolingbroke was also a historian of some talent. Intelligent and widely read, he was also noted for his handsome appearance, graceful manners, and brilliant conversation. Clear and forceful in speech and in print and imperious in temperament, he captivated some of the finest minds of his age. On the other hand, he was a notorious libertine and a poor manager of men who tended to lose his nerve in a crisis, and his unscrupulous ambition betrayed him into serious political errors and gained him a reputation for treachery.Though he died a neglected figure, the posthumous publication of his works in 1754 stirred considerable controversy. His unorthodox religious views were at last made public and were denounced on all sides. Modern scholars have paid much less attention to his philosophical works, but he is widely regarded as one of the best contemporary analysts of the politics of the Whig supremacy. (H.T.D.)

BIBLIOGRAPHY. H.T. Dickinson, *Bolingbroke* (1970), now the standard life, based on extensive research and seeking to integrate and interpret Bolingbroke's political career and intellectual development; W.S. Sichel, *Bolingbroke and His Times,* 2 vol. (1901–02, reprinted 1968), an old-fashioned biography, which is not very good on interpretation but which quotes much useful source material; G. Holmes, *British Politics in the Age of Anne* (1967), a brilliant analysis, based on exhaustive research; L. Kramnick, *Bolingbroke and His Circle* (1968), a stimulating study of the political ideology of the age of Walpole.

Bolívar, department, northwestern Colombia, bounded northwest by the Caribbean Sea, west by the Río Cauca, and east by the Río Magdalena. Much of its area of 10,030 sq mi (25,978 sq km) consists of hot, humid, forested lowlands. The department produces livestock, sugarcane, tobacco, cotton, cereals, coffee, and forest products. Mineral resources include gold, coal, and oil. Bolívar's main industries (textiles, petroleum refining, and beverages) and foreign commerce are centred in the departmental capital of Cartagena (*q.v.*). Transportation includes the Río Magdalena, roads linking Bolívar with neighbouring departments and other areas to the south, and air services to all parts of Colombia. Pop. (1981 est.) 1,321,592.

Bolívar, province, central highland Ecuador, almost entirely in the western cordillera (mountains) of the Andes. Formed from part of Los Ríos province in 1884, Bolívar has an area of 1,546 sq mi (4,003 sq km) and lies between the Cordillera de Guaranda on the west and Mt. Chimborazo, the highest peak of the Ecuadorian Andes (20,561 ft [6,267 m]), on the east. It is drained by the Río Chimbo. From its forests come valuable timber and cinchona (a source of quinine); cultivated crops include cereals, potatoes, sugarcane, tobacco, oranges, and coffee. Corn (maize) is extensively cultivated on large haciendas (estates). Beef cattle and hog raising are important. There are known deposits of mercury and salt near Guaranda (*q.v.*), the provincial capital, but they are little exploited.

The Roman Catholic Church has organized urban and rural development programs in the province. Pop. (1983 est.) 173,395.

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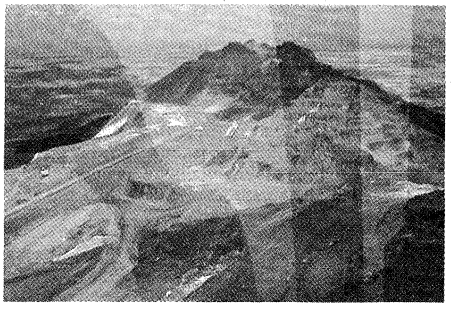
Bolívar, state, southeastern Venezuela, bounded north by the Orinoco River, south by Brazil and the Venezuelan territory of Amazonas, east by Guyana, and west by the Orinoco River and Colombia. It is the largest (area 91,892 sq mi [238,000 sq km]) and potentially one of the richest states of Venezuela. Northern Bolívar consists of rolling hills; in the far south are groups of high plateaus and mesas, including the region of La Gran Sabana, the site of Angel Falls (*q.v.*). In between is jungle, largely uninhabited and unexplored, pierced by the valleys of the Caroní, Paragua, Caura, and many smaller rivers.

The Caroní River is one of the world's largest sources of hydroelectric power. A large power project is in operation at the Macagua Dam, near the mouth of the Caroní; at Guri, 80 mi (130 km) upstream, is one of the world's largest hydroelectric projects. Other projects on the Caroní have been planned.

At the confluence of the Caroní and the Orinoco lies the planned industrial and commercial city of Ciudad Guayana (*q.v.*), which has a national steel mill, an aluminum plant, and several other mills. The city is the largest urban complex in the southern three-fourths of the country.

Bolívar contains most of Venezuela's iron ore deposits (*see* Bolívar, Cerro). Other minerals exploited are diamonds, gold, coal, lime, manganese, nickel, bauxite, and kaolin. A small amount of farming is carried on in the north. Transportation is poorly developed in most of the state. The navigable waterways, railroads, and nearly all the first-class highways are in the north, near Ciudad Guayana and Ciudad Bolívar (*q.v.*), the state capital. Pop. (1983) 566,593.

Bolívar, Cerro, hill of iron ore in north central Bolívar state, southeastern Venezuela.



Cerro Bolívar, Venezuela
Georges de Steinheil

Discovered in 1947, the hill is ¾ mi (1.2 km) wide, 4 mi long and rises 1,650 ft (500 m) above the surrounding grasslands in the Guiana Highlands. With San Isidro, to the south, it is one of the most important mineral finds in the 20th century. Cerro Bolívar is thought to contain more than 250,000,000 tons of high-grade ore, a mixture of hematite, limonite, and a small percentage of magnetite, with an average of more than 50 percent iron. The ore is mined year-round by open-cut methods and sent by rail to Puerto Ordaz 90 mi (120 km) to the northeast at the confluence of the Caroní and the Orinoco, for loading into oceangoing vessels. Millions of tons are shipped annually to the United States, Europe, and Japan. Some ore is used domestically at Ciudad Guayana. Ciudad Piar was established to house the employees of the mine.

Bolívar, Simón, byname THE LIBERATOR, Spanish EL LIBERTADOR (b. July 24, 1783, Caracas—d. Dec. 17, 1830, near Santa Marta, Colom.), South American Creole soldier and statesman who led the revolutions against Spanish rule in New Granada (renamed Colombia, or Gran Colombia, in 1819 and including Venezuela and Ecuador as well as Colombia), Peru, and Upper Peru (Bolivia). He was president, actually dictator, of both Colombia (1821–30) and Peru (1823–29).

Bolívar, detail of an engraving by C.G. Childs
Courtesy of the Library of Congress, Washington, D.C.

The son of a Venezuelan aristocrat of Spanish descent, Bolívar was born to wealth and position. His father having died when the boy was three and his mother six years later, his uncle administered his inheritance and provided him with tutors. At the age of 16, Bolívar was sent to Europe to complete his education. For three years he lived in Spain and in 1801 married the daughter of a Spanish nobleman, with whom he returned to Caracas. The young bride died of yellow fever less than a year after her marriage. In 1804, when Napoleon was approaching the pinnacle of his career, Bolívar returned to Europe. In Paris he re-met a former childhood tutor, Simón Rodríguez, who guided him to the writings of such European rationalist thinkers as Locke, Hobbes, Buffon, d'Alembert, and Helvetius as well as Voltaire, Montesquieu, and Rousseau. The idea of independence for Hispanic America took root in Bolívar's imagination, and, on a trip to Rome, standing on the heights of the Monte Sacro, he made a vow to liberate his country. In 1807 he returned to Venezuela by way of the United States, visiting the eastern cities.

Independence movement. The Latin-American independence movement was launched a year after Bolívar's return, as Napoleon's invasion of Spain unsettled Spanish authority. Bolívar himself participated in many conspiratorial meetings, and on April 19, 1810, the Spanish governor was officially deprived of his powers and expelled from Venezuela. A junta took over. To obtain help, Bolívar was sent on a mission to London, where he arrived in July. His assignment was to explain to England the plight of the revolutionary colony, to gain recognition for it, and to obtain arms and support. Although he failed in his negotiations on all these counts, he did foster the cause of the revolution by persuading the exiled Francisco de Miranda, who in 1806 had attempted to liberate Venezuela singlehandedly, to return to Caracas and to assume command of the independence movement.

Venezuela was in ferment. In March 1811 a national congress met in Caracas to draft a constitution. After long deliberation, it declared Venezuela's independence on July 5, 1811. Bolívar now entered the army of the young republic and was placed in charge of Puerto Cabello, a port vital to Venezuela. Treasonable action by one of Bolívar's officers opened the fortress to the Spanish forces, and Miranda, the commander in chief, entered into negotiations with the Spanish commander in chief. An armistice was signed (July 1812) which left the entire country to the mercy of Spain. Miranda was turned over to the Spaniards—some authorities say at Bolívar's instigation—and spent the rest of his life in Spanish dungeons.

Determined to continue the struggle, Bolívar obtained a passport to leave the country and went to Cartagena in New Granada (present-day Colombia). There he published the first of his great political statements, *El Manifiesto de Cartagena,* in which he urged the revolutionary forces to destroy the power of Spain in Venezuela.

Bolívar now emerged as the champion of strong government for the nascent republics of Hispanic America and was named commander of an expeditionary force whose task was to liberate Venezuela. In a sweeping hard-fought campaign he vanquished the Spaniards in six pitched battles and regained control of the capital. On Aug. 6, 1813, he entered Caracas, was given the title of liberator, and assumed political dictatorship.

But the war of independence was just beginning. In 1814 Bolívar was once more defeated by the Spanish, who had converted the *llaneros,* or cowboys, led by José Tomás Boves, into an undisciplined but savagely effective cavalry that Bolívar was unable to repulse. Boves captured Caracas in 1814 and subjected the city to terrible atrocities. Thus ended the second Venezuelan republic. Bolívar narrowly escaped Miranda's fate. After some more sporadic warfare, he fled to Jamaica.

In exile he wrote the greatest document of his career: *La Carta de Jamaica* ("The Letter from Jamaica"), in which he outlined a grandiose panorama from Chile and Argentina to Mexico. "The bonds," wrote Bolívar, "that united us to Spain have been severed." He proposed constitutional republics throughout Hispanic America, modelled on the government of Great Britain, with a hereditary upper house, an elected lower house, and a president chosen for life. The last provision, to which Bolívar clung throughout his career, constituted the most dubious feature of his political thinking.

Liberation of New Granada. By 1815 Spain had sent to its seditious colonies the strongest expeditionary force that had ever crossed the Atlantic. Its commander was Pablo Morillo. Since neither Great Britain nor the United States would promise aid, Bolívar turned to Haiti, a small republic that had freed itself from French rule, where he was given a friendly reception, as well as money and weapons.

Three years of indecisive defeats and victories followed. In 1817 Bolívar decided to set up headquarters in the Orinoco region, which had not been devastated by war and from which the Spaniards could not easily oust him. He engaged the services of several thousand foreign soldiers and officers, mostly British and Irish, established his capital at Angostura (now Ciudad Bolívar), began to publish a newspaper, and established liaison with the revolutionary forces of the plains, including one group led by José Antonio Páez and another group led by Francisco de Paula Santander. In the spring of 1819 he conceived his master plan of attacking the Spanish viceroyalty of New Granada.

Bolívar's attack on New Granada will always be considered one of the most daring in military history. The route of the small army (about 2,500 men, including the British legion) led through flood-swept plains and icy mountains, over routes that the Spanish considered impassable. The Spaniards were taken by surprise, and in the crucial Battle of Boyacá on Aug. 7, 1819, the bulk of the royalist army surrendered to Bolívar. Three days later he entered Bogotá. It was the turning point in the history of northern South America.

Indefatigably Bolívar set out to complete his task. He appointed Santander vice president in charge of the administration and in December 1819 made his appearance before the congress that had assembled in Angostura. Bolívar was made president and military dictator. He urged the legislators to proclaim the creation of a new state: the republic of Gran Colombia, and three days later La República de Colombia was established. It was a federation and, since two of its three departments, Venezuela and Quito (Ecuador), were still under royalist control, it was only a paper achievement. Bolívar knew, however, that victory was finally within his reach. A revolution in Spain had forced the Spanish king to recognize the ideals of liberalism on the home front, and his action quite naturally discouraged the Spanish forces in South America. Bolívar persuaded Morillo to open armistice negotiations, and the two warriors met in a memorable encounter at Santa Ana, signing, in November 1820, a treaty that ended hostilities for a six-month period. When fighting was resumed, Bolívar found it easy, with his superior manpower, to defeat the Spanish forces in Venezuela. The

Battle of Carabobo (June 1821) opened the gates of Caracas, and Bolívar's Venezuelan homeland was at last free. In the autumn of the same year a congress convened in Cúcuta to draft a constitution for Colombia. Its provisions disappointed Bolívar. Although he had been elected president, he thought the constitution too liberal in character to guarantee the survival of his creation. As long as more urgent assignments claimed his attention, however, he was willing to put up with its weak structure. Leaving the administration to Santander, he asked permission to continue his military campaign.

At the end of a year, Ecuador was liberated. In this campaign Bolívar was assisted by the most brilliant of his officers, Antonio José de Sucre. While Bolívar engaged the Spaniards in the mountains that defended the northern access to Quito, capital of modern Ecuador, Sucre marched from the Pacific coast to the interior. At Pichincha on May 24, 1822, he won a victory that freed Ecuador from the Spanish yoke. On the following day the capital fell, and Bolívar joined forces with Sucre on June 16.

It was in Quito that the Liberator met the great passion of his life, Manuela Sáenz, an ardent revolutionary who freely admitted her love for Bolívar and accompanied him from the battlefields to the presidential palace.

Liberation of Peru. The territory of Gran Colombia, comprising what is now Colombia, Venezuela, and Ecuador, had now been completely recovered from Spain and its new government recognized by the United States. Only Peru remained in the hands of the Spaniards. It was the Peruvian problem that brought Bolívar and the Argentinian revolutionary José de San Martín together. San Martín had done for the southern part of the continent what Bolívar had accomplished for the north. In addition, he had already entered Lima and proclaimed Peru's independence. But the Spanish forces retreated into the highlands, and San Martín, unable to follow them, decided to consult with Bolívar. On July 26, 1822, the two men met in the port city of Guayaquil, Ecuador. Apparently San Martín came to request military aid from Bolívar, and in addition he wanted to reach an understanding on problems of boundaries and the political future of Latin America. There was scant sympathy between the two men owing to differences in their outlook and personality, however, and San Martín's failure to influence Bolívar was almost a foregone conclusion. On his return from Guayaquil, San Martín resigned his office in Lima and went into exile. Whether he took this action out of a wish to give Bolívar a free hand or out of a sense of personal frustration is still not clear.

The avenue that would lead to Bolívar's ultimate ambition was now open. In September 1823 he arrived in Lima. The Spanish army occupied the mountains east of Lima, and its position was considered to be unassailable. Bolívar systematically assembled troops, horses, mules, and ammunition to form an army, and in 1824 he moved out of the temporary capital in Trujillo and ascended the high cordillera country. The first major battle took place at Junín and was easily won by Bolívar, who then left the successful termination of the campaign to his able chief of staff, Sucre. On Dec. 9, 1824, the Spanish viceroy lost the battle of Ayacucho to Sucre and surrendered with his entire army.

Bolivia. Bolívar was now president of Gran Colombia and Peru. Only a small section of the continent—Upper Peru—was still defended by royalist forces. The liberation of this region fell to Sucre, and in April of 1825 he reported that the task had been terminated. The new nation chose to be called Bolivia after the name of the Liberator. For this child of his genius, Bolívar drafted a constitution that showed once more his authoritarian inclinations: a lifetime president, a legislative body without power, and a highly restricted suffrage. Bolívar was devoted to his own creation, but, as the instrument of social reform that he had envisaged, the constitution was a failure.

Bolívar had now reached the high point of his career. His power extended from the Caribbean to the Argentine-Bolivian border. He had conquered severe illness, which during his sojourn in Peru had made him practically an invalid for months at a time. Another of his favourite projects, a league of Hispanic-American states, came to fruition in 1826. He had long advocated treaties of alliance between the American republics, whose weakness he correctly apprehended. By 1824 such treaties had been signed and ratified by the republics of Colombia, Peru, Mexico, Central America, and the united Provinces of Río de la Plata. In 1826 a general American congress convened in Panama. Compared with Bolívar's original proposals, it was a fragmentary affair, since only Colombia, Peru, Central America, and Mexico sent representatives. The four nations who attended signed a treaty of alliance and invited all other nations to adhere to it. A common army and navy were planned, and a biannual assembly representing the federated states was projected. All controversies among the states were to be solved by arbitration. Despite its meagre results, the congress of Panama provided an important example for future hemispheric solidarity and understanding in South America.

But Bolívar was aware that his plans for hemispheric organization had met with only limited acceptance. His contemporaries thought in terms of individual nation-states, Bolívar in continents. In the field of domestic policy he continued to be an authoritarian republican. He thought of himself as a rallying point and anticipated civil war as soon as his words should no longer be heeded. Such a prophecy, made in 1824, was fulfilled in 1826.

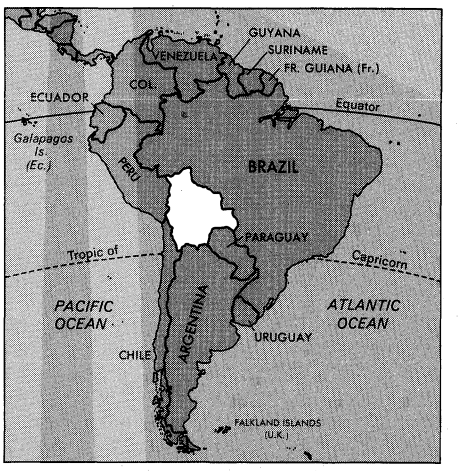
Civil war. Venezuela and New Granada began to chafe at the bonds of their union in Gran Colombia. The protagonists in each country, Páez in Venezuela and Santander in New Granada, opposed each other, and at length civil war broke out. Bolívar left Lima in haste, and most authorities agree that Peru was glad to see the end of his three-year reign and its liberation from Colombian influence. In Bogotá, Bolívar found Santander upholding the constitution of Cúcuta and arguing that Páez be punished as a rebel. But Bolívar was determined to preserve the unity of Gran Colombia and was therefore willing to appease Páez, with whom he became reconciled early in 1827. Páez bowed to the supreme authority of the Liberator, and in turn Bolívar promised a new constitution that would do justice to Venezuela's desire for regional independence. He took over the presidency of Gran Colombia and called for a national convention that met in April 1828. Bolívar refused to influence the elections, with the result that the liberals under the leadership of Santander gained the majority. Bolívar had hoped that the constitution of Cúcuta would be revised and presidential authority strengthened, but the liberals blocked any such attempts. A stalemate developed. Arguing that the old constitution was no longer valid and that no new one had taken its place, Bolívar assumed dictatorial powers in Gran Colombia. A group of liberal conspirators invaded the presidential palace on the night of September 25, and Bolívar was saved from the daggers of the assassins only by the quick-wittedness of Manuela Sáenz. But, though this attempt on his life had failed, the storm signals increased. Bolívar's precarious health began to fail. Peru invaded Ecuador with the intention of annexing Guayaquil. Once more Sucre saved Ecuador and defeated the Peruvians at Tarqui (1829). A few months later, one of Bolívar's most honoured generals, José María Córdoba, staged a revolt. It was crushed, but Bolívar was disheartened by the continued ingratitude of his former adherents. France, England, and the United States tried to intervene in the domestic affairs of the country. In the fall of 1829, Venezuela seceded from Gran Colombia.

Reluctantly, Bolívar realized that his very existence presented a danger to the internal and external peace of the nations that owed their independence to him, and on May 8, 1830, he left Bogotá, planning to take refuge in Europe. Reaching the Atlantic coast, he learned that Sucre, whom he had trained as his successor, had been assassinated. Bolívar's grief was boundless. The projected trip to Europe was canceled; and, at the invitation of a Spanish admirer, Bolívar journeyed to his estate near Santa Marta. Ironically his life ended in the house of a Spaniard, where, toward the end of 1830, he died of tuberculosis.

BIBLIOGRAPHY. Gerhard Masur, *Simón Bolívar,* 2nd ed. (1969), recognized as the best biography in English; V.A. Belaunde, *Bolívar and the Political Thought of the Spanish American Revolution* (1938), a penetrating study of Bolívar's ideas; D.F. O'Leary, *Bolívar and the War of Independence* (1970), an abridged translation of the recollections of one of Bolívar's closest political and military aides (ends at 1826); S. de Madariaga, *Bolívar* (1951; Eng. trans. 1952), an unfavourable assessment of Bolívar by a great Spanish writer; V.W. von Hagen, *The Four Seasons of Manuela, a Biography: The Love Story of Manuela Sáenz and Simón Bolívar* (1952), the best biography of Manuela Sáenz; Simón Bolívar, *Cartas del Libertador,* ed. by Vicente Lecuna, 12 vol. (1929–59), the most important collection of source material for the personality of Bolívar—a selection from these letters may be found in Simón Bolívar's, *Selected Writings,* comp. by Vicente Lecuna, ed. by H.A. Bierck, 2 vol. (1951); D. Bushnell, *The Liberator: Simón Bolívar* (1970), a useful introduction to the man and his image; Pan American Union, *Bibliography of the Liberator, Simón Bolívar* (1930), incomplete but still useful; R.A. Humphreys, *Latin American History: A Guide to the Literature in English* (1958), an indispensable tool for those who do not read Spanish.

Bolivia, officially REPUBLIC OF BOLIVIA, Spanish REPÚBLICA DE BOLIVIA, landlocked country of west-central South America, covering an area of 424,164 square miles (1,098,581 square km). Its administrative capital is La Paz; its constitutional (or judicial) capital is Sucre. Bolivia lies wholly within the tropics and is bordered on the north and east by Brazil, on the southeast by Paraguay, on the south by Argentina, on the southwest by Chile, and on the west by Peru. The population was estimated at 6,993,000 in 1988.

A brief treatment of Bolivia follows. For full treatment, *see* MACROPAEDIA: Bolivia.



Bolivia

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Bolivia may be divided into three major physiographic regions. The southwestern highlands, or Altiplano (High Plateau), with elevations of between 12,000 and 12,500 feet (3,600 and 3,800 m), is a large interior basin that extends through southwestern Bolivia and is enclosed by the second physiographic region, the western (Cordillera Occidental) and eastern (Cordillera Oriental, or Cordillera Real—a name sometimes applied to the northern extension of the Oriental) branches of the Andes mountain chain. Much of the eastern slope of the Cordillera Oriental is a heavily forested belt of rugged terrain, with many deep river valleys and gorges separated by high ridges. (This region is called the Yungas in the north and the Valles in the south). The Cordillera Occidental, less dramatic in relief, is a high plateau bordered by volcanoes rising above 20,000 feet (6,100 m). The country's highest peak (Mount Sajama), at 21,463 feet (6,542 m), lies about 100 miles (160 km) southwest of La Paz. A very active seismic region is centred less than 100 miles north of Sucre; much seismic activity has been recorded there in recent years, with extreme damage following an earthquake in September 1958. The third region is the Oriente, a lowland region that comprises the northern and eastern two-thirds of the country. It ranges from tropical rain forests in the northern Llanos, through a humid subtropical central zone, to the grasslands of the Bolivian Chaco with their semiarid climate in the southeast.

The Altiplano region, a basin of interior drainage—*i.e.,* not reaching the sea—contains Lake Titicaca, the highest commercially navigable body of water in the world (at 12,500 feet [3,810 m]) and one of South America's largest bodies of fresh water (3,200 square miles [8,300 square km]). The unevenness of rainfall on the Altiplano region led to a major expansion of irrigated land there during the 1970s. The confluence of the Oriente region's many northward-flowing rivers with Brazil's Madeira River contributes more than 10 percent of the total discharge of the Amazon River system, the world's largest. The Oriente's huge lowland basin is sparsely populated, though, for, while it contains arable land, extensive seasonal flooding and its relative inaccessibility to the transportation routes of the more populous highlands to the west have hindered development.

Bolivia's rainfall varies from little or no precipitation in the Cordillera Occidental in the southwest to more than 60 inches (1,530 mm) in the humid rain forests of the Oriente in the far northeast. The entire southern part of the country has little or no rainfall for at least four to six months each summer. The more densely populated La Paz and Lake Titicaca areas in the northern Altiplano average about 23 inches (580 mm) of rainfall annually, with the dry season lasting only several months. Annual temperature variations are related primarily to changes in elevation. The lowlands and the intermontane valleys average about 77° F (25° C), the more elevated regions about 50° F (16° C). The annual temperatures of the lowland region (Oriente) vary little, averaging from 73° to 80° F (23° to 27° C).

Only 3 percent of Bolivia's land area is considered arable. About one-fourth of the country is pastureland supporting the distinctive Andean ruminants, the guanaco, llama, alpaca, and vicuña, at higher elevations and cattle in parts of the lowland Oriente region.

On the cold, bleak, windswept Altiplano, vegetation is generally scarce, consisting mostly of grasslands with scattered small trees and bushes. Paradoxically, this highland plateau is the most densely populated region of the country because of sufficient rainfall there for agriculture, the presence there of important mines, and its relative proximity to Chilean and Peruvian ports. More than half of Bolivia is forested, ranging from the great temperate forests of the intermontane valleys to the wide variety of tropical trees found in the upper reaches of the Amazon River basin in the northern part of the Oriente region. Among the teeming animal life of the rain forests, the anaconda, caiman, sloth, and jaguar (now endangered) are typical. The rhea, puma, and marsh deer are found in the grasslands and scrub forests to the south of the rain forests.

Bolivia has rich mineral deposits in the Altiplano region, including large reserves of antimony, tungsten, and tin and commercially valuable quantities of zinc, lead, copper, silver, gold, and sulfur.

The people. The population of Bolivia consists of three principal ethnic groups: the Indians, the mestizos (of mixed Indian and Spanish descent), and the descendants of the Spanish. The Indians are the descendants of two major groups, the Aymara and the Quechua, and also comprise a number of smaller Amazonian and Andean forest tribes; the great majority of Indians are farmers or mine, factory, and construction workers. Spanish is Bolivia's primary language, but the Indian languages, especially Aymara and Quechua, are still widely used and have been declared official languages together with Spanish. The mestizos have traditionally devoted themselves to handicrafts, trades, or small business in the cities. Since the initiation of major social reforms in 1952, a considerable proportion of this group has had access to schools, colleges, and universities, and thus to the professions. The descendants of the Spaniards have historically formed the country's ruling elite: landowners, mine owners and other businessmen, and professionals. Since the 1940s the Spanish descendants have increasingly intermarried with the mestizos, however, and the division between these two groups has become less clearly defined.

The Roman Catholic religion has the adherence of nearly 95 percent of the population. In the Indian communities of the Altiplano, some of the characteristics of pantheistic pre-Columbian religion have survived. Protestant denominations make up a small minority of the population, and there are also small groups of Jews and Muslims.

Bolivia has a relatively high annual rate of population growth, owing to a birth rate that is the highest in South America. It also has the highest registered death rate in South America. More than two-fifths of the population is less than 15 years of age. Bolivia is one of the least urban countries of Latin America; about 50 percent of its population lives in rural areas. La Paz, located on the Altiplano, is the largest city.

The economy. Bolivia has a developing, mixed economy based primarily upon the production of natural gas, tin, and other minerals, together with livestock raising, the production of agricultural foodstuffs, and some industry. The gross national product (GNP) per capita, which had a negative real growth rate in the mid-1980s, is one of the lowest in South America. Annual growth of the real GNP was 2.3 percent during the 1970s but became negative in the early and mid-1980s. Agriculture accounts for about one-fourth of the GNP and employs about half of the labour force. Potatoes and cereals, mainly corn (maize), rice, wheat, and barley, are the principal crops. Bananas, oranges, and cassava are also major food crops, and sugarcane, coffee, cotton, cacao, and tobacco are major cash crops. Coca, the source of the drug cocaine, grown in the intermontane valleys north and east of La Paz, is also an important cash crop, though grown to supply the illegal international drug market. The principal livestock are sheep, cattle, goats, and pigs; besides these there are also indigenous domesticated animals, the llama, alpaca, and cavy (a type of guinea pig).

Most of Bolivia's forests are concentrated in the northern and eastern Oriente region, where there are large stands of virgin tropical forests. The forestry industry has remained largely underdeveloped, however.

The mining sector, although producing less than one-tenth of the GNP, accounts for about 90 percent of the value of Bolivia's export earnings. The country is a major producer of tin, antimony, and tungsten. Petroleum production is about equal to domestic demand; natural gas is also produced and has become Bolivia's leading legal export by value. More than two-thirds of the country's electric power production is generated by hydroelectric power stations, and the remainder by thermal plants. Political turmoil, a paucity of processing industries, and inadequate internal transport have hindered the maximization of output and profit from Bolivia's mineral industries.

Manufacturing also remains underdeveloped, contributing somewhat less than one-fifth of the GNP and employing about one-tenth of the work force. Important products include foodstuffs (flour, refined sugar, and coffee), cement, footwear, furniture, and textiles; smelted nonferrous metals, mining equipment, and refined petroleum also are produced. Construction is also underdeveloped.

Tourism in Bolivia is centred on Lake Titicaca in the Altiplano region, where Inca ruins, Spanish colonial buildings, the natural beauties of the lake, and skiing in the Andes all attract visitors.

During the 1950s and '60s most of the larger Bolivian mining and industrial enterprises were nationalized, and the government regulated development through five-year economic plans. Since the mid-1980s, however, the policy has been reversed, and the private sector has been viewed as the major development force. The principal labour federation is the Central Obrera Boliviana (COB), whose member unions are grouped by industry. Bolivia's labour unions, especially its well-organized tin miners, have a history of clashes with Bolivia's successive governmental regimes.

Bolivia is one of South America's poorest nations. The scarcity of foreign investment, a lack of internal savings, and governmental instability, mismanagement, and corruption have hindered the development of the country's industry and agriculture. Bolivia experienced five years of minimal or negative economic growth by the mid-1980s, and inflation reached an estimated 14,000 percent. The subsequent introduction of monetary and wage controls, the removal of subsidies, and the introduction of a near-floating exchange rate helped reduce the annual rate of inflation.

Bolivia is a member of the United Nations and its agencies. It also belongs to the Organization of American States, the Latin-American Integration Association, the Andean Group, and the Latin American Economic System.

The country's railways are mostly nationalized and are operated by the Bolivian National Railways (Empresa Nacional de Ferrocarriles). Only a small proportion of Bolivia's road network is paved, and, excepting the highway to Santa Cruz, all paved roads are concentrated in the Altiplano and the Andes valleys regions. There are some 9,000 miles (14,500 km) of navigable inland waterways, and, through agreements negotiated with Paraguay, Brazil, and Argentina, landlocked Bolivia has duty-free access to Atlantic ports. There are international airports at La Paz and Santa Cruz.

Bolivia's main trading partners are Argentina, the United States, Brazil, West Germany, the United Kingdom, and Japan. Its principal exports are natural gas, tin, zinc, coffee, silver, and tungsten, and its principal imports are industrial raw materials, consumer goods, in-

dustrial machinery and equipment, and transport equipment.

Government and social conditions. Bolivia is an independent republic whose political life has been frequently dominated by the military. The Bolivian army's seizure of power in July 1980, for example, constituted the 189th coup in the country's 154 years of independence. A civilian government was elected in 1985 and ruled by authority of the country's 1947 constitution.

The government is led by a popularly elected president and cabinet. Legislative authority is vested in a 157-member National Congress (Congreso Nacional), consisting of a Chamber of Deputies and a Senate. The president and members of the legislature are elected for four-year terms; the president may not be immediately reelected. The dominant political parties are the extreme right-wing Nationalist Democratic Action and the centre-right National Revolutionary Movement (Historical). The judiciary is headed by a 12-member Supreme Court appointed by the Congress.

Bolivia suffers from relatively poor health conditions, particularly in the rural areas. Serious diseases such as typhoid fever, tuberculosis, and malaria still infect significant numbers of people. Malnutrition is also a problem. The infant mortality rate is one of the highest in South America, and the average life expectancy is only about 51 years. The country's health problems are aggravated by a shortage of doctors. Housing conditions in many parts of Bolivia are also still relatively primitive.

The government offers free education in primary and secondary schools. Primary education for children between the ages of 6 and 14 years is officially compulsory. Despite government efforts to promote literacy, the literacy rate stands at only about 60 percent. The largest of Bolivia's institutions of higher education is the Higher University of San Andrés, located in La Paz.

Bolivia's news media are usually subject to governmental censorship during times of military rule. Newspapers are privately owned. Among Bolivia's most powerful radio stations is the government-operated Radio Illimani—the Voice of Bolivia. Television programming falls within the province of the state-run television-broadcasting agency; the University Television Service (Televisión Universitaria) presents educational programs.

Cultural life. The remarkable cultural achievements of the Andean cultures of western Bolivia, notably the Inca and their successors and subject peoples, beginning in the 1st millennium AD, are displayed in the National Museum and the National Museum of Archaeology, both in La Paz, and in the Tiahuanaco Regional Museum in Tiahuanaco. These museums display Incan architecture, metalwork, and textiles. Folk expression in music and dance has flourished in Bolivia for the last two centuries and is seen especially in local festivals celebrating a wedding, a wake, or the birthday of a local patron saint. Development of literature and the fine arts was relatively slow until the first few decades of the 20th century, when writers and artists began creating works of uniquely Bolivian expression. A major concern was the social problems of Bolivia's poor, especially the Indians, manifest in the works of the novelist Alcides Arguedas, the poet Franz Tamayo, the painter Guzmán de Rojas, and the sculptors Marina Nuñez del Prado and Hugo Almaraz. Art inspired by native themes or motifs can be seen in Bolivia's many art museums, most located in La Paz.

History. The earliest history of Bolivia is not well-known. Human habitation in the Andean area is at least 21,000 years old, though definable and regionally significant cultures did not develop until the 1st millennium AD. These cultures probably brought about the domestication of the potato and the llama. Sometime after AD 600, high culture centred on Tiahuanaco, a ceremonial centre about 30 miles (48 km) south of Lake Titicaca. It had been developing for some 500 years, spreading its influence outward and leaving monumental structures as evidence of its achievements. After 1200, the Tiahuanaco culture was succeeded by numerous small, Aymara-speaking kingdoms, which predominated throughout Bolivia until well into the Spanish period.

The more westerly Quechua-speaking Inca peoples incorporated the Aymara into their empire in the late 15th century and called the resulting province Kollasuyo but left the native language and culture basically intact. However, the Inca did establish Quechua-speaking colonies throughout the area.

Spain invaded the Inca empire in 1532. Before the end of that century, Spain had established the cities of Charcas (now Sucre), La Paz, Santa Cruz, and Villa de Oropeza (Cochabamba) and had begun to exploit the silver wealth of Potosí. Bolivia, then known as the Audiencia of Charcas in the Viceroyalty of Peru, flourished in the 17th century. For a time, Potosí was the largest city in the Americas; Charcas, because of its academies and university, was known as the "Athens of America." By the end of the 17th century, however, the mineral wealth had begun to dry up. Severe economic depression followed the Wars of Independence in the early 1800s, and when Bolivia entered nationhood, it was economically undeveloped.

Talk of independence began as early as 1809, but not until the victory of Simón Bolívar's lieutenant, Antonio José de Sucre, over Spanish forces at Ayacucho in 1824 did the fight for independence gain full support. In 1825 the Spanish forces were finally defeated by Sucre.

Independent Bolivia's political history was, almost from the beginning, marked by insurrection and instability. A short-lived union with Peru failed in 1839, and in 1884 the Atacama province on the Pacific coast was lost to Chile. In 1880 a period of civilian rule began that lasted until 1936. The disastrous Chaco War of 1932–35, a border war with Paraguay for control of the Chaco Boreal, shattered Bolivia. The ensuing proliferation of political parties in the 1940s made government stability nearly impossible to achieve, but in April 1952 an alliance of mine workers, peasants, and other groups overthrew the current military regime and began the Bolivian National Revolution. This important social revolution in the early 1950s nationalized the tin-mining sector, granted universal suffrage for the first time, distributed land to many of Bolivia's Indians, and partially freed them from their traditionally servile status.

In the late 1950s, some of the social programs inaugurated in the 1952 revolution were suspended in order to bolster the flagging economy. Instability continued through the following decades and into the 1980s. Democratic elections held in 1980 were set aside by a coup, and a military regime was installed until civil unrest forced it to return power to the elected civilian government in 1982. With inflation running out of control, new elections were called for 1985; the resulting newly elected administration instituted severe austerity measures designed to control inflation and stabilize the economy.

Böll, Heinrich (Theodor) (b. Dec. 21, 1917, Cologne—d. July 16, 1985, near Bonn), German writer, winner of the Nobel Prize for Literature in 1972. Böll's ironic novels on the travails of German life during and after World War II capture the changing psychology of the German nation.

The son of a cabinetmaker, Böll graduated from high school in 1937. He was called into labour service in 1938 and then served six years as a private and corporal in the German army, fighting on the Russian and other fronts. Böll's wartime experiences were central to the art of a writer who remembered the "frightful fate of being a soldier and having to wish that the war might be lost." After the war he settled in his native Cologne.

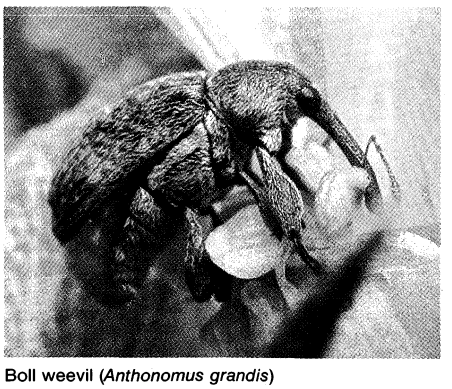
Böll's first stories were published in 1947. In his first novels, *Der Zug war pünktlich* (1949; *The Train Was on Time*) and *Wo warst du Adam?* (1951; *Adam, Where Art Thou?*), he describes the grimness and despair of soldiers' lives. The uneasiness of reality is explored in the life of a mechanic in *Das Brot der frühen Jahre* (1955; *The Bread of Our Early Years*) and in a family of architects in *Billard um halb zehn* (1959; *Billiards at Half-Past Nine*), which, with its interior monologues and flashbacks, is his most complex novel. In the popular *Ansichten eines Clowns* (1963; *The Clown*), the protagonist deteriorates through drinking from being a well-paid entertainer to a begging street musician.

Böll's other writings include *Und sagte kein einziges Wort* (1953; *Acquainted with the Night*) and *Ende einer Dienstfahrt* (1966; *End of a Mission*), in which the trial of a father and son lays bare the character of the townspeople. In his longest novel, *Gruppenbild mit Dame* (1971; *Group Portrait with Lady*), Böll presented a panorama of German life from the world wars to the 1970s through the accounts of the many people who have figured in the life of his middle-aged "lady," Leni Pfeiffer. *Die verlorene Ehre der Katharina Blum* (1974; *The Lost Honour of Katharina Blum*) attacked modern journalistic ethics as well as the values of contemporary Germany. *Was soll aus dem Jungen bloss werden?, oder, Irgendwas mit Büchern* (1981; *What's to Become of the Boy?, or Something to do with Books*) is a memoir of the period 1933–37.

A Christian and a pacifist, Böll developed a highly moral but individual vision of the society around him. A frequent theme of his was the individual's acceptance or refusal of personal responsibility. Böll used austere prose and frequently sharp satire to present his antiwar, nonconformist point of view. He was widely regarded as the outstanding humanist interpreter of his nation's experiences in World War II.

boll weevil (*Anthonomus grandis*), the most serious cotton pest in North America, a beetle of the insect family Curculionidae (order Coleoptera). The size of the adult boll weevil varies according to the amount of food it receives during its larval stage, but it averages about 6 mm (¼ inch), including the long, curved snout, which is about one-half the body length. The light yellow of the newly emerged adult boll weevil changes to gray or black in several weeks.

In the spring, adult boll weevils emerge from a partly dormant state and deposit between about 100 and 300 eggs in cotton buds or



Boll weevil (*Anthonomus grandis*)
Harry Rogers

fruit. The females do not deposit their eggs in cotton bolls already visited by another female at least until most of the bolls are infested. An average of two or three weeks is required for an egg to develop into an adult; thus, there may be from two to ten generations each year.

The larvae live entirely within the cotton boll, destroying not only the seeds but also the surrounding fibres. Because the larvae and pupae remain inside the cotton bolls for their entire period of development, the application of insecticides at this time is useless.

The boll weevil occurs in North America in almost every area where cotton is cultivated. It entered the United States from Mexico in the 1890s, causing much damage. It is estimated that between 3,000,000 and 5,000,000 bales of cotton are destroyed annually by this pest. It has been said that the boll weevil infestation caused many farmers to realize that they should diversify their crops rather than be totally dependent on cotton. Control programs include early destruction of cotton stalks, cleanup of hibernating areas, seed treatments, early planting, and the development of early maturing and rapid fruiting varieties of cotton.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bolland, Jean, Latin JOHANNES BOLLANDUS (b. Aug. 18, 1596, Tirlemont, Duchy of Brabant—d. Sept. 12, 1665, Antwerp), Jesuit ecclesiastical historian known for his major role in the compilation of the *Acta Sanctorum,* a vast collection of lives of the Christian saints, and as the founder of the Bollandists, a small group of Jesuits who continued to edit and publish the collection. Apart from containing extensive amounts of biographical material, this work is distinguished for its use of the principles of historical criticism.

Little is known of Bolland's life. In 1629 he was chosen to continue the hagiographic work of the priest Héribert Rosweyde, who initiated the *Acta Sanctorum.* Bolland, in collaboration with his associate Henschenius (Godefroid Henskens), modified and extended the original plan of the *Acta;* he arranged the saints according to the date of their deaths, included doubtful cases (but with notes), and added indexes, chronologies, and histories to each chapter. The parts completed during his life were *January* (2 vol., 1643) and *February* (3 vol., 1658), containing the biographies and legends of the saints whose feast days fell in those two months.

In his researches Bolland corresponded and travelled widely, investigating previously unexamined sources in Italian libraries. His work was continued by his disciples, Henschenius and Papebroch (Daniel van Papenbroeck), and then carried on by later hagiographers.

Bollandist, member of a small group of Belgian Jesuits who edit and publish the *Acta Sanctorum,* the great collection of biographies and legends of the saints, arranged according to their feast days. The idea was conceived by Heribert Rosweyde, a Jesuit who intended to publish, from early manuscripts, 18 volumes of lives of the saints with notes attached. After Rosweyde's death in 1629, Jean Bolland organized a group that continued to gather material and, especially on the advice of Henschenius (Godefroid Henskens), an associate, extended the scope of the work. Publication began in Antwerp in 1643 with the two January volumes. From 1659 Daniel van Papenbroeck, perhaps the outstanding Bollandist, collaborated. This is considered the golden age of the group.

After the suppression of the Society of Jesus in 1773, the work of the Bollandists was continued, first at Antwerp until 1778, then at Brussels, and finally at Tongerloo, north of Louvain. In 1794 the French Revolutionary armies invaded Belgium, and the work had to stop. After the reestablishment of the Society of Jesus in Belgium, the work was begun again in 1837, and activities were brought more into line with the progress of historical methods. Besides the 67 folio volumes of the *Acta Sanctorum,* the Bollandists publish a quarterly review, *Analecta Bollandiana,* established in 1882; a bulletin of recent hagiographical publications; and inventories of texts previously published.

Bollingen Prize, award for achievement in American poetry, originally conferred by the Library of Congress with funds established in 1948 by the philanthropist Paul Mellon. An admirer of the psychoanalyst Carl Jung, Mellon named the prize after the Swiss town where Jung spent his summers. In 1949 the first award was made for *The Pisan Cantos* to Ezra Pound, who was then under indictment for treason in World War II for his broadcasts from Italy, which were anti-Semitic and pro-Fascist. A bitter controversy ensued in the press, and the Library of Congress was requested by a congressional committee to disassociate itself from the award. In 1950 it was transferred to the Yale University Library, under the auspices of which it has since been administered. Originally annual, it became biennial in 1964. In 1961 the Bollingen Foundation also established a prize for translation.

bollworm, any larva of various moths (order Lepidoptera), including the pink bollworm of the family Gelechiidae (*see* gelechiid moth) and some *Heliothis* species. The larvae of the corn earworm (*q.v.*; *Heliothis zea*), a member of the family Noctuidae, feed on the corn kernels near the tip of the ear. Because the larvae of this pest also burrow into tomatoes and cotton bolls, they are sometimes known as tomato fruitworms or cotton bollworms.

Other plants attacked by the bollworm include peas, alfalfa, beans, soybeans, flax, peanuts, and other commercial crops. The pests can be controlled by natural parasites, early crop planting, trap crops, and insecticides.

Bologna (Italian painter): *see* Primaticcio, Francesco.

Bologna, Latin BONONIA, city, capital of Bologna province and of Emilia-Romagna region, in northern Italy, north of Florence,

S. Procolo church, Bologna, Italy
Ralph Bartholomew—Shostal/EB Inc.

between the Reno and Savena rivers. It lies at the northern foot of the Apennines, on the ancient Via Aemilia, 180 ft (55 m) above sea level. Originally the Etruscan Felsina (*q.v.*), it was occupied by the Gallic Boii in the 4th century BC and became a Roman colony and municipium (Bononia) *c.* 190 BC. It was subject to the Greek exarchate of Ravenna (6th century) and then passed to the papacy. It was occupied by the Visigoths, Huns, Goths, and Lombards after the barbarian invasions. After a feudal period, Bologna became a free commune when the emperor recognized its rights in the early 12th century. The conflict between the Guelfs and the Ghibellines (two parties in medieval Italian politics) led to the city's domination by a series of signori (lords)—the Pepoli, Visconti, Bentivoglio—before it was incorporated into the Papal States by Pope Julius II in 1506. Thereafter it enjoyed more than three centuries of peace and prosperity. Papal rule was interrupted only by a brief period of French control (1797–1814) before Bologna was garrisoned by the Austrians (1849–60) and was united to the Kingdom of Italy in 1860. Occupied by German troops from September 1943 until it was recaptured by Allied forces in 1945, it suffered heavy air and artillery bombardment.

The arcaded streets of the central part of the city, built on the old Roman town, still preserve a medieval aspect, characterized by the leaning Asinelli and Garisenda towers (300 ft [91 m] and 150 ft, respectively, and both built in 1109–19). Among numerous medieval palaces (palazzi) the most notable are the Palazzi Comunale (town hall), Podestà, Mercanzia (chamber of commerce), and Re Enzio (where King Enzio, son of Emperor Frederick II, was imprisoned from 1249 until his death in 1272). The Palazzo Bevilacqua (1477–82), with a magnificent inner courtyard, is one of the finest in Bologna. The seat of an archbishop, the city has many magnificent churches, including S. Petronio (begun 1390, never completed), where the emperor Charles V was crowned by Pope Clement VII (1530); S. Francesco (1236–63; restored after World War II damage); S. Domenico, formed in 1221 to house the tomb of the saint; the Baroque S. Pietro Metropolitana cathedral; and Sta. Maria dei Servi. S. Stefano is the name given to a group of four Romanesque churches of the 11th to 13th centuries erected on the ruins of a pagan temple and incorporating earlier foundations.

The university, one of the oldest and most famous in Europe, dating from the 11th century, attained its greatest renown in the 12th–13th centuries. It originally had no fixed location; lectures were generally held in the great halls of convents until the Archiginnasio Palace was erected under Pius IV (1562). The university moved to the Palazzo Celesi in 1803; the Archiginnasio was restored after World War II. The university's most eminent teachers included Irnerius and Francesco Accursius (Accursio), noted jurists; Ulisse Aldrovandi, Marcello Malpighi, Luigi Galvani, and Giosuè Carducci. Famous natives of Bologna include Guglielmo Marconi, inventor of radiotelegraphy, and the popes Gregory XIII, Gregory XV, Lucius II, and Benedict XIV. Bologna is noted for its great communal and university libraries and others with special collections, such as that of the conservatory. The Civic Museum, founded in 1712 and accommodated since 1881 in the Palazzo Galvani, contains important remains of past civilizations, including collections from the Umbrian (Villanova) civilization and the Etruscan necropolis. The art gallery houses a fine collection of paintings of the Bolognese school (the Carracci, Francesco Albani, Guido Reni, Domenichino, Guercino, Francia, Pellegrino Tibaldi) and numerous other works, the most famous of which is Raphael's "St. Cecilia."

Bologna is of paramount importance as a road and rail centre through which must pass most traffic between central and southern Italy and the north. Until World War I the city was chiefly dependent upon agriculture based on the surrounding fertile plain. Although still an important agricultural market and food-pro-

cessing centre, Bologna also has developed into an important industrial centre; its chief manufactures include agricultural machinery, electric motors, motorcycles, railway equipment, chemicals, and shoes. A strong local Communist movement has kept local administration in Communist hands since World War II. Pop. (1981 prelim.) mun., 455,853.

Bologna, Giovanni da: *see* Giambologna.

Bologna, University of, Italian UNIVERSITÀ DEGLI STUDI DI BOLOGNA, one of the oldest and most famous universities in Europe, founded in Bologna in the 11th century. It became in the 12th and 13th centuries the principal centre for studies in civil and canon law and attracted students from all over Europe. Since it then had no fixed site or student housing, scholars of like nationality formed free associations, or guilds, to secure protections that they could not claim as citizens (*see* nation.) The organizations formed at Bologna became models for modern universities. In 1158 Emperor Frederick I Barbarossa granted privileges to scholars of Bologna that were eventually extended to all Italian universities.

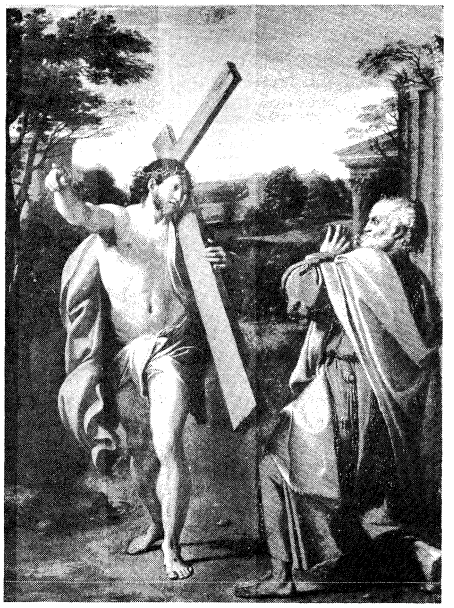
The students at Bologna were mostly mature men; as the civil law and canon law were at first the only branches of study, they attracted men already filling office in some department of the church or state—archdeacons, heads of schools, canons of cathedrals, and like functionaries. About the year 1200 the faculties of medicine and philosophy (or liberal arts) were formed. The faculty of science was developed in the 17th century, and in the 18th century women were admitted as students and teachers.

After a period of decline, Bologna was reorganized in 1860 and resumed its place among Italy's foremost universities. The contemporary university includes faculties of jurisprudence, political science, letters and philosophy, medicine, and engineering.

Bologna stone, any of the dense, silvery white stones first found (1603) on Monte Paderno, near Bologna, by an Italian cobbler-alchemist, Vicenzo Cascariolo, who synthesized from them a luminescent material that glowed at night after being exposed by day to the Sun. Originally thought to be the philosopher's stone that was believed capable of transmuting base metals into gold, Bologna stone ultimately was shown to be the mineral barite, barium sulfate.

Bolognese school, in the most restricted sense, the works produced and the theories expounded by the late 16th- and early 17th-century Italian painters Lodovico Carracci and his cousins, the brothers Agostino and Annibale Carracci. Although each was different in temperament and inclination, the three Carraccis cooperated in a number of early works, especially fresco (*q.v.*; painting executed on fresh plaster) cycles. Disturbed by the excesses of the Mannerist painters (*see* Mannerism), they took it upon themselves to reform art through a process of research and experiment. Professing the superiority of direct observation, they drew from the actual model. Their clear, simple, direct pictures fit well the demands of the Counter-Reformation that in religious art there be no barriers between observer and object. Around 1585 the cousins formed the Accademia degli Incamminati (Academy of the Progressives) in order to foster their ideas and to train young painters.

The activity of the Bolognese school caught the attention of Cardinal Odoardo Farnese, and Annibale was invited to Rome in 1595 to decorate first the ceiling of the Camerino and later that of the Galleria in the Palazzo Farnese. A short time later Agostino joined his brother, as did a number of the Carracci



"Christ Appearing to St. Peter on the Appian Way" ("Domine, Quo Vadis?"), oil painting by Annibale Carracci, Bolognese school, *c.* 1601; in the National Gallery, London

By courtesy of the trustees of the National Gallery, London; photograph, A.C. Cooper, Ltd.

pupils, among them Domenichino, Guido Reni, Albani, and Lanfranco. The result was that what had hitherto been an essentially regional movement became the most influential force in Italian Baroque painting. The complex of painted episodes on the vault of the Farnese Galleria, showing the loves of the pagan gods and goddesses, became the new "academy," and greatly influenced later masters. In addition to his work in the Palazzo Farnese, Annibale Carracci is credited with establishing the rules for the heroic landscape.

Lodovico never went to Rome but remained in Bologna where he continued to paint until his death. In 1622 Guido Reni returned to Bologna and became the leading painter there, and the Bolognese school after his arrival was ruled by Reni's tempered classicism.

bolometer, instrument for measuring radiation by means of the rise in temperature of a blackened metal strip in one of the arms of a resistance bridge. In the first bolometer, invented by the U.S. scientist Samuel P. Langley in 1880, a Wheatstone bridge was used along with a galvanometer that produced a deflection proportional to the intensity of radiation for small deflections. A later bolometer consists of four platinum gratings (each of which is made of a series of strips) inserted in the arms of a resistance bridge; two of these gratings, in opposite arms of the bridge, are placed one behind another, so that the openings of one are opposite the strips of the other and are exposed to the radiation, the other opposite pair being shielded; this arrangement doubles the effect on the galvanometer and also compensates for any extraneous temperature changes. Changes in temperature as small as 0.0001° C may be detected in this way.

The spectrum bolometer consists of a single strip set on edge, in an arm of a bridge. It is used for exploring the distribution of intensity of radiation in a spectrum.

Bolovens, Plateau des, English BOLOVEN PLATEAU, fertile, gently rolling upland, southern Laos, east of Pakxé between the Mekong River and western foothills of the southern Chaîne Annamitique (Annamite Chain). Basically a large, basaltic lava extrusion, about 3,500 ft (1,100 m) in altitude, the saucer-shaped upland is highest on its northern and southern rims, where peaks rise 5,194 ft and 3,058 ft above sea level. Directly in the path of the June-to-November southwest monsoon, the Boloven receives annually more than 160 in. (4,000 mm) of rainfall, the heaviest in Laos. The Plateau des Bolovens is sparsely populated by the Loven, Nha Huen Sovei, and Sou of the Lao-Theng (Lao-Theung; Mountain Mon-Khmer) peoples. Though the region is reputed to have rich soil, civil wars, poor transportation, and plant disease have combined to curb the success of coffee, cotton, and tobacco experiments. The Muang Pakxan–Saravan highway crosses the plateau. Much of the region still remains in brush and tall grass. Some spices, notably cardamom and cinnamon, are raised for export; pagodite, a stone used in carving, is mined. An agricultural experimental station is in Muang Pakxong.

Bolsena, town, Viterbo province, Lazio (Latium) region, central Italy, on the northeast bank of the Lago (lake) di Bolsena (ancient Lacus Volsiniensis), just southwest of Orvieto. It occupies the site of the ancient Etruscan town of Volsinii (*q.v.*). After the latter was razed by the Romans in 265 BC, the inhabitants moved to another site, perhaps at modern Orvieto. Bolsena is famous for the miracle of 1263 when a Bohemian priest, skeptical about the doctrine of transubstantiation (the conversion of the eucharistic bread and wine into the substance of the body and blood of Christ), was convinced of its truth by the miraculous appearance of drops of blood on the Host he was consecrating at Mass on an altar in the crypt of the 11th-century church of Sta. Cristina. In the Vatican the marvel is commemorated by Raphael's fresco "The Miracle at Bolsena" in the "Stanza d'Eliodoro." In commemoration of the miracle Pope Urban IV instituted the Feast of Corpus Christi (Body of Christ) and built Orvieto Cathedral, which houses the blood-stained altar cloth. The church of Sta. Cristina and the Cappella del Miracolo in the catacombs contain statues by the 14th- and 15th-century Della Robbia family. The town has a 10th- and 13th-century castle and a small museum of Etruscan and Roman remains.

Market gardening, fishing, and wine and oil production are the principal economic activities. Pop. (1981 prelim.) mun., 3,960.

Bolshaya Sovetskaya Entsiklopediya, English GREAT SOVIET ENCYCLOPEDIA, major encyclopaedia of the Union of Soviet Socialist Republics.

The first edition, which appeared in 65 volumes from 1926 to 1947, had lost its official approval by the time it was completed. A second edition, begun in 1949, was published in 50 volumes from 1950 to 1958. Although written from a Marxist–Leninist point of view, it is considered less biased than the first edition. One complete volume of the second edition was devoted to the Soviet Union. A supplemental volume (no. 51) contains political biographies (chiefly of persons "rehabilitated" after having been purged during the Stalin era), tables of weights and measures, currencies, etc.

A third edition of 30 volumes, published according to a decree of the Central Committee of the Communist Party of the Soviet Union (1967), printed in smaller type and containing generally shorter, more tightly edited articles, appeared from 1970 to 1978. A name index appeared in 1981. The Macmillan Company of New York City and London began issuing an English translation in 1973. Since 1974, the Soviets have entered into translation and publishing agreements with Italian, Greek, Spanish, Latin-American, and Bangladesh publishers.

Bolshevik (Russian: One of the Majority), plural BOLSHEVIKS, or BOLSHEVIKI, member of a wing of the Russian Social-Democratic Workers' Party (*q.v.*), which, led by Lenin, seized control of the government in Russia (October 1917) and became the dominant

political power. The group originated at the party's second congress (1903) when Lenin's followers, insisting that party membership be restricted to professional revolutionaries, won a temporary majority on the party's central committee and on the editorial board of its newspaper *Iskra*. They assumed the name Bolsheviks and dubbed their opponents the Mensheviks (Those of the Minority).

Although both factions participated together in the Revolution of 1905 and went through periods of apparent reconciliation (about 1906 and 1910), their differences increased. The Bolsheviks continued to insist upon a highly centralized, disciplined, professional party. They boycotted the elections to the First State Duma (parliament) in 1906 and refused to cooperate with the government and other political parties in subsequent Dumas. Furthermore, their methods of obtaining revenue (including robbery) were disapproved of by the Mensheviks and non-Russian Social Democrats.

In 1912 Lenin, leading a very small minority, formed a distinct Bolshevik organization, decisively (although not formally) splitting the Russian Social-Democratic Workers' Party. His determination to keep his own faction strictly organized, however, had also alienated many of his Bolshevik colleagues, who had wished to undertake nonrevolutionary activities or who had disagreed with Lenin on political tactics and on the infallibility of orthodox Marxism. No outstanding Russian Social Democrats joined Lenin in 1912.

Nevertheless, the Bolsheviks became increasingly popular among urban workers and soldiers in Russia after the February Revolution (1917), particularly after April when Lenin returned to the country, demanding immediate peace and that the workers' councils, or Soviets, assume power. By October the Bolsheviks had majorities in the Petrograd and Moscow Soviets; and when they overthrew the Provisional Government, the second Congress of Soviets (devoid of peasant deputies) approved the action and formally took control of the government.

Immediately after the October Revolution, the Bolsheviks refused to share power with other revolutionary groups, with the exception of the Left Socialist Revolutionaries; eventually they suppressed all rival political organizations. They changed their name to Russian Communist Party (of Bolsheviks) in March 1918; to All-Union Communist Party (of Bolsheviks) in December 1925; and to Communist Party of the Soviet Union (Kommunisticheskaya Partiya Sovetskogo Soyuza, KPSS) in October 1952.

Bolshevik Revolution: *see* October Revolution.

Bolshoi Ballet (Russian: Big Ballet), leading ballet company of the Soviet Union, famous for elaborately staged productions of the classics and children's ballets that preserve the traditions of 19th-century classical dance. The Bolshoi Ballet took that name in 1825, when the new Bolshoi Theatre in Moscow took over the ballet company of its predecessor, the Petrovsky Theatre, which had been established in 1776. The company's style, later called "the Moscow style," gradually emerged, more spontaneous and influenced by Russian folklore than the traditional style that was the hallmark of the St. Petersburg companies.

Throughout the 19th century, such prominent choreographers as Marius Petipa, Carlo Blasis, and Arthur Saint-Léon staged productions at the Bolshoi Theatre. After a period of decline at the end of the 19th century, Aleksandr Gorsky was appointed maître de ballet in 1900. He once again shaped a first-rate company and introduced the realism in scenery and costume that has since characterized the group's productions. By the 1960s the Bolshoi Ballet was one of the world's foremost ballet companies.

Bolshoi Theatre, in full STATE ACADEMIC BOLSHOI THEATRE OF THE UNION OF SOVIET SOCIALIST REPUBLICS, Russian BOLSHOY TEATR, or GOSUDARSTVENNY AKADEMICHESKY BOLSHOY TEATR SOYUZA SOVETSKIKH SOTSIALISTICHESKIKH RESPUBLIK, leading theatre company for ballet and opera in the Soviet Union. The original group, made up of several smaller troupes, was organized in Moscow in the mid-1770s, performing primarily at the mansion of Count R.I. Vorontsov. In 1780 the first permanent theatre building in Moscow was opened as the company's home, but it burned in 1805. A year later the Bolshoi (English: Big) Theatre was made a government institution, and a new building was opened in 1825. It, too, was destroyed by fire, in 1853, but was rebuilt and enlarged in 1856 to accommodate an audience of more than 2,000. By the end of the 19th century the Bolshoi's operatic and ballet productions of Russian and other European works were influencing the performing arts throughout the Western world. In 1924 a smaller, affiliate auditorium was added to the theatre complex, and in 1961 the Kremlin Palace of Congresses, with a capacity of about 6,000, was acquired as a third performing space for bigger productions.

The company was kept intact during the revolution of 1917 and both world wars. Since the mid-1950s the opera and ballet troupes have travelled extensively. The Bolshoi ballet school has officially been known since 1961 as the Moscow Academic Choreographic School.

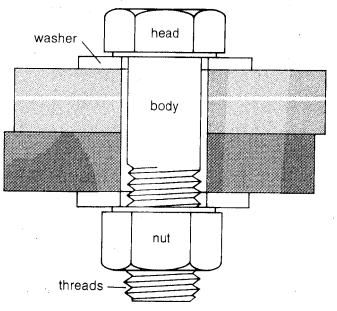
Bolshoy Kavkaz (mountains, Asia): *see* Great Caucasus.

Bolshoy Tokmak (Kirgiz S.S.R.): *see* Tokmak.

bolson (from Spanish *bolsón*, "large purse"), a semi-arid, flat-floored valley or depression, usually focussing on a playa or salt pan and entirely surrounded by hills or mountains. It is a type of basin (*q.v.*), and the term is usually applied only to certain basins of the southwestern United States and northern Mexico.

Bolsover, district, county of Derbyshire, England, with an area of 62 sq mi (160 sq km). It takes its name from the principal town in an area of agricultural land interspersed with small coal-mining settlements. The district's administrative headquarters are in Mansfield, across the Nottinghamshire border. Britain's largest smokeless fuel plant is located at Bolsover. New industries have been sought to compensate for the contraction of coal-mining employment. Important remnants of the pre-industrial era include the 17th-century Bolsover Castle, which commands the River Doe Lea valley, now followed by a major motorway. Stately Hardwick Hall, built in the late 16th century by Elizabeth, dowager countess of Shrewsbury (Bess of Hardwick), is now the property of the National Trust. Pop. (1982 est.) 70,800.

bolt, mechanical fastener usually used with a nut (*q.v.*) for connecting two or more parts. A bolted joint can be readily disassembled and reassembled; for this reason bolts or screw fasteners are used to a greater extent than any other type of mechanical fastener and have played an important part in the development of mass-produced articles and steel structures.



Bolt

The bolt, which forms part of the connection shown in the Figure, consists of a head and a cylindrical body with screw threads along a portion of its length. The nut is the female member of the pair, having internal threads to match those of the bolt. Washers (*q.v.*) are often used to prevent crushing and to distribute the preload, or initial stress of tightening, into the members.

Bolt, Robert (Oxton) (b. Aug. 15, 1924, Manchester), English dramatist hailed for the talent revealed in his third play, *A Man for All Seasons* (London, 1960; New York, 1961; filmed 1966; Academy Award), a study of Sir Thomas More.

Bolt left Manchester in 1941 to work for an insurance company; then, after service in the Royal Air Force and the army in World War II, he went to Manchester and Exeter universities, subsequently working as a schoolteacher until 1958.

The most successful of Bolt's other plays were *Flowering Cherry* (London, 1957), a Chekhovian study of failure and self-deception, and *Vivat! Vivat! Regina!* (1970), popular both in London and in New York. Bolt has also enjoyed much prestige as scriptwriter of such films as *Lawrence of Arabia* (1962), *Doctor Zhivago* (1965; Academy Award), *Ryan's Daughter* (1970), and *Lady Caroline Lamb* (1972), which he also directed.

bolt action, type of breech mechanism combining the firing pin, a spring, and an extractor, all housed in a locking breechblock, and the key to the development of the truly effective repeating rifle. The spring-loaded firing pin slides back and forth inside the bolt, which itself is the breechblock. The bolt is moved back and forth, and partially rotated, in the receiver by a projecting handle with a round knob. One or more lugs at the front or rear of the bolt (or both) fit into slots in the receiver and lock the bolt firmly in place against the base of the cartridge chamber when the rifle is to be fired. As the bolt is thrust forward, it pushes a cartridge into the chamber and cocks the piece. The trigger releases the spring-driven firing pin inside the bolt. After firing, the extractor on the head of the bolt removes the spent cartridge and ejects it. The bolt moves a new cartridge from the magazine and repeats the process.

Some bolt actions lock without rotating. Straight-pull bolts are used in the Canadian Ross, the Austrian Mannlicher, and the Swiss Schmidt-Rubin rifles. Bolts that turn to lock have been standard in the Krag-Jorgensen, Lee-Enfield, Springfield, and Lebel rifles, among others.

Bolton, district (borough), metropolitan county of Greater Manchester, England, with an area of 54 sq mi (140 sq km).

The town of Bolton is at the hub of the borough, which lies in the northwest of the conurbation and rises in the north to the Pennine foothills. By the 16th century Bolton was known for woollen textiles, but by the 18th century cotton had replaced wool, and the production of yarns and fabrics was increasing. Samuel Crompton, a native of Bolton, invented in 1779 the spinning mule, which revolutionized spinning, and Bolton's first spinning mill was opened in 1780. By the mid-19th century Bolton was an important centre for textiles and coal mining as well as papermaking, bleaching, engineering, and a range of other industries.

The cotton industry has contracted in the 20th century and the industrial structure has diversified so that by the 1960s engineer-

ing employed most workers in the district. William Hesketh Lever, the first Lord Leverhulme, was born in Bolton in 1851. Both Firwood Fold, where Samuel Crompton was born, and Hall I'th'Wood, a manor house where he later lived, are preserved, the latter as a museum. Pop. (1982 est.) 262,300.

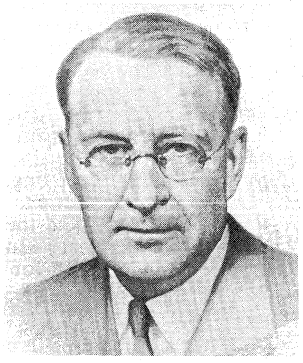
Bolton, Charles E.: *see* Black Bart.

Bolton, Edmund, Bolton also spelled BOULTON (b. 1575?—d. ?1633), English historian, antiquarian, and poet whose lyrics are among the best in the miscellany *Englands Helicon* (1600), a widely known anthology of late 16th-century lyric and pastoral poetry.

He was educated at Cambridge and the Inner Temple, London. He obtained a minor position at court but was debarred from public office because of his Catholicism and tried to support himself by writing. A friend of Camden and other scholars, he petitioned James I to form a royal academy, but the King died before giving formal sanction. Plans for official histories of England and London also failed, and Bolton, after imprisonment for recusancy, seems to have died in poverty. His most considerable works are the history *Nero Caesar* (1624) and *Hypercritica*, a treatise on the writing of history in which he reviews contemporary authors.

Bolton, Herbert Eugene (b. July 20, 1870, Wilton Township, Wis., U.S.—d. Jan. 30, 1953, Berkeley, Calif.), U.S. historian and educator who was one of the first scholars to stress the importance of a hemispheric rather than a national concept of the Americas.

Bolton received his Ph.D. at the University of Pennsylvania in 1899 and began teaching medieval history in 1901 at the University of Texas, where he soon shifted his interests to an investigation of Mexican archives. His *Guide to Materials for the History of the United States in the Principal Archives of Mexico* (1913) became an invaluable aid to future researchers. In 1909 he was called to Stanford University, and in 1911 he moved to the University of California at Berkeley, where he



Herbert Eugene Bolton, charcoal sketch by Peter Van Valkenbough, 1937; in the collection of the University of California, Berkeley

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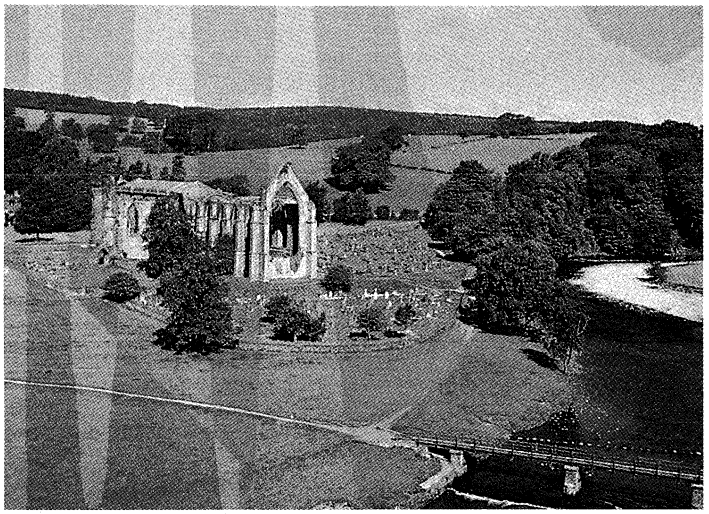
remained until his death. As director (1916–40) of the Bancroft Library, he guided it to a position as the principal centre for research in Western and Latin-American history.

In 1920 Bolton completed a text with T.M. Marshall on *The Colonization of North America, 1492–1783,* which emphasized non-English colonies and English colonies other than the original 13. His concept of the Americas was most fully expressed in his presidential speech to the American Historical Association in 1932, "The Epic of Greater America," a critique of the purely national and Anglo-Saxon definitions of American institutions. His chief works are: *The Spanish Borderlands* (1921); *Outpost of Empire* (1931); *Rim of Christendom: A Biography of Eusebio Francisco Kino* (1936); and *Coronado on the Turquoise Trail* (1949). Further information may be found in *Bolton and the Spanish Borderlands* (1964; J.F. Bannon, ed.) and in *Do the Americas Have a Common History?* (1964; Lewis Hanke, ed.).

Bolton, Lavinia Fenton, duchess of (English actress): *see* Fenton, Lavinia.

Bolton Abbey, parish, Craven district, county of North Yorkshire, England, on the River Wharfe, northwest of Leeds. The ruins of the Augustinian priory are set in the wooded Wharfedale. The nave has been used as the



Ruins of the Augustinian priory on the River Wharfe at Bolton Abbey, North Yorkshire

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parish church since the 13th century, but the transepts and choir were sacked at the Reformation. In 1542 the manor, also called Bolton Abbey, passed to the dukes of Devonshire. Pop. (1971) 136.

Boltwood, Bertram Borden (b. July 27, 1870, Amherst, Mass., U.S.—d. Aug. 15, 1927, Hancock Point, Maine), U.S. chemist and physicist whose work on the radioactive decay of uranium and thorium was important in the development of the theory of isotopes.

Boltwood was a member of the Yale faculty from 1897 until 1900, when he established a consulting firm of mining engineers and chemists in partnership with the U.S. chemist Joseph Hyde Pratt. Boltwood grew interested in radioactivity and, in 1904, showed that many of the radioactive elements decay into other radioactive elements. He discovered ionium, now called thorium-230. In 1905 he proposed that lead is the final decay product of uranium and two years later developed a method of determining the age of some rocks by measuring the ratio of lead and uranium. Additional methods of radiometric dating that followed revolutionized estimates of the age of Earth and proved invaluable in archaeology.

In 1910 Boltwood became professor of radiochemistry at Yale University. Overwork brought on a nervous breakdown, and intermittent fits of depression culminated in his suicide.

Boltzmann, Ludwig Eduard (b. Feb. 20, 1844, Vienna—d. Sept. 5, 1906, Duino, Italy), physicist whose greatest achievement was in the development of statistical mechanics, which explains and predicts how the properties of atoms (such as mass, charge, and structure) determine the visible properties of matter (such as viscosity, thermal conductivity, and diffusion).

After receiving his doctorate from the University of Vienna in 1866, he held professorships in mathematics and physics at Vienna, Graz, Munich, and Leipzig.

In the 1870s Boltzmann published a series of papers in which he showed that the second law of thermodynamics, which concerns energy exchange, could be explained by applying the laws of mechanics and the theory of probability to the motions of the atoms. In so doing, he made clear that the second law is essentially statistical and that a system approaches a state of thermodynamic equilibrium (uniform energy distribution throughout) because equilibrium is overwhelmingly the most probable state of a material system. During these investigations Boltzmann worked out the general law for the distribution of energy among the various parts of a system at a specific temperature and derived the theorem of equipartition of energy (Maxwell–Boltzmann law). This law states that the average amount of energy involved in each different direction of motion of an atom is the same. He derived an equation for the change of the distribution of energy among atoms due to collisions and laid the foundations of statistical mechanics.

Boltzmann, lithograph by Rudolf Fenzi, 1898

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

Boltzmann was also one of the first continental scientists to recognize the importance of the electromagnetic theory proposed by James Clerk Maxwell of England. Though his work on statistical mechanics was strongly attacked and long misunderstood, his conclusions were finally supported by the discoveries in atomic physics that began shortly before 1900 and by recognition that fluctuation phenomena, such as Brownian motion (random movement of microscopic particles suspended in a fluid), could be explained only by statistical mechanics.

Boltzmann constant (symbol k), a fundamental constant of physics occurring in nearly every statistical formulation of both classical and quantum physics. The constant is named after Ludwig Boltzmann, a 19th-century Austrian physicist, who substantially contributed to the foundation and development of statistical mechanics, a branch of theoretical physics. Having dimensions of energy per degree of temperature, the Boltzmann constant has a value of 1.380662×10^{-23} joule per kelvin (K), or 1.380662×10^{-16} erg per kelvin.

Boltzmann distribution law: *see* Maxwell–Boltzmann distribution law.

Bolu, city, northwestern Turkey. It is situated at 2,434 feet (742 m) above sea level on the southern slopes of a bare hill. The region was once part of the Hittite Empire and became the kingdom of Bithynia in the 5th century BC. At nearby Eskihisar are ruins of the ancient Bithynium, a flourishing town of Asia Minor and—as birthplace of the Roman emperor Hadrian's favourite, Antinoüs—recipient of many privileges during that emperor's reign (AD 117–138). Taken by the Ottoman Turks about 1325, Bolu is the reputed home of the legendary Turkish folk hero Köroğlu. The modern city is the seat of a women's teacher-training college and a school of forestry, and its industries produce leather products. The products of the surrounding agricultural area include cereals, tobacco, and corn (maize). The region also has a lumber industry based on its extensive forests of oak, beech, elm, chestnut, and pine. Pop. (1985) city, 50,288.

Bólu-Hjálmar (Icelandic folk poet): *see* Jónsson, Hjálmar.

bolus, food that has been chewed and mixed in the mouth with saliva. Chewing helps to reduce food particles to a size readily swallowed; saliva adds digestive enzymes, water, and mucus that help chemically to reduce food particles, hydrate them for taste, and lubricate them for easy swallowing. The term bolus applies to this mixture of food and solutions until they are passed into the stomach. Once the bolus reaches the stomach, mixes with gastric juices, and becomes reduced in size, the food mass becomes known as chyme.

Bolyai, Farkas (b. Feb. 9, 1775, Bolya, near Nagyszeben, Hung.—d. Nov. 20, 1856, Marosvásárhely), Hungarian mathematician, poet, and dramatist who spent a lifetime trying to prove Euclid's (fifth) postulate that parallel lines do not meet. In the process, while studying at the University of Göttingen, he became a close friend of the noted German mathematician Carl F. Gauss, with whom he corresponded until Gauss's death in 1855.

In 1804 Bolyai took a position with the Evangelical-Reformed College at Marosvásárhely, where he taught until his retirement in 1853. Almost completely isolated from the scientific world, he worked tirelessly on the parallel line postulate and, in 1804, sent a proof to Gauss. Gauss pointed out a flaw, and Bolyai continued his pursuit. During moments of despair he sought refuge in writing poetry, music, and drama. His dramatic works include *Öt Szomorujáték, Irta egy Hazafi* (1817; "Five Tragedies, Written by a Patriot") and *A Párisi Pár* (1818; "The Paris Process").

In 1829 Bolyai finished his most important work, *Tentamen Juventutem Studiosam in Elementa Matheseos Purae Introducendi* (1832; "An Attempt to Introduce Studious Youth to the Elements of Pure Mathematics"). A rigorous and systematic exposition of geometry, arithmetic, algebra, and analysis, the work was largely unappreciated by his contemporaries.

Bolyai, János (b. Dec. 15, 1802, Koloszvár, Hung.—d. Jan. 27, 1860, Marosvásárhely), Hungarian mathematician and one of the founders of non-Euclidean geometry—geometry that does not include Euclid's axiom that only one line can be drawn parallel to a given line through a point not on the given line.

Although Bolyai knew nothing of mathematics at the age of 10, by the age of 13 he had mastered calculus and analytic mechanics under the tutelage of his father, the distinguished mathematician Farkas Bolyai. He also became an accomplished violinist at an early age and later was renowned as a superb swordsman. He studied at the Royal Engineering College in Vienna (1818–22) and served in the army engineering corps (1822–33).

The elder Bolyai's fanatic preoccupation with proving Euclid's parallel axiom infected his son, and, despite his father's warnings, János persisted in his own search for a solution. In 1820 he concluded that a proof was probably impossible and began developing a geometry that did not depend on Euclid's axiom. In 1823 he sent his father a draft of "Appendix Scientiam Spatii Absolute Veram Exhibens" ("Appendix Explaining the Absolutely True Science of Space"), a complete and consistent system of non-Euclidean geometry.

Before his work was published, Bolyai found that he had largely been anticipated by Carl Gauss of Germany. Bolyai allowed the "Appendix" to be published with his father's *Tentamen Juventutem Studiosam in Elementa Matheseos Purae Introducendi* (1832; "An Attempt to Introduce Studious Youth to the Elements of Pure Mathematics"), but the essay went unnoticed by other mathematicians. In 1848 he discovered that N.I. Lobachevsky had published an account of virtually the same geometry in 1829.

Although Bolyai continued his mathematical studies, the importance of his work was never recognized in his lifetime. In addition to work on his non-Euclidean geometry, he developed a geometric concept of complex numbers as ordered pairs of real numbers.

Bolza, Oskar (b. May 12, 1857, Bergzabern, Rhenish Palatinate [now in West Germany]—d. July 5, 1942, Freiburg im Breisgau, Ger. [now in West Germany]), German mathematician and educator noted for his reduction of hyperelliptic to elliptic integrals and for his original contributions to the calculus of variations.

Bolza studied at the University of Berlin under Karl Weierstrass and received his doctoral degree in 1886 under Felix Klein at the University of Göttingen. He accepted a position as a reader in mathematics at Johns Hopkins University, Baltimore, Md., in 1889 and within a year was appointed associate in mathematics at Clark University. In 1893 Bolza was asked by Eliakim H. Moore, chairman of the department of mathematics at the newly established University of Chicago, to join the faculty. At Bolza's urging Moore also enticed Heinrich Maschke to leave Germany and join the faculty, thus making the department one of the strongest in the country. In 1910 Bolza returned to Germany as honorary professor of mathematics at the University of Freiburg, where he remained until his death.

Bolza served as vice president of the American Mathematical Society in 1903–04. He lectured extensively in both the United States and Europe on the calculus of variations and, in 1904, published a treatise, *Lectures on the Calculus of Variations* (revised and translated by him into German as *Vorlesungen über Variationsrechnung,* 1908), which became a classic in the field. Several papers published in 1913 and 1914 developed an original variational problem known as the problem of Bolza, which combines the earlier problems of J.-L. Lagrange and C.G.A. Mayer into a generalized statement. Bolza's later lectures on his function theory and integral equations were collected by William V. Lovitt, one of Bolza's students, and published in 1924 as *Linear Integral Equations.*

Bolzano, German BOZEN, capital (since 1927) of Bolzano (Bozen) *provincia,* in the Trentino-Alto Adige *regione* of northern Italy. The city lies at the juncture of the Talvera and Isarco (Eisack) rivers just northeast of their confluence with the Adige (Etsch), north of Trento. It is surrounded on three sides by mountains and opens to the south onto a floodplain that is intensively cultivated with vineyards, fruit, and vegetables. Bolzano is sheltered from cold north winds by the surrounding mountains and in consequence is both an agricultural and a tourist centre.

Nothing is known of a settlement at the site before the Middle Ages. Held by the counts of Bavaria from 680, it was given with the rest of the diocese to the bishop of Trent by Conrad II in 1027. Because the city lay along the important trade route from Verona and Trento north to Austria, it was fought over by the bishops of Trent and the counts of Tirol until it was ceded to the counts in 1531. It passed to Bavaria with the rest of the Tirol in 1805 and was united to Austria in 1809 as a result of the rebellion led by the Tirolian patriot Andreas Hofer. Part of the Napoleonic kingdom of Italy from 1810 to 1813, it then belonged to the Austrian Empire until Italy acquired it in 1918 at the end of World War I. By this time the city's inhabitants had long been largely German speaking. In the interwar period Italy's Fascist government attempted to Italianize the city and *provincia* by bringing large numbers of Italian settlers into the area, but Bolzano's German-speaking majority continued after World War II to demand either annexation by Austria or more cultural autonomy within Italy; the Italian government granted the latter in legislation in 1947 and 1969.

Bolzano was heavily bombed during World War II but was afterward restored, and it preserves its Austrian architectural character. Notable landmarks of the old town include the cathedral; the 14th- and 15th-century parish church; the former Dominican monastery with a frescoed cloister and chapels; and the 14th-century Franciscan church. The 13th-century Mareccio Castle (with five later towers) houses the municipal archives, and the Roncolo (Runkelstein) Castle contains murals of chivalric subjects from *c.* 1400. There is a musical conservatory and a civic museum.

A tourist and commercial centre, Bolzano has electrometallurgical and engineering industries and manufactures vehicles and textiles. Other industries include winemaking and the processing of fruits and other food products grown in the adjacent floodplain. Pop. (1987 est.) mun., 101,515.

Bolzano, Bernhard (b. Oct. 5, 1781, Prague—d. Dec. 18, 1848, Prague), Bohemian mathematician and theologian who provided a more detailed proof for the binomial theorem in 1816 and suggested the means of distinguishing between finite and infinite classes.

Bolzano graduated from the University of Prague as an ordained priest in 1805 and was immediately appointed professor of philosophy and religion at the university. Within a matter of years, however, Bolzano alienated many faculty and church leaders with his teachings of the social waste of militarism and the needlessness of war. He urged a total reform of the educational, social, and economic systems that would direct the nation's interests toward peace rather than toward armed conflict between nations. His views placed him in disfavour with both university and Roman Catholic religious authorities, who demanded that he recant his beliefs and cease his liberal teachings. Upon his refusal to do so, Bolzano was dismissed in 1819 and at that point devoted his energies to his writings

on social, religious, philosophical, and mathematical matters.

Bolzano held advanced views on logic, mathematical variables, limits, and continuity. In his studies of the physical aspects of force, space, and time he proposed theories counter to those suggested by the German philosopher Immanuel Kant. Much of his work remained unpublished during his lifetime and did not have wide impact until the late 19th and early 20th centuries, when a number of his conclusions were arrived at independently.

Bolzano's published works include *Der binomische Lehrsatz* (1816; "The Binomial Theorem"), *Rein analytischer Beweis* (1817; "Pure Analytical Proof"), *Functionenlehre* (1834; "Functions Model"), *Wissenschaftslehre,* 4 vol. (1834; "Scientific Model"), *Versuch einer neuen Darstellung der Logik,* 4 vol. (1837; "An Attempt at a New Presentation of Logic"), and *Paradoxien des Unendlichen* (1851; "Paradoxes of Infinity").

Boma, formerly LOMBI, or EMBOMMA, city and port on the Congo (Zaire) River Estuary (60 miles [100 km] from the Atlantic), southwestern Zaire, central Africa. One of the nation's oldest towns, it was a trading centre and slave market before the middle of the 19th century. In 1886 Boma became the capital of the Congo Free State, later the Belgian Congo, until replaced by Léopoldville (now Kinshasa) in 1926. Boma is the terminus of a railroad to Tshela and is the outlet for palm oil, bananas, and timber (limba) from the rich forest area of Mayumbe to the north. Pop. (1984) 88,556.

bomb, in ordnance, explosive weapon designed to detonate under certain conditions, often, but not always, on impact. A bomb is analogous to the projectile of an artillery shell in that it contains a high-explosive bursting charge and sometimes incendiary or other material, but not including shell-casing and propellant charge. Bombs assumed military importance with the rapid development of aircraft in World War I, when they reached sizes of 660 pounds (about 300 kg). During World War II even larger bombs were produced, and effectiveness was improved by sighting devices and rockets to give a measure of control to the bomb's flight. Incendiary bombs were used in World War I and, in enormous quantity, in the Allied bombing of Germany and Japan during World War II. Incendiary mixtures include white phosphorus, compounds of aluminum and iron oxide (thermite), aluminum and magnesium, aluminum soaps and a petroleum fraction (napalm), and others.

Parachutes were attached to high-explosive bombs so as to detonate the bomb just above its target to maximize the blast effect. After its development, the proximity fuze (*q.v.*) was employed to the same effect.

In 1945 an enormous increase in explosive power was effected by development of the atomic bomb (*q.v.*), and, in the 1950s, of the even more powerful thermonuclear bomb (*q.v.*), or hydrogen bomb. During World War II the Germans introduced a flying bomb, the V-1 missile, essentially a pilotless aircraft loaded with explosive, and the bomb-carrying V-2 rocket, forerunner of the nuclear-armed missile weapons of the 1950s and later. In the 1960s and '70s a kind of smart bomb (*q.v.*) was developed that could be released from an aircraft and guided by remote control or self-contained guidance equipment to a particular target. The projectile of a mortar is also called, and shaped like, a bomb.

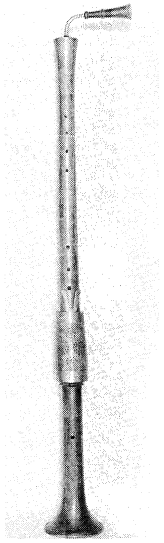
bomb, in volcanology, unconsolidated volcanic material that has a diameter greater than 32 mm (1¼ inches) that forms from clots of wholly or partly liquid lava ejected during a volcanic explosion, solidifying during flight. The final shape is determined by the initial size, viscosity, and flight velocity of the magma. Some, called spindle bombs, are shaped like a football or spindle of thread; others, called cow-dung or pancake bombs, may be flattened; and still others are ribbon-shaped.

If bombs are still molten or plastic when they land, a characteristic of those formed during the relatively weak explosions of mafic (ferromagnesian) magma, they may partly fuse to form agglutinate. If their outer surfaces are partly solidified, impact may produce bread-crust bombs with a cracked skin. A rock deposit composed of bombs cemented (not fused) together is called agglomerate.

Bombacaceae, the bombax or kapok family of flowering trees and shrubs, in the mallow order (Malvales), comprising 27 genera. It is allied to the mallow family (Malvaceae), to which the cotton plant belongs, and is characteristic of the tropics. Bombacaceae members' flowers are often large and showy. The family includes: *Adansonia digitata,* the African baobab (*q.v.*); the genus *Bombax* with eight species, including the red silk-cotton tree (*B. ceiba*); the genus *Pseudobombax* with 20 species, including the shaving-brush tree (*P. ellipticum*); and *Ceiba,* with 10 species, the fruits of which produce the kapok (*q.v.*) of commerce. *Ochroma lagopus* is the South American balsa (*q.v.*), noted for its very light wood, and the Malayan *Durio zibethinus* bears the noted durian (*q.v.*) fruit, remarkable for its distinctive odour and large size.

Shaving-brush tree (*Pseudobombax ellipticum*)
Walter Dawn

bombard, French BOMBARDE, German PUMHART, or POMMER, double-reed wind instrument belonging to the shawm family; its name is derived from a piece of artillery of the 14th century. By the 16th century shawms were constructed in all sizes, ranging from sopranino to double bass. Although the higher pitched instruments retained the name shawm, the lower pitched versions became known as bombards. In Brittany, the bombard is played in duet with a bagpipe.



Tenor bombard; in the Musée Instrumental du Conservatoire Royal, Brussels
By courtesy of the Musee Instrumental, Brussels; photograph, © A.C.L., Brussels

bombasine (textile): *see* bombazine.

bombax cotton, also called TREE COTTON, or VEGETABLE DOWN, seed floss of various trees of the *Bombax* genus of the Bombacaceae family; the plants grow in tropical countries and are cultivated in the West Indies and Brazil. The seed floss's individual fibres, soft and ranging from pale yellow to brown in colour, are 0.25 to 1.25 inches (about 0.5 to 3.25 cm) long and 20 to 40 microns (a micron is about 0.00004 inch) in diameter. Unlike the fibres of the common commercial cotton (*Gossypium*), the bombax cotton fibres grow from the side of the seedpod instead of from the seed itself. Although sometimes mixed with common-cotton fibres for spinning, bombax cotton is weaker and less elastic and contains the woody plant substance lignin, making it unsatisfactory for use alone as a textile fibre. The floss is used primarily as wadding and upholstery material.

Plants producing bombax cotton include *Bombax septenatum,* yielding the strongest and longest fibres, ranging from 0.75 to 1.1 inches (about 2 to 3 cm) in length, and *B. ceiba,* with fibres from 0.4 to 0.6 inch (about 1 to 1.5 cm) long, both growing in tropical areas of the Western Hemisphere, where the floss is sometimes called ceiba cotton or *paina limpa.* In southern Asia and Africa the fibres of *B. malabarica,* called simal cotton, or red silk cotton, in India, are 0.375 to 0.75 inch (about 1 to 2 cm) long. The term tree cotton is also sometimes applied to floss obtained from *Gossypium arboreum,* a plant species growing chiefly in Asia.

Bombay, Marathi MUMBAI, city, capital of Mahārāshtra state, India, and the nation's financial and commercial centre. It is India's principal port on the Arabian Sea and is one of the largest and most densely populated cities in the world.

A brief treatment of Bombay follows. For full treatment (including a map), *see* MACROPAEDIA: Bombay.

Bombay city occupies a group of former islands off the Konkan Coast that are united by landfills and breakwaters. Known as Bombay Island, the site is joined on the north with the larger island of Salsette, which is connected with the mainland to the east. Bombay Island itself consists of a low-lying plain between ridges of low hills. The city is flanked by Bombay Harbour on the east and the Arabian Sea on the west; Back Bay forms the southwestern contour. The climate is hot and humid most of the year, with the rainy season lasting from June to September. The coolest season is from December to February.

Bombay is the economic hub of India. The cotton-textile industry, on which its traditional prosperity is founded, is still important. Manufacturing is diversified and includes the production of chemicals, automobiles, and silk and artificial fibres; machinery and equipment firms and printing houses are also numerous. The Reserve Bank of India, the State Bank of India, and the Bombay Mint are located there, as is the country's leading stock exchange. Much of India's international trade moves through the city's port.

The city's high population growth rate has created serious overcrowding, housing shortages, and pollution. The poverty of many residents is reflected in Bombay's slum areas, which are among the largest in India. By necessity, the metropolitan area has expanded

northward past Thāna, and a "twin city" on the mainland opposite Bombay has arisen to relieve some of the urban pressures.

Bombay's educational and cultural life reflects its cosmopolitan and polyglot population. The University of Bombay (1857) and the Indian Institute of Technology offer higher education. Also located there are the Haffkine Institute for bacteriological research; the Bharatiya Vidya Bhavan (Palace of Indian Learning) for promotion of education, art, and culture; the Prince of Wales Museum; and the Tata Institute of Fundamental Research. Perhaps no other Indian city matches Bombay in the wide scope of its cultural and entertainment facilities. It is the centre of India's thriving film industry and is host to concerts, festivals, and dance performances reflecting the influences of both Eastern and Western culture.

Traffic inside Bombay, despite two suburban electric-train systems, is highly congested because of a growing number of private automobiles and taxis. The city is linked by road and rail to all the major cities of India. Sahar International Airport (1981), located in Sahar village on Salsette Island, handles foreign flights formerly served by Santa Cruz Airport. Ferry service connects Bombay to mainland cities. The city is India's major western harbour. Area, metropolitan area (Greater Bombay), 233 square miles (603 square km). Pop. (1981) metropolitan area (Greater Bombay), 8,243,405.

Bombay, University of, one of India's first modern universities, established by the British in 1857. Originally an affiliating and degree-granting body, the university later added teaching to its functions. With the establishment of regional universities in the state in 1948–50, it was designated a federal university, with jurisdiction over numerous colleges and postgraduate institutions in the metropolitan area of Greater Bombay. The university has faculties of arts, science, technology, law, medicine, commerce, dentistry, fine arts, and Indian medicine. In the late 20th century it had about 160,000 full-time students. The primary language of instruction is English.

Bombay duck (*Harpodon nehereus*), fish of the family Harpodontidae, found in estuaries of northern India, where it is widely used as a food fish and, when dried, as a condiment. The Bombay duck grows to a length of about 41 cm (16 inches) and is a dull, translucent gray or brown in colour with small, dark speckles. It has a large mouth, a forked tail, and large pectoral and pelvic fins. Several related species, also belonging to the genus *Harpodon,* are found from Africa to Australia and New Guinea.

bombazine, also spelled BOMBASINE, textile, usually black in colour, with a silk warp and worsted weft, or filling, woven in either plain or twill weave. Cheaper grades are woven with a rayon warp and worsted or cotton weft. Bombazine was originally made exclusively of silk and in a variety of colours, but the usual colour gradually became standardized as black because of its principal use in garb of mourning and of persons in religious orders. It was woven with silk warps and worsted wefts.

Bombazine was produced in ancient China and Japan, Elizabethan England, and in Italy, France, Spain, and England during the 18th and 19th centuries. Mantillas for winter wear in Spain and Latin America are frequently made of black bombazine.

bomber, military aircraft designed to make high-altitude attacks by dropping bombs or torpedos on selected surface targets. The bombs may be high-explosive, incendiary, nuclear, thermonuclear, or of other types.

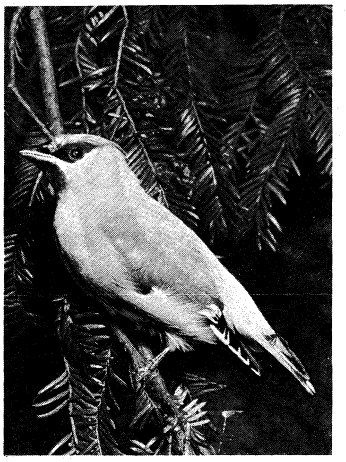
Aerial bombardment can be traced to the Italo-Turkish war, in which early in December 1911 an Italian pilot on an observation mission reached over the side of his airplane and dropped four grenades on two Turkish targets. The German rigid airships known as Zeppelins, which had originally been designed for naval reconnaissance, began to be used as strategic bombers in raids starting in 1915 during World War I. The Zeppelins were soon accompanied in their attacks by large biplanes called Gothas. Bomber airplanes were subsequently developed by all the major combatant nations during the war. All were biplanes. The British Admiralty commissioned the Handley Page 0/100, which became the first heavy night-flying bomber. Meanwhile, the French Voisin, an 80-horsepower scout plane, carried some 130 pounds of small bombs on its cockpit floor, and when the observer saw a likely target he picked up a bomb and dropped it over the side. The Germans developed the Staaken R.VI, which had four 260-hp Mercedes engines, was manned by a crew of seven, and carried two tons of bombs. By the end of the war, bombers were under construction everywhere, and though these planes lacked the bombload capacity to do decisive damage to either military or civilian targets, military tacticians had become aware that improved bombers could play an important role in modern warfare.

Between the wars, bomber construction shifted (with that of most other airplanes) from wooden frame and fabric covering to all metal. Biplanes—with lots of lift and plenty of maneuverability at low speeds—gave way to monoplanes, with greater speed from increasingly powerful engines. During the 1930s the first four-engined heavy bombers, including the American B-17, began to be built. Dive bombers (*i.e.,* planes that make a steep dive toward the target before releasing their bombs) were also developed, notably the Stuka aircraft by Germany. Germany developed its Junkers, Heinkel, and Dornier lines of bombers, while Britain created the Lancaster, Halifax, and Wellington bombers and the Soviet Union began making its Tupolev bombers. These planes all had higher speeds, longer ranges, and much larger bombload capacities than their World War I ancestors. They were usually large and heavy planes that needed protection by high-speed fighter escorts against enemy attack.

When World War II broke out, Britain's Wellington bombers caught fire consistently when their fuel tanks were hit; as a result, self-sealing gas tanks were universally adopted. Dive bomber tactics became part of the routine of attack aircraft (*q.v.*) and their pilots. Day bombers, heavily armed with machine guns, were developed to fend off fighters (with little success). Night bombers were developed that could penetrate enemy airspace by stealth. At the war's beginning, accuracy in bombing raids had been negligible, but new bombsights, radio navigation, and radar sighting were by the war's end enabling bombers to drop their bombs on targets accurately at night and from relatively high altitudes. The height of the bomber's technical development during World War II was reached by the United States in its B-17, B-24, and B-29 (*qq.v.*) heavy bombers. The latter plane carried 20,000 pounds (9,000 kg) of bombs and was defended by 10 .50-calibre machine guns.

The first turbojet-powered bombers appeared in the years after World War II, notably the United States' B-52 (*q.v.*). But the advent of air-to-air and surface-to-air missiles and improvements in anti-aircraft defense systems eventually made these big bombers more vulnerable, even at very high altitudes, while the nuclear-armed intercontinental ballistic missile threatened to take over their central role in a nuclear war. Indeed, the question of whether the bomber aircraft supplemented missiles or were supplemented by them had no ready answer. Nevertheless, despite missiles, the heavy bomber remained an important component of the strategic deterrent forces of the nuclear powers, and improved bombers such as the B-1 and the later Tupolev models were developed by the United States and the Soviet Union.

Bombycillidae, songbird family, order Passeriformes, that includes waxwings (*see* waxwing), the silky flycatchers (the best-known of which is the phainopepla, *Phainopepla nitens*), and the little-known gray hypocolius of southwest Asia. The waxwing species are irregularly distributed across the Northern Hemisphere, but the silky flycatchers are limited to North and Central America. Most bombycillids have tapering crests; distinctive wing markings; and a short, rather broad bill. All are arboreal. Most live chiefly on fruit, especially berries; silky flycatchers, however, may take insects on the wing, and all bombycillids catch insects to feed to their nestlings. Some authorities include the palm-chat (*q.v.*) in this family.



Bohemian waxwing (*Bombycilla garrulus*)
John Markham

Bomi Hills (Liberia): *see* Vaitown.

Bomu River, also called MBOMOU, in the Central African Republic, headstream of the Ubangi River, rising 30 miles (50 km) northwest of Doruma, Zaire, and flowing 450 miles (725 km) west, forming, together with the Ubangi, the frontier between Zaire and the Central African Republic. Its course takes it in a wide curve through savannas, past Bangassou, to join the Uele River at Yakoma, where it forms the Ubangi River. Its lower course contains rapids. The Bomu was discovered from the north in 1877 by a Greek, P. Potagos. Wilhelm Junker, a German explorer from Moscow, navigated its upper course, and in 1910–11 a French expedition made a complete hydrographic survey of the river.

Bon, also called BON MATSURI, or URABON, one of the most popular annual festivals in Japan, observed July 13–15, honouring the spirits of deceased family ancestors and of the dead generally. It is, along with the New Year festival, one of the two main occasions during the year when the dead are believed to return to their birthplaces. Memorial stones are cleaned, joyful community dances performed, and paper lanterns and fires are lit to welcome the dead and to bid them farewell at the end of their visit.

The word Urabon was probably derived from the Sanskrit Avalambana (All Souls Day), a Buddhist ceremony based on the *Avalambana-sūtra* (*Urabon-kyō* in Japanese). The sutra relates the story of Maudgalyāyana, a disciple of the Buddha, who secured his mother's release from hell by having monks offer food, drink, and shelter to the spirits of his ancestors. Though observed as a Buddhist festival,

Bon odori, dance for the dead, from the hand scroll "Twelve Months of the Year," Tosa school, *c.* 1700; in the collection of Richard Gale

By courtesy of Richard Gale; photograph, Minneapolis Institute of Arts

Bon is not exclusively so and reflects the ancient theme of close continuity in Japanese religious life between the living and the dead.

Bon, indigenous religion of Tibet that, when absorbed by the Buddhist traditions introduced from India in the 8th century, gave Tibetan Buddhism much of its distinctive character.

The original features of Bon seem to have been largely magic-related; they concerned the propitiation of demonic forces and included the practice of blood sacrifices. Later, there is evidence of a cult of divine kingship, the kings being regarded as manifestations of the sky divinity (reformulated in Buddhism as the reincarnation of lamas); an order of oracular priests (their counterpart, the Buddhist soothsayers); and a cult of the gods of the atmosphere, the earth, and subterranean regions (now lesser deities in the Buddhist pantheon).

In the 8th and 9th centuries, struggles took place between the ruling house of Tibet, whose members sided with Buddhism, and the powerful noble families, who sided with Bon. Enabled by deliberate Buddhist concern for written works, Bon was developed into a systematized religion with specific doctrine and a sacred literature. Although any serious Bon claims to religious supremacy were ended by the late 8th-century persecution by King Khrisong Detsen, it was never completely destroyed and continues to survive both in the aspects of Tibetan Buddhism that are mentioned above and as a living religion on the northern and eastern frontiers of Tibet.

Bon, Cape, Arabic RA'S AṬ-ṬĪB, peninsula of northeastern Tunisia, 20 miles (32 km) wide and protruding 50 miles (80 km) into the Mediterranean Sea between the Gulf of Tunis and Khalij (gulf) al-Ḥammāmāt (Hammamet). Cape Bon was the site of the surrender of more than 250,000 Germans and Italians to the Allies in 1943. A region of hills and fertile plains, with a Mediterranean climate and adequate rainfall, it is noted for its irrigated market gardens, orchards (especially oranges), and olive groves. Cape Bon also has important vineyards, fishing ports, beach resorts, and natural gas deposits. Main centres include Nābul (Nabeul), a pottery and handicraft centre; Qulaybīyah (Kélibia), a fishing port; and al-Ḥammāmāt (Hammamet), a fishing port and beach resort.

Bon Marché (French: "Good Buy"), department store in Paris, founded as a small shop in the early 19th century. By about 1865 it had become the world's first true department store. In 1876 the shop was given a new building, with skylighted interior courts, designed by the engineer Alexandre-Gustave Eiffel and architect Louis-Auguste Boileau.

Bona (Algeria): *see* Annaba.

Bona Dea (Latin: "Good Goddess"), in Roman religion, deity of fruitfulness, both in the earth and in women. She was identified with various goddesses who had similar functions. The dedication day of her temple on the Aventine was May 1. Her temple was cared for and attended by women only, and the same was the case at a second celebration, at the beginning of December, in the house of a sovereign magistrate. Wine and myrtle were taboo, and her victim was a sow (*porca*) called *damium.* The goddess herself was also known as Damia and her priestess as *damiatrix.* These names are almost certainly Greek, and it is highly probable that the Greek cult of Damia was grafted onto the original cult of the Roman goddess Bona Dea.

Bonacolsi FAMILY, Italian family in despotic control of the cities of Mantua (1276–1328), Modena (1312–26), and Carpi (1317–26). The first member recorded in Mantua was Otolino de Bonacosa in 1168. His son Gandolfo became console in 1200, and his grandson Martino was rector (1233).

The signoria (lordship) of the Bonacolsi was first established by Pinamonte (died 1293), who allied himself with other powerful families to eliminate his rivals and finally seized power by driving out the podesta (feudal mayor) and his supporters (1276). After transferring control of Mantua from the pro-papist Guelf party to the pro-imperial Ghibelline party, Pinamonte conquered several Guelf cities (1275–79).

In 1291 Pinamonte was forced to yield power to his son Bardellone, who later poisoned him. Proclaiming himself captain general and perpetual rector, Bardellone pursued an anti-Ghibelline policy until he, in turn, was overthrown in 1299 by his nephews Guido (died 1309) and Rinaldo, also called Passerino (died 1328). Guido ruled until his death, having named Passerino his successor in 1308.

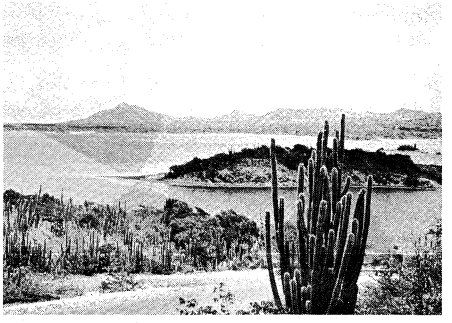
Taking power without opposition, Passerino raised the family to its greatest power. The emperor Henry VII (1269–1313) recognized him as signore (lord) of Mantua with the title of imperial vicar (1311). Passerino expanded the area under his control to include Modena and Carpi. He secured important positions for his sons Filippo (died 1303), bishop of Trento, Tagino (died 1302), and Zagnino, podesta of Verona (1274–77).

The tyrannical rule of the Bonacolsi finally provoked an insurrection (August 1328) led by the Gonzaga, who ousted the Bonacolsi from power and killed first Passerino and then his sons and nephews.

Bonaire, second largest island of the Netherlands Antilles, the westernmost group of the Lesser Antilles in the Caribbean Sea. It is 111 square miles (288 square km) in area and lies 50 miles (80 km) north of the Venezuelan coast and 20 miles east of Curaçao. The northern part is hilly, with a peak, Mount Brandaris, 787 feet (240 m) high, while the southern part is flat with desert-like vegetation. The adjacent island, Little Bonaire (3 square miles), is uninhabited, but its sandy white beaches are popular with skin divers. The temperature averages 82° F (28° C); the fresh and dry easterly trade winds bring less than 20 inches (500 mm) of rain a year.

Bonaire served in colonial times as a slave market, supplying slaves to the plantation economy of Curaçao. Most of the population is descended from black slaves, while the remainder are various admixtures of native American Indian, Spanish, and Dutch. The vast majority are Roman Catholic. The island has control of local matters through an Island Council, an Executive Council, and a lieutenant governor. The island sends one member elected by direct vote to the Netherlands Antilles legislature (Staten) in the national capital of Willemstad (Curaçao).

Farming on the arid island provides food only for local consumption; the only export crop, aloes, does not require irrigation. Drinking water is provided by the government desalination plant. Tons of salt from the extensive salt flats are exported annually from the deepwater port at Kralendijk. The only other industry includes a small clothing factory and local handicrafts for the increasing numbers of tourists. A tourist attraction is the colourful flocks of birds that congregate over the salt flats. The brilliant pink flamingos, a protected species, are the pride of the island and inspired the name of the local airport (Flamingo Airport). Some 70 percent of the island's surface is coral limestone, from which



Gotto Lake on Bonaire, Netherlands Antilles

Arthur Griffin—EB Inc.

the capital, Kralendijk, meaning "coral dike," derives its name; Kralendijk is a small, quiet town with some fine examples of Dutch colonial architecture. Pop. (1981) 8,753.

Bonaiuti, Andrea di (Florentine painter): *see* Andrea da Firenze.

Bonald, Louis-Gabriel-Ambroise, vicomte de (viscount of) (b. Oct. 2, 1754, Le Monna, near Millau, Fr.—d. Nov. 23, 1840, Le Monna), political philosopher and statesman who, with the French Roman Catholic thinker Joseph de Maistre, was a leading apologist for Legitimism, a position contrary to the values of the French Revolution and favouring monarchical and ecclesiastical authority.

Mayor of Millau from 1785 to 1789, Bonald became president of the district of Aveyron's administration in 1790 but resigned the next year in protest against the Civil Constitution of the Clergy. Passed by the new Constituent

Bonald, portrait engraving, *c.* 1820
By courtesy of the Bibliotheque Nationale, Paris

Assembly of the nation, that reform was rejected by the Pope, most of the French clergy, and King Louis XVI for the restraints that it put upon the Roman Catholic Church in France. Emigrating to Heidelberg, Bonald was soon condemned by the revolutionary Directory for his highly royalist *Théorie du pouvoir politique et religieux* (1796; "Theory of Political and Religious Power"). In 1797 he returned to France, where he wrote his *Essai analytique sur les lois naturelles de l'ordre social* (1800; "Analytical Essay on the Natural Laws of Social Order"); *Du divorce* (1801); and *Législation primitive considérée . . . par les seules lumières de la raison,* 3 vol. (1802; "Primitive Legislation Considered . . . by the Light of Reason Alone").

After the exile of Napoleon and the restoration of the Bourbon monarchy in 1814, Bonald became a member of the council of public instruction (1814), was nominated to the Académie Française (1816), and was created vicomte (1821) and peer (1823). During these years he wrote *Réflexions sur l'intérêt général de l'Europe* (1815; "Reflections on the General Interest of Europe") and *Démonstration philosophique du principe constitutif de la société* (1830; "Philosophical Demonstration of the Formative Principle of Society"). With the advent of the July Revolution of 1830, Bonald resigned his peerage and retired to spend the last years of his life at the château Le Monna.

Henry Moulinié's *De Bonald* appeared in 1915, and Mary Hall Quinlan's *Historical Thought of the Vicomte de Bonald* appeared in 1953.

Bonanza Creek, stream in the western Yukon Territory, Canada, rising near Dawson and flowing 20 mi (32 km) northwest to the Klondike River. In it gold was found by George Washington Carmack on Aug. 17, 1896, setting off the gold rush of that year into the Klondike Valley. The creek, formerly called Rabbit Creek, was renamed Bonanza Creek to mark Carmack's strike. *See also* Klondike River.

Bonaparte FAMILY, Italian BUONAPARTE, a family made famous by Napoleon I (*q.v.*), emperor of the French (1804–1814/15). The French form Bonaparte was not commonly used, even by Napoleon, until after the spring of 1796. The original name was Buonaparte, which was borne in the early Middle Ages by several distinct families in Italy. One of these, which settled at Florence before the year 1100, was divided in the 13th century into the two branches of San Miniato and Sarzana. A member of this latter, Francesco Buonaparte, emigrated in the middle of the 16th century to Corsica, where his descendants continued to occupy themselves with the affairs of law and the magistracy.

Napoleon's Corsican parents were Carlo Maria and Maria Letizia Buonaparte (*qq.v.*). Joseph, their third child and the first to survive, was born in 1768, Napoleon in 1769, and nine other children, six of whom survived, in subsequent years: Lucien (1775); Élisa (1777); Louis (1778); Pauline (1780); Caroline (1782); and Jérôme (1784). Louis's son, Charles-Louis, became emperor of the French as Napoleon III (1852–70). The Bonaparte name survived in descendants of Lucien, Louis, and Jérôme into the late 20th century.

Bonaparte, Carlo Maria (father of Napoleon): *see* Buonaparte, Carlo Maria.

Bonaparte, (Marie-Annonciade-)Caroline, original Italian MARIA NUNZIATA CAROLINA BUONAPARTE (b. March 25, 1782, Ajaccio, Corsica—d. May 18, 1839, Florence), queen of Naples (1808–15), Napoleon's youngest sister and the wife (1800) of Joachim Murat (*q.v.*).

As a result of her ambitious and intriguing nature, her husband became governor of Paris, marshal of France (1804), grand duke of Berg and of Cleves (1806), lieutenant of the emperor in Spain (1803), and king of Naples (1808). Her relations with Napoleon became strained as she associated herself with the shifting allegiances of her husband in 1814–15, which led ultimately to Murat's fall and execution in 1815. Thereafter, Caroline took refuge in Trieste, taking the title comtesse de Lipona.

Bonaparte, Charles Joseph (b. June 9, 1851, Baltimore—d. June 28, 1921, Baltimore), lawyer and grandson of Jérôme Bonaparte, youngest brother of Napoleon; he became one of Pres. Theodore Roosevelt's chief "trust-busters" as U.S. attorney general.

After graduating from Harvard Law School (1872), Bonaparte began the practice of law in Baltimore in 1874. He was active in organizations advocating municipal and civil service reform, which gained him the admiration of Roosevelt, who was then a member of the U.S. Civil Service Commission. Upon Roosevelt's accession to the presidency, Bonaparte served as secretary of the navy (1905–06) and as attorney general (1906–09). In this last post he prosecuted numerous antitrust suits, most notably that which resulted in the dissolution in 1911 of the American Tobacco Company.

Bonaparte, Charles-Louis-Napoléon: *see* Napoleon III.

Bonaparte, Charles-Lucien, PRINCIPE (prince) DI CANINO E DI MUSIGNANO (b. May 24, 1803, Paris—d. July 29, 1857, Paris), scientist, eldest son of Napoleon I's second surviving brother Lucien. His publication of *American Ornithology,* 4 vol. (1825–33), established his scientific reputation. In 1848–49, when he took part in the political agitation for Italian independence against the Austrians, his scientific career experienced a brief hiatus, and he was forced to leave Italy in July 1849. He went to Holland and then to France. His principal works are a general zoological conspectus, *Conspectus systematis ornithologiae, mastozoologiae, reptologiae et amphibologiae, ichthyologiae* (1850); a work on hummingbirds, *Tableau des oiseaux-mouches* (1854); and one on extinct birds, *Ornithologie fossile* (1858).

Bonaparte, (Marie-Anne-)Élisa, original Italian MARIA ANNA ELISA BUONAPARTE (b. Jan. 3, 1777, Ajaccio, Corsica—d. Aug. 7, 1820, Sant'Andrea, near Trieste), Napoleon I's eldest sister to survive infancy.

She was married on May 1, 1797, to Félix Baciocchi, a member of a Corsican noble family. Napoleon gave her the principality of Piombino in March 1805 and the principality of Lucca in the following June and finally, in March 1809, made her grand duchess of Tuscany. Her pride and ability had great influence on the administration and on Italian affairs in general. Her relations with Napoleon were frequently strained; in 1813–14 she abetted Joachim Murat in his enterprises. After her brother's fall she retired, with the title of contessa (countess) di Compignano, first to Bologna and afterward to Sant'Andrea near Trieste.

Bonaparte, Jérôme, original Italian ROLAND BUONAPARTE (b. Nov. 15, 1784, Ajaccio, Corsica—d. June 24, 1860, Villegenis, Fr.), king of Westphalia, marshal of France, and Napoleon I's youngest brother, the only one whose career stretched into the second French empire of Louis-Napoléon (later Napoleon III). It was through Jérôme that the Bonaparte line extended into the U.S.; his eldest son, Jérôme, established residence there.

A member of the consular guard from 1800, Jérôme was transferred to the navy soon after he was wounded in a duel. He cruised in the West Indies, where he left his ship and went to the United States; there he married (Dec. 24, 1803) Elizabeth (or Elisa) Patterson, whom he brought to Europe in 1805. Napoleon ordered Elizabeth excluded from his states, but Jérôme remained, taking command of a small squadron in the Mediterranean. He then took part in the campaign of 1806. An imperial decree annulled the Patterson marriage. The Emperor then married Jérôme to Princess Catherine of Württemberg and made him king of Westphalia. In the Russian campaign of 1812 Jérôme failed in his assigned mission and was returned to Kassel, Ger.

In 1813, on the fall of the Napoleonic regime in Germany, Jérôme returned to France. He commanded a division on the French left wing at Waterloo and attacked with great pertinacity. On Napoleon's second abdication Jérôme left France, not returning until 1847 when, after the rise of his nephew Louis-Napoléon, he became, successively, governor of the Invalides, marshal of France, and president of the Senate.

Bonaparte, Joseph, original Italian GIUSEPPE BUONAPARTE (b. Jan. 7, 1768, Corte, Corsica—d. July 28, 1844, Florence), lawyer, diplomat, soldier, and Napoleon I's eldest surviving brother, who was successively king of Naples (1806–08) and king of Spain (1808–13).

Like his brothers, Joseph embraced the French republican cause and, with the victory of Corsican patriot Pasquale Paoli, was forced to leave Corsica to seek refuge in France. In 1796 he accompanied Napoleon in the early part of his Italian campaign and had some part in the negotiations with Sardinia that led to the armistice of Cherasco. He then took part in the French expedition for the recovery of Corsica and assisted in the reorganization of the island. He was appointed by the Directory minister to the court of Parma (1797) and then to Rome. Late in 1797 he returned to Paris and became one of the members for Corsica in the Council of Five Hundred.

Joseph did little in the coup d'etat of 18 Brumaire (Nov. 9, 1799). He was a member of the Council of State and of the Corps Législatif, and he concluded at Mortfontaine a convention with the United States (1800). He also presided over negotiations leading to the Treaty of Lunéville with Austria (1801); and he was one of those who represented France in discussions with the British envoy, Lord Cornwallis, that led to the treaty of Amiens (1802), which marked Napoleon's total pacification of Europe. A year later, however, relations between England and France were severed, and Joseph's diplomatic efforts proved to have been in vain.

On the question of the consolidation of Napoleon's power as first consul for life (Aug. 1, 1802) with the power to nominate his own successor, the brothers disagreed. As Napoleon had no heir, Joseph as eldest brother claimed to be recognized as heir, while Napoleon wished to recognize the son of Louis Bonaparte. On the proclamation of the French

empire (May 1804) the friction became acute. Joseph refused Napoleon's offer to make him king of Lombardy if he would waive all claim of succession to the French throne.

After acting for a year as chief of the French government while Napoleon was in Germany, Joseph was sent to Naples to expel the Bourbon dynasty (1806). Proclaimed king of Naples by imperial decree later the same year, he abolished the relics of feudalism, reformed the monastic orders, and reorganized the judicial, financial, and educational systems.

From 1808 Napoleon became increasingly dissatisfied with Joseph's conduct. Called away from Naples to become king of Spain, Joseph was forced to leave Madrid hastily when Spanish insurgents defeated French forces at Baylen. He was reinstated by Napoleon at the close of 1808 and thereafter was kept in a subordinate position that led him on four occasions to offer to abdicate.

On March 30, 1814, when the troops of the Allies reached Paris, Joseph fled, having left Marshal Marmont to make a truce with the assailants of Paris if they should be in overpowering strength. He played only an insignificant role in the Hundred Days (1815). After Napoleon's surrender at Rochefort, Joseph went to the United States and in 1830 pleaded for the recognition of the claims of Napoleon's son, the Duke of Reichstadt, to the French throne. He afterward visited England and for a time resided in Genoa and then in Florence, where he died.

Bonaparte, Joséphine: *see* Joséphine.

Bonaparte, (Maria-)Letizia (mother of Napoleon): *see* Buonaparte, Letizia.

Bonaparte, Louis, original Italian LUIGI BUONAPARTE, also called (from 1810) COMTE (count) DE SAINT-LEU (b. Sept. 2, 1778, Ajaccio, Corsica—d. July 25, 1846, Livorno, Italy), French soldier and Napoleon I's third surviving brother. As king of Holland (1806–10) he guarded the welfare of his subjects. His unwillingness to join the Continental System brought him into conflict with the Emperor.

After attending military school at Châlons, Louis accompanied Napoleon on the Italian campaign of 1796–97 and acted as his aide-de-camp in Egypt in 1798–99. In 1802 Napoleon as first consul married him to Joséphine's daughter Hortense de Beauharnais; the forced union led to deplorable results springing from Louis's violent jealousy of his wife and his growing resentment toward Napoleon for not allowing the couple to divorce. In 1804 Louis was raised to the rank of general and the following year became governor of Paris.

Napoleon proclaimed Louis king of Holland on July 5, 1806. From the first, the Emperor reproached him for being too easy on his subjects. By 1809 Napoleon was considering annexing Holland in order to arrest the trade the Dutch secretly conducted with England. In 1810, failing to negotiate successfully with either England or Louis, the Emperor dispatched French troops against the Dutch capital. Louis abdicated and fled his kingdom, which on July 9 Napoleon annexed to France.

Styling himself the comte de Saint-Leu, Louis lived for some time in Bohemia, Austria, and Switzerland. He spent his later life in Italy, largely occupied with literary pursuits. He wrote *Documents historiques et réflexions sur le gouvernement de la Hollande,* 3 vol. (1820; *Historical Documents and Reflections on the Government of Holland,* 1820), and two partial works, *Marie, ou les peines de l'amour,* 2 vol. (1812; *Maria; or, the Hollanders,* 1815), and *Le Retour* (1846; "The Return").

Bonaparte, (Napoléon-Eugène-)Louis (b. March 16, 1856, Paris—d. June 1, 1879, near Ulundi, Zululand), French prince imperial, the only son of Napoleon III by Empress Eugénie.

He was a delicate boy, but when the Franco-German War of 1870 broke out his mother sent him to the army. After the first defeats he had to flee from France with the Empress and settled in England at Chislehurst, completing his military education at Woolwich. On his father's death (Jan. 9, 1873) the Bonapartists proclaimed him Napoleon IV, and he became the official pretender. The Bonapartist leaders thought that he should win his crown by military prestige, and he was persuaded to attach himself as a volunteer to the British expedition to Zululand in February 1879. While out on reconnaissance with a few troopers he was surprised by Zulus and killed at Ulundi. His body was brought back to England and buried at Chislehurst.

Bonaparte, Louis-Lucien (b. Jan. 4, 1813, Thorngrove, Worcestershire, Eng.—d. Nov. 3, 1891, Fano, Italy), philologist, politician, and third son of Napoleon's second surviving brother, Lucien Bonaparte.

He passed his youth in Italy and did not go to France until 1848, when he served two brief terms in the Assembly as representative for Corsica (1848) and for the Seine (1849). He played no direct part in the coup d'etat of Dec. 2, 1851, of his cousin Napoleon III. Although he was named senator and prince, he took only a small part in politics. He devoted himself to the study of English dialects. He also published some notable works on the Basque language.

Bonaparte, Lucien, original Italian LUCIANO BUONAPARTE (b. May 21, 1775, Ajaccio, Corsica—d. June 29, 1840, Viterbo, Italy), Napoleon I's second surviving brother who, as president of the Council of Five Hundred at Saint-Cloud, was responsible for Napoleon's election as consul on 19 Brumaire (Nov. 10, 1799).

Educated in France, Lucien returned to Corsica in 1789 and became an outspoken speaker in the Jacobin Club at Ajaccio. He urged his brothers to break with the Corsican patriot Pasquale Paoli, and he headed a Corsican deputation that went to France to denounce Paoli and to solicit aid against him. In the south of France he worked hard for the Jacobin cause. The coup d'etat of Thermidor (July 1794) compelled him to accept a small post at St.-Chamans. There he was arrested and imprisoned until Napoleon procured his release and found him a post as commissioner in the French army in Germany. Lucien disliked the army and was sent to Corsica. In 1798 he entered the Council of Five Hundred as deputy for Corsica. He was president of that body on 18–19 Brumaire (Nov. 9–10, 1799), when Napoleon overthrew the national councils at the palace of Saint-Cloud. By refusing to put the vote of outlawry, for which the majority of the council clamoured, by his opportune closing of the sitting, and by appealing to the soldiers outside to disperse "the representatives of the dagger," Lucien turned the scale in favour of his brother.

This event, the chief event of Lucien's life, was fatal to the cause of democracy of which he had been the most eager exponent. In one of his earlier letters to his brother Joseph, Lucien stated that he had detected in Napoleon "an ambition not altogether egotistic but which surpassed his love for the general weal; . . . in case of a counterrevolution he would try to ride the crest of events." This suspicion became a dominant feeling, and the relations between Lucien and Napoleon became strained during the Consulate (1799–1804). Lucien believed that Napoleon's growing ambition for power was jeopardizing the cause of democracy. He accepted office as minister of the interior but was soon deprived of it because of political and personal differences with the first consul. Napoleon next appointed him ambassador to the court of Madrid (1800), where he again fell into disfavour. He returned to Paris and again opposed Napoleon's schemes. The breach was completed when Lucien was secretly married to Mme Jouberthou (Alexandrine de Bleschamps) despite Napoleon's express prohibition. Lucien's first wife, Christine Boyer, had died in 1800, and Napoleon had wanted him to marry the Spanish infanta Maria Luisa, the widow of Louis, king of Etruria. Ordered to leave France, Lucien lived in Italy.

In December 1807 Napoleon sought to come to an arrangement by which Lucien would be made a French prince, provided that he would agree to have his marriage annulled. Lucien refused and left for the U.S. He was captured at sea by the British and taken to England, where he lived under light surveillance until his return to Rome in 1814. He offered Napoleon his help during the Hundred Days (1815), stood by his side in Paris, and was the last to defend Napoleon's prerogatives at the time of his second abdication. The rest of Lucien's life was spent in Italy. His publications include an epic, *Charlemagne ou L'Église délivrée* (1814; "Charlemagne; or, The Church Delivered"); *La Vérité sur les Cent-Jours* (1835; "The Truth About the Hundred Days"); and *Mémoires,* of which only the first volume appeared (1836).

Bonaparte, Napoléon: *see* Napoleon I.

Bonaparte, Napoléon-François-Charles-Joseph: *see* Reichstadt, Napoléon-François-Charles-Joseph, Herzog von.

Bonaparte, Napoléon-Joseph-Charles-Paul, also called (from 1852) PRINCE NAPOLÉON-JÉRÔME (b. Sept. 9, 1822, Trieste—d. March 17, 1891, Rome), youngest son of Jérôme Bonaparte, Napoleon I's youngest brother, and his second wife, Catherine of Württemberg. In 1852 he was named heir presumptive to the throne of the Second Empire.

After the French Revolution of 1848, he was elected to the National Assembly as a representative of Corsica and assumed the name of Jérôme. Notwithstanding his ostensible opposition to the coup d'etat of 1851 on the establishment of the empire, he was designated successor to the throne, as Prince Napoléon-Jérôme, if Napoleon III should die childless. Associating mainly with men of progressive ideas, he represented at court liberal opinion against the empress Eugénie.

In 1854 he took part in the Crimean campaign as general of a division. (About this time he became known as "Plon Plon," supposedly because soldiers who fought under his command thought him a coward and nicknamed him "Plomb-plomb" or "Craint-plomb," meaning "Fear-lead.") Returning to France, he undertook the direction of the national exhibition for the international exhibition of 1855. In 1858 he was appointed minister for the colonies and Algeria. He found his political activity was diverted into a different channel by his sudden marriage in 1859 to the princess Maria Clotilde of Savoy, daughter of Victor Emmanuel II, the king of Sardinia. When the war for the liberation of Italy broke out, Prince Napoléon-Jérôme commanded the French corps that occupied Tuscany.

In the last years of the Second Empire Prince Napoléon-Jérôme lost all his official dignities as the result of several indiscreet speeches. After the fall of the empire he lived in comparative retirement until, in 1879, the death of Napoleon III's son made him direct heir to the Napoleonic succession. As the Bonapartist pretender he was unfortunate and inglorious, and before his death he was virtually deposed in favour of his elder son, Napoléon-Victor-Jérôme (1862–1926). The latter became the recognized Bonapartist pretender on his father's death in 1891.

Bonaparte, (Marie-)Pauline, original Italian MARIA PAOLA BUONAPARTE (b. Oct. 20, 1780, Ajaccio, Corsica—d. June 9, 1825, Florence), second sister of Napoleon to survive infancy, the gayest and most beautiful of his sisters.

She married Gen. C.V.E. Leclerc (1772–1802), a staff officer of Napoleon, in 1797 and accompanied him to San Domingo. When Leclerc died of yellow fever she returned to Paris. She then married Prince Camillo Borghese (Nov. 6, 1803) and went with him to Rome, but soon tired of him, and returned to Paris, where her behaviour caused some scandal. In 1806 she received the title of duchess of Guastalla. Her offhand treatment of Napoleon's new empress, Marie-Louise, led to her removal from court in 1810. Nevertheless, she went with her mother to Elba in 1814 and is said to have expressed a wish to share Napoleon's exile in St. Helena. She died of cancer in Florence in 1825. Canova's statue of her as Venus reclining on a couch is well known.

Bonaparte, Pierre-Napoléon (b. Oct. 11, 1815, Rome—d. April 7, 1881, Versailles, Fr.), French prince (after 1851) and son of Napoleon I's brother Lucien Bonaparte.

A self-proclaimed republican after 1848 and deputy for Corsica, Bonaparte was reconciled to his cousin Napoleon III after the latter's coup d'etat in 1851. With this the republicans abandoned the Prince, and he had little effect on the politics of his time. His killing of the journalist Victor Noir in January 1870 hastened the already rising tide of republican and radical agitation directed against the Second Empire in its final months. The incident was the result of a controversy with another journalist, Paschal Grousset, who had sent Noir to invite the Prince to engage in a duel. The Prince was acquitted of murder by a special high court of justice at Tours. His *Souvenirs, traditions et révélations* appeared in 1876.

Bonaparte weasel: *see* stoat.

Bonapartist, French BONAPARTISTE, any of the 19th-century supporters of Napoleon I and Napoleon III and of their political theories and policies. The Bonapartist party advanced the claims of the Bonaparte family throughout the century and, though never completely united, believed in an autocratic government run with the presumed consent of the people.

After Napoleon I's abdication (1814), many of his followers turned to his son, Napoleon II, named as his successor; and after Napoleon I's exile to St. Helena (1815) and death (1821), they tried vainly to rally around Napoleon II (by then duke of Reichstadt), who, however, was being held virtual prisoner by the Austrian Habsburgs and was in ill health (he died in 1832). The Bonapartists, in any case, were poorly organized; and the memories of Napoleon's failures were too recent for them to secure power.

Nevertheless, a cult began to surround Napoleon Bonaparte after his death, and within a few years he was being promoted as the saviour of the common man and a political genius of the first order. Napoleon I's tyranny was being forgotten or glossed over as the memory of it grew dimmer, and instead his "glory," which contrasted so strikingly with the timidity and dullness of the *bourgeois* monarchy of Louis-Philippe, was lauded nostalgically. This sentiment left the way open for his nephew, Louis-Napoléon, an able propagandist, who gave all his energies to winning the throne of France. The failure of the Orléanists under Louis-Philippe and of the republicans under the Second Republic to satisfy the needs and demands of the French people gave Louis-Napoléon the opening he needed, and in December 1848 the Bonapartists garnered enough votes to elect him president. Within three years he was able to dissolve the parliament, arrest his enemies, and have himself voted dictatorial powers. In November 1852 he was elected emperor of the French.

Bonapartism differed somewhat under Louis-Napoléon (Napoleon III from Dec. 2, 1852), who sought to establish a liberal empire and avoid war. (He nevertheless got the nation involved in a series of foreign adventures—the Crimean War, the wars of Italian independence, the Mexican empire, and the fateful Franco-German War that led to his downfall in 1870.) During this period of Napoleonic power, the Bonapartists split into two factions. First, there were the conservatives surrounding Napoleon III, who encouraged the participation of the Catholic Church in education and rural organization, a laissez-faire attitude toward business and investment, and a strong central government working through approval of policy by plebiscite and an ostensibly independent system of local government. Second, there were the radicals, anticlericals all, who held to the republican ideals of universal suffrage, with real power exerted through the leadership of the Bonapartes.

The death (1873) of Napoleon III after his overthrow and the early death of his son, Louis, the prince imperial (1879), left the party split even worse under Napoléon-Jérôme Bonaparte (Napoleon III's first cousin) and the latter's elder son Napoléon-Victor—respectively leaders of the radicals and the conservatives. They continued to elect representatives but slowly lost members to the emerging parties of the Third Republic. When Napoléon-Jérôme died in 1891, the Bonapartist party effectively ceased to exist.

Bonard, Louis-Adolphe (b. March 27, 1805, Cherbourg, Fr.—d. March 31, 1867, Amiens), French admiral who served as the first official military governor of Cochinchina (the name given by Westerners to southern Vietnam).

Entering service in the French Navy in 1825, Bonard was promoted to lieutenant in 1835, captain in 1842, and was commissioned vice admiral in 1862. He was captured by Algerians after a shipwreck in 1830 and later helped quell an insurrection in Tahiti. He was put in command of French territory in Oceania in 1849. In 1853 he was named governor of French Guiana in South America.

On Nov. 29, 1861, Bonard was put in command of French forces in Cochinchina and charged with governing the French territories there. He captured the province of Bien Hoa that December, and Vinh Long province fell to him in March 1862. On June 5 he went to Saigon to negotiate a peace treaty with the representative of the court of Annam (central Vietnam). Under its terms Bonard secured for France the provinces of Gia Dinh, Dinh Tuong, and Bien Hoa as well as the island of Poulo Condore (modern Con Son). The Vietnamese emperor Tu Duc reluctantly signed the treaty in April 1863.

During his administration, Bonard established a military hospital in Saigon. He pursued a moderate course in the realm of colonial policy; his immediate concern was the relationship between the French administrators and the Vietnamese people. He hoped to govern Cochinchina indirectly, with the French ruling through the intermediary of native officials under the nominal direction of a few competent French officers; and toward this end he tried to reinstate Vietnamese mandarins, who had been removed from their posts. But the mandarins chose not to cooperate; their pride and hostility kept most of them from returning to their posts. Bonard set up schools to teach his officers the Vietnamese language. He also installed French in the curriculum of native schools, striving to bridge the communication gap between the French and the Vietnamese.

Bonard's policies were unpopular with Frenchmen in Cochinchina, especially with the missionaries. He had to satisfy both the indigenous peoples and the French colonists, and whatever he did for one group was almost certain to annoy the other. His conciliatory attitude toward the mandarins was the subject of stringent criticism from the missionaries, who considered the mandarins the symbol of the indigenous culture, particularly of Confucianism and Buddhism, both obstacles to Christianity.

In 1862–63 the dissatisfied mandarins led the Vietnamese people in revolt; only with considerable difficulty was the insurrection put down. After the uprising had subsided and the peace treaty with Tu Duc had been secured, Bonard returned with the treaty to France on April 30, 1863. He had full intentions of resuming his position in Indochina, but poor health prevented his return. He was named prefect of Cherbourg early in 1867.

Bonaventure, SAINT, Italian SAN BONAVENTURA, original name GIOVANNI DI FIDANZA (b. *c.* 1217, Bagnoregio, Papal States—d. July 15, 1274, Lyon; canonized April 14, 1482; feast day July 15), leading medieval theologian, minister general of the Franciscan order, and cardinal bishop of Albano. He wrote several works on the spiritual life and recodified the constitution of his order (1260). He was declared a doctor (teacher) of the church in 1587.

St. Bonaventure, detail of a fresco by Benozzo Gozzoli; in the church of S. Francesco, Montefalco, Italy

Alinari—Art Resource/EB Inc.

He was a son of Giovanni of Fidanza, a physician, and Maria of Ritella. He fell ill while a boy and, according to his own words, was saved from death by the intercession of St. Francis of Assisi. Entering the University of Paris in 1235, he received the master of arts degree in 1243 and then joined the Franciscan order, which named him Bonaventure in 1244. He studied theology in the Franciscan school at Paris from 1243 to 1248. His masters, especially Alexander of Hales, recognized in him a student with a keen memory and unusual intelligence. He was also under the tutelage of John of La Rochelle. After their deaths (1245) he studied further under Eudes Rigauld and William of Meliton. He was later probably influenced by the Dominican Guerric of Saint-Quentin.

By turning the pursuit of truth into a form of divine worship, he integrated his study of theology with the Franciscan mode of the mendicant life. In 1248, he began to teach the Bible; from 1251 to 1253 he lectured on the *Sentences,* a medieval theology textbook by Peter Lombard, an Italian theologian of the 12th century, and he became a master of theology in 1254, when he assumed control of the Franciscan school in Paris. He taught there

until 1257, producing many works, notably commentaries on the Bible and the *Sentences* and the *Breviloquium* (Summary), which presented a summary of his theology. These works showed his deep understanding of Scripture, the Fathers of the early church—principally St. Augustine—and a wide knowledge of the philosophers, particularly Aristotle.

Bonaventure was particularly noted in his day as a man with the rare ability to reconcile diverse traditions in theology and philosophy. He united different doctrines in a synthesis containing his personal conception of truth as a road to the love of God. In 1256, he defended the Franciscan ideal of the Christian life against William of Saint-Amour, a university teacher who accused the mendicants—friars who wandered about and begged for a living—of defaming the Gospel by their practice of poverty and who wanted to prevent the Franciscans and their fellow mendicants, the Dominicans, from attaining teaching positions. Bonaventure's defense of the Franciscans and his personal probity as a member of his religious order led to his election as minister general of the Franciscans on Feb. 2, 1257.

Founded by St. Francis according to strict views about poverty, the Franciscan order was at that time undergoing internal discord. One group, the Spirituals, disrupted the order by a rigorous view of poverty; another, the Relaxati, disturbed it by a laxity of life. Bonaventure used his authority so prudently that, placating the first group and reproving the second, he preserved the unity of the order and reformed it in the spirit of St. Francis. The work of restoration and reconciliation owed its success to Bonaventure's tireless visits, despite delicate health, to each province of the order and to his own personal realization of the Franciscan ideal. In his travels, he preached the Gospel constantly and so elegantly that he was recognized everywhere as a most eloquent preacher. As a theologian, he based the revival of the order on his conception of the spiritual life, which he expounded in mystical treatises manifesting his Franciscan experience of contemplation as a perfection of the Christian life. His *Journey of the Mind to God* (1259) was a masterpiece showing the way by which man as a creature ought to love and contemplate God through Christ after the example of St. Francis. Revered by his order, Bonaventure recodified its constitutions (1260), wrote for it a new *Life of St. Francis of Assisi* (1263), and protected it (1269) from an assault by Gerard of Abbeville, a teacher of theology at Paris, who renewed the charge of William of Saint-Amour. He also protected the church during the period 1267–73 by upholding the Christian faith while denouncing the views of unorthodox masters at Paris who contradicted revelation in their philosophy.

Bonaventure's wisdom and ability to reconcile opposing views moved Pope Gregory X to name him cardinal bishop of Albano, Italy, in May 1273, though Bonaventure had declined to accept appointment to the see of York, England, from Pope Clement IV in 1265. Gregory consecrated him in November at Lyon, where he resigned as minister general in May 1274. At the second Council of Lyon he was the leading figure in the reform of the church, reconciling the secular (parish) clergy with the mendicant orders. He also had a part in restoring the Greek Church to union with Rome. His death, at the council, was viewed as the loss of a wise and holy man, full of compassion and virtue, captivating with love all who knew him. He was buried the same day in a Franciscan church with the Pope in attendance. The respect and love that was held for Bonaventure is exemplified in the formal announcement of the council: "At the funeral there was much sorrow and tears; for the Lord has given him this grace, that all who saw him were filled with an immense love for him." His exemplary life as a Franciscan and the continual influence of his doctrine on the life and devotion of the Western Church won for him a declaration of sanctity by Pope Sixtus IV; he was designated a doctor of the church by Sixtus V.

Modern scholars consider him to have been one of the foremost men of his age, an intrepid defender of human and divine truth, and an outstanding exponent of a mystical and Christian wisdom. (J.F.Q.)

BIBLIOGRAPHY. The critical edition of Bonaventure's works is *Opera omnia*, 10 vol. (Quaracchi; 1882–1902). Translations of his works by Jose de Vinck are "The Journey of the Mind to God," in vol. 1 of *The Works of Bonaventure* (1960); and vol. 2, *Breviloquium* (1963). Studies of his doctrine and life (with bibliographies) are J.G. Bougerol, *Introduction à l'étude de Saint Bonaventure* (1961; Eng. trans. 1964); and I.C. Brady, "Bonaventure, St.," in *New Catholic Encyclopedia*, vol. 2, pp. 658–664 (1967).

Bonaventure Island, French ÎLE BONAVENTURE, island in Bas-Saint-Laurent-Gaspésie region, eastern Quebec province, Canada, lying in the Gulf of St. Lawrence off Percé at the end of the Gaspé Peninsula. Although only 2½ mi (4 km) long, its rocky cliffs provide sanctuary for thousands of nesting gannets from April to November, in addition to auks, gulls, kittiwakes, and guillemots. Originally named Bonne Aventure by Jacques Cartier, the French navigator-explorer, it was settled by Capt. Peter Duval, a Jersey (Channel Islands) sea captain and privateer, whose descendants still live there.

Bonavista, town, eastern Newfoundland, Canada, on the northeastern shore of Bonavista Bay. Cape Bonavista may have been where John Cabot first landed in 1497, but the site was probably named in 1500 by the Portuguese explorer Gaspar Côrte-Real, after Boa Vista, one of the Cape Verde Islands. An important cod- and salmon-fishing port, the town has modern fish-drying, filleting, and cold-storage plants. Bonavista was the site of the province's first school, established in 1726. Roads and a railroad connect it to St. John's (187 mi [301 km] south-southeast) and other parts of the island. Terra Nova National Park (153 sq mi [396 sq km]) extends around the bay's southern shores. Inc. 1964. Pop. (1981) 4,460.

Boncompagni, Ugo (pope): *see* Gregory XIII.

Boncourt, Louis-Charles-Adélaïde Chamisso de: *see* Chamisso, Adelbert von.

bond, in finance, a loan contract issued by local, state, and national governments and by private corporations specifying an obligation to return borrowed funds. The borrower promises to pay interest on the debt when due (usually semi-annually) at a stipulated percentage of the face value and to redeem the face value of the bond at maturity in legal tender. Bonds usually indicate a debt of substantial size and are issued in more formal fashion than promissory notes, ordinarily under seal. Contract terms are normally found in the indenture, an agreement between the borrower and a trustee acting on behalf of the bondholders. Interest on bonds is most often collectible through the presentation of numbered coupons, which the holder clips from the bond; a coupon is usually printed and attached to the bond for every interest date throughout the life of the bond.

When bonds are sold, interest accrued since the previous interest-due date is added to the sale price. Most bonds are payable to the bearer and are thus easily negotiable, but it is usually possible to have the bond registered and thus made payable only to the named holder. The great majority of bonds are callable, meaning that the issuer can redeem them at his option, upon appropriate notice, well before maturity. Maturity, or due, dates for bonds normally run from 10 to 30 years.

Government bonds may be backed by the taxing power of the government unit issuing the bond, or they may be revenue bonds, backed only by the revenue from the specific projects—*e.g.*, toll roads, airports, waterworks—to which they are committed. Corporate bonds may be secured by a lien against real estate (mortgage bonds) or other property, such as equipment (equipment obligations) owned by the borrower. If the bond is unsecured, it is known as a debenture bond.

bond, in masonry, systematic arrangement of bricks or other building units composing a wall or structure in such a way as to ensure its stability and strength. The various types of bond may also have a secondary, decorative function.

Bonding may be achieved by overlapping alternate courses (rows or layers) in brickwork, by using metal ties, and by inserting units vertically so they join adjacent courses. A bond course of headers (units laid with their ends toward the face of the wall) can be used to bond exterior masonry to backing masonry. Headers used in this manner may also be called throughstones, or perpends. Units laid with their lengths parallel to the face of a wall are called stretchers.

Among the commoner types of bond are the English bond, in which bricks are laid in alternating courses of stretchers and headers; the Flemish or Dutch bond, which consists of headers and stretchers laid alternately within each course, each header being centred over the stretcher below it; and the American bond, in which only every fifth or sixth course consists of headers, the rest being stretchers. The American bond is the most common because it is so easily laid. The herringbone bond is a variety of raking bond in which units are laid at an angle of 45° to the direction of the row, instead of horizontally. Alternate courses lie in opposing directions, resulting in a zigzag pattern. Other types of bond include the blind, block-in-course, chain, cross, cross-and-English, diagonal, dog's tooth, English-cross, flying, in-and-out, plumb, ranging, running, and split.

Bond, Carrie Jacobs (b. Aug. 11, 1862, Janesville, Wis., U.S.—d. Dec. 28, 1946, Hollywood), composer-author of sentimental art songs that attained great popularity, among them "Just a-Wearyin' for You" (1901; words by Frank Stanton), "I Love You Truly" (1906), and, especially, "A Perfect Day" (1910).

Widowed in 1895, in ill health, and without money, she went to Chicago, where she established her own song-publishing business, The Bond Shop (C.J. Bond & Son). The words to "A Perfect Day" were inspired by a California sunset; more than 5,000,000 sheet music copies of the song were sold. Bond wrote about 170 songs; an autobiography, *The Roads of Melody* (1927); and a book of poems and philosophical writings, *The End of the Road* (1940).

Bond, Julian (b. Jan. 14, 1940, Nashville, Tenn., U.S.), U.S. legislator and black civil rights leader, best known for his fight to take his duly elected seat in the Georgia House of Representatives.

The son of prominent educators, Bond attended Morehouse College in Atlanta, where he helped found a civil rights group and led a sit-in movement intended to desegregate Atlanta lunch counters.

In 1960 Bond joined in creating the Student Nonviolent Coordinating Committee (SNCC), and he later served as communications director for the group. In 1965 he won a seat in the Georgia state legislature, but his en-

dorsement of a SNCC statement accusing the United States of violating international law in Vietnam prompted the legislature to refuse to admit him.

The voters in his district twice re-elected him, but each time, the legislature barred him. Finally, in December 1966, the U.S. Supreme Court ruled the exclusion unconstitutional, and Bond was sworn in on January 9, 1967.

At the Democratic National Convention in 1968, Bond led an insurgent group of delegates that won half the Georgia seats. He seconded the nomination of Eugene McCarthy and became the first black man to have his name placed in nomination for the vice-presidential candidacy of a major party. Younger than the minimum age required for the position under the Constitution, however, Bond withdrew his name.

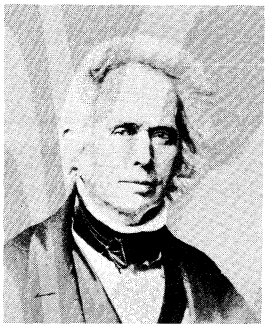
Bond served in the Georgia House of Representatives until 1975, in which year he took a seat in the state Senate. In addition to his legislative activities, he served as president of the Southern Poverty Law Center.

Bond, Sir Robert (b. Feb. 25, 1857, St. John's, Nfd.—d. March 16, 1927, Whitbourne), leader of the Liberal Party in Newfoundland and prime minister of the British colony from 1900 to 1909.

Bond was elected to the Newfoundland House of Assembly in 1882. He became speaker in 1884 and colonial secretary in 1889 in the Liberal ministry. His attempts to settle the fishing rights allowed to France and the U.S. were overruled by the United Kingdom and, although France gave up the right to use Newfoundland shores in 1904, agreement was not made between the U.S. and the imperial government until 1910.

As prime minister, Bond made major concessions to outside capital to stimulate home economy. Consequently, the London *Daily Mail* established at Grand Falls a paper mill that led to development of logging as Newfoundland's major industry. He resigned in 1909 after disagreeing with the British governor over procedure following the deadlocked election in 1908 and formed an alliance with a radical fishermen's union, but his influence declined and he retired in 1914. He was knighted in 1901.

Bond, William Cranch (b. Sept. 9, 1789, Falmouth, Portland, Dist. of Maine, Mass., U.S.—d. Jan. 29, 1859, Cambridge, Mass.),



William Cranch Bond

By courtesy of the Lick Observatory Archives, Santa Cruz, Calif.

astronomer who, with his son George P. Bond, discovered Hyperion, the eighth satellite of Saturn, and an inner ring called Ring C, or the Crepe Ring.

Largely self-educated, Bond became interested in astronomy after observing the solar eclipse of 1806. He independently discovered many comets and was appointed the first astronomical observer at Harvard College in 1840. He became the first director of the Harvard Observatory in 1847 and was elected associate of the Royal Astronomical Society two years later, the first American so honoured. In 1848 Bond undertook extensive studies of the Orion Nebula and Saturn and discovered Hyperion. He made the first recognizable daguerreotype of the Moon and of Vega (α Lyrae) in 1850 and the first recognizable photographic print of the Moon in 1857.

Bond albedo: *see* albedo.

Bonde, Gustaf, Friherre (Baron) (b. Feb. 4, 1620, Esplunda, Swed.—d. May 25, 1667, Hamburg), statesman and one of the regents

Bonde, detail from an oil painting by D.K. Ehrenstrahl; in Vibyholm Castle, Sweden

By courtesy of the Svenska Portrattarkivet, Stockholm

ruling Sweden during the minority of the Swedish king Charles XI, whose policies foreshadowed the King's key reforms.

After becoming governor of the province of Södermanland (1648) and a privy councillor (1653), Bonde was chosen lord treasurer and a member of the regency council (1660). He reduced state expenditures and presented a plan to make Sweden independent of foreign subsidies by pursuing a policy of peace, economic development, and repossession of royal lands.

Bonde's budget of 1662, which embodied these principles, later served as a guide to Charles XI. But the majority of the regency council preferred the ambitious financial and foreign policies of the chancellor Magnus Gabriel De la Gardie and helped him sabotage Bonde's economic programs. After the collapse of the public finances during Sweden's wasteful war with Bremen (1655), Bonde withdrew from further political disputes.

Bondfield, Margaret (Grace) (b. March 17, 1873, Chard, Somerset, Eng.—d. June 16, 1953, Sanderstead, Surrey), trade union leader and the first woman to attain Cabinet rank in Great Britain.

She had little schooling. Starting as a draper's assistant at 14, she found conditions miserable and joined the National Union of Shop Assistants at its formation. In 1899 she was the only woman delegate to the Trades Union Congress, and she became its first woman chairman in 1923. In 1923 she also was elected a Labour Party member of the House of Commons. Reelected in 1929, she became minister of labour in Ramsey MacDonald's second administration but was defeated in the 1931 election. She retired from

Margaret Bondfield

Elliott and Fry

trade-union work in 1938. She was appointed a companion of honour in 1948, and her autobiography, *A Life's Work,* was published in 1949.

Bondi, Sir Hermann (b. Nov. 1, 1919, Vienna), British mathematician and cosmologist who, with Fred Hoyle and Thomas Gold, formulated the steady-state theory of the universe.

Bondi received his M.A. from Trinity College, Cambridge. During World War II he worked in the British Admiralty (1942–45). He then taught mathematics at Cambridge (1945–54) and at King's College, London (from 1954). Bondi combined his academic career with active involvement in public service. He was director general of the European Space Research Organization (1967–71), the chief scientific adviser to the British ministry of defense (1971–77), chief scientist of the department of energy (1977–80), and chairman of the Natural Environment Research Council (from 1980).

In 1948 Bondi, Hoyle, and Gold advanced their cosmological theory of a steady-state universe, which postulates that the universe is the same everywhere and for all time. This means that as the universe expands, new matter would have to be created to balance this expansion. The theory of an eternal, steady-state universe, with no specific origin, has fallen into disrepute since the discovery (1961) of cosmic background radiation (*i.e.*, a faint glow of radio radiation emanating from all directions in space), which strongly suggests that the universe began at some definable moment in the past with a violent explosion of an extremely dense and intensely hot mass of material.

Works by Bondi include *Cosmology* (1952; reissued 1960), *The Universe at Large* (1960), *Relativity and Commonsense* (1964), and *Assumption and Myth in Physical Theory* (1967). He was made a fellow of the Royal Society in 1959 and a Knight Commander of the Bath in 1973.

bonding, in textiles, production of nonwoven cloth from fibres held together by an adhesive substance or by the inclusion of man-made fibres that can be fused by the application of heat or solvents. Such fabrics are frequently used for inexpensive disposable articles and for garment interlinings.

The word bonding is often applied to the process of laminating two layers of cloth with an adhesive. It is also used for the fusing of a sheet of plastic foam between two layers of cloth to provide insulation and for the fusing of a cloth to a plastic foam backing.

Bondoukou, town, administrative centre (since 1969) of Bondoukou *département,* eastern Ivory Coast, at the intersection of roads from Ghana, Burkina Faso (formerly Upper Volta), and Abidjan, the national capital. An early trade centre of the Kulango (Koulango, Pakhalla, N'Gora) people, it was captured in the late 15th century by the Brong (Abron), an Akan people from the west. The Abron were converted to Islām by Diula (Dioula) traders from the north, who founded a Koranic university and made the town a Muslim cultural centre. The kingdom of Bondoukou was part of the Ashanti union from the mid-18th century to 1874. In 1941 the King led thousands of his people into the Gold Coast (now Ghana) to join Gen. Charles de Gaulle's Free French forces.

The town is the chief trade and tourist centre of its *département,* which includes the 2,223,000-ac (900,000-ha) Bouna Game Reserve. Pop. (1975) town, 19,021; *département,* 295,368.

Bône (Algeria): *see* Annaba.

bone, rigid body tissue consisting of cells embedded in a hard intercellular matrix.

A brief treatment of bone follows. For full treatment, *see* MACROPAEDIA: Supportive and Connective Tissues.

Bone exists in vertebrates only. Bone has many functions—it serves as a structural frame to support the body; it enables movement by providing a point of attachment for the muscles and by serving as a system of levers; it protects the brain, spinal cord, and the soft internal organs; it houses the blood-forming system (red bone marrow); and it acts as a reservoir for the mineral calcium, which is vital to many body processes.

Composition. The intercellular matrix of bone consists of an organic component—the fibrous connective protein collagen—and an inorganic component—crystals formed by the calcium, phosphate, and carbonate minerals. These two components are intimately bound, with the mineral crystals wrapped around and embedded among the collagen fibres. The hard mineral crystals provide great compressional strength, making bone an excellent load-bearing material. The collagen fibres add elasticity and high tensile strength, enabling bone to withstand tension forces.

The living material of the bone, the bone cells, account for only 1 to 5 percent of the total bone volume in the adult skeleton. Bone cells are of four basic types: (1) osteoblasts, which are located on the external and internal surfaces of the bone and serve to create new intercellular matrix; (2) osteoclasts, which also reside on bone surfaces but which serve to resorb and thus destroy bone matrix; (3) osteocytes, which are derived from osteoblasts that have become embedded within the intercellular matrix, and which serve to maintain the bone as a living tissue; and (4) undifferentiated bone mesenchymal cells, which are found chiefly on the membrane that covers the outside of the bone (the periosteum) and within the internal spaces of the bone, and which form new osteoblasts or osteoclasts.

Structure. Most bones, and especially the long bones, are made up of two types of structure. The shafts, or diaphyses, are formed of compact bone; the expanded ends, or epiphyses, usually include a vaulted structure of spongy, or cancellous, bone, with a thin cortex, or outer layer, of compact bone; this arrangement serves to transfer weight and stress from the shafts of the bones to the joints.

The haversian system, or osteon, is the unit of structure of compact bone. This is irregularly cylindrical and branching, of microscopic size, with thick walls and a narrow central canal, carrying one or more small blood vessels, and is usually oriented in the long axis of the bone. The walls of the osteons are made up of concentric layers, or lamellae, of collagen and mineral crystals. The haversian system, in addition to being arranged around a central canal, includes large numbers of lacunae, or small spaces, which house the osteocytes and are interconnected by a network of canaliculi, or minute canals. The canaliculi are the channels through which the fluids derived from the blood reach and nourish the bone tissue.

Cancellous bone lacks osteons; it is composed of a complex system of cavities and intersecting plates and spicules called trabeculae. The trabeculae are arranged along the stress lines of the bone, thereby giving cancellous bone great strength.

Bone formation. Bone formation, also called ossification, is the process by which new bone is produced. Ossification begins about the third month of fetal life in humans and is completed by late adolescence. The process takes two general forms, one for compact bone, and the other for cancellous bone.

Bone of the first type begins in the embryonic skeleton with a cartilage model, which is gradually replaced by bone. Osteoblasts within the cartilage secrete a matrix material called osteoid, a gelatinous substance made up of collagen and mucopolysaccharide, an organic glue. Soon after the osteoid is laid down, inorganic salts are deposited in it to form the hardened material recognized as bone. The cartilage cells die out and are replaced by osteoblasts clustered in ossification centres. Bone formation proceeds outward from these centres. Most short bones have a single ossification centre near the middle of the bone; long bones of the arms and legs typically have three, one at the centre of the bone and one at each end. Ossification of long bones proceeds until only a thin strip of cartilage remains at either end; this cartilage, called the epiphyseal plate, persists until the bone reaches its full adult length and is then replaced with bone.

The flat bones of the skull and other cancellous bones are not preformed in cartilage like compact bone, but begin as fibrous membranes consisting largely of collagen and blood vessels. Osteoblasts secrete the osteoid into this membrane to form a sponge-like network of trabeculae. The new bone formation radiates outward from ossification centres in the membrane. There are several ossification centres in the skull; at birth, bone formation is incomplete and soft spots can be felt between these centres. The lines where the new bone from adjacent centres meets form cranial sutures visible on the surface of the adult skull.

Bone remodelling. Both processes of ossification produce immature bone with a comparatively random pattern of bone deposition. A process of destruction and regeneration, called bone remodelling, follows to organize the bone into more orderly units that give the mature bone greater strength.

Destruction, or resorption, of bone by osteoclasts allows the bone, which is inhibited by its inorganic component from growing by cell division like other tissues, to alter size and shape as it grows to adult proportions. Osteoclasts act on the inner surfaces of bones, in the marrow cavity and the spaces of cancellous bone, to widen these cavities; they also act on the outer surfaces to reduce bony processes, such as the epiphyseal swellings at the ends of the long bones of the arm and leg. Osteoclast activity takes place behind the epiphyseal growth zone to reduce former swellings to the width of the lengthening shaft. Within the bone, osteoclastic destruction helps to convert immature bone (often called woven bone) into mature compact bone by clearing long tubular spaces that will serve as centres for the development of osteons.

While the osteoclasts resorb bone at various sites, osteoblasts make new bone to maintain the skeletal structure. During childhood, bone formation outpaces destruction as growth proceeds. After skeletal maturity is reached, the two processes maintain an approximate balance. Osteoclasts create cavities much faster than osteoblasts make new bone, so there are usually many more of the bone-forming cells in a bone system than osteoclasts, and new bone synthesis proceeds more gradually. As osteocytes behind the growth zones at the ends of the long bone destroy the old epiphyseal swellings, osteoblasts ahead of the zone create a new epiphysis. Within each of the tubular spaces cleared by osteoclasts inside the bone, the osteoblasts follow along, laying down a layer of new bone to form the mature osteon, narrowing the channel to the size of the blood vessel that runs through it. Between the areas of osteoclastic and osteoblastic activity is a cement line containing bone matrix material, which delineates the zones of resorption and new bone formation.

Bone formation takes place in areas where bone undergoes the greatest stress. Therefore, a bone that is underutilized, such as a leg that is immobilized, is prone to resorption.

Bone remodelling not only alters the architecture of the bone, it also enables the body to regulate the levels of calcium ions in the blood and interstitial fluid. These calcium levels must remain within a fairly tight range in order to ensure the proper functioning of nerve transmission, the integrity and permeability of cellular membranes, and the ability of the blood to clot. Bone contains about 99 percent of the body's calcium. When fluid calcium levels fall too low, parathyroid hormone stimulates osteoclast activity and the subsequent release of calcium into the bloodstream. When fluid calcium levels rise excessively, the hormone calcitonin inhibits resorption, thereby restricting the release of calcium from the bones. It is necessary to have a healthy intake of calcium to maintain the body's calcium reserve; otherwise, the calcium levels in the body become dependent on the resorption of bone tissue. Vitamin D is also essential, for it makes possible the body's use of ingested calcium.

Bone disorders. The susceptibility to bone diseases alters with age. Children suffer mainly from abnormal bone development. Young adults are prone to rheumatoid arthritis and spinal difficulties, such as scoliosis. The elderly are vulnerable to metabolic disorders that affect the composition of bone, as well as to osteoarthritis and other joint disorders and to circulatory problems that affect bone health.

Many bone diseases are related to the composition and scale of bone tissue. When a bone has much more bone tissue than average, it is termed osteosclerosis; when there is less, it is called osteopenia. If bone suffers from a lack of mineral content, it is called rickets in children and osteomalacia in adults. The afflicted bones become malleable and vulnerable to deformities. In children, this condition is often the result of vitamin D deficiency. Of all bone diseases, osteoporosis, a generalized osteopenia, is the most common. This disease primarily affects the aged and is more serious in women than men. Osteoporosis is responsible for many of the fractures encountered by the elderly. Another disease that most often afflicts the elderly is Paget's disease, characterized by bone deformity and calcium imbalance.

Bone cells are killed by a lack of blood supply; this tissue death is termed necrosis or osteonecrosis. It can be brought on by injury, the blockage of an artery, circulatory problems, the administration of corticosteroid hormones for the treatment of another affliction, or by a disease of the metabolic system. Osteomyelitis refers to a bone infection, which can be picked up through an open wound, or from an infection elsewhere in the body. Tumours can also develop in bone tissue. Primary tumours are confined to bone and may or may not be malignant. Metastatic (or secondary) tumours originate in other parts of the body and are always malignant. Congenital bone diseases refer to abnormalities which are present at birth; some are genetically transferred but most occur due to problems during pregnancy or delivery.

Bone fractures are the result of a force greater than the strength and resistance of the bone. Age and disease are factors which determine whether a given force will cause a fracture. The bones of a child are elastic, those of a young adult are most able to resist force, and those of the aged are brittle and vulnerable to fracture. Fractures are not always the result of a single act of force but can occur over time, as stress or fatigue fractures. In bone tissue, with its abundance of blood vessels, there is bleeding and swelling at the location of the fracture. The fracture begins to heal at the moment it occurs, unless the supply of blood is insufficient, an infection sets in, or the fragments of bone are separated.

There are many methods used for the treatment of bone diseases and injuries. Traction offsets the strain of muscles on the skeletal system, while also helping to set fractures. Internal fixation, or osteosynthesis, utilizes screws, pins, plates, and wires to secure bones while healing. Arthroplasty involves the surgical replacement of a bone or joint to facilitate normal movement. Arthrodesis is a surgical procedure to remove joint cartilage, aimed at immobilizing a joint or removing infected tissue. Epiphysiodesis fuses the end of a bone (epiphysis) to its shaft, precluding further growth, when matching bones are of unequal length. Tendon transfer is used to replace a damaged tendon or to change the movement of a joint. The transplanting of bone chips, usually from the patient's own skeleton, aids in bone formation and adds to a bone's stability while healing. Amputation is necessary when there is massive injury, tumour, disease of the arterial system, or gross irregularities in bone development.

Bone, Henry (b. Feb. 6, 1755, Truro, Cornwall, Eng.—d. Dec. 17, 1834, London), English painter whose miniature portraits in enamel were among the most outstanding produced in Europe in the late 18th and early 19th centuries.

By 1800 the beauty of his portrait pieces had attracted the notice of the Royal Academy, to which he was admitted in 1811. He executed many beautiful miniature pieces of much larger size than had been attempted before in England. Among them are copies of 85 portraits painted during the time of Queen Elizabeth I that are considered among his greatest works. They are displayed at Kingston Lacey, Wimborne Minster, Dorset.

Bone, Sir Muirhead (b. March 23, 1876, Glasgow—d. Oct. 21, 1953, Ferry Hinksey, Oxford), Scottish artist, best known as an etcher and drypoint engraver of architectural subjects.

He first studied architecture and then art at the Glasgow School of Art. Being attracted by the picturesque aspect of buildings, he depicted views of his native town, among them "Portfolio," a series of etchings (1899), and "Glasgow Fifty Drawings" (1911). He generally worked in drypoint or, as a draftsman, used pencil, charcoal, and sepia. In 1901 he moved to London, where the exhibition of his works in 1903 established his fame.

In 1936 Bone published *Old Spain*, a popular two-volume collection of watercolours and drawings along with a text by his wife. During World Wars I and II he served as official artist with the British forces. He was knighted in 1937.

bone, necrosis of: *see* osteonecrosis.

bone and shell script: *see* chia-ku-wen.

bone black, also called BONE CHAR, or BONE CHARCOAL, a form of charcoal (*q.v.*) produced by heating bone in the presence of a limited amount of air. It is used in removing coloured impurities from liquids, especially solutions of raw sugar. Bone black contains only about 12 percent elemental carbon, the remainder being made up principally of calcium phosphate and calcium carbonate.

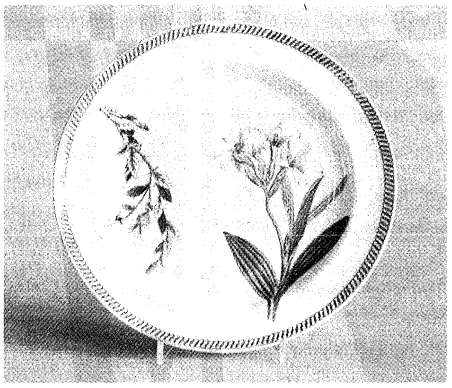
bone china, hybrid hard-paste porcelain containing bone ash. The initial development of bone china is attributed to Josiah Spode the Second, who introduced it around 1800. His basic formula of six parts bone ash, four parts china stone, and three and a half parts china clay remains the standard English body. Hard porcelain is strong but chips fairly easily and, unless specially treated, is usually tinged with blue or gray. Somewhat easier to manufacture, bone china is strong, does not chip easily, and has an ivory-white appearance.

Shortly after its introduction, the formula for bone china was being utilized by Spode's competitors—Minton, Coalport, Davenport, Derby, Worcester, and the Herculaneum factory at Liverpool. Later entrants in the field

Spode bone china potpourri, Staffordshire, *c.* 1825; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

were New Hall in 1810, Wedgwood in 1812, and Rockingham in 1820. Quality, as much as form and decoration, varied from factory to factory; some tended, after about 1820, toward brilliant colour, lavish gilding, and overcrowded design; others produced tasteful, simply ornamented tableware. Since much early



Wedgwood bone china plate, Staffordshire, 1815–20; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

bone china was issued unmarked, speculative attribution has been inevitable. Bone china is most popular for table services in England and the United States.

bone conduction, the conduction of sound through the bones of the skull. Two types of bone conduction are recognized. In compressional bone conduction, high-pitched sounds cause the segments of the skull to vibrate individually. The vibrations, by compressing the bony case of the inner ear, stimulate the sensory cells that are involved in perceiving sound waves in the air. In inertial bone conduction, low-pitched sounds vibrate the entire skull, causing it to move while the suspended sensory parts of the inner ear remain at rest. The effect is the perception of sound, just as if airborne compressional waves were moving those sensory parts while the skull was stationary.

bone cyst, circumscribed, benign (noncancerous) lesion, usually saclike and filled with fluid. Unicameral bone cyst affects the long bones or heel bones in children and adolescents and is frequently detected as a result of a pathological fracture. Treatment is by excision and bone graft, but spontaneous healing is common. Aneurysmal bone cyst, usually occurring in young males, consists of a vascular mass causing expansion of bone. Swelling and pain are present; this cyst may regress spontaneously or following X-ray therapy, or it may require excision.

bone lace (type of lace): *see* bobbin lace.

bone lesion, malignant growth of the bone caused by metastatic spread from cancer in other organs. Primary bone cancer is fairly uncommon, but bone lesions from metastases are seen in more than half of all cancer patients at the time of death. There are two types of metastatic bone lesion: osteoblastic, in which new bone is laid down in a disorganized fashion, and osteolytic, in which bone is destroyed, causing fractures and deep bone pain. Lung, breast, kidney, and prostate cancers are the primary tumours that most commonly cause bone lesions; lung cancer causes a typical punched-out lytic lesion while breast and prostate tumours more often produce osteoblastic metastases. Bone lesions commonly occur in the vertebral column, ribs, and pelvis, as well as in the long bones of the arms and legs. *See also* sarcoma.

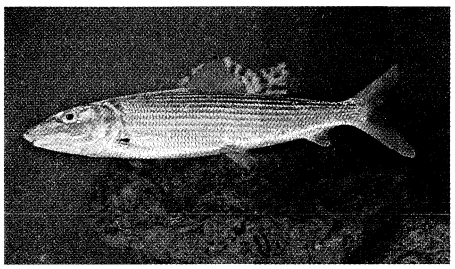
bone marrow, also called MYELOID TISSUE, soft, gelatinous tissue that fills the cavities of the bones. Bone marrow is either red or yellow, depending upon the preponderance of vascular (red) or fatty (yellow) tissue. In humans, the red bone marrow forms all of the blood cells with the exception of the lymphocytes, which are produced in the marrow and reach their mature form in the lymphoid organs. Red bone marrow also contributes, along with the liver and spleen, to the destruction of old red blood cells. Yellow bone marrow serves primarily as a storehouse for fats but may be converted to red marrow under certain conditions, such as severe blood loss or fever. At birth and until about the age of seven, all human marrow is red, as the need for new blood formation is high. Thereafter, fat tissue gradually replaces the red marrow, which in adults is found only in the vertebrae, hips, breastbone, ribs, and skull and at the ends of the long bones of the arm and leg; other cancellous, or spongy, bones and the central cavities of the long bones are filled with yellow marrow.

Red marrow consists of a delicate, highly vascular fibrous tissue containing reticular cells, which differentiate into various blood cells. Reticular cells first become precursors or stem cells of various kinds; rubiblasts give rise to the red blood cells (erythrocytes), and myeloblasts become the granulocytes, a type of white blood cell. Platelets, small blood cells involved in clotting, form from giant marrow cells called megakaryoblasts. The new blood cells are released into the sinusoids, large thin-walled vessels that drain into the veins of the bone. In mammals, blood formation in adults takes place predominantly in the marrow. In lower vertebrates a number of other tissues may also produce blood cells, while in reptiles and amphibians some blood cells are formed in the bloodstream itself. In humans the red blood cells and the platelets undergo no further development or growth after leaving the marrow. *See also* blood cell formation.

Because the white blood cells produced in the bone marrow are involved in the body's immune defenses, marrow transplants have been used to treat certain types of immune deficiency. The sensitivity of marrow to damage by radiation and some anti-cancer drugs accounts for the tendency of these treatments to impair immunity.

Examination of the bone marrow is helpful in diagnosing certain diseases, especially those related to blood and blood-forming organs, because it provides information on iron stores and the site of blood production. Bone marrow aspiration, the direct removal of a small amount (about 1 ml) of bone marrow, is accomplished by suction through a hollow needle. The needle is usually inserted into the sternum, or breastbone, in adults, and into the upper part of the tibia, the larger bone of the lower leg, in children. The necessity for a bone marrow aspiration is ordinarily based on previous blood studies and is particularly useful in providing information on various stages of immature blood cells. Disorders in which bone marrow examination is of special diagnostic value include leukemia, multiple myeloma, Gaucher's disease, unusual cases of anemia, and other hematological diseases.

bonefish, also called BANANA FISH, or LADYFISH (*Albula vulpes*), marine game fish of the family Albulidae (order Elopiformes). It



Bonefish (*Albula vulpes*)
Batchelor-Farwig—EB Inc.

inhabits shallow coastal and island waters in tropical seas and is admired by anglers for its speed and strength. Maximum length and weight are about 76 cm (30 inches) and 6.4 kg (14 pounds). The bonefish has a deeply notched caudal fin (near the tail) and a small mouth beneath a pointed, piglike snout. It grubs on the bottom for worms and other food. The shafted bonefish (*Dixonina nemoptera*) is the only other species of the family.

Boner, Edmund (English bishop): *see* Bonner, Edmund.

Boner, Ulrich, Latin ULRICH BONERIUS (fl. 1324–49), Swiss writer and Dominican monk, whose collection of fables in verse was the first book to be printed in the German language (Bamberg, 1461).

Boner, known to have been of a Bernese family, is mentioned in records between 1324 and 1349. He compiled and translated his collection of fables for Johann von Ringgenberg, his Bernese patron. The form that Boner used was referred to as *bîschaft* or *bîspel* ("examples"), and each of the tales includes a moral. Written in Middle High German, the collection was probably completed in about 1350.

The fables were entitled *Der Edelstein* ("The Precious Stone"), because precious stones were said to cast a spell and Boner hoped that his tales would do the same. Although he named only two of his sources—Aesop's *Fables* and the fables of Flavius Avianus (a 4th-century Latin writer)—it is clear that he also drew on other material. Many manuscripts of the collection existed, and further evidence of its popularity can be noted in its having been chosen as one of the first manuscripts to be printed.

boneset, also called THOROUGHWORT, any of about 500 species of herbaceous plants comprising the genus *Eupatorium* of the composite family (Asteraceae), native primarily to tropical America. The North American plant known as boneset is *E. perfoliatum,* also known as agueweed and Indian sage. It is common in wet places and is a coarse, rough, hairy perennial about 0.6 to 1.8 m (2 to 6 feet) high. Its lance-shaped, toothed, and wrinkled leaves are joined together at their bases around the stem. In August the plants bear small, tubular, white flowers in numerous heads that form a flat and branched cluster.

Several species are known as joe-pye-weed, especially *E. dubium,* native to the eastern coastal plain. Sweet joe-pye-weed (*E. purpureum*), spotted joe-pye-weed (*E. maculatum*), and hollow joe-pye-weed (*E. fistulosum*) are found in wet thickets and meadows of the northern and central United States. Most joe-pye-weeds have clusters of fuzzy pink or purple flowers. White snakeroot, or white sanicle (*E. rugosum*), contains a toxic alcohol that causes trembles—muscular tremors, weakness, and constipation often leading to death—when eaten by animals; ingestion of the meat or dairy products of livestock so afflicted causes in humans an acute illness known as milk sickness, which is characterized by weakness, vomiting, and constipation. Boneset tea is a folk remedy for fever.

Bonet, Juan Pablo (b. 1560, Torres de Berrellen, Spain—d. 1620, Torres de Berrellen), Spanish cleric and educator who pioneered in the education of the deaf.

Bonet developed one of the earliest and most successful methods for educating the deaf and improving both the verbal and the nonverbal communications skills of deaf-mutes. Bonet's multidimensional approach, which he detailed in *Reducción de las letras y arte para enseñar a hablar a los mudos* (1620; "Teaching Mutes to Speak Through the Conquest of Letters and Art"), used every technique available. Beginning with the study of written words, Bonet taught the phonetic values of the letters, emphasizing the correct positioning of the lips and tongue needed for clear articulation. He also taught manual signs and a finger alphabet.

Bonfils, Frederick Gilmer (b. Dec. 21, 1860, Troy, Mo., U.S.—d. Feb. 2, 1933, Denver, Colo.), publisher who made the *Denver Post* into a crusading newspaper of nationwide prominence in the United States.

Bonfils entered the U.S. Military Academy in 1878 but resigned in 1881. With Harry H. Tammen (1856–1924) he purchased the *Post* in 1895. They dedicated the paper to "the

Bonfils
The Denver Post Historical Collection

service of the people" and conducted spirited crusades against crime and corruption; above the door of the *Post* building they inscribed "O Justice, when expelled from other habitations, make this thy dwelling place." Their exposés often involved them in lawsuits, and in 1900 an irate lawyer attempted to kill them. Under their direction, the *Post* became and remains an influential and widely circulated newspaper.

Bong Range, mountain chain, west central Liberia, West Africa, extending for about 25 miles (40 km) in a northeast–southwest direction at elevations averaging from 600 to 1,000 feet (180–300 m). Its highest point, however, is 2,116 feet. The range is the source of the Farmington River. Since the mid-1960s its iron-ore deposits have been worked by the German-Liberian Mining Corporation (Delimco) and shipped via the company railroad to the Port of Monrovia (50 miles southwest).

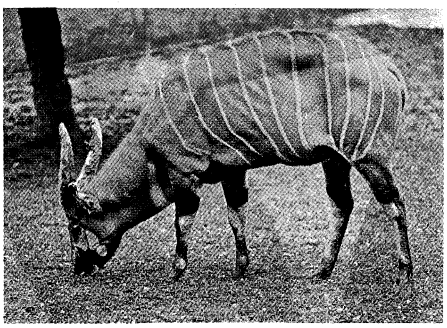
Bongars, Jacques, SEIGNEUR (lord) DE BAULDRY ET DE LA CHESNAYE (b. 1554, Orléans, Fr.—d. July 29, 1612, Paris), French diplomat and classical scholar who compiled a history of the Crusades.

A Huguenot, Bongars studied in Germany, Italy, and Constantinople. From 1586 Henry of Navarre (later King Henry IV of France) sent him on missions to obtain men and money from the German princes and from Queen Elizabeth I of England. As French minister in Germany (1593–1610) he tried to unite Protestant princes in a league with King James I of England at its head.

Bongars published an annotated edition of the Roman historian Justin's works in 1581 and a French translation of the letters of Aristaenetus in 1597. He was interested, however, not only in ancient writings but also in medieval chronicles. His collection of historical works on Hungary (1600) was followed, in 1611, by the far more important *Gesta Dei per Francos* ("God's Work Through the Franks"), a collection of contemporary accounts of the Crusades. An edition of his letters, in Latin, appeared in 1647, a French translation in 1668–70. His diary of his journey to Constantinople was printed in 1874.

Bongo, also spelled BUNGU, a people once extensive in the southwestern area of present-day Sudan, now found in small, scattered settlements south and east of Wau. They speak a Central Sudanic language of the Chari-Nile branch of the Nilo-Saharan family. Because they were separated by miles of bush, the various Bongo subgroups were only loosely affiliated; this lack of cooperation was decisive in their decimation by waves of invaders from the 18th century on. Chiefs had little authority although they were consulted in important legal and social matters. The Bongo now live along roads, subsist largely on the cultivation of sorghum, eleusine, sesame, and tobacco, and raise chickens and a few sheep and goats. Famed as hunters, they spend each dry season hunting and fishing, using poisoned arrows and spears, nets, traps, and snares. Noted also for their metalwork, the Bongo supplied neighbouring peoples with iron tools until imported iron replaced locally smelted iron ore.

bongo, also called BROAD-HORNED ANTELOPE (*Boocercus,* or *Taurotragus, euryceros*), large, brightly coloured antelope, family Bovidae (order Artiodactyla). Shy, swift, and elusive, the bongo frequents dense forests of central Africa, living in small groups or in pairs. It stands about 1.3 m (51 inches) at the shoulder and has an erect mane running the length of the back. Both sexes bear heavy, spirally twisted horns. The male is reddish brown to dark mahogany brown with black underparts, black and white legs, white head



Bongo (*Boocercus euryceros*)
Tom McHugh—Photo Researchers

markings, and narrow, vertical white stripes on the body. The female is similarly marked, but usually a brighter reddish brown.

bongo drum, also called BONGO, one of a pair of small Afro-Cuban drums played with the fingers, used principally in Latin-American dance music (in which they are usually tuned a fifth apart, as C–G). Bongo drums are yoked in pairs, and the two heads (about 5 inches [13 centimetres] and about 7 inches [18 centimetres] across) are nailed or rod tensioned. The drum "shells" are wooden and open at one end. In Cuban folk music several other drums are also called bongos.

Bongor, town, seat of Mayo-Kebbi *préfecture,* southwestern Chad, on the Logone River opposite Dana, Cameroon. It has health, educational, and other service centres for the surrounding agricultural region. It lies in Chad's cotton-growing area, and in the 1970s there was some controlled irrigation near the town as part of an effort to develop the rice-growing potential of the Logone floodplain. During the dry season, the area's wells and pools attract nomads from north of Lake Chad. Bongor has an airport, and the Logone is seasonally navigable between Bongor and N'Djamena. Pop. (1973 est.), 16,188.

Bonham's Case (1610), case decided by Sir Edward Coke, chief justice of the Court of Common Pleas, in which he asserted the supremacy of the common law in England, noting that the prerogatives of Parliament were derived from and circumscribed by precedent. He declared that "when an act of parliament is against common right or reason, or repugnant, or impossible to be performed, the common law will control it and adjudge such act to be void." Coke had already applied this doctrine to acts of the king and, in this case, was extending it to parliamentary legislation.

Bonheur, Rosa, original name MARIE-ROSALIE BONHEUR (b. March 16, 1822, Bordeaux, Fr.—d. May 25, 1899, Melun), painter and sculptor famed for the remarkable accuracy and detail of her portrayals of animals. Toward the end of her career these qualities were accentuated by a lighter palette and the use of a highly polished surface finish reminiscent of the famed 17th-century Dutch painter of animals, Paulus Potter.

She was first trained by her father, Raymond Bonheur, an art teacher, and later by Léon Cogniet in Paris. Bonheur was a regular Salon exhibitor from 1841 onward. "The Horse Fair," one of her Salon pieces exhibited in 1853, was acquired in 1887 by Cornelius Vanderbilt for a record sum and became one of her most widely reproduced works. Bonheur was unconventional for her time. She wore trousers, smoked cigarettes, and for a time kept a lioness and would paint only wild animals. In 1865 she became the first woman to receive the Grand Cross of the Légion d'Honneur.

bonheur du jour, small, dainty writing table, introduced in the 1760s, which became one of the most popular varieties of French 18th-century furniture. A block of storage compartments, set along the back of the top and often partly enclosed, incorporates a drawer, cupboards, and shelves and is sometimes topped by a decorative brass or ormolu gallery. High, slender legs are often joined by a shelf that acts as a stretcher, and the frieze (decorative horizontal band) contains a drawer. Some bonheurs du jour are fitted with toilet accessories.

Bonheur du jour of sycamore wood with ormolu mounts and inlaid plaques of Sèvres porcelain, French, second half of the 18th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London, Jones Collection

The finest examples are decorated with intricate marquetry veneers and are mounted with ormolu and sometimes with plaques of Sèvres porcelain. The earliest represent some of the finest examples of the transition between the curved lines of the Louis XV style and the more severe, straight lines of the Louis XVI style. Although most later pieces are rectangular, the early form is sometimes oval and normally has slightly curved cabriole legs.

Bonhoeffer, Dietrich (b. Feb. 4, 1906, Breslau, Prussia, Ger.—d. April 9, 1945, Flössenberg, Bavaria), German Protestant theologian, important for his support of ecumenism and his view of Christianity's role in a secular world. His involvement in a plot to overthrow Adolf Hitler led to his imprisonment and execution. His *Prisoner of God: Letters and Papers from Prison,* published posthumously in 1951, is perhaps the most profound document of his convictions.

Early training. Bonhoeffer grew up amid the academic circles of the University of Berlin, where his father, Karl Bonhoeffer, was professor of psychiatry and neurology. From 1923 to 1927 he studied theology at the universities of Tübingen and Berlin. At Berlin he was influenced by the historical theologians Adolf von Harnack, Reinhold Seeberg, and Karl Holl but also was strongly attracted by the new "theology of revelation" being propounded elsewhere by Karl Barth. His concern to relate himself critically to Barth is seen in his doctoral thesis, *Sanctorum Communio* (1930; *The Communion of Saints,* 1963), in which he tried to combine a sociological and a theological understanding of the church, and in *Akt und Sein* (1931; *Act and Being,* 1962), in which he traces the influence of transcendental philosophy and ontology, Kantian and post-Kantian theories of knowledge and of being, on Protestant and Catholic theologies.

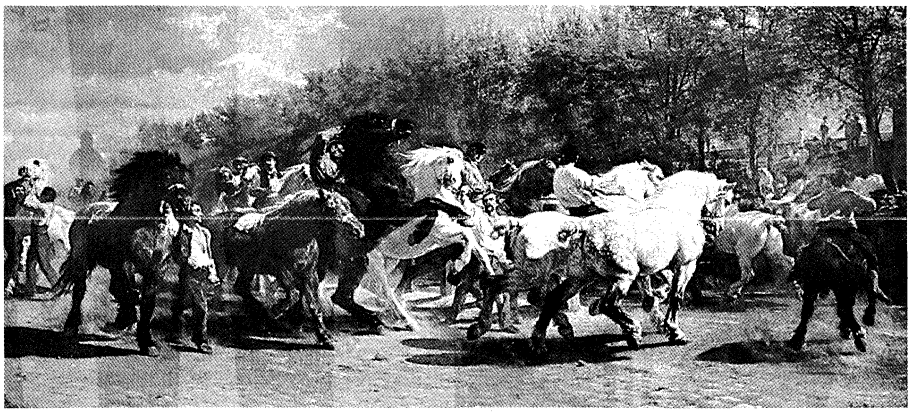
After serving in 1928–29 as assistant pastor of a German-speaking congregation in Barcelona, he spent a year as an exchange student at Union Theological Seminary in New York City. On his return to Germany in 1931 he took up an appointment as lecturer in systematic theology at the University of Berlin.

Opponent of the Nazis. From the first days of the Nazi accession to power in 1933 he was involved in protests against the regime, especially its anti-Semitism, and despite another 18-month absence when he served as pastor of two small German congregations in London (1933–35), Bonhoeffer became a leading spokesman for the Confessing Church, the centre of German Protestant resistance to the Nazi regime. In 1935 he was appointed to organize and head a new seminary for the Confessing Church at Finkenwald (Pomerania), which continued in disguised form until 1940, despite its proscription by the political authorities in 1937. Here he introduced the practices of prayer, private confession, and common discipline described in his book *Gemeinsames Leben* (1939; *Life Together,* 1954). From this period also dates *Nachfolge* (1937; *The Cost of Discipleship,* 1948, rev. ed., 1959), a study of the Sermon on the Mount in which he attacked the "cheap grace" being marketed in Protestant (especially Lutheran) churches—*i.e.,* an unlimited offer of forgiveness, which in fact served as a cover for ethical laxity. It was in this rigorous and even ascetic guise (to which his later theme of "Christian worldliness" provides a contrast if not a contradiction) that Bonhoeffer first became widely known. His views on international affairs at this time were close to pacifism.

After attending the ecumenical conference at Cambridge in 1931, Bonhoeffer was appointed a European youth secretary of the World Alliance for Promoting International Friendship through the Churches, and he re-

Bonhoeffer, 1939

By courtesy of Eberhard Bethge



"The Horse Fair," oil on canvas by Rosa Bonheur, 1853–55; in the Metropolitan Museum of Art, New York City

By courtesy of the Metropolitan Museum of Art, New York, gift of Cornelius Vanderbilt, 1887

mained an active participant in ecumenical affairs despite the increasingly nationalistic mood in Germany. In his efforts to interpret to Christians elsewhere the significance of the German Church struggle, he found a sympathetic advocate in G.K.A. Bell, bishop of Chichester, Eng. Bonhoeffer's own involvement took an increasingly political character after 1938, when his brother-in-law, the jurist Hans von Dohnanyi, introduced him to the group seeking Hitler's overthrow. In 1939 he considered taking refuge in the United States but returned after only two weeks in New York City, writing to his sponsor, the theologian Reinhold Niebuhr, that "I will have no right to participate in the reconstruction of Christian life in Germany after the war if I do not share the trials of this time with my people." Despite the restrictions imposed on him, Bonhoeffer was able to continue his work for the resistance movement under cover of employment in the Military Intelligence Department, which in fact was a centre of the resistance. In May 1942 he flew to Sweden to convey to the British government, through Bishop Bell, the conspirators' proposals for a negotiated peace; these hopes were thwarted, however, by the Allies' "unconditional surrender" policy. Bonhoeffer was arrested on April 5, 1943, and imprisoned in Berlin. Following the failure of the attempt on Hitler's life on July 20, 1944, the discovery of documents linking Bonhoeffer directly with the conspiracy led to his further interrogation and eventual execution. Bonhoeffer never married, his engagement having been announced just before his imprisonment.

Ethical and religious thought. During the years 1940–43 Bonhoeffer worked intermittently on a volume on Christian ethics but completed only fragments, which were published posthumously (*Ethik,* 1949; *Ethics,* 1955). Abjuring all "thinking in terms of two spheres,"—*i.e.,* any dualistic separation of the church and the world, nature and grace, the sacred and the profane—he called for a unitive, concrete ethic founded on Christology (doctrines about the person and work of Christ), an ethic in which labour, marriage, and government are to be viewed dynamically as divinely imposed tasks or functions ("mandates") rather than orders of creation. Bonhoeffer welcomed the rapprochement of Christianity and humanism in the face of modern tyrannies and urged a recovery of the concept of "the natural" in Protestant thought. The prison writings, published in 1951 (*Widerstand und Ergebung; Letters and Papers from Prison,* 1955, rev. ed., 1972), are of interest both for the remarkable richness of cultural and spiritual life that they display and for the theological themes developed especially in the letters to Bonhoeffer's friend and later editor and biographer, Eberhard Bethge. Reviewing the history of secularization in the West since the Renaissance, Bonhoeffer asked whether man's increasing ability to cope with his problems without the hypothesis of God may not indicate the obsolescence of the "religious premise" upon which Christianity has hitherto been based. Rather than looking for gaps in human knowledge or accenting human weaknesses as a basis for apologetics, he asserted that the church ought to affirm man's maturity in a "world come of age." The stripping off of "religion," in the sense of otherworldliness and preoccupation with personal salvation, Bonhoeffer suggested, will in fact free Christianity for its authentic this-worldliness in accordance with its Judaic roots. The church should give up its inherited privileges in order to free Christians to "share in God's sufferings in the world" in imitation of Jesus, "the man for others." These ideas have subsequently been influential in movements for the reform of church and ministry; in the "Honest to God" debate initiated by John A.T. Robinson, the bishop of Woolwich, Eng.; in efforts to propound a "secular Christianity" or "the secular meaning of the Gospel"; in the "death of God" controversy of the 1960s; and, from a different perspective, in the articulation of a "theology of hope."

The chief works by Bonhoeffer in addition to those already mentioned are *Creation and Fall: A Theological Interpretation of Genesis 1–3* (1933; Eng. trans. 1959) and the collected shorter writings, *Gesammelte Schriften,* 5 vol. (2nd ed., 1965–69), selections from which have been published in English translation under the titles *No Rusty Swords* (1965), *Christ the Center* (1966; British title, *Christology*), and *The Way to Freedom* (1966). (F.S.)

BIBLIOGRAPHY. The definitive biography is Eberhard Bethge, *Dietrich Bonhoeffer* (1967; Eng. trans. 1970). Symposia dealing with Bonhoeffer's thought are: M.E. Marty (ed.), *The Place of Bonhoeffer* (1962); R.G. Smith (ed.), *World Come of Age* (1967); and Peter Vorkink (ed.), *Bonhoeffer in a World Come of Age* (1968). Other major studies include: J.D. Godsey, *The Theology of Dietrich Bonhoeffer* (1960); J.A. Phillips, *Christ for Us in the Theology of Dietrich Bonhoeffer* (1967; British title, *The Form of Christ in the World,* 1967); William Kuhns, *In Pursuit of Dietrich Bonhoeffer* (1967); and Larry L. Rasmussen, *Dietrich Bonhoeffer: Reality and Resistance* (1972).

Bonhomme Richard and Serapis, engagement between (Sept. 23, 1779), in U.S. War of Independence, notable American naval victory, won off the east coast of England by Capt. John Paul Jones. Challenged by a large combined French and Spanish fleet, the British Navy was too preoccupied to prevent American interference with its merchant marine in the Atlantic. Operating from French bases, Jones led a small fleet around the British Isles from August to October 1779.

Sighting two enemy ships of war conveying merchantmen loaded with naval stores, Jones's "Bonhomme Richard" engaged the British frigate "Serapis," commanded by Capt. Richard Pearson, in a memorable 3½-hour duel. The American commander answered a challenge to surrender early in the battle with the famous quotation, "I have not yet begun to fight!" The slaughter on both sides was great; an estimated 300 Americans and uncounted British were killed or wounded. Despite the fact that his ship was sinking (later Jones moved his command to the "Serapis"), Jones outlasted his adversary and forced a surrender.

Articles are alphabetized word by word, not letter by letter

Boniface, Latin BONIFATIUS, or BONIFACIUS, name of Roman Catholic popes and antipopes, grouped below chronologically and indicated by the symbol •.

• **Boniface I,** SAINT (b. Rome—d. Sept. 4, 422, Rome; feast day September 4), pope from 418 to 422, whose reign was markedly disrupted by the faction of the antipope Eulalius.

Boniface was a priest, believed to have been ordained by Pope St. Damasus I and to have served Pope St. Innocent I at Constantinople.

When Boniface was chosen pope by a majority of the Roman electors, his rival Eulalius, a deacon, was simultaneously chosen by a clerical faction. The two claims and the fifth schism that resulted caused chaos in Rome. Eulalius lost the support of the West Roman emperor Flavius Honorius for violating an agreement that both claimants leave Rome pending a council's decision.

Boniface's reentry into Rome ended the 15-week schism. Thereafter his pontificate was noted for his peaceful, yet firm, diplomacy and for his zealous support of Bishop St. Augustine of Hippo, particularly in the fight against Pelagianism (*q.v.*), a heresy that denied original sin.

• **Boniface II** (b. Rome—d. Oct. 17, 532, Rome), pope from 530 to 532. Of Gothic descent, he was the first Germanic pontiff.

He was an archdeacon under Pope Felix IV, who designated him as his successor. Fearing Ostrogothic domination, however, the majority of the Roman clergy elected the deacon Dioscorus of Alexandria. Both popes were consecrated, and the resulting schism was terminated by Dioscorus' death (October 14). Boniface convoked three Roman synods: in that of 530 he received the submission of his opponents; in the first of 531 he proposed the right of a pope to select his successor; in the second of 531 he annulled the succession arrangement. He solemnly approved the conciliar decrees of the second Council of Orange (France), which condemned Semi-Pelagianism, the heretical belief in the power of man's innate will to seek God.

• **Boniface III** (b. Rome—d. Nov. 12, 607, Rome), pope from Feb. 19 to Nov. 12, 607. He was a deacon of the Roman Church when Pope St. Gregory I the Great sent him in 603 as a legate to Constantinople, where he obtained from the Byzantine emperor Phocas an edict recognizing the see of Rome as the head of all the churches.

• **Boniface IV,** SAINT (b. Valeria, Italy—d. May 8, 615, Rome; feast day May 8), pope from 608 to 615.

Possibly a student of Pope St. Gregory I the Great in Rome, he was a deacon of the Roman Church when elected pope. Receiving permission from Byzantine emperor Phocas, he converted the Roman Pantheon into the church of Sta. Maria Rotonda (May 13, 609). In 610 Boniface presided over the Council of Rome for the restoration of monastic discipline; it was attended by St. Mellitus, the first bishop of London, by whom Boniface sent letters and instructions to St. Lawrence, archbishop of Canterbury, and to King St. Aethelberht of Kent.

Boniface's pontificate was plagued, politically and ecclesiastically, by the Monophysites whose heretical bishops cooperated with invaders of the Byzantine Empire led by Heraclius, exarch of Africa. A schism in Istria caused by a condemnation of Nestorianism at the second Council of Constantinople (553) led Abbot St. Columban to reprimand Boniface for supporting the council's decision. Boniface died in monastic retirement and was buried in St. Peter's, Rome.

• **Boniface V** (b. Naples—d. Oct. 25, 625, Rome), pope from 619 to 625. He succeeded St. Deusdedit after the papacy had been vacant for more than a year and was faced with the task of organizing an Italy war-torn by Eleutherius, exarch of Ravenna. In endeavouring to apply canon law to civil law, he established the right of asylum. He also greatly helped the spread of Christianity in England, especially in Northumbria, by encouraging, through letters, the saintly missionaries evangelizing the Britons.

• **Boniface VI** (b. Rome—d. April 19, 896, Rome), pope in April 896. He was a subdeacon when he was elected to succeed Formosus. Boniface either died of gout or was murdered by Stephen VI, who became the next pope. A central figure during a dark period in papal history (896–898) revolving around the death of Pope Formosus, Boniface was denounced at a Roman council held by Pope John IX in 898.

• **Boniface VII,** original name FRANCO (b. Rome—d. July 985, Rome), pope, or antipope, from June to July 974 and from August 984 to July 985; he owed his rule to the support of the Crescentii, a powerful and unscrupulous Roman family.

A cardinal deacon, he ordered the murder of his predecessor, Benedict VI, and was installed by Crescentius I. Later, however, he was expelled at the behest of Otto II, the Holy Roman emperor, and was replaced on the papal throne by Benedict VII. Otto died shortly after Benedict's successor, John XIV, was elected pope, and the Crescentii attempted to regain control of the papacy. They summoned Boniface (984) from his refuge in Constantinople, where he had fled with the church treasury; on his return he imprisoned, and presumably murdered, John. A reign of intrigue ensued, which ended with Boniface's murder by a vengeful Roman mob.

• **Boniface VIII,** original name BENEDICT CAETANI (b. *c.* 1235–40, Anagni, Papal States—d. Oct. 11, 1303, Rome), pope from 1294 to 1303, the extent of whose authority was vigorously challenged by the emergent

Boniface VIII, detail of a fresco by Giotto, *c.* 1300; in the church of S. Giovanni in Laterano, Rome

Anderson—Alinari from Art Resource/EB Inc.

powerful monarchies of western Europe, especially France. Among the lasting achievements of his pontificate were the publication of the third part of the *Corpus Juris Canonici,* the *Liber Sextus,* and the institution of the Jubilee of 1300, the first Holy Year.

Early life and election to the papacy. Benedict Caetani was born of an old and influential Roman family. He studied law in Bologna and then for many years held increasingly important functions in the papal government. Martin IV made him cardinal-deacon of St. Nicholas in Carcere Tulliano in 1281; under Nicholas IV he became cardinal-priest of St. Martin in Montibus in 1291. As papal legate to a church council in Paris from 1290 to 1291, he succeeded in delaying the outbreak of renewed war between France and England and in bringing about peace between France and Aragon. It was Cardinal Benedict Caetani who confirmed the unhappy pope Celestine V in his wish to resign and then, after he had succeeded him as Boniface VIII, found it advisable to intern the old man in the castle of Fumone, where he soon died. Although Celestine died of natural causes, the death was open to suspicion and incriminating aspersions by Boniface's enemies. Among those who carried on the propaganda and opposition against Boniface were many of the Franciscan "Spirituals" (members of the order founded by St. Francis of Assisi who followed a literal observance of his rule of poverty), including the poet Iacopone da Todi, some of whose poems were written during his imprisonment by Boniface.

The two principal international conflicts that existed from the beginning of Boniface's pontificate were that between France and England concerning Guyenne and Flanders, and that between the kingdoms of Naples and Aragon concerning the island of Sicily, which, after much provocation, had broken away from the Neapolitan king, disregarding papal feudal overlordship. Boniface finally, though unwillingly, accepted the independence of the island kingdom under Frederick of Aragon. His attempts to stop hostilities between Edward I of England and Philip IV of France, however, became enmeshed with another important problem, the increasing tendency of these warring monarchs to tax the clergy without obtaining papal consent. Although the desire of the late-medieval rulers to tax the wealth of their clergy has been defended and can perhaps be understood, the practice was unquestionably contrary to the canon law (ecclesiastical law) of the time. That Boniface refused to look on inactively while the struggle between France and England, which he was trying to terminate, was being financed at the cost and to the prejudice of the church and the papacy is not surprising. In 1296 he issued the bull *Clericis Laicos,* which forbade under the sanction of automatic excommunication any imposition of taxes on the clergy without express license by the pope. This bull had some effect in England, chiefly because of its support by the archbishop of Canterbury, Robert Winchelsey; but in France there was no strong defender of papal prerogative against the concerted action of the King and his civil lawyers.

Conflicts with Philip IV of France. Philip IV countered or even forestalled the publication of *Clericis Laicos* with an order forbidding all export of money and valuables from France and with the expulsion of foreign merchants. Although these measures were a serious threat to papal revenues, they alone probably would not have forced Boniface to the far-reaching concessions that he had to grant the French king within the year, concessions that almost amounted to revocation of *Clericis Laicos.* The necessity of coming to terms was primarily the result of an insurrection against Boniface by a section of the Colonna family, a powerful anti-papal Roman family that included two cardinals, culminating in the armed robbery of a large amount of papal treasure in May 1297. A year of military action against the Colonna followed, which ended with their unconditional surrender. They were absolved from excommunication but were not reinstated in their offices and possessions; they therefore rebelled again and fled; some of them went to Philip, with whom they had conspired, perhaps, even before the issue of *Clericis Laicos.*

Boniface's first conflict with the French king was followed by an apparent reconciliation, which was emphasized by the Pope's canonization of Philip's holy ancestor Louis IX. A second conflict, which broke out in 1301 around the trumped-up charges against a southern French bishop, Bernard Saisset of Pamiers, and his summary trial and imprisonment, proved to be irreconcilable. Now the King threatened and meant to destroy one of the most fundamental gains that the papacy had made and maintained in the great struggles of the last two centuries: papal, rather than secular, control of the clergy. The Pope could not compromise here, and in the bull *Ausculta Fili* ("Listen Son") he sharply rebuked Philip and demanded amends, especially the release of the Bishop, who had appealed to Rome. Instead, the King's chancellor, Pierre Flotte, was allowed to circulate a distorted extract of the bull and thus to prepare public opinion for the great assembly of the States General (the legislative body of France) in April 1302, in which nobles and burghers enthusiastically, and the clergy reluctantly, supported the King.

Boniface, nevertheless, appears to have had good reason to hope for a favourable termination of the conflict, because Philip's army was shortly afterward disastrously defeated by a league of Flemish townspeople and because the German king and prospective emperor, Albert I of Habsburg, was ready to give up his French alliance if the Pope would recognize the contested legitimacy of his rule. This recognition was granted early in 1303 in terms that exalted the ideal and traditional, though rarely realized, harmonious relationship between the papacy and the Holy Roman Empire. This empire now was said by the Pope to possess—under ultimate papal supremacy—an overlordship over all other kingdoms, including France. In November 1302 Boniface had issued an even more fundamental declaration concerning the position of the papacy in the Christian world, the bull *Unam Sanctam* ("One Holy"), which has become the most widely known of all papal documents of the Middle Ages because of its allegedly radical and extreme formulation of the content of the papal office. The bull as a whole is indeed a strong but not a novel invocation of the supremacy of the spiritual over the temporal power. Nevertheless, the old Gelasian doctrine that both powers are distinct and both are from God is clearly stated, and in the final dogmatic sentence the Pope speaks not of the temporal power but of the human creature as the object of the papal plenitude of power, submission to which is said to be necessary for salvation.

Meanwhile in France, Philip IV's councillor Guillaume de Nogaret had taken Flotte's place as the leader of an actively anti-papal royal policy. Philip was supported in this policy by other enemies of the Pope, including the legate whom Boniface had dispatched to France in these critical months and who betrayed his master, the French cardinal Jean Lemoine (Johannes Monachus). Many unjustified accusations against Boniface, ranging from unlawful entry into the papal office to heresy, were raised against him at a secret meeting of the King and his advisers held in the Louvre at Paris; these accusations were to be taken up and elaborated upon later during the posthumous trial against the Pope pursued by Philip IV. Shortly after the Louvre meeting, at which Nogaret had demanded the condemnation of the Pope by a general council of the church, Nogaret went to Italy to stir up, if possible, rebellion against the Pope.

Boniface's capture. He was unsuccessful in this attempt, but when he learned that Boniface was about to publish a new bull announcing Philip's excommunication, Nogaret, with the assistance of Sciarra Colonna—a bold member of the powerful family—and with the connivance of some of the cardinals, decided to capture the Pope at Anagni, where the Pope was spending the summer. In this he succeeded through the momentary complicity of the local leaders of the city of Anagni, who, however, after two days changed their minds, rescued the Pope, and thus frustrated whatever further plans Nogaret may have had. During these two days Boniface, whom Sciarra Colonna would have killed but for Nogaret's wish to drag the Pope before a council, was probably physically ill-treated. He bore everything with great courage and patience. Boniface returned to Rome physically and mentally broken and died soon after.

During his reign, the so-called *Liber Sextus* ("Sixth Book") of the *Corpus Juris Canonici* (*Corpus of Canon Law*) was published. The Jubilee Year of 1300 was commemorated in a painting by Giotto, a fragment of which still survives in the basilica of S. Giovanni in Laterano. Boniface's sepulchre came from the workshop of Arnolfo di Cambio; his sarcophagus with his reclining statue is in the Vatican grottoes. Of the numerous memorial statues

erected in his honour by himself or others—and later used by his enemies to brand him as an idolater—several still survive. They are visual evidence for the fact, known also from other sources, that Boniface VIII extended the height of the papal tiara and increased the number of crowns that circle the tiara from one to two and perhaps to three, which is their number in modern times.

Assessment. The violent attack on Boniface VIII marks the first open rejection of papal spiritual dominance by the rising national monarchies of the West and, above all, by France. Boniface's assertions of papal plenitude of power did not go beyond those of his predecessors in the 13th century. They were in fact more moderate than, for instance, those of Innocent IV and were in any case well within the range of the opinions gradually elaborated in the schools of theology and canon law in the period between the age of Gregory VII, the great 11th-century reformer, and that of Boniface. Boniface's failure was not caused by any novelty of his views or claims but by changed circumstances, by his inability or unwillingness to gauge their significance adequately, and, last but not least, by his own character: conscious of his superior intellect and at the same time tormented by illness, he was impulsive to the point of imprudence and short-tempered to the point of uncharitableness. It was his exaggerated harshness against the Colonna—whose hatred for the Caetani pope was largely the result of conflicting interests of the two families—as well as his shortsighted underestimation of the ruthlessness of Philip IV of France and his helpers that led to the coalition of these two disparate forces and to the Pope's downfall. Boniface VIII's personal failings, however, can in no way exculpate Philip IV the Fair and his ministers, who used forgery, defamation, intimidation, and finally violence against the Pope. (G.B.L.)

BIBLIOGRAPHY. An excellent biography is T.S.R. Boase, *Boniface VIII* (1933). The following studies are concerned specifically with Boniface's quarrel with the French king Philip IV: A.F.J.P.M. de Lévis-Mirepoix, *Le Conflit entre la Papauté et le roi de France, 7 Septembre 1303* (1969); J. Rivière, *Le Problème de l'église et de l'état au temps de Philippe le Bel* (1926); and C.T. Wood, *Philip the Fair and Boniface VIII* (1967). Boniface's correspondence and promulgations may be studied in *Les Registres de Boniface VIII*, ed. by G.A.L. Digard *et al.*, 4 vol. (1884–1939).

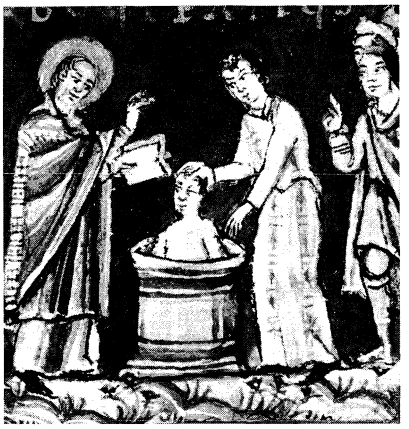
• Boniface IX, original name PIETRO TOMACELLI (b. *c.* 1355, Naples—d. Oct. 1, 1404, Rome), pope from 1389 to 1404; he was the second pontiff to rule in Rome during the Western Schism (1378–1417).

Created cardinal deacon early in life and cardinal priest by Urban VI in 1385, he succeeded Urban, whose disputed election was the original cause of the rupture between Rome and Avignon over legal claimants to the papal throne. Boniface, viewing the Schism as a political problem, resorted to all possible means of raising money in order to win allies against the Avignon antipopes Clement VII (whom he excommunicated) and Clement's successor, Benedict XIII. He not only failed to end the breach, but he also aroused hostility by his high-handed methods to raise the large sums of money required for his campaigns.

Boniface IX, detail from a statue, 14th century; in the basilica of St. Paul Outside the Walls, Rome

Alinari—Art Resource/EB Inc.

Boniface, SAINT, Latin BONIFATIUS, original name WYNFRID, or WYNFRITH (b. *c.* 675, Wessex, England—d. June 5, 754, Dokkum, Frisia; feast day June 5), English missionary and reformer, often called the Apostle of Germany for his role in the Christianization of



St. Boniface baptizing converts into the German Church; detail from a manuscript from Fulda Abbey, 10th–11th century; in the Staatsbibliothek Bamberg (MS. Lit. 1)

By courtesy of the Staatsbibliothek Bamberg

that country. Boniface set the church in Germany on a firm course of undeviating piety and irreproachable conduct. In his letters and in the writings of his contemporaries, he appears as a man of purpose and dedication, an innovator with a powerful though willful personality.

Boniface belonged to a noble family of Wessex, England. He received an excellent education in the Benedictine abbeys of Adescancastre (Exeter) and Nhutscelle (Nursling, between Winchester and Southampton) and became a Benedictine monk, being ordained priest at about the age of 30. From 716 to 722 he made two attempts to evangelize the Frisian Saxons on the Continent but was balked by their king, Radbod. On his return to England he learned that his abbot had died and that he had been elected in his stead—an honour he declined in favour of a second attempt at a missionary career. In 718 he accompanied a group of Anglo-Saxon pilgrims to Rome, where Pope Gregory II entrusted him with a mission to the pagans east of the Rhine, asking him only to use the Roman formula for Baptism, rather than the Celtic, and to consult with Rome on major problems arising from his work. Gregory II changed Wynfrid's name to Boniface. In the meantime, Radbod had died (719), and Boniface returned to Frisia to assist his countryman Bishop Willibrord in his missionary activities. In 722 he went to Hesse, where he established the first of many Benedictine monasteries as a means of consolidating his work.

So great was his success that he was called to Rome, where Gregory consecrated him a missionary bishop. The Pope also provided him with a collection of canons (ecclesiastical regulations) and letters of recommendation to such important personages as Charles Martel, master of the Frankish kingdom, whose protection was essential to Boniface's success. It was the pagan awe of Martel's name that allowed Boniface to destroy the sacred oak of the Germanic god Thor at Geismar.

For 10 years (725–735) Boniface was active in Thuringia, converting pagans and renewing the faith of Christians who had been converted earlier by Irish missionaries, whose haphazard methods of evangelization were henceforth to be the bane of Boniface's life. He met opposition, he said, "from ambitious and free-living clerics" whom he pursued relentlessly, even when they appealed to the popes. On a later occasion, Pope Zachary was forced to moderate the zeal of Boniface, who requested not only excommunication but also solitary confinement for two "heretical" missionaries, Adalbert and Clement the Irishman—sentences that the Pope avoided imposing by deliberate delay. Boniface's handling of missionaries whose methods he deplored sheds light on his personality and temperament: he turned immediately to Rome, he expected prompt and ruthless action, and he seems at times to have been excessively severe in his judgments.

Boniface's career was assisted in a unique and moving way by his brother and sister Benedictines from England. They supported him by gifts and encouraged him by their faithful love, expressed in letters that were delightful in their openness and humanity. Their final expression of love for him was to cast their lots with him in Germany, where they formed the nucleus of four monasteries that served as centres of civilized Christian life.

Ordered by Pope Gregory III (731–741) to organize the church in Bavaria, Boniface initially established four bishoprics there. His work had far-reaching political repercussions, for his Christianization of Bavaria paved the way for the ultimate incorporation of the country into the Carolingian Empire. After 740 he added another see in Bavaria and also created three in central Germany. Aided by his new suffragan bishops—for such they were, in fact, though his appointment as archbishop of Mainz came later (751)—Boniface undertook the reform of the Frankish clergy and, wherever possible, of Irish missionaries. Between 740 and 745, five synods were convened for this purpose. In 747 a reforming council was held for the entire Frankish kingdom with the wholehearted collaboration of Carloman and Pepin, the sons and heirs of Charles Martel. Though Charles had protected Boniface, he had, at the same time, given church land to his magnates and used the discipline of the church as a means of taming recalcitrant Germanic tribes. Carloman and Pepin, on the other hand, made the decisions of the council of 747 binding in Frankish law.

Boniface's life ended in martyrdom at the hands of a band of pagan Frisians, who killed him as he was reading the Scriptures to Christian neophytes on Pentecost Sunday. Boniface had asked to be buried at Fulda, the monastery he had entrusted (744) to his Bavarian disciple Sturmi. There his body rests in a magnificent baroque sarcophagus.

Organizer, educator, and reformer, Boniface profoundly influenced the course of intellectual, political, and ecclesiastical history in Germany and France throughout the Middle Ages. He unified the missionary movement by bringing it under the control of Rome. Through his monasteries, which furnished bishops and teachers for many generations, he significantly improved the quality of life in the Frankish kingdom. (C.M.A.)

BIBLIOGRAPHY. E.S. Duckett, *Anglo Saxon Saints and Scholars*, pp. 337–455 (1947), a popular account based on excellent scholarship; E. Emerton, *Letters of St. Boniface* (1940), a translation of letters to and from St. Boniface; G.W. Greenaway, *Saint Boniface* (1955); S. Hilpisch and C.M. Aherne, *New Catholic Encyclopedia*, vol. 2, pp. 665–668 (1967), contains an excellent bibliography; E. Kylie (ed. and trans.), *The English Correspon-*

dence of Saint Boniface (1924, reprinted 1966); J.B. Russell, "Saint Boniface and the Eccentrics," *Church History*, 33:235–247 (1964), gives new insight into Boniface's reaction to Irish missionaries; Willibald, *The Life of Saint Boniface* (Eng. trans. 1916).

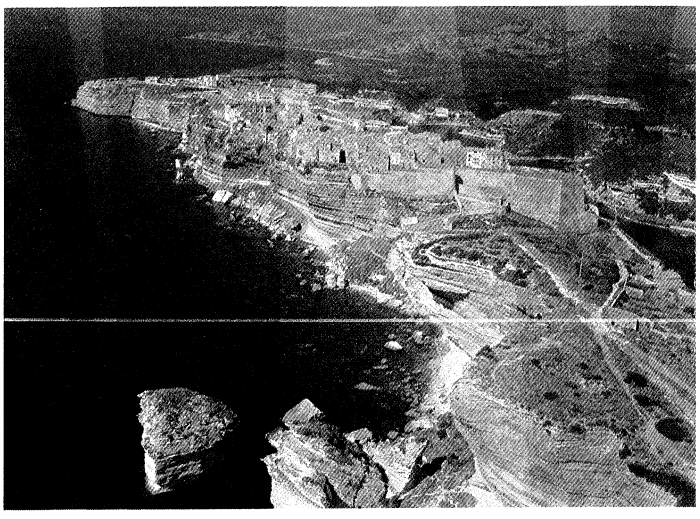
Boniface OF QUERFURT, SAINT: *see* Bruno of Querfurt, Saint.

Boniface OF SAVOY (b. *c.* 1207—d. July 14, 1270, Sainte-Hélène, Savoy), archbishop of Canterbury who, because he was a foreigner and because he attempted to remedy the financial disarray of his see, won the enmity of the English clergy. He succeeded in repaying a portion of the immense debt incurred by his predecessor, Edmund of Abingdon, and is also remembered for the hospital he founded at Maidstone, Kent.

A son of the Count of Savoy, Boniface entered the Carthusian order in his childhood. He was elected bishop of Belley in Burgundy in 1234. After his niece married King Henry III of England, Boniface was, through the King's influence, chosen in 1241 to serve as archbishop of Canterbury. Circumstances prevented him from taking office until 1244; at that time he also made his first visit to England. Discovering that the see of Canterbury was deeply in debt, he proposed sweeping economies, including the abolition of certain church offices and the exacting of contributions from tenants and clergy.

Late in 1244 he left England to attend the Council of Lyon, where he obtained permission from Pope Innocent IV to institute further measures to raise funds for the see, among them the levying of contributions throughout the province. Upon returning to England in 1249, he came into conflict with local diocesan officials who refused to recognize his authority. In one instance, the dispute erupted into violence and resulted in the excommunication of the Bishop of London. Boniface left for Rome in 1252, to be present in his own defense at proceedings brought against him by his English opponents. A compromise was reached, and Boniface returned to England during the period from 1265 to 1269; he set out on a crusade with King Edward I but died en route. His feast day, July 14, is celebrated in Savoy and by the Carthusians.

Bonifacio, town, Corse-du-Sud *département*, Corse region, France, just west of Cap Pertusato, southernmost point of the island of Corsica, giving its name to the strait (7.5 mi [12 km] wide) separating Corsica from the northern tip of Sardinia. The town is perched on a narrow limestone peninsula about 1 mi long that parallels the coast and forms a natural harbour. Founded about AD 828 as a defense against pirates, the town was taken from Pisa at the end of the 12th century by the Genoese. Traditionally it has remained Genoese, the inhabitants speaking Genoese dialect and refusing to adopt such Corsican customs as the vendetta. Not linked to the rest of the island by rail, Bonifacio trades by sea, mostly with Sardinia, in cereals, wine, and cork. Pop. (1982) 1,727.



Bonifacio on a limestone peninsula, southern Corsica
Editions "La Cigogne"—Hachette

Bonifacio, Andres (b. Nov. 30, 1863, Manila—d. May 10, 1897, Mt. Buntis, Phil.), Philippine patriot, founder and leader of the nationalist Katipunan society, who instigated the revolt of August 1896 against the Spanish.

Bonifacio was born of poor parents in Manila and had little formal education, working as a messenger and warehouse keeper before becoming involved in revolutionary activity. He was, however, well-read. Unlike the nationalist poet and novelist José Rizal, who wanted to reform Spanish rule in the Philippines, Bonifacio advocated complete independence from Spain. In 1892 he founded the Katipunan in Manila, modelling its organization and ceremony on that of the Masonic order. The Katipunan at first grew slowly, but by 1896 it had an estimated 100,000 members and branches not only in Manila but also in central Luzon and on the islands of Panay, Mindoro, and Mindanao. Its members were mostly workers and peasants; the urban middle class supported reform rather than revolution.

In August 1896 Bonifacio led the long-planned insurrection on Luzon; but his forces were defeated by Spanish troops, and he was forced to retreat to Montalban in the north, while Emilio Aguinaldo, one of his lieutenants, carried on resistance. As the Spanish systematically routed the *insurrectos*, it became increasingly clear that Bonifacio was an ineffective military leader. In March 1897 a convention at Tejeros named Aguinaldo, rather than Bonifacio, president of a new Philippine republic. Refusing to recognize the convention, Bonifacio tried to establish his own rebel government. In April 1897 Aguinaldo had Bonifacio arrested and tried for treason; he was executed by a firing squad.

Bonin Islands, Japanese OGASAWARA-GUNTŌ, about 30 volcanic islands and islets in the central Pacific Ocean, 500 mi (800 km) southeast of Japan. They can be divided into three main groups: Chichijima-rettō (Beechey Group: Ani-jima, Chichi-jima), Mukojima-rettō (Parry Group: Muko-jima), and Hahajima-rettō (Baily Group: Haha-jima). The highest point (1,500 ft [450 m]) is on Haha-jima. A part of Tokyo Metropolis (*to*) before World War II, they were afterward placed under U.S. military control until returned to Japan in 1968. They are now under a common administration with Minami-Torishima (Marcus Island) and the Volcano Islands (Kazan-rettō). The largest island, Chichi-jima (9.5 sq mi [25 sq km]), has the best anchorage, Futamibyōchi (Port Lloyd Harbour).

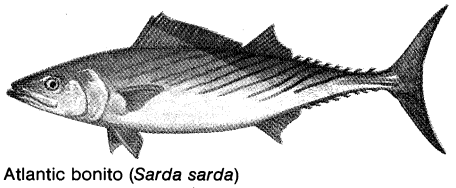
Discovered by the Spanish navigator Ruy Lopez de Villalobos in 1543, the islands, which command a strategic position astride the Pacific approaches to East Asia, were vaguely claimed by the U.S. (1823) and Britain (1825) but were formally annexed by Japan (1876). Only 11 percent of their total land area (28 sq mi) is arable, the remainder being hilly and forested. Valuable stands of timber include cedar, rosewood, ironwood, boxwood, sandalwood, and white oak. Whaling is conducted offshore. Pop. (1980) 2,010.

Bonington, Richard Parkes (b. Oct. 25, 1801, Arnold, near Nottingham, Nottinghamshire, Eng.—d. Sept. 23, 1828, London), English Romantic painter, known for his landscapes and historical scenes. His style attracted many imitators in both England and France, and he exercised an influence out of all proportion to his brief life.

At Calais, Fr. (*c.* 1817), Bonington learned the watercolour tradition of the English painter Thomas Girtin. He became acquainted with the French painter Eugène Delacroix in Paris. Bonington entered the École des Beaux-Arts, Paris (1819), and joined the atelier of Baron Gros, who had departed from the rigid classicism of the influential Jacques-Louis David. Bonington's bright watercolours, a novelty in Paris, financed sketching tours in Normandy, Picardy, and Flanders (1821–23). He showed at the Paris Salon in 1822 and at the famous Salon of 1824 with John Constable, Sir Thomas Lawrence, and others, where he won a gold medal. With Delacroix he studied Constable, and together they went to England (1825), where Bonington learned something of Turner's skill. More important, both were affected by the English fashion for painting scenes from history. In his subsequent historical pictures, he evolved in oil a new synthesis of Flemish and Venetian techniques. His works were exhibited in London (1826, 1828) and won immediate popularity.

As a master of the Romantic movement and as a technical innovator in oil and watercolour, Bonington was influential in England and France. His gifts as a draftsman were high; as a colourist, good. He also showed his talent in the new medium of lithography, illustrating Sir Walter Scott. A. Dubuisson's *Richard Parkes Bonington, His Life and Work* was translated by C.E. Hughes (1924). There is also a study by A. Shirley, *Bonington* (1940).

bonito (*Sarda*), tuna-like, schooling fish of the tuna and mackerel family, Scombridae (order Perciformes). Bonitos are swift, predacious



Atlantic bonito (*Sarda sarda*)
Painting by Richard Ellis

fishes found worldwide. They have striped backs and silvery bellies and grow to a length of about 75 centimetres (30 inches). Like tunas, they are streamlined, with a narrow tail base, a forked tail, and a row of small finlets behind the dorsal and anal fins. Bonitos are of both commercial and sporting value. Three species are generally recognized: *S. sarda* of the Atlantic and Mediterranean; *S. orientalis* of the Indo-Pacific; and *S. chilensis* of the Pacific.

The leaping bonito (*Cybiosarda elegans*) is a

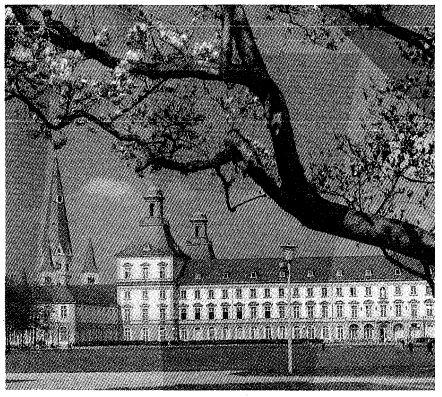
related Indo-Pacific food and sport fish. The oceanic bonito is the skipjack tuna (*see* tuna).

Bonivard, François (b. 1493, Seyssel, Savoy—d. 1570, Geneva), Genevan patriot, the hero of Lord Byron's poem "The Prisoner of Chillon."

Bonivard's real character and history are very different from the legendary account that Byron popularized. After succeeding his uncle as head of the Cluniac priory of St. Victor, near Geneva, he began to oppose the encroachments made by Charles III, duke of Savoy, and the Bishop of Geneva against that city's liberties. He was imprisoned by the Duke at Grolée from 1519 to 1521, lost his priory, and became more and more anti-Savoyard. In 1528, supported by the city of Geneva, he took up arms against those who had seized his ecclesiastical revenues; in 1530, however, he was imprisoned in the castle of Chillon, where he was kept underground from 1532 until he was released in 1536.

Becoming a Protestant, Bonivard obtained a pension from Geneva and was married four times. In 1542 he began compiling his *Chroniques de Genève,* a history of Geneva from the earliest times. His manuscript was submitted to the reformer John Calvin for correction in 1551, but it was not published until 1831. He also wrote *De l'ancienne et nouvelle police de Genève* (1555; "The Old and New Government of Geneva").

Bonn, provisional capital of the Federal Republic of Germany (West Germany) in the *Land* (state) of Nordrhein-Westfalen. The city is located on the Rhine River, about 15 mi (24 km) south of Cologne.



The University of Bonn
O.J. Troisfontaines—Shostal Assoc.

The oldest settlement known by the name of Bonn was a river crossing discovered by Roman legionaries in the 1st century BC. The settlement itself probably disappeared soon afterward, but its name was continued in Castra Bonnensia, a fortress built by the Romans in the 1st century AD. In the centuries that followed the breakup of the Roman Empire, Castra Bonnensia survived as a civilian settlement, and in the 9th century it became the Frankish town of Bonnburg.

Bonn grew in importance from the 13th to the 19th century, becoming the capital of the Electorate and Archbishopric of Cologne, and then a sovereign state in its own right. This era ended in 1794, when the French Revolutionary forces occupied the city. In 1815 France annexed Bonn to Prussia, and there was little development until the second half of the 19th century when the city became fashionable as one of Germany's residential towns. It was severely damaged during World War II. Development was accelerated after 1949, when Bonn was chosen as the provisional capital of West Germany, and in 1969 the city was amalgamated with the towns of Bad Godesberg and Beuel and several small parishes.

Those responsible for economic development in the late 19th century did their utmost to keep large industries out to preserve the city's attractions as a residential town for the rich. As a result, Bonn has only limited light industry. Typical products are laboratory equipment, switchgear, organs, and flags. By far the most important employer is the service industry, which includes the many organizations associated with Bonn's function as a capital. Agricultural products are supplied mainly by the neighbouring villages.

The Bundestag and the Bundesrat (legislative bodies), the *Bundespräsident* (head of state), and the *Bundeskanzler* (head of government) all are found in Bonn. These and other central institutions are concentrated south of the old city. Bonn also accommodates a large number of foreign embassies, regional institutions, and local and regional courts. National and international travel facilities, provided mainly by the Federal Railways and by Cologne Airport, are well developed.

As Beethoven's birthplace, Bonn is particularly devoted to the promotion of the musical arts. It maintains a municipal orchestra and arranges numerous national and international concerts. The Beethovenhalle, a modern concert hall, is the centre of Bonn's musical life.

Apart from the spacious municipal theatre (drama, opera, operetta, musicals, and ballet), there are several private theatres. Other important institutions are the Rhine Provincial Museum (archaeology) and the Museum Alexander Koenig (zoology).

Prominent historic buildings are the cathedral, a Romanesque basilica (11th–13th century) surmounted by five towers, of which the central (315 ft [96 m] high) is a landmark in the Rhine Valley, and the old village churches of Muffendorf (10th century), Vilich (11th century), and Schwarz Rheindorf (12th century). The former Electoral Palace (now the Rhenish Friedrich Wilhelm University of Bonn) and the Poppelsdorf Palace, with its botanical gardens, along with the city's beautiful avenues and parks are reminders of the electoral and archiepiscopal capital. Recreational areas include the forests of Venusberg, Kreuzberg, Kottenforst, and Ennert on the southern and western fringes of the city. Beyond the city, the mountain country of the Westerwald and the Eifel are within easy reach. Pop. (1983 est.) city, 293,852; (1979 est.) metropolitan area, 555,000.

Bonnard, Pierre (b. Oct. 3, 1867, Fontenay-aux-Roses, Fr.—d. Jan. 23, 1947, Le Cannet), French painter and printmaker, member of the group of artists called the Nabis and afterward a leader of the Intimists; he is generally regarded as one of the greatest colourists of modern art. His characteristically intimate, sunlit domestic interiors and still lifes include "The Dining Room" (1913) and "Bowl of Fruit" (*c.* 1933).

Bonnard, detail of a self-portrait, oil on canvas, 1938; in a private collection
Private collection, Europe

After taking his baccalaureate, in which he distinguished himself in classics, Bonnard studied law at the insistence of his father, and for a short time in 1888 he worked in a government office. In the meantime he attended the École des Beaux-Arts, but, failing to win the Prix de Rome (a prize to study at the French Academy in Rome), he transferred to the Académie Julian, where he came into contact with some of the major figures of the new artistic generation—Maurice Denis, Ker-Xavier Roussel, Paul Sérusier, Édouard Vuillard, and Félix Vallotton. In 1890, after a year's military service, he shared a studio in Montmartre with Denis and Vuillard. Later they were joined by the theatrical producer Aurélien-Marie Lugné-Poe, with whom Bonnard collaborated on productions for the Théâtre de l'Oeuvre, in Paris. At this time he became influenced by Japanese prints, which had earlier attracted the Impressionists.

During the 1890s Bonnard became one of the leading members of the Nabis, a group of artists who specialized in painting intimate domestic scenes as well as decorative curvilinear compositions akin to those produced by painters of the contemporary Art Nouveau movement. Bonnard's pictures of charming interiors lighted by oil lamps, nudes on voluptuous beds, and Montmartre scenes made him a recorder of France's Belle Époque. It was typical of his humour and taste for urban life at the time that he illustrated *Petites scènes familières* and *Petit solfège illustré* (1893), written by his brother-in-law Claude Terrasse, and executed the lithograph series *Quelques aspects de la vie de Paris* ("Aspects of the Life of Paris"), which was issued by the famous art dealer Ambroise Vollard in 1895. He also contributed illustrations to the celebrated avant-garde review *La Revue blanche.* A new phase in book illustration was inaugurated with Bonnard's decoration of the pages in Paul Verlaine's book of Symbolist poetry, *Parallèlement,* published by Vollard in 1900. He undertook the illustration of other books during the 1900s.

His ability as a large-scale decorator is sometimes overlooked, in view of his more quiet, domestic paintings in the Intimist style. But around 1906 he painted "Pleasure, Study, Play, and the Voyage," a series of four decorations made to resemble tapestries, for the salon of Misia Natanson, the wife of one of the editors of *La Revue blanche.* These pictures show that he was an heir to the French grand tradition of pictorial design that may be traced to Charles Le Brun, the director of all artistic activity under Louis XIV, and François Boucher, the most fashionable painter in the mid-18th century.

By about 1908 Bonnard's Intimist period had concluded. A picture such as "Nude Against the Light" (1908; Musée Royaux des Beaux-Arts de Belgique, Brussels) was painted not only on a bigger scale but also with broader and more colouristic effects. Because of his increasing interest in landscape painting, he had begun painting scenes in northern France. In 1910, however, he discovered the south of France, and from then onward he became the magical painter of this region. The Mediterranean was considered by many of the period to be a source of French civilization. Bonnard was eager to emphasize the connections between his art and France's classical heritage. This was evident in the pose of certain of his figures, which hark back to ancient Hellenistic sculpture. He was also enamoured of the colouristic tradition of the 16th-century Venetian school. "The Abduction of Europa" (1919; Toledo Museum of Art, Ohio), for example, is in a direct line of descent from the work of Titian.

The subjects of Bonnard's pictures are simple, but the means by which he rendered such familiar themes as a table laden with fruit or a sun-drenched landscape show that he was one of the most subtle masters of his day; he was particularly fascinated with tricks of perspective, as the Postimpressionist painter Paul Cézanne had been. In "The Dining Room," for example, he employed different levels of perspective and varied the transitions of tone, from warm to cool.

By about 1915 Bonnard realized that he had tended to sacrifice form for colour, so from that point until the late 1920s he painted nudes that reflect a new concern for structure without losing their strong colour values. In the 1920s he undertook a series of paintings on one of his most famous themes—a nude in a bath. From the end of the 1920s onward, the subject matter of his pictures hardly varied—still lifes, searching self-portraits, seascapes at Saint-Tropez on the Riviera, and views of his garden at Le Cannet, near Cannes, where he had moved in 1925 after marrying his model and companion of 30 years, Maria Boursin. These are paintings intense with colour.

The chronological order of Bonnard's paintings is difficult to determine, for he would make sketches in pencil or colour and then use them as the basis for several pictures on which he would work simultaneously. When working in the studio, he would rely on his memory of the subject and constantly retouch the surface, building up a mosaic of colours. It is impossible, therefore, to give more than approximate dates for many of his works. In 1944 Bonnard illustrated a group of early letters, which were published in facsimile under the appropriate title of *Correspondances. Formes et couleurs.* (D.Su.)

MAJOR WORKS. *Paintings.* "The Croquet Game" (1892; private collection, Paris); "Street Scene with Two Dogs" (1895; private collection, Mexico City); "The Bridge at Chatou" (*c.* 1896; private collection, New York); "Interior" (1898; Norton Simon Collection, Los Angeles); "Place Blanche" (*c.* 1902; private collection, Los Angeles); "Girl in a Straw Hat" (1903; Milwaukee Art Center); "Repas des bêtes" (*c.* 1906; private collection, New York); "Regatta" (1908–12; Carnegie Institute, Pittsburgh); "The Dining Room" (1913; Minneapolis Institute of Arts, Minnesota); "Woman with Basket of Fruit" (1915–18; Baltimore Museum of Art); "The Brothers Jean and Gaston Bernheim" (1920; Musée d'Art Moderne de la Ville de Paris); "Interior with Woman in Wicker Chair" (1920; Nationalmuseum, Stockholm); "Still Life" (*c.* 1924; Art Gallery of Toronto); "The Table" (1925; Tate Gallery, London); "The Palm" (1926; Phillips Collection, Washington, D.C.); "The Road to Nantes" (*c.* 1930; Cleveland Museum of Art); "The Breakfast Room" (*c.* 1930–31; Museum of Modern Art, New York City); "Bowl of Fruit" (*c.* 1933; Philadelphia Museum of Art); "Dining Room on the Garden" (*c.* 1933; Solomon R. Guggenheim Museum, New York City); "Nude Before a Mirror" (1933; Galleria Internazionale d'Arte Moderna, Venice); "Table Before Window" (1943; private collection, New York); "Flowering Almond Tree" (1946; Musée d'Art Moderne de la Ville de Paris).

Lithographs. "Child with Lamp" (1896); "The Laundry Girl" (1896); "Boating" (*c.* 1897); "Place Clichy" (*c.* 1923); *Quelques aspects de la vie de Paris* (1895); also illustrations for *La Revue blanche* (1891–1903).

BIBLIOGRAPHY. Jean and Henri Dauberville, *Bonnard: Catalogue raisonné de l'oeuvre peint.* vol. 1, *1888–1905* (1966), vol. 2, *1906–1919* (1968), consists of a detailed catalog of the artist's work and is still in progress. Charles Terrssse, *Bonnard* (1927), in French; and Thadée Natanson, *Le Bonnard que je propose, 1867–1947* (1951), contain much first-hand information about the artist by writers who knew him. John Rewald, *Pierre Bonnard* (1948), is a valuable account of the artist's development with notes on his technique. Antoine Terrasse, *Bonnard* (1964; Eng. trans. 1964) and *Pierre Bonnard* (1967), in French; and André Fermigier, *Pierre Bonnard* (1969; Eng. trans. 1971), are two modern studies with fresh information and good plates. Claude Roger-Marx, *Bonnard, lithographe* (1952), is an illustrated catalog of the artist's lithographs. *Bonnard and His Environment,* Museum of Modern Art, New York City (1964); and *Pierre Bonnard, 1867–1947,* Royal Academy of Arts, London, 2nd ed. (1966), are two important exhibition catalogs.

Consult the INDEX *first*

Bonnat, Léon(-Joseph-Florentin) (b. June 20, 1833, Bayonne, Fr.—d. Sept. 8, 1922, Monchy-St-Éloi), notable French portrait painter and teacher.

He studied under Federico Madrazo in Madrid and, sponsored by the city of Bayonne, under Léon Cogniet in Paris. His earlier works are genre paintings in which his study of old Spanish art is evident. His later and better known portrait series was begun in 1875. In these he drew inspiration from Velázquez and the Spanish realists. His subjects included Adolphe Thiers, Victor Hugo, Hippolyte Taine, Louis Pasteur, Ingres, and other contemporaries. He painted about 200 portraits, the finest of these being perhaps that of Cogniet.

In 1888 Bonnat became professor of painting at the École des Beaux-Arts and became its director in 1905. His excellent and wide-ranging art collection is part of the Musée Bonnat in Bayonne.

Bonne, François de: *see* Lesdiguières, François de Bonne, duc de (duke of).

Bonner, Edmund, Bonner also spelled BONER (b. *c.* 1500—d. Sept. 5, 1569, London), bishop of London who supported Henry VIII's anti-papal measures but rejected the imposition of Protestant doctrine and worship during the reigns of Edward VI and Elizabeth I. For centuries Bonner, on the basis of evidence from his contemporary, the Protestant martyrologist John Foxe, was pictured as a monster who enjoyed burning Protestants at the stake during the reign of the Roman Catholic Mary I.

Bonner became an outstanding Oxford lawyer and from 1532 to 1543 he served Henry VIII on various foreign embassies, including several to Pope Clement VII to plead for an annulment of Henry's marriage to Catherine of Aragon. Having supported Henry when the King took control of the English Church, Bonner was made Bishop of London in 1540. But upon the accession of Edward VI, Bonner, with Stephen Gardiner, felt he could no longer accept royal supremacy in religious matters. As a result he was deprived of his London bishopric and imprisoned from 1549 to 1553. Restored to his see on Aug. 5, 1553, after the accession of Mary Tudor, he was rebuked by Mary's government for his reluctance to intensify the prosecution of Protestants in London, but subsequently he became actively involved. At the beginning of Elizabeth's reign he was again deprived of his bishopric because he refused to acknowledge her supremacy over the English Church, and he spent the last 10 years of his life in the Marshalsea Prison in London.

Bonner Durchmusterung (BD), English BONN SURVEY, star catalog showing positions and apparent magnitudes of 324,188 northern stars. Compiled at Bonn under the direction of the German astronomer F.W.A. Argelander, it required 25 years' work and was published in 1859–62. The accompanying charts, published in 1863, were the most complete and accurate made until that time. The catalog was reissued in 1950. *See also* Córdoba Durchmusterung.

Bonnet, Charles (b. March 13, 1720, Geneva—d. May 20, 1793, near Geneva), Swiss naturalist, philosophical writer, who discovered parthenogenesis (reproduction without fertilization) and developed the catastrophe theory of evolution. Though he was a lawyer by profession, his favourite pursuit was natural science. Concentrating first on entomology, he studied the habits of the aphid and found that the female insect was able to reproduce without fertilization by the male. In 1742 he discovered that caterpillars and butterflies breathe through pores, which he named stigmata. Bonnet next turned to botany, studying the structures and functions of leaves.

Charles Bonnet, lithograph by J.-H. Deville, 1843, after a portrait by J. Juel
By courtesy of the Bibliotheque Nationale Suisse, Bern

Approaching blindness forced him to change his emphasis once more, this time to philosophy. Affected by his observation of the aphid, Bonnet argued, in *Considérations sur les corps organisés* (1762; "Considerations on Organized Bodies"), that each organism contains within itself an infinite series of preformed individuals, leading to an immortality and immutability of species. He responded to fossil evidence of extinct species with *La Palingénésie philosophique* (1769; "The Philosophical Revival"), in which he theorized that the Earth periodically suffers universal catastrophes, destroying most life, and that the survivors move up a notch on the evolutionary scale. Bonnet was the first to use the term evolution in a biological context. His *Essai de psychologie* (1754) and *Essai analytique sur les facultés de l'âme* (1760; "Analytical Essay on the Powers of the Soul") anticipated physiological psychology.

Bonnet, Georges-Étienne (b. July 23, 1889, Bassillac, Fr.—d. June 18, 1973, Paris), leader in the French Radical-Socialist Party and minister of foreign affairs immediately preceding World War II, who was a prominent supporter of appeasement of Nazi Germany.

Bonnet studied at the Sorbonne, graduating in law and political science. His marriage to the niece of a prominent politician launched his political career. After minor ministerial and legal positions, he was elected to the

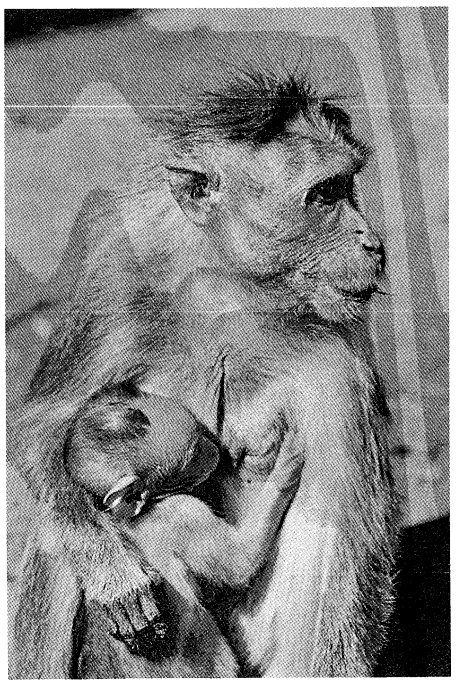
Georges-Étienne Bonnet, 1943
H. Roger-Viollet

Chamber of Deputies (1924–28 and 1929–40). Appointed undersecretary of state in 1925, he continued to serve in high ministerial positions throughout the 1930s and was named ambassador to the United States in 1936.

After the defeat of Léon Blum's Popular Front (Front Populaire) government in 1937, Bonnet was named finance minister under Camille Chautemps. In April 1938 he became foreign minister under Édouard Daladier and in this capacity supported the Munich Agreement, which allowed Hitler to occupy the Czech Sudetenland. Bonnet continued to pursue a program of appeasement until the outbreak of World War II in September 1939, when he was demoted to justice minister. He left that post on the resignation of Daladier in March 1940. Bonnet argued in favour of the French armistice, supported the Vichy regime, and was appointed to the National Council (1941–42). Yet he refused other office and left France before the Allied invasion. After the liberation, proceedings were started against him but were dropped. Expelled from the Radical Party (Parti Républicain Radical et Radical-Socialiste) in 1944, he was readmitted in 1952 only to be expelled again in 1955 for his opposition to Pierre Mendès-France. Later, he was again elected to the Chamber of Deputies (1956–68). *Le Quai d'Orsay* (1961; Eng. trans. 1965) is a book of memoirs.

Bonnet Carre Spillway, emergency floodway in St. Charles Parish, southeastern Louisiana, U.S., extending from the left bank of the Mississippi River about 25 mi (40 km) upstream from New Orleans to Lake Pontchartrain. About 7 mi long and completed in 1935, the spillway, with a capacity for diverting 250,000 cu ft (7,100 cu m) of water a second, has a concrete dike 7,698 ft (2,346 m) long, which includes 350 bays or weirs that are opened or closed by a mobile electric crane mounted on a narrow-gauge track. It saved New Orleans from considerable damage during the floods in 1937, 1945, and 1950. A spillway in the area had been proposed by the geologist Raymond Thomassy as early as 1860.

bonnet monkey (*Macaca radiata*), Indian macaque named for the thatch of long hair forming a cap, or "bonnet," on the crown. The bonnet monkey is grayish brown with a hairless pink face. It is about 35–60 centimetres (14–24 inches) long, excluding its 50–70-cm tail, and weighs about 3–9 kilograms (7–20 pounds). It is an agile monkey and sometimes raids gardens or stores of food.



Bonnet monkey (*Macaca radiata*)
Warren Garst—Tom Stack & Associates

bonnet shell, any of certain small marine mollusks of the helmet shell (*q.v.*) group.

Bonneville, Benjamin-Louis-Eulalie de (b. April 14, 1796, Paris or nearby—d. June 12, 1878, Fort Smith, Ark., U.S.), U.S. army engineer and frontiersman who gained contemporary fame as an explorer of the Rocky Mountains. Historical reevaluation of his activities, however, has virtually destroyed the romanticized, heroic image of him that had been established chiefly through the U.S. author Washington Irving's editing of his journals, *The Adventures of Capt. Bonneville, U.S.A., in the Rocky Mountains and the Far West* (1837).

The son of a prominent French radical, Bonneville moved with his family to the U.S. in 1803. He graduated from the U.S. Military Academy, West Point, N.Y., in 1815, and was assigned to Fort Smith in 1821. Obtaining leave from the army in order to explore the West (1832), he gathered a party of 110 men and, from a base on the Green River in present-day Wyoming, attempted mainly to establish himself as a fur trader. He sent groups of hunters and trappers in all directions, but his scheme resulted neither in notable exploration nor in his being able to establish himself in the fur trade. Dismissed from the army for overstaying his leave, but reinstated in his commission, he eventually attained the rank of brigadier general (1865).

Bonneville, Lake, prehistoric lake, formed during the Pleistocene Epoch (more than 2,000,000 years ago), that covered an estimated 19,000 sq mi (49,210 sq km), embracing much of what is now the state of Utah and parts of Nevada and Idaho in the U.S. Surviving remnants are the freshwater Utah Lake and the saline Great Salt, Sevier Dry, and Little Salt lakes. Deposits from its tributaries created deltas and canyon mouths where all of Utah's principal cities have been built and where most of the irrigable land is found. The Great Salt Lake in the northwestern part of the Lake Bonneville region is today the site of major chemical industries that use its brines to produce potassium sulfate and sodium sulfate as well as salt. To the southwest is the Great Salt Lake Desert, covering about 4,000 sq mi and including the Bonneville Salt Flats, famous for land-speed racing.

Bonneville Salt Flats, stretch of barren salt flats covering about 100 sq mi (260 sq km) in Tooele County, northwestern Utah, U.S., east of Wendover. The flats, part of the Great Salt Lake Desert, are a remnant of the bed of an ancient lake formed more than 2,000,000 years ago during the Pleistocene Epoch and named for B.-L.-E. de Bonneville, an explorer and fur trader. The site of Bonneville Speedway, the flats are as solid as concrete by the summer's end and are ideally suited for speed trials; several world automobile and motorcycle speed and endurance records have been established there since 1935.

Bonney, William H., Jr.: *see* Billy the Kid.

Bonnie and Clyde: *see* Barrow, Clyde; and Parker, Bonnie.

Bonnie Prince Charlie: *see* Charles Edward, the Young Pretender.

Bonny, formerly IBANI, or UBANI, town and Atlantic oil port, situated in Rivers State, southern Nigeria, on the Bonny River (an eastern distributary of the Niger), 6 mi (10 km) upstream from the Bight of Biafra. A traditional trading centre (fish, salt, palm oil, and palm kernels) of the Ijaw people, it was the capital of the 15th-century to 19th-century Kingdom of Bonny. Reaching its height in the reign of the Pepple dynasty in the 18th and early 19th centuries, its economy (also the kingdom's) was based on the sale of slaves to European traders. It was one of the largest slave-exporting depots of West Africa—in the year 1790 about 20,000 people (most of them Ibo and other hinterland groups) were shipped to the Americas. The Pepple kings were unhappy with the British decision in the 1830s to enforce the end of the slave trade; but British arms and political intrigue proved decisive, and by the 1850s Bonny had become a major exporter of palm oil and kernels. It remained an important port (shipping ivory, timber, and beeswax, as well as palm produce) until it was eclipsed by Port Harcourt, the new railroad terminus (1916), 35 mi upstream.

Not until the exploitation of oil in the Niger Delta began in the late 1950s did the port regain its former importance. Since 1961 it has been the chief shipper of the delta's oil, and in 1964 its harbour was enlarged to accommodate vessels of up to 35-ft (11-m) draft. The port has numerous storage tanks for the oil brought in by pipelines.

The town of Bonny also has a government health centre, an Anglican cathedral (1889), and a local industry which exports coconuts and coir (coconut fibre). Pop. (1971 est.) 8,957.

Bonny, Bight of (Atlantic Ocean): *see* Benin, Bight of.

Bonny River, river, an arm of the Niger River Delta in Rivers State, southern Nigeria. At its mouth, 25 mi (40 km) south-southeast of Port Harcourt, is Bonny town, a river pilot station and oil terminal. Products include palm oil and kernels, hardwood, and rubber. There are fisheries. Under the influence of European traders from the 16th century, Bonny became the centre of a miniature slave-trading empire under militarized chiefdoms controlling the routes from the interior to the coast.

Bono, Akan state of West Africa from the 15th to the 18th century, between the forests of Guinea and the savannas of the Sudan in what is now Brong-Ahafo Region in the Republic of Ghana.

Bono was probably founded about 1450, and its rise was undoubtedly connected with the developing gold trade of Bighu, a Malian Muslim or Dyula commercial centre 40 miles (64 kilometres) to the northwest. From there Muslim traders came to Bono soon after its foundation, and many members of the royal household were later converted to Islām.

The kings of Bono are said to have played a major role in the gold-mining industry: both Obunumankoma (fl. *c.* 1450–75) and ʿAlī Kwame (fl. *c.* 1550–60) are thought to have introduced new mining techniques from the Western Sudan to the Akan fields, while Owusu Aduam (fl. *c.* 1650) is reported to have completely reorganized the industry. From the Akan fields the gold passed through the entrepôts of the Western Sudan along the trade routes of the Sahara to the terminal ports of North Africa and from there to Europe and elsewhere. Bono engaged in wars with Jakpa of Gonja and was finally subjugated by Opoku Ware of Ashanti in 1722–23.

Bono, Michele di Taddeo: *see* Giambono, Michele.

Bonomi, Ivanoe (b. Oct. 18, 1873, Mantua, Italy—d. April 20, 1951, Rome), statesman who served terms as Italian prime minister before and after the Fascist regime of Mussolini and who led the anti-Fascist movement during World War II.

Elected to Parliament in 1909 as Socialist deputy for Mantua, he was expelled from the

Bonomi
B. Pellegrini

Socialist Party in 1912 with the reform leader Leonida Bissolati for his moderate, democratic views, joining the Reformist Socialist group. During World War I he served as a volunteer and became war minister in 1920 in the government of Giovanni Giolitti, negotiating the Treaty of Rapallo between Italy and Yugoslavia. Made prime minister in July 1921, with a coalition government, he was unable to control Fascist and Socialist excesses and resigned in February 1922, retiring from politics after Benito Mussolini's accession to power. In 1940 he joined the anti-Fascist movement, becoming its leader in 1942. After Mussolini's fall on July 25, 1943, he headed the national committee of anti-Fascist groups and, after the liberation of Rome (June 9, 1944), was designated prime minister by the National Committee of Liberation. The committee, however, soon began to press for a more vigorous policy, and Bonomi resigned on Nov. 26, 1944, to be reinstated shortly after through the intervention of the British government.

Bonomi laid the foundations of Italy's economic and administrative reconstruction and began the reorganization of the army. On June 12, 1945, he resigned in favour of Ferruccio Parri, but, as chairman of the Constituent Assembly's committee for treaties, took part in the council of foreign ministers at Paris in 1946. From 1948 until his death he served as president of the Senate.

Bononcini, Giovanni, Bononcini also spelled BUONONCINI (b. July 18, 1670, Modena, Duchy of Modena—d. July 9, 1747, Vienna), composer, chiefly remembered as Handel's rival in England. He studied with his father, composer and theoretician Giovanni Maria

Giovanni Bononcini, drawing by Joseph Sympson the Younger
The Andre Meyer Collection—J.P. Ziolo

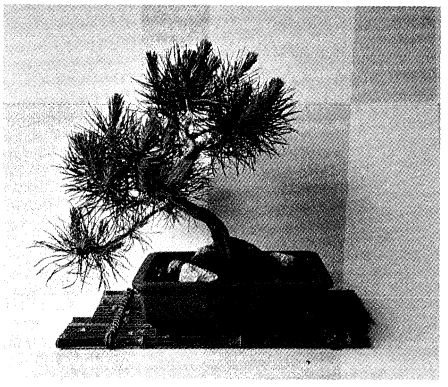
Bononcini, and later at Bologna. Precocious musical gifts won him his first appointment, as a cellist, in 1687, and he soon became *maestro di cappella* of S. Giovanni in Monte. He moved to Rome about 1691 and in 1698, after a brief period in Venice, settled in Vienna with his brother, the composer Antonio Maria Bononcini.

In 1720 he was invited to London by the new operatic organization, the Royal Academy of Music. His rivalry with Handel and their backing by opposed political and social factions ended in defeat for Bononcini. His backers were a group of noblemen; Handel was backed by the king. A three-act opera, *Muzio Scevola*, was looked upon as a public competition, with Bononcini and Handel composing the second and third acts, respectively. Handel was judged the winner. This reverse and others led to Bononcini's loss of support.

Eight of his operas were produced in London, the most successful being *Astarto*, *Crispo*, and *Griselda*. Other compositions of this period include an anthem on the death (1722) of the Duke of Marlborough and harpsichord and chamber music. In the early 1730s he went to Paris, leaving England in disgrace after submitting to the Academy of Ancient Music as his own composition a madrigal actually written by Antonio Lotti. His last work, *Te Deum*, was written in Vienna in the 1740s.

Though he was a prolific and gifted composer, Bononcini's abilities are dwarfed by comparison with Handel's. Only in opera, where both used the same highly conventionalized idiom, are the two men comparable. Nonetheless, Bononcini achieved a simple and fluent melodic style and the ability to write well for his singers.

bonsai (Japanese: "tray-planted"), living dwarf tree or trees or the art of training and growing them in containers.



Bonsai pine
Judith Groffman

Bonsai specimens are ordinary trees and shrubs, not hereditary dwarfs; they are dwarfed by a system of pruning roots and branches and training branches by tying with wire. The art originated in China, where, perhaps over 1,000 years ago, trees were cultivated in trays, wooden containers, and earthenware pots and trained in naturalistic shapes. Bonsai, however, has been pursued and developed primarily by the Japanese. The first Japanese record of dwarfed potted trees is in the *Kasuga-gongen-genki*, a picture scroll by Takashina Takakane (1309).

The direct inspiration for bonsai is found in nature. Trees that grow in rocky crevices of high mountains, or that overhang cliffs, remain dwarfed and gnarled throughout their existence. The Japanese prize in bonsai an aged appearance of the trunk and branches and a weathered character in the exposed upper roots. These aesthetic qualities are seen to embody the philosophical concept of the mutability of all things.

Bonsai may live for a century or more, and be handed down from one generation to another as valued family possessions. Aesthetics of scale call for short needles on conifers and relatively small leaves on deciduous trees. Small-flowered, small-fruited varieties of trees are favoured. Open space between branches and between masses of foliage are also important aesthetically. In diminutive forests the lower portions of the trunks should be bare.

Good bonsai specimens are usually hardy species that can be kept outdoors the year round wherever winters are mild. They can be brought into the house occasionally for appreciation and enjoyment. In Japan they are customarily displayed in an alcove or on small tables in a living room and later returned to their outdoor bonsai stands.

The selection of the appropriate container in which to cultivate a bonsai is an essential element of the art. Bonsai pots are usually earthenware, with or without a colourful exterior glaze. They may be round, oval, square, rectangular, octagonal, or lobed and have one or more drainage holes in the bottom. Containers are carefully chosen to harmonize in colour and proportion with the tree. If the container is rectangular or oval, the tree is planted not quite halfway between the midpoint and one side, according to the spread of the branches. In a square or round container the tree is placed slightly off centre, except for cascade types, which are planted toward the opposite side of the container from which they overhang. Bonsai are trained to have a front, or viewing side, oriented toward the observer when on exhibit.

Miniature bonsai range up to 2 inches (5 centimetres) in height, and, started from seeds or cuttings, take three to five years to come to quality stage. They may live several decades. Small bonsai, 2 to 6 in. in height, require 5 to 10 or more years to train. Medium bonsai, 6 to 12 in. in height, or average bonsai, up to about 2 feet (60 centimetres), can be produced in as little as three years.

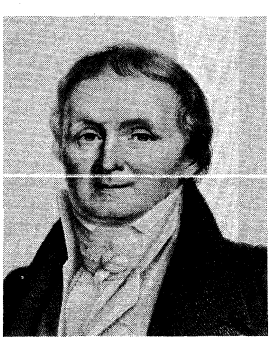
Naturally dwarfed trees collected in the wild frequently fail to adapt to cultivation as bonsai because of the severe shock brought about by the change of environment and substrate.

Bonsai must be repotted every one to five years, depending on the species and extent of root growth. Gradual root pruning during transplanting in subsequent years reduces the size of the soil ball so that the tree can ultimately go into the desired small and shallow container. Water is provided as frequently as for other plants; liquid fertilizer is also used. Pruning and nipping of shoots is performed through the growing season.

A bonsai industry of considerable size exists as part of the nursery industry in sections of Japan; the technique is also pursued on a small industrial scale in California.

Bonstetten, Karl Viktor von, also called CHARLES VICTOR VON BONSTETTEN (b. Sept. 3, 1745, Bern—d. Feb. 3, 1832, Geneva), Swiss writer (in both French and German) of wide cosmopolitan interests and outlook.

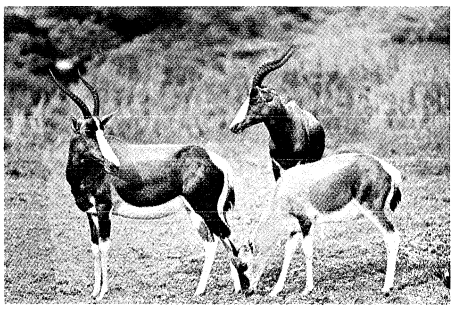
Of a conservative and patrician family, Bonstetten for 12 years had to resist being



Bonstetten, lithograph by P.E. Bovet, after a portrait by Munier
By courtesy of the Bibliotheque Nationale Suisse, Bern

forced into the traditional career of municipal magistrate. Instead he studied Horace and Jean-Jacques Rousseau, travelled abroad, and cultivated friendships in the liberal intellectual circles of Geneva (1763–67), Leiden, England, France, Germany, and Italy. After his return to Bern and his father's death (1773), he at last entered provincial politics. He became the enlightened administrator, first of Saanen (1779), then of Nyon (1787), and, finally, a judge in the canton of Ticino (1795–97). After the French invasion and the collapse of the ancien régime in 1798, he went to Denmark, spending three years there before settling in Geneva. His charm and cosmopolitan temperament made him an outstanding member of the international elite and are revealed in his wide correspondence and in various books, forerunners of modern comparative studies of national characteristics. The best is his excellent work *L'Homme du midi et l'homme du nord, ou l'influence des climats* (1824; Eng. trans., 1864). Such books surpass his philosophical works—*Pensées sur divers objets de bien public* (1815), *Études de l'homme* (1821), etc. He also wrote autobiographical sketches—*Erinnerungen an mein Jugendleben* (1821) and *Souvenirs* (1832).

bontebok (*Damaliscus dorcas dorcas*), antelope species, belonging to the family Bovidae (order Artiodactyla), that inhabits the dry grasslands and woods of southern Africa. The bontebok, standing up to 102 centimetres (40



Bontebok (*Damaliscus dorcas dorcas*)
Francisco Erize—Bruce Coleman Ltd.

inches) at the shoulder, is deep reddish brown with lyre-shaped horns and striking white markings on the face, rump, underparts, and legs. Once hunted almost to extinction, this antelope has increased under protection. The related but somewhat smaller blesbok (*D. d. philippsi*) also has lyre-shaped horns but is less richly coloured, with a pale brown rump and darker legs. It is semidomesticated.

The genus *Damaliscus* also includes the sassaby, or tsessebe (*D. lunatus*), and the topi, tiang, and korrigum (or Senegal hartebeest), which are subspecies of *D. korrigum*. These antelopes stand at heights up to 127 cm at the shoulder and are reddish brown with black on the face, shoulder, hips, and upper parts of the legs. The rare Hunter's hartebeest, or hirola (*Beatragus hunteri*), which is about the size of a bontebok and is reddish brown with a white face marking, is sometimes included in the genus *Damaliscus*.

Bontebok National Park, national park in southern Cape Province, South Africa, occupying 11 sq mi (28 sq km) in the Breë (Breede) River Valley south of the Langeberg mountains. The park, established in 1931, was moved to its present site in 1960. It is a reserve for the rare bontebok antelope and small numbers of other antelope including the rhebok, springbok, grysbok, and duiker.

Bontempelli, Massimo (b. May 12, 1878, Como, Italy—d. July 21, 1960, Rome), Italian poet, novelist, dramatist, and literary critic whose "magic realism" developed from Futurism (*q.v.*).

First a teacher, Bontempelli wrote several volumes of traditional poetry, later adopted the anti-traditional, anarchic literary doctrine of the Futurists, and ultimately developed his own point of view, expressed particularly in his review *900* (founded 1926). European in outlook (one foreign editor was James Joyce), *900* sought a middle ground between the extremes of traditionalism and the literary avant-garde.

Bontempelli followed his early poetry with novels and plays noted for their intelligence and quixotic humour. *La vita intensa* (1920; "The Intense Life"), an early Futuristic novel, was followed by more independent works such as *Gente nel tempo* (1937; "People in Time") and *Giro del sole* (1941; "Revolution of the Sun"). His *L'amante fedele* (1953; "The Faithful Lover"), a collection of surrealistic stories, won Italy's highest literary award, the Strega Prize.

Bontempelli's best dramas are *Siepe a nordovest* (published 1919, performed 1923; "Barrier to the Northwest"); and *Nostra dea* (performed 1925; "Our Goddess"). A particularly striking play is *La guardia alla luna* (performed 1916), the story of a woman who blames the moon for her child's death and climbs a mountain to try to kill it.

Notable among Bontempelli's critical works are *L'avventura novecentista* (1939; "The 20th-Century Adventure") and *Introduzioni e discorsi* (1945; "Introductions and Discourses"), which treats the work of many major 19th- and 20th-century Italian writers. He also wrote music criticism, collected in *Passione incompiuta: scritti sulla musica, 1910–1950* (1958; "Unfulfilled Passion: Writings on Music").

Bontemps, Arna (Wendell) (b. Oct. 13, 1902, Alexandria, La., U.S.—d. June 4, 1973, Nashville, Tenn.), U.S. writer who depicted the lives and struggles of black Americans.

The son of a stonemason father and schoolteacher mother, he grew up in California. After graduating from Pacific Union College, Angwin, Calif., in 1923, he taught in New York and elsewhere. His poetry began to appear in the influential Negro magazines *Opportunity* and *Crisis* in the mid-1920s. His first novel, *God Sends Sunday* (1931), about a jockey who was good with horses but inadequate with people, is considered the final work of the Harlem Renaissance (*q.v.*). The novel was dramatized as *St. Louis Woman* (1946), in collaboration with the poet Countée Cullen.

Bontemps' next two novels were about slave revolts—in Virginia in *Black Thunder* (1935) and in Haiti in *Drums at Dusk* (1939). In 1943 he went to Fisk University, Nashville, Tenn., where he served as head librarian for more than two decades.

His nonfiction works, many for younger readers, include *The Story of the Negro* (1948; 4th ed., 1964); *Chariot in the Sky* (1951), about the famed Jubilee Singers of Fisk University; *Frederick Douglass: Slave-Fighter-Freeman* (1959); *One Hundred Years of Negro Freedom* (1961); and *Famous Negro Athletes* (1964). Among the anthologies he has edited are *Father of the Blues* (1941), W.C. Handy's compositions; *The Poetry of the Negro* (1949) and *The Book of Negro Folklore* (1958), both with Langston Hughes; *American Negro Poetry* (1963); and *Great Slave Narratives* (1969).

Bonthe, Atlantic seaport, southwestern Sierra Leone, West Africa, on the eastern shore of Sherbro Island, on the Sherbro River estuary. A 19th-century British control post against the slave trade, it was settled by freed African slaves and grew as a shipping port for agricultural products. Its harbour still exports palm kernels, ginger, piassava, and coffee, but the silting up of the estuary, coastal swamps, and new internal routes have reduced its importance as a port. The town is a trade centre in swamp rice, fish, and piassava among the Mende and Sherbro peoples, who now outnumber the Creoles (descendants of the liberated slaves). Bonthe is the administrative headquarters of the Sherbro Urban District (1950), a subdivision of the western area. It has a government hospital, a Catholic secondary school, and several churches. Pop. (1974) 6,398.

Bonus Army (1932), spontaneous convergence on Washington, D.C., of more than 12,000 World War I veterans demanding immediate bonus payment for wartime services, to alleviate the economic hardship of the Great Depression. Adjusted Compensation certificates had been voted by Congress in 1924, payable in 1945. In an effort to force early lump-sum payment of these urgently needed

Bonus Army battling police during demonstration in Washington, D.C., 1932
UPI Compix/EB Inc.

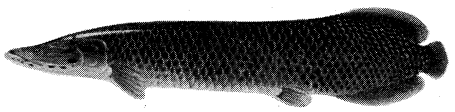
benefits, the Bonus Army, sometimes called the "Bonus Expeditionary Force," marched on the nation's capital in the summer of 1932. Despite inadequate housing, sanitation, and food supply, the movement's leader, Walter W. Waters, managed to maintain order and to oust agitators. When the government refused to act, half the destitute veterans returned home, but the rest refused to leave and had to be driven out by the U.S. Army, which used tanks and tear gas. In 1936 Congress finally voted to disburse almost $2,500,000,000 in veterans' benefits.

bony fish, any member of the class Osteichthyes in the subphylum Vertebrata, including virtually all of the world's sport and commercial fishes. The scientific term Pisces has also been used to identify this group of fishes. Osteichthyes excludes the classes Agnatha (hagfishes and lampreys) and Chondrichthyes (sharks and rays) but includes the perhaps 20,000 species and more than 400 families of modern bony fishes (infraclass Teleostei) of the world, as well as a variety of primitive forms. The primary characteristic of bony fishes is a skeleton at least partly of true bone (as opposed to cartilage). Other features include, in most forms, the presence of a swim bladder or lungs, external fertilization, and a skull with sutures.

Bony fishes occur in all freshwater and ocean environments, including caves, deep-sea habitats, and thermal springs. The variety of shapes and behavioral habits is remarkable. Body sizes range from tiny species such as the pygmy goby (*Pandaka pygmaea*; 12 millimetres [½ inch]) to the enormous marlins and swordfishes (family Istiophoridae) with lengths up to 4.5 metres (15 feet) and the ocean sunfish (*Mola mola*), which may weigh more than 900 kilograms (1 ton).

bony tongue, any of several heavy-bodied tropical river fishes, family Osteoglossidae,

covered with large, hard, mosaic-like scales except on the head. The largest member of the family, the arapaima, paiche, or pirarucu



Pirarucu (*Arapaima gigas*)
Tom Dolan—EB Inc., painted under the supervision of Loren P. Woods, Chicago Natural History Museum

(*Arapaima gigas*) of South America, may be about 2.4 metres (8 feet) long and weigh about 91 kilograms (200 pounds). It is a valuable, sinuous green fish with a reddish tail. Other bony tongues are the African *Clupisudis* (also known as *Heterotis*), the South American arawana (*Osteoglossum bicirrhosum*), and two species of the East Indian genus *Scleropages*.

booby (*Sula*), any of six or seven species of large tropical seabirds constituting the family Sulidae (order Pelecaniformes). They vary in

Red-footed booby (*Sula sula*)
Eric Hosking—Bruce Coleman Inc.

length from about 65 to 85 centimetres (25–35 inches). The red-footed booby (*Sula sula*) and the masked, or blue-faced, booby (*S. dactylatra*) are wide-ranging in the Atlantic, Pacific, and Indian oceans. The blue-footed booby (*S. nebouxii*) occurs in the Pacific from southern California to northern Peru and on the Galápagos Islands. Boobies' bills are long, their bodies cigar-shaped, and their wings long, narrow, and angular. They fly high above the ocean looking for schools of fish and squid. When prey is sighted they plunge headlong into the water in a swift, vertical drop.

Boobies nest in colonies but have a highly developed territorial sense. Many ritualized displays (*e.g.*, head nodding and jabbing) are used to defend the individual's territory within the large breeding colony. Courtship also involves display—an elaborate dance by the male in which the feet are raised alternately several times, followed by a gesture known to ornithologists as sky-pointing (the birds extend their wings horizontally and toward the tail, raise their heads, and emit a long, continuous whistle). The eggs, usually two in number, are laid on the ground in a rudimentary nest. Boobies get their name from their tameness and lack of fear of humans; they were easily killed by early mariners, who named them boobies to denote their presumed lack of intelligence.

boogie-woogie, heavily percussive style of blues piano in which the right hand plays riffs (syncopated, repeating phrases) against a driving pattern of repeating eighth notes (ostinato bass). It began to appear at the beginning of the 20th century and was associated with the southwestern states—hence its early names, "fast Western style" and "Western rolling blues." Its bass figures are believed to derive from the running sequence of guitar accompaniment.

Boogie-woogie was played in honky-tonks and rent parties on the South Side of Chicago in the 1920s but gained national attention only in the late 1930s. The height of its popularity was marked by a 1938 concert in Carnegie Hall, New York City, featuring its most prominent interpreters. It declined rapidly after World War II.

Among the greatest popularizers of boogie-woogie were Jimmy Yancey, Pinetop Smith, who is generally credited with inventing the term itself, Albert Ammons, Pete Johnson, and Meade "Lux" Lewis.

boojum tree (*Idria columnaris*), tree that is the only species of its genus, in the family Fouquieriaceae. The boojum tree is an unusual plant found native only in the deserts of Baja California and Sonora, Mexico. Fancifully, it resembles a slender upside-down carrot, up to 15 metres (50 feet) tall and covered with spiny twigs that bear yellowish flowers in hanging clusters. As with its relative the ocotillo, the small leaves fall early, leaving the greenish stems to carry out food-producing photosynthesis. The swollen trunk base is often hollow and provides a habitat for honeybees; the wood is somewhat spongy and retains water. The boojum tree is sometimes planted in southern California and Arizona as a landscape curiosity; small plants can be grown indoors.

book, published work of literature or scholarship; the term has been defined by UNESCO for statistical purposes as a "non-periodical printed publication of at least 49 pages excluding covers," but no strict definition satisfactorily covers the variety of publications so identified.

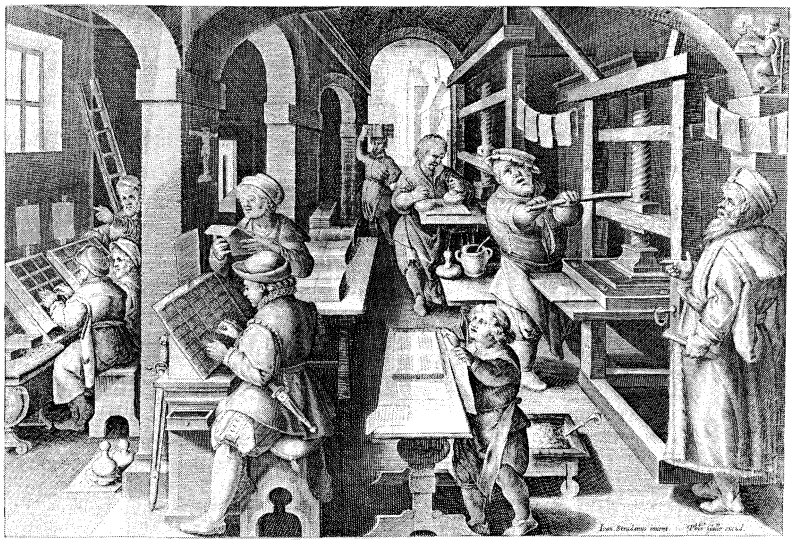
A brief treatment of books follows. For full treatment, *see* MACROPAEDIA: Publishing.

Although the form, content, and provisions for making books have varied widely during their long history, some constant characteristics may be identified. The most obvious is that a book is designed to serve as an instrument of communication—the purpose of such diverse forms as the Babylonian clay tablet, the Egyptian papyrus roll, the medieval vellum or parchment codex, the printed paper codex (most familiar in modern times), microfilm, and various other media and combinations. The second characteristic of the book is its use of writing or some other system of visual symbols (such as pictures or musical notation) to convey meaning. A third distinguishing feature is publication for tangible circulation. A temple column with a message carved on it is not a book nor is a sign or placard, which, though it may be easy enough to transport, is made to attract the eye of the passerby from a fixed location. Nor are private documents considered books. A book may be defined, therefore, as a written (or printed) message of considerable length, meant for public circulation and recorded on materials that are light yet durable enough to afford comparatively easy portability. Its primary purpose is to announce, expound, preserve, and transmit knowledge and information between people, depending on the twin faculties of portability and permanence. Books have attended the preservation and dissemination of knowledge in every literate society.

The papyrus roll of ancient Egypt is more nearly the direct ancestor of the modern book than is the clay tablet of the ancient Sumerians, Babylonians, Assyrians, and Hittites; examples of both date from about 3000 BC.

The Chinese independently created an extensive scholarship based on books, though not so early as the Sumerians and the Egyptians. Primitive Chinese books were made of wood or bamboo strips bound together with cords. The emperor Shih Huang Ti attempted to blot out publishing by burning books in 213 BC, but the tradition of book scholarship was nurtured under the Han dynasty (206 BC to AD 220). The survival of Chinese texts was assured by continuous copying. In AD 175, Confucian texts began to be carved into stone tablets and preserved by rubbings. Lampblack ink was introduced in China in AD 400 and printing from wooden blocks in the 6th century.

The Greeks adopted the papyrus roll and passed it on to the Romans. The vellum or parchment codex, which had superseded the roll by AD 400, was a revolutionary change in the form of the book. The codex introduced several advantages: a series of pages could be opened to any point in the text, both sides of the leaf could carry the message, and longer texts could be bound in a single volume. The medieval vellum or parchment leaves were prepared from the skins of animals. By the 15th century paper manuscripts were common. During the Middle Ages, monasteries characteristically had libraries and scriptoria, places in which scribes copied books. The



Printing books from the *Nova Reperta* (first half of the 17th century), engraving by Theodoor Galle after a drawing by Jan van der Straet *c.* 1550; in the British Museum
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

manuscript books of the Middle Ages, the models for the first printed books, were affected by the rise of Humanism and the growing interest in vernacular languages in the 14th and 15th centuries.

The spread of printing was rapid in the second half of the 15th century; the printed books of that period are known as incunabula. The book made possible a revolution in thought and scholarship that became evident by the 16th century: the sources lay in the capacity of the press to multiply copies, to complete editions, and to reproduce a uniform graphic design along new conventional patterns that made the printed volume differ in appearance from the handwritten book. Other aspects of the printing revolution—cultural change associated with concentration on visual communication as contrasted to the oral modes of earlier times—have been emphasized by Marshall McLuhan.

In the 17th century books were generally inferior in appearance to the best examples of the art of the book in the 16th. There was a great expansion in the reading public in the 17th and 18th centuries in the West, in part because of the increasing literacy of women. Type designs were advanced. The lithographic process of printing illustrations, discovered at the end of the 18th century, was significant because it became the basis for offset printing.

In the 19th century the mechanization of printing provided the means for meeting the increased demand for books in industrialized societies. William Morris, in an effort to renew a spirit of craftsmanship, started the private press movement late in the 19th century. In the 20th century the book maintained a role of cultural ascendancy, although challenged by new media for dissemination of knowledge and its storage and retrieval. The paperbound format proved successful not only for the mass marketing of books but also from the 1950s for books of less general appeal. After World War II, an increase in use of colour illustration, particularly in children's books and textbooks, was an obvious trend, facilitated by the development of improved high-speed, offset printing.

book club, marketing service whereby potential book buyers subscribe to free periodicals describing available books, which are sold by order or by "negative option" (*see* below) and then distributed by mail.

The first book club, established in Germany (1919), reprinted and distributed classics. In the United States the Book-of-the-Month Club (1926) and the Literary Guild (1927) were the first such enterprises, the former distributing more than 200,000,000 new copies of fiction and nonfiction in its first 40 years, especially to areas where there were few bookstores. Book clubs—and similar marketing ventures patterned after them—usually use a technique called negative option, whereby the subscriber must exercise his right to refuse the offered special of the month by returning a refusal notice by mail; otherwise, the book is shipped and the subscriber billed automatically.

By the 1980s nearly 100 book clubs existed in the United States, most of them specialized. The larger general clubs select books judiciously, encouraging business by offering premiums to faithful subscribers, and reducing costs and prices both by marketing large editions and by printing their own editions from publishers' plates. Specialty book clubs cater to particular interests, *e.g.,* psychology, law, religion, mystery stories, history, politics, gardening, and books for younger readers. A common incentive for attracting new members is the offer of several free or heavily discounted books; long-standing members often receive bonuses of books.

book collecting, the exercise of taste, judgment, and connoisseurship in the formation of a special kind of library. The collector's library is formed not merely for his own reference, current reading, or entertainment (though it may include all these) but rather for comprehensiveness and quality within the area it covers.

Private collections have provided the cornerstones of many of the world's great libraries. Oxford's famous library, for example, bears the name of its benefactor, Sir Thomas Bodley, and the collection formed by Charles V, king of France in the 14th century, lies at the heart of the Bibliothèque Nationale of France. Through the efforts of book collectors, basic sources of history and priceless monuments of art and literature have survived that might otherwise have been irretrievably lost. Only in very recent times have governments and institutions assumed some of the functions of preservation; and institutional collections can seldom afford the flexibility of a private library.

Much of the attraction of book collecting lies in the search and pursuit of rare copies. Yet rarity is not necessarily reflected in price. Many books are far more uncommon than Gutenberg Bibles or first folios of Shakespeare, but, when they can be found at all, they may sell for a small fraction of the price of the famous rarities.

While many collectors specialize in first editions, the approaches to collecting are varied. In general, there are three types: the author collection, the subject collection, and the cabinet collection. For an author collection, the collector sets out to gather the works of his chosen author in all the forms in which they have appeared before the public, or he may concentrate on only one phase of his career or even on only one or two of his works. The subject collection can range from a field as sweeping as a collection of classics or of American literature to books on Chess, coffee, prizefighting, detective fiction, or the development of nuclear energy. The third kind of collector limits his library to a small group, or cabinet, of choice specimens, each the best obtainable of its type, although a particular author or subject may form the basis of his collection. Illuminated manuscripts, bookbindings, publishing styles, fine printing, book illustration, and many other topics lend themselves to this approach.

Condition is an important consideration in all types of collecting: a very great difference in value separates a superlative copy of a book from a poor or even an average one. Association is another important factor—a book annotated or otherwise inscribed by its author or containing the markings of some other prominent or interesting person who has owned and used it is particularly desirable to the collector.

The collector must know how books are produced. There are points, or distinctive variations or marks that distinguish one printing or edition from another, which must be learned.

book lung, form of respiratory organ found in certain air-breathing arachnid arthropods (scorpions and a few spiders). Each book lung consists of a series of plates that are highly vascular (*i.e.,* richly supplied with blood vessels), parallel, and leaflike. They provide an extensive surface for the exchange of oxygen and carbon dioxide with the surrounding air. There are four pairs in scorpions and up to two in spiders, each lung being enclosed in a cavity that opens to the exterior by a small slit.

Book of ———: *see under* substantive word (*e.g.*, Mormon, Book of), except as below.

book of hours, devotional book widely popular in the later Middle Ages. The book of hours began to appear in the 13th century, containing prayers to be said at the canonical hours in honour of the Virgin Mary. The growing demand for smaller such books for family and individual use created a prayerbook style enormously popular among the wealthy. The demand for the books was crucial to the development of Gothic illumination. These lavishly decorated texts, of small dimensions, varied in content according to their patrons' desires.

One of the most splendid examples, the *Très Riches Heures* of the Duc de Berry, was created in northern France and the Low Countries during the 14th and 15th centuries. Now held in Chantilly at the Musée Condé, it is an excellent pictorial record of the duke's spectacular residences, with magnificent calendar pages illuminated by the Pol de Limbourg and his brothers (*c.* 1414–18), as well as many biblical scenes and illustrations of the lives of the saints. Other renowned examples are the *Hours* of Jeanne d'Evreux (*c.* 1325), now held in The Cloisters, New York City, and the *Book of Hours of Charles of Angoulême* and the *Livres d'Heures de Rohan* in the Bibliotheque Nationale in Paris.

Book of the Dead, ancient Egyptian collection of mortuary texts made up of spells or magic formulas, placed in tombs and believed to protect and aid the deceased in the hereafter. Probably compiled and re-edited during the 16th century BC, the collection included Coffin Texts dating from *c.* 2000 BC, Pyramid Texts dating from *c.* 2400 BC, and other writings. Later compilations included hymns to Re, the sun god. Numerous authors, compilers, and sources contributed to the work. Scribes copied the texts on rolls of papyrus, often colourfully illustrated, and sold them to individuals for burial use. Many copies of the book have been found in Egyptian tombs, but none contains all of the approximately 200 known chapters. The collection, literally titled "The Chapters of Coming-Forth-by-Day," received its present name from Richard Lepsius, German Egyptologist who published the first collection of the texts in 1842.

book van: *see* bookmobile.

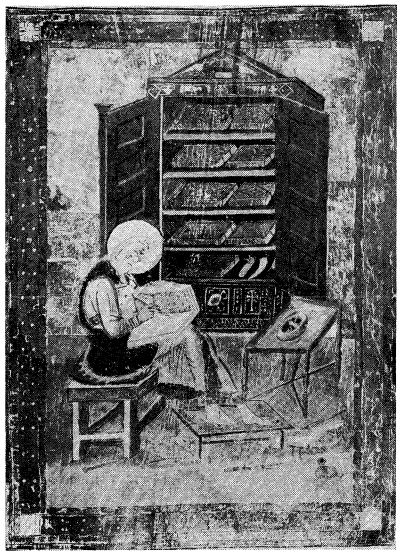
bookbinding, the joining together of a number of leaves or folios (most frequently of paper, parchment, or vellum) within covers to form a codex or book, as opposed to a roll or scroll.

Bookbinding began when the codex started to replace the roll. The earliest elaborately decorated bookbindings were those produced for use on church altars. Those that survive are often magnificent examples of the jeweller's, goldsmith's, ivory carver's, or embroiderer's arts. But the typical artistic bookbinding is of decorated leather, an art first practiced in the monasteries of the Coptic Church in Egypt.

Hand bindery work includes the making of fine-tooled bindings, binding reference books and books of special economic or personal value, and the repair of rare manuscripts, early printed books, and historical documents. In machine bookbinding, casing-in, or affixing the book into its cover (case), is done entirely by semiautomatic or fully automatic machines. The sheets from the press are first folded into sections, or signatures (delivered often as folded sections of 64 pages, or as two 32-page sections, or as four 16-page sections). End sheets (or papers) may be attached to the first and last sections of the book, and systems are designed to sew sections together or fasten them by gluing (called "perfect" binding in the U.S.). Larger books, such as encyclopaedia volumes and other reference books, are usually side sewn (side-sewing machines drill holes through the books, and stitching is done through prepared holes). Other steps, many of which are often linked in automated systems, are "smashing and nipping" (in order to reduce

swell and bring the books down to uniform size), trimming, edge colouring, rounding the backs of books, jacketing and packaging, and wrapping and addressing for mailing. For paperback books, which may be produced on lines similar to those for a case-bound book, specialist binderies have developed combination units that eliminate separate handling for each operation.

bookcase, piece of furniture fitted with shelves, often enclosed by glass doors, to hold books. A form of bookcase was used in early times: the illuminated manuscript Codex Amiatinus (AD 689–716) in Florence contains an illustration of the prophet Ezra writing



The prophet Ezra seated in front of a cupboard designed to hold books, illustration from the illuminated manuscript Codex Amiatinus, 689–716; in the Biblioteca Laurenziana, Florence

By courtesy of the Biblioteca Laurenziana, Florence

in front of a cupboard with open doors and shelves holding books. Ambries (recesses in walls) were used to hold books from the earliest times, and the history of bookcases was also connected with the medieval fittings of college libraries in Britain. Even after the invention of printing, books were still such a rare luxury that they were commonly kept in a chest or on one shelf beneath a desk.

In the Bodleian Library at Oxford, presses (medieval cupboards) were abandoned in favour of shelves rising to such a height that a gallery was introduced for ease of access. This system was adopted in a number of great Palladian houses in Britain in the first half of the 18th century.

Twelve oak bookcases made for the diarist Samuel Pepys are considered the earliest dated domestic examples. The first were installed in August 1666, and they are all now in the Pepys Library at Magdalene College, Cambridge.

In Italy fine built-in bookcases with pilasters, or recessed columns, sometimes with statues or carved urns on the cornice, also made their appearance in the 17th century. At the same time, the French were the first to use bookcases in which the upper part was panelled in glass instead of wood.

In Queen Anne's reign in England (1702–14), bookcases became extremely simple, relying for effect on fine proportions and veneers. They normally had a straight front, the doors of the lower portion revealing drawers when open. Within a few years architectural characteristics such as pediments, cornices, and pilasters became prominent. This trend was less pronounced by 1750. Decoration could be elaborate, but, as Thomas Chippendale suggested in *The Gentleman and Cabinetmaker's Director* (1st edition, 1754), "all may be omitted if required." By this time, too, most large examples were blockfronted.

The classical revival affected the design of bookcases from about 1770, with an emphasis on simple forms and restrained detail. Introduced in the late 18th century were small revolving bookcases, circular or square, with open shelves diminishing in diameter from bottom to top; they revolved on a central pillar resting on a base or claws.

bookkeeping, the recording of the money values of the transactions of a business. Bookkeeping provides the information from which accounts are prepared but is a distinct process, preliminary to accounting (*q.v.*).

Essentially bookkeeping provides two kinds of information: (1) the current value, or equity, of an enterprise and (2) the change in value—profit or loss—taking place in the enterprise over a given period of time. Management officials, investors, and credit grantors all require such information: management in order to interpret the results of operations, to control costs, to budget for the future, and to make financial policy decisions; investors in order to interpret the results of business operations and make decisions about buying, holding, and selling securities; and credit grantors in order to analyze the financial statements of an enterprise in deciding whether or not to grant a loan.

Traces of financial and numerical records can be found for nearly every civilization with a commercial background. Records of commercial contracts have been found in the ruins of Babylon, and accounts for both farms and estates were kept in ancient Greece and Rome. The double-entry method of bookkeeping began with the development of the commercial republics of Italy, and instruction manuals for bookkeeping were developed during the 15th century in various Italian cities.

In the late 18th and early 19th centuries, the Industrial Revolution provided an important stimulus to accounting and bookkeeping. The rise of manufacturing, trading, shipping, and subsidiary services made accurate financial records a necessity. The history of bookkeeping, in fact, closely reflects the history of commerce, industry, and government. In the second half of the 20th century, for example, the vast expansion of industrial and commercial activity required more sophisticated decision-making processes, which in turn required more sophistication in the selection, classification, and presentation of information, increasingly with the aid of computers. Taxation and government regulation became more important and resulted in increased demand for information; business firms had to have available information to support their income tax, payroll tax, sales tax, and other tax reports. Governmental agencies and educational and other nonprofit institutions also grew in size, and the demand for bookkeeping for their own operations increased.

Although bookkeeping procedures can be extremely complex, basically there are two types of books used in the bookkeeping process—journals and ledgers. A journal contains the daily transactions (sales, purchases, and so on), and the ledger contains the record of individual accounts. The daily records from the journals are entered in the ledgers. Each month, as a general rule, an income statement and a balance sheet are prepared from the trial balance posted in the ledger. The purpose of the income statement or profit-and-loss statement is to present an analysis of the changes that have taken place in the ownership equity as a result of the operations of the period. The balance sheet shows the financial condition of a company at a particular date in terms of assets, liabilities, and the ownership equity.

bookmaking, gambling practice of determining odds and receiving and paying off bets on the outcome of sporting events (particularly horse races), political contests, and other competitions. Some Commonwealth countries (including the United Kingdom, Australia, and New Zealand), Belgium, and West Germany permit the operation of bookmaking organizations.

In the United States, however, there are probably several hundred thousand bookmakers, only a few thousand of whom (in Nevada, New York, and New Jersey), operate legally. In addition to horse racing in which the track odds are at least a base for bookmakers' odds, legal bookmaking concentrates on professional baseball, football, basketball, and boxing. Morning-line odds, established by legal bookmakers, are printed in the sports sections of newspapers throughout the United States. Illegally operating bookmakers established, before 1950, a national organization of expert observers who transmit their odds through a network of clearinghouses to individual bookmakers.

The bookmaker seeks in every case to achieve a balanced book, one in which bettors are competing against one another, so that the bookmaker will profit whichever bettor wins. For example, if one bettor bets 6 to 5 on A and another bets 6 to 5 on B in a situation where only one can win, the bookmaker will collect twelve units and pay only eleven units no matter which bettor wins. The vagaries of individual bettors and special information acquired by certain large bettors often make a truly balanced book impossible. To protect himself, therefore, the smaller bookmaker will either limit the total amount bet on a favourite or will "lay off" (re-bet) with a larger bookmaker such bets as he is not prepared conveniently to pay if he loses. Laying off has led to the creation of several large and heavily capitalized bookmaking organizations that accept only bets laid off by other bookmakers. The casual bettor is thereby assured against such losses as occurred often before the 1940s, when local bookmakers, ruined by the victory of some heavily played horse or team, defaulted and vanished.

bookmobile, also called BOOK VAN, or TRAVELING LIBRARY, shelf-lined motor van or other vehicle that carries books to rural and urban areas, establishes library service in areas that are too small to justify the creation of a stable branch, and acts as a demonstration model for communities that can afford library service and may choose to establish future stable branches. The earliest prototypes, which appeared in the 19th century in England and in the early 20th century in the United States, were horse-drawn book wagons. These provided service to individual homes, as well as to village centres.

The development of the automobile eventually made possible the commercial manufacture of specially designed, automated bookmobiles in the period after World War II. Their use spread to France, East and West Germany, Scandinavia, the Soviet Union, Oceania, and other areas.

In a county or provincial library system, the bookmobile may serve as the only distributing agency, or as a substitute or supplement for book stations (book-deposit stops), places where books are left and picked up for readers (*e.g.*, a store, post office, etc.). It can also provide door-to-door service to widely scattered populations with great flexibility in the number of stops, the length of distance covered, and uses. Bookmobiles have been used for servicing school districts, housing visual aids, and transporting educational exhibits. In some areas of the world, bookmobile service may be extended by phone or boat; *e.g.*, Canadian libraries saw in bookmobiles a means of establishing contact with the Eskimos.

bookplate, a label with a printed design intended to indicate ownership, usually pasted inside the front cover of a book. Bookplates probably originated in Germany, where the earliest known example, dated about the middle of the 15th century, is found. The earliest dated bookplate extant is also German, from 1516. The earliest dated example by an American engraver is a bookplate for Thomas Dering in 1749.

Early armorial bookplates in 16th-century England consisted of a simple unornamented shield, symmetrically mantled helmet, crest, and a scroll beneath for the owner's name. Ornamentation waxed gradually until about 1770, when classical motifs regained favour.

Jane Patterson's bookplate designed by Robert Anning Bell, English, 1890s

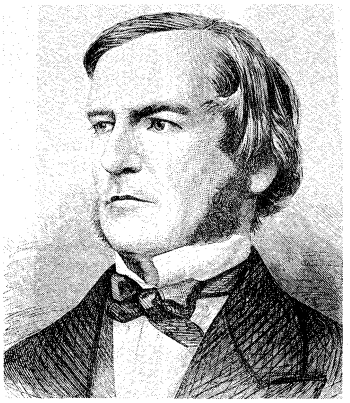
By courtesy of the Victoria and Albert Museum, London

Pictorial bookplates included portraits (one by Albrecht Dürer engraved in 1524), arrangements of stacks of books, views of libraries, and landscapes. Allegorical bookplates were in favour in France during the reign of Louis XV and in England by mid-18th century. On these appeared personifications of the Christian cardinal virtues and other abstract ideas, such as truth, justice, wisdom, hope, and faith. Also introduced into the design were symbols of the interests and occupations of the book's owner, such as scales of justice, naval and military trophies, and palettes. Toward the end of the 19th century, German designers began to use nude figures as a major motif of bookplate design, and this fashion was followed in Europe and the United States. Figures were treated naturalistically, sometimes with erotic intent.

bookworm, any insect (*e.g.,* moths, beetles) whose larval (or adult) forms injure books by gnawing the binding and piercing the pages with small holes. No single species may properly be called the bookworm because a large number of insects feed upon dry, starchy material or paper and may damage books.

Among the most widely known bookworms are the silverfish (order Thysanura) and the booklice (order Psocoptera). Termites and roaches are also frequently guilty.

Boole, George (b. Nov. 2, 1815, Lincoln, Lincolnshire, Eng.—d. Dec. 8, 1864, Ballintemple, County Cork, Ire.), English mathematician who helped establish modern symbolic logic and whose algebra of logic, now called Boolean algebra, is basic to the design of digital computer circuits.



Boole, engraving

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Boole was given his first lessons in mathematics by his father, a tradesman, who also taught him to make optical instruments. Aside from his father's help and a few years at local schools, however, Boole was self-taught in mathematics. When his father's business declined, George had to work to support the family. From the age of 16 he taught in village schools in West Riding, Yorkshire, and opened his own school in Lincoln when he was 20. During scant leisure time he read mathematics journals in the Mechanics Institute, founded about that time for science education. There he wrestled with the *Principia* of the 17th-century English physicist and mathematician Isaac Newton, the *Traité de mécanique céleste* of Pierre-Simon Laplace, and the *Mécanique analytique* of Joseph-Louis Lagrange, both 18th- and early 19th-century French mathematicians, and began to solve advanced problems in algebra.

Boole submitted a stream of original papers to the new *Cambridge Mathematical Journal,* beginning in 1839 with his "Researches on the Theory of Analytical Transformations." These papers were on differential equations and the algebraic problem of linear transformation, emphasizing the concept of invariance. In 1844 he discussed how methods of algebra and calculus may be combined in an important paper in the *Philosophical Transactions of the Royal Society.* That same year he was awarded a medal by the Royal Society for his contributions to analysis (*i.e.,* using algebra and calculus to deal with the infinitely large and the infinitely small). Boole soon saw that his algebra could also be applied in logic.

Developing novel ideas on logical method, and confident in the symbolic reasoning he had derived from his mathematical investigations, he published in 1847 a pamphlet, "Mathematical Analysis of Logic," in which he argued persuasively that logic should be allied with mathematics, not philosophy. He won the admiration of the English logician Augustus De Morgan, who published *Formal Logic* the same year. On the basis of his publications, Boole in 1849 was appointed professor of mathematics at Queen's College, County Cork, even though he had no university degree.

In 1854 he published *An Investigation into the Laws of Thought, on Which Are Founded the Mathematical Theories of Logic and Probabilities,* which he regarded as a mature statement of his ideas. The next year he married Mary Everest, niece of Sir George Everest, for whom the mountain is named. The Booles had five daughters.

One of the first Englishmen to write on logic, Boole pointed out the analogy between the algebraic symbols and those that can represent logical forms and syllogisms, showing how the symbols of quantity can be separated from those of operation. With Boole in 1847 and 1854 began the algebra of logic, or what is now called Boolean algebra. It is basically two-valued in that it involves a subdivision of objects into separate classes, each with a given property. Different classes can then be treated as to the presence or absence of the same property.

Boole's original and remarkable general symbolic method of logical inference, fully stated in *Laws of Thought* (1854), enables one, given any propositions involving any number of terms, to draw conclusions, by the symbolic treatment of the premises, that are logically contained in the premises. He also attempted a general method in probabilities, which would make it possible from the given probabilities of any system of events to determine the consequent probability of any other event logically connected with the given events. In 1857 he was elected a Fellow of the Royal Society.

The influential *Treatise on Differential Equations* appeared in 1859 and was followed the next year by its sequel, *Treatise on the Calculus of Finite Differences.* Used as texts for many years, these works embody an elaboration of Boole's more important discoveries.

Boole's abstruse reasoning led to applications of which he never dreamed: telephone switching and electronic computers use binary digits, which allow a series of dual alternative routines in the mathematical sequence of instructions to these devices.

BIBLIOGRAPHY. For details about Boole's life and contributions to logic, see William Kneale, "Boole and the Revival of Logic," *Mind,* 57:149–175 (1948), with bibliography; see also "Boole" by T.A.A. Broadbent in the *Dictionary of Scientific Biography,* vol. 2 (1970); and E.T. Bell, *Men of Mathematics* (1937, reprinted 1961).

Boolean algebra, symbolic system of mathematical logic that represents relationships between entities—either ideas or objects. The basic rules of this system were formulated in 1847 by George Boole of England and were subsequently refined by other mathematicians and applied to set theory. Today, Boolean algebra is of significance to the theory of probability, geometry of sets, and information theory. Furthermore, it constitutes the basis for the design of circuits used in electronic digital computers (*see* digital computer).

In a Boolean algebra a set of elements is closed under two commutative binary operations that can be described by any of various systems of postulates, all of which can be deduced from the basic postulates that an identity element exists for each operation, that each operation is distributive over the other, and that for every element in the set there is another element that combines with the first under either of the operations to yield the identity element of the other.

The ordinary algebra (in which the elements are the real numbers and the commutative binary operations are addition and multiplication) does not satisfy all the requirements of a Boolean algebra. The set of real numbers is closed under the two operations (that is, the sum or the product of two real numbers also is a real number); identity elements exist—0 for addition and 1 for multiplication (that is, $a + 0 = a$ and $a \times 1 = a$ for any real number a); and multiplication is distributive over addition (that is, $a \times [b + c] = [a \times b] + [a \times c]$); but addition is not distributive over multiplication (that is, $a + [b \times c]$ does not, in general, equal $[a + b] \times [a + c]$.

The advantage of Boolean algebra is that it is valid when truth-values—*i.e.,* the truth or falsity of a given proposition or logical statement—are used as variables instead of the numeric quantities employed by ordinary algebra. It lends itself to manipulating propositions that are either true (with truth-value 1) or false (with truth-value 0). Two such propositions can be combined to form a compound proposition by use of the logical connectives, or operators, AND or OR. (The standard

symbols for these connectives are $\wedge$ and $\vee$, respectively.) The truth-value of the resulting proposition is dependent on the truth-values of the components and the connective employed. For example, the propositions *a* and *b* may be true or false, independently of one another. The connective AND produces a proposition, $a \wedge b$, that is true when both *a* and *b* are true, and false otherwise.

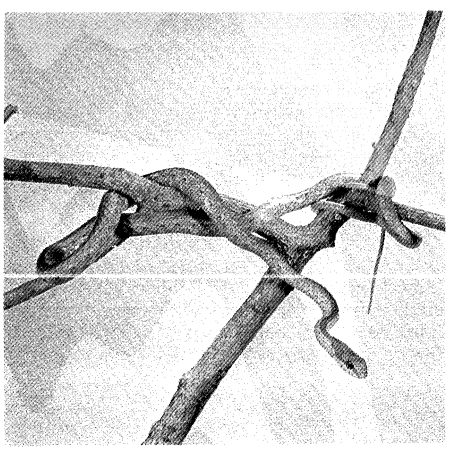
boomerang, curved throwing stick used chiefly by the aborigines of Australia for hunting and warfare. The aborigines used two kinds of boomerangs and many varieties of boomerang-shaped clubs. The returning boomerang (the name derives from the word used by the Turuwal tribe in New South Wales) is light, thin and well balanced, 12–30 inches (30–75 centimetres) in length, and up to 12 ounces (about 340 grams) in weight. It varies in shape from a deep, even curve to almost straight sides of an angle. The ends are twisted or skewed in opposite directions either as the boomerang is being made or after it has been heated in ashes.

The boomerang is thrown with a vigorous action in which the thrower may run a few steps to gain greater impetus. It is held at one end, above and behind the thrower's shoulder, with the concave edge to the front, and swung forward rapidly with the flatter side underneath. Just before release, added impetus is given by a strong wrist movement; it is this spin, together with the skew of the edges, which determines its unique flight pattern. If thrown downward or parallel to the ground, it sweeps upward to a height of 50 feet (15 metres) or more. When thrown so that one end strikes the ground, it ricochets into the air at terrific speed, spinning endwise. It completes a circle or oval 50 yards (45 metres) or more wide and then several smaller ones as it drops to the ground near the thrower. A figure-eight course may also be followed.

Returning boomerangs were used only in eastern and western Australia as playthings, in tournament competition, and by hunters to imitate hawks for driving flocks of game birds into nets strung from trees. The returning boomerang is generally considered to have developed from the nonreturning types, which swerve in flight.

The nonreturning boomerang is longer, straighter, and heavier than the returning variety. With it animals were maimed and killed, while in warfare it caused serious injuries and death. One type has a picklike hook at one end. Boomerang-shaped, nonreturning weapons were used by the ancient Egyptians, by Indians of California and Arizona, and in southern India for killing birds, rabbits, and other animals.

boomslang (*Dispholidus typus*), venomous snake of the family Colubridae, the only colubrid that is decidedly dangerous to man. Occurring in savannas throughout sub-Saharan Africa, it lies in wait in a bush or tree for chameleons and birds; the forepart of the body often extends motionless into the air.



Boomslang (*Dispholidus typus*)

Dade Thornton—The National Audubon Society Collection/Photo Researchers

Its body and eye colour are extremely variable, and camouflage is excellent. In defense the boomslang inflates the neck, showing the dark skin between the scales; it then may strike. It is rear-fanged, but the fangs are set relatively far forward in the mouth. The venom causes hemorrhages and is fatal to man in minuscule amounts.

Boone, city, Boone County, central Iowa, U.S., near the Des Moines River, 15 mi (24 km) west of Ames. Founded in 1865 as a railroad town, it was originally called Montana but was renamed (1871) to honour Capt. Nathan Boone, son of Daniel Boone. With the annexation in 1887 of adjacent Boonesboro (established 1848), it became the county seat. Boone Biblical College was opened in 1905 and the Boone campus of Des Moines Area Community College in 1969. The city's economy is sustained by agriculture, railroads, and light manufacturing. There are many summer camps for youth organizations in the vicinity. Ledges State Park is 4 mi south. The Kate Shelley High Bridge, 4 mi west, is one of the highest (185 ft [56 m] above the river) and longest (2,685 ft) railroad bridges in the U.S. Inc. town, 1866; city, 1868. Pop. (1980) 12,602.

Boone, town, seat of Watauga County, northwestern North Carolina, U.S., 4 mi (6 km) from the Blue Ridge Parkway atop the Blue Ridge Mountains at an altitude of 3,333 ft (1,016 m), near the Tennessee line. On the Daniel Boone Trail at the fork of the Wilderness Road, the settlement was incorporated in 1871 and named for the pioneer who, according to tradition, camped there while on a hunting trip. A noted mountain vacation spot with fishing streams and game forests, it also has a large burley tobacco market and is a beef and dairy cattle centre. Electric components, apparel, and canned foods are produced there. Boone is the seat of Appalachian State University (founded as a teachers' college in 1899), which has a collection of Appalachian artifacts in its Belk Library. An outdoor pioneer drama "Horn in the West" by Kermit Hunter has been produced each summer since 1952 in the Daniel Boone Theatre, 1 mi east. The Seven Devils Ski Area is 1 mi south. Pop. (1980) 10,191.

Boone, Daniel (b. *c.* Nov. 2, 1734, Berks County, Pa.—d. *c.* Sept. 26, 1820, St. Charles, Mo., U.S.), early American frontiersman and legendary hero who helped blaze a trail through Cumberland Gap, a notch in the Appalachian Mountains near the juncture of Virginia, Tennessee, and Kentucky.

Boone had little formal schooling but learned to read and write. As a youth he moved with his family (English Quakers) to the North Carolina frontier. Most of his life was spent as a wandering hunter and trapper.

Many white men had traversed Kentucky before Boone; hence, the legend that he was its discoverer needs qualification. Boone first went a short way through Cumberland Gap to hunt in the fall of 1767, and he and several companions returned to Kentucky to trap and hunt in 1769–71. In 1773 Boone undertook to lead his own and several other families to Kentucky, but the group was attacked by Cherokee Indians just beyond the last settlement. Two of the party, including Boone's son James, were tortured and murdered, whereupon the survivors turned back.

In March 1775 Boone and 28 companions were employed by Richard Henderson's Transylvania Company to blaze a trail through Cumberland Gap. The company planned to establish Kentucky as a 14th colony. Despite Indian attacks, the party built the Wilderness Road, which ran from eastern Virginia into the interior of Kentucky and beyond and became the main route to the region then known as the West. It helped make possible the immediate opening of the first settlements in Kentucky: Boonesborough, Harrod's Town, and Benjamin Logan's. In August 1775 Boone brought his wife Rebecca and their daughter to Boonesborough. They were, except for a few women who had been captured by Indians, the first white women in Kentucky, and their arrival may be said to mark the first permanent settlement there. The plan to establish the 14th colony failed, however, and Kentucky was made a county of Virginia. Boone became a captain in the county's militia and a leader in defending Boonesborough against the Indians. He was captured by Indians in 1778 and was adopted as a son by the Shawnee chief, Blackfish. After five months he escaped to warn Boonesborough settlers of an impending attack. When the attack by British soldiers and Indians came (September 1778), the settlement successfully withstood a 10-day siege.

Boone, portrait by Chester Harding, 1820; in the collection of the Massachusetts Historical Society

By courtesy of the Massachusetts Historical Society

Although a courageous and resourceful leader, Boone did not prosper. He established extensive land claims but could rarely make them good. After the American Revolution he worked as a surveyor along the Ohio River. He settled for a few years in Kanawha County, Va. (now West Virginia). Then, in 1799, he followed his son Daniel Morgan Boone to Missouri, in Louisiana Territory, where he continued to hunt and trap.

A legendary hero even at the time of his death, his fame spread worldwide when in 1823 Lord Byron devoted seven stanzas to him in "Don Juan."

BIBLIOGRAPHY. John Bakeless, *Daniel Boone* (1939, reprinted 1965); J.J. Van Noppen and I.F. Woestemeyer, *Daniel Boone, Backwoodsman* (1966).

Boonesboro, resort village, Clark County, Kentucky, U.S., on the Kentucky River, 9 mi (14 km) southwest of Winchester. It is the site of Ft. Boonesboro, built in 1775 by Daniel Boone and a company of North Carolina men under Col. Richard Henderson who had just opened Boone's Trace (an offshoot of the Wilderness Road) through the Cumberland (Mountains) Gap. The group, under a grant from the Cherokees (regarded as illegal by Britain and Virginia), claimed all the land between the Kentucky and Cumberland rivers which they called Transylvania. The Transylvania Convention held at the fort in May 1775 was the first legislative assembly west of the Appalachians. During the Revolution the settlement was under constant Indian attack.

Here took place the first marriage in Kentucky (Aug. 7, 1776), between Samuel Henderson, younger brother of the pioneer, and Betsy Calloway (who, along with her sister, Fanny, and Boone's daughter, Jemima, had just been rescued from the Indians). The fort, which was abandoned in 1778 after withstanding a Shawnee Indian attack, has been reconstructed within Fort Boonesboro State Park and includes blockhouses, craft shops, and a museum. Pop. (1980) 1,935.

Boonville, city, seat (1818) of Cooper County, central Missouri, U.S. It lies along the Missouri River, 27 miles (43 km) west of Columbia. Settled in 1810 (by Kentuckians, among others) and named for Daniel Boone, it was enlarged as a fort during the War of 1812 and became an important trading post on the river and the Santa Fe Trail. During the American Civil War the first battle in the state was fought near Boonville, and the victory by Captain N. Lyon's Federal troops there is credited with preserving Missouri for the North. Thespian Hall (1855–57), allegedly the oldest theatre west of the Alleghenies, was used during the war as a supply depot, barracks, and hospital. Boonville is now an agriculture-trade centre with some light manufactures (electric appliances, shoes, wood products). It is the home of Kemper Military School and College (1844), the oldest military school west of the Mississippi, and the Missouri Training School for Boys (1889). Arrow Rock State Park is nearby. Inc. village, 1839; city, 1896. Pop. (1984 est.) 6,899.

Boorstin, Daniel J(oseph) (b. Oct. 1, 1914, Atlanta, Ga., U.S.), influential social historian and educator known for his studies of American civilization, notably his major work, *The Americans,* in three volumes: *The Colonial Experience* (1958), *The National Experience* (1965), and *The Democratic Experience* (1973; Pulitzer Prize, 1974).

Boorstin received his B.A. from Harvard University (1934) and two law degrees from the University of Oxford (1936, 1937) as a Rhodes scholar. He taught history at the University of Chicago from 1944 to 1969, writing while there *The Lost World of Thomas Jefferson* (1948), *The Genius of American Politics* (1953), and the first two volumes of *The Americans,* his analysis of American history and culture's distinctive characteristics. Boorstin directed the National Museum of History and Technology at the Smithsonian Institution, Washington, D.C., from 1969 to 1973, and in 1975 he was appointed librarian of Congress, serving in the latter post until 1987. The public use of the Library of Congress more than doubled during his tenure there.

Boorstin continued to write works on American history, politics, and technological change. He was the editor of the "Chicago History of American Civilization" series.

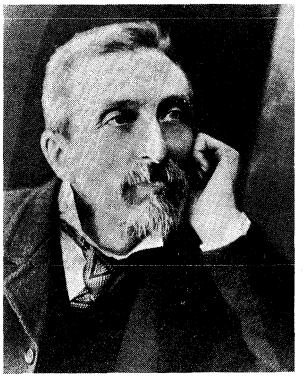
Booth, Catherine, *née* MUMFORD (b. Jan. 17, 1829, Ashbourne, Derbyshire, Eng.—d. Oct. 4, 1890, Clacton, Essex), wife of the founder of the Salvation Army (William Booth), and herself an eloquent preacher and social worker.

Her father was a carriage builder and sometime Methodist lay preacher, her mother a deeply religious woman of Puritan type. Catherine, in adolescence an invalid, was educated principally at home, and early acquired some competence in the theology of her day. The family moved to London in 1844, and she became an active member of the Wesleyan Methodist Church in Brixton. When this church expelled a group of "reformers," she and her future husband joined them. They were married in 1855, and Catherine became her husband's devoted helper.

Catherine Booth was a convinced believer in women's right to preach the gospel, and her pamphlet *Female Ministry* (1859) is still cogent. She herself began to preach in her husband's church at Gateshead in 1860. She became a notable orator and in 1880–84 conducted highly successful meetings in various halls in the West End of London. In 1885 she took part in a campaign that secured the passing of the Criminal Law Amendment Act, designed to protect young girls.

She did not believe that the sacraments are essential to salvation. Although the evolution of the sacramental attitude of the Salvation Army must not be wholly attributed to Catherine Booth, her beliefs were undoubtedly influential.

Booth, Charles (b. March 30, 1840, Liverpool—d. Nov. 23, 1916, Whitwick, Leicestershire, Eng.), English shipowner and sociologist whose *Life and Labour of the People in London,* 17 vol. (1889–91, 1892–97, 1902), contributed to the knowledge of social problems and to the methodology of statistical measurement.



Charles Booth
The Mansell Collection

In 1866 Booth and his brother Alfred began a shipping service between Europe and Brazil. The business was reorganized as Booth Steamship Company, Ltd., in 1901, with Charles Booth as chairman. Appointed a privy councillor in 1904, he was a member of the royal commission on the poor law from 1905 to 1909.

Life and Labour is divided into three subject areas: poverty, industry, and the influences of religion. Booth described the conditions under which various social classes lived. He tried to determine the causes of poverty (of 4,076 cases, 62 percent were paid low or irregular wages; 23 percent had large families or suffered from illness; and 15 percent squandered their earnings, drank excessively, or refused to work) and to show the relationship between poverty and depravity on the one hand and regularity of income and a decent way of living on the other hand. *Life and Labour* contains a series of maps on which various colours indicate the degrees of poverty found street by street. Booth drew on his own observations and those of clergymen of long service in their parishes and consulted records of schools and charitable organizations. Especially concerned with the aged, Booth advocated old-age pensions for all rather than just for persons whose incomes were below a certain standard.

Booth, Edwin (Thomas) (b. Nov. 13, 1833, near Belair, Md., U.S.—d. June 7, 1893, New York City), renowned tragedian of the 19th-century American stage, best-remembered as one of the greatest performers of Shakespeare's *Hamlet.* He was a member of a famous acting family; his brother was John Wilkes Booth, the assassin of President Abraham Lincoln.

At 13 years of age Edwin became companion and chaperon to his eccentric father, the actor Junius Brutus Booth (born in London, 1796), who in 1821 had moved to the United States,

Edwin Booth, photograph by Bradley and Rulofson
By courtesy of the Theatre Collection, the New York Public Library at Lincoln Center, Astor, Lenox and Tilden Foundations

where he achieved popularity second only to that of the American actor Edwin Forrest.

Traveling with his father, whom he endeavoured to keep sane and sober, Edwin absorbed the rudiments of acting in the bombastic style then fashionable. He made his stage debut at the Boston Museum on Sept. 10, 1849, in the part of Tressel to his father's Richard III in an adaptation of Shakespeare's play. Two years later in New York City, when his father refused to act one night, Edwin replaced him as Richard III, giving an imitative but creditable performance.

In 1852 Edwin accompanied his father to California and, after his father's death that year, continued acting, barnstorming through the California mining towns and, in 1854–55, touring Australia and the Sandwich Islands (now Hawaii). His first important appearances as a star were in Boston and New York City in 1857. Younger playgoers flocked to see him, and in 1860, in a series of brilliant performances in New York, he challenged and overcame the dramatic supremacy of the veteran Forrest.

Booth had not yet, however, overcome the unruly temperament inherited from his father. His acting was occasionally fuddled by drink. In 1860 he married the actress Mary Devlin, by whom he had one daughter. It was the double shock of Mary's death in 1863 and his failure to be at her side because he was too drunk to respond to the summons of friends that henceforth made him abstemious.

In 1864 Edwin Booth became comanager of the Winter Garden Theatre in New York. There, he and his brothers, Junius Brutus and John Wilkes, appeared together for the only time on Nov. 25, 1864, playing Brutus, Cassius, and Mark Antony, respectively, in Shakespeare's *Julius Caesar.* From Nov. 26, 1864, to March 22, 1865, Edwin played Hamlet for 100 consecutive nights. Thereafter, he was identified with the part, for which his looks, voice, and bearing suited him. He was slight and dark, with a musical, sympathetic voice and a natural air of reserve. His acting style, quieter than his father's had been, became increasingly sensitive and subdued.

The assassination of President Lincoln by John Wilkes Booth on April 14, 1865, was a blow from which Edwin's spirit never recovered, causing his withdrawal from the stage until January 1866, when he reappeared at the Winter Garden as Hamlet.

In 1869 Booth married the actress Mary McVicker, whose nervous instability made the marriage unhappy. In the same year, he opened his own theatre in New York City. His Shakespearean and other productions were beautifully mounted, but his lack of business

acumen ultimately cost him his theatre and left him bankrupt at 40. By hard work he recouped his losses, acting from then on under the management of others.

Booth first acted in London in 1861. When he revisited England in 1880, his appearances at London's Princess Theatre were near failures until Henry Irving, star and manager of the much superior Lyceum Theatre, invited him to costar at the Lyceum in what proved a memorable engagement, the two actors alternating as Othello and Iago. In 1882, the year after his wife's death, Booth again played England and the next year toured Germany, where the acclaim given his Hamlet, and his Iago and King Lear (considered, after Hamlet, his finest roles) made the German engagement the peak of his career. At home, his financial affairs improved permanently when, in 1886, he formed a business and acting partnership with the American actor-manager Lawrence Barrett.

In 1888 Booth founded a club, the Players, in New York City, that was intended as a gathering place for actors and eminent men in other professions. He lived at the club in his last years. His farewell stage appearance was as Hamlet, in 1891 at the Academy of Music in Brooklyn. To his own and later generations, the nobility of his mature character, his splendid achievement in his art, and his zeal to raise both the moral and social standing of his fellow actors combined to make him one of the great figures of the American stage.

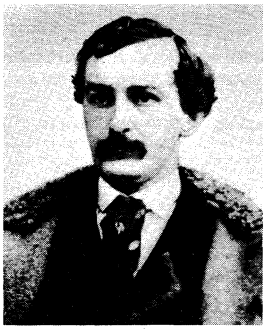
(E.Ru.)

BIBLIOGRAPHY. Eleanor Ruggles, *Prince of Players* (1953), a comprehensive biography. Earlier biographies include: Richard Lockridge, *Darling of Misfortune* (1932), especially interesting for details of Booth's business misadventures; Charles Townsend Copeland, *Edwin Booth* (1901), an admirably concise profile; and William Winter, *Life and Art of Edwin Booth* (1893), a standard and valuable study by a contemporary. An exhaustive work by Stanley Kimmel, *The Mad Booths of Maryland* (1940), examines the entire Booth clan. Otis Skinner, *The Last Tragedian* (1939), presents a sensitive selection of Booth's letters, together with Skinner's vivid memories of him.

Booth, George: *see* Delamere, George Booth, 1st Baron.

Booth, John Wilkes (b. May 10, 1838, near Bel Air, Md., U.S.—d. April 26, 1865, near Port Royal, Va.), member of one of the United States' most distinguished acting families of the 19th century, who assassinated Pres. Abraham Lincoln.

The ninth of ten children born to the actor Junius Brutus Booth, he early showed excellent theatrical potential but also exhibited an emotional instability and a driving egocentricity that made it difficult for him to accept his brother Edwin's rise to acclaim as the foremost actor of the day.



John Wilkes Booth

By courtesy of the National Archives, Washington, D.C.

After an unsuccessful Baltimore theatrical debut in 1856, John played minor roles in Philadelphia until 1859, when he joined a Shakespearean stock company in Richmond, Va. He was widely acclaimed on a tour of the Deep South in 1860 and remained in demand as an actor throughout the Civil War.

A vigorous supporter of the Southern cause, Booth was outspoken in his advocacy of slavery and his hatred for Lincoln. He was a volunteer in the Richmond militia that hanged the Abolitionist John Brown in 1859 and served as a Confederate secret service agent during the war.

By the autumn of 1864 Booth had begun to plan a sensational abduction of President Lincoln. He recruited several co-conspirators, and throughout the winter of 1864–65 the group gathered frequently in Washington, D.C., where they mapped out a number of alternative abduction plans. After several attempts had miscarried, Booth resolved to destroy the President and his officers at any cost.

On the morning of April 14, 1865, he learned that the President was to attend an evening performance of the comedy *Our American Cousin* at Ford's Theatre in the capital. Booth hurriedly assembled his band and assigned each member his task, including the murder of Secretary of State William Seward. He himself would kill Lincoln. Around 6 PM Booth entered the deserted theatre, where he tampered with the outer door of the presidential box so that it could be jammed shut from the inside. He returned during the play's third act to find Lincoln and his guests unguarded.

Entering the box, Booth drew a pistol and shot Lincoln through the back of the head. He grappled briefly with a patron, swung himself over the balustrade, and leaped off it, shouting "Sic semper tyrannis! The South is avenged!" He landed heavily on the stage, breaking a bone in his left leg, but was able to make his escape to the alleyway and his horse. The attempt on Seward's life failed, but Lincoln died shortly after seven the following morning.

Twelve days later, Federal troops arrived at a farm in Virginia, just south of the Rappahannock River, where a man said to be Booth was hiding in a tobacco barn. The barn was set afire, and the man either shot himself or was shot by a soldier. The badly distorted body was transported back to Washington, where it was identified by several of Booth's acquaintances. Because the identification was equivocal, some people doubted that the man was actually Booth, but none of the various charges that people or organizations other than Booth engineered the assassination was ever proved.

Booth, Maud Ballington, *née* MAUD ELIZABETH CHARLESWORTH (b. Sept. 13, 1865, Limpsfield, Surrey, Eng.—d. Aug. 26, 1948, Great Neck, N.Y., U.S.), Salvation Army leader and co-founder of the Volunteers of America.

Booth began attending Salvation Army meetings in 1881 and was soon working for the organization in France, Switzerland, and England. In 1886 she married Ballington Booth, son of William Booth, the founder of the Salvation Army, and the next year they took command of Salvation Army work in the United States.

For nine years Maud Booth helped to establish the Salvation Army in America. In 1896 a disagreement with William Booth over administrative policy led Maud and Ballington Booth to resign from the Salvation Army and to establish the rival Volunteers of America, which became a lasting religious and charitable organization.

Maud Booth later became absorbed in prison reform, working for the religious and social rehabilitation of prisoners and contributing to the development of the parole system.

Booth, William (b. April 10, 1829, Nottingham, Nottinghamshire, Eng.—d. Aug. 20, 1912, London), founder and general (1878–1912) of the Salvation Army.

The son of a speculative builder, he was apprenticed as a boy to a pawnbroker. At 15 he underwent the experience of religious conversion and became a revivalist preacher. In 1849 he went to London, where he worked in a pawnbroker's shop at Walworth, hating the business but bound to it by the necessity of sending money home. At this period he met Catherine Mumford, his future wife and lifelong helpmate (*see* Booth, Catherine). In 1852 he had become a regular preacher of the Methodist New Connection, and in 1855 they were married. After nine years of ministry Booth broke loose from the New Connection and began his career as an independent revivalist.

Booth held the simple belief that eternal punishment was the fate of the unconverted. Coupled with this was a profound pity for the outcast and a hatred of dirt, squalor, and suffering. In 1864 Booth went to London and continued his services in tents and in the open air and founded at Whitechapel the Christian Mission, which became (in 1878) the Salvation Army and which made every convert a "daily witness for Christ," both in public and private. Booth modelled its "Orders and Regulations" on those of the British Army. Its early "campaigns" excited violent opposition; a "Skeleton Army" was organized to break up the meetings, and for many years Booth's followers were subjected to fines and imprisonment as breakers of the peace. After 1889 these disorders were little heard of. The operations of the Army were extended in 1880 to the United States, in 1881 to Australia, and later to the European Continent, to India, to Ceylon, and elsewhere—General Booth himself being an indefatigable traveller, organizer, and speaker.

In 1890 General Booth published *In Darkest England, and the Way Out,* in which he had the assistance of William Thomas Stead. He proposed to remedy pauperism and vice by 10 expedients: (1) the city colony; (2) the farm colony; (3) the oversea colony; (4) the household salvage brigade; (5) the rescue homes for fallen women; (6) deliverance for the drunkard; (7) the prisongate brigade; (8) the poor man's bank; (9) the poor man's lawyer; (10) Whitechapel-by-the-Sea. Money was liberally subscribed and a large part of the scheme was carried out. The opposition and ridicule with which Booth's work was for many years received gave way, towards the end of the 19th century, to very widespread sympathy as his genius and its results were more fully realized. The active encouragement of King Edward VII, at whose insistence in 1902 he was invited officially to be present at the coronation ceremony, marked the completeness of the change; and when, in 1905, General Booth went through England, he was received in state by the mayors and corporations of many towns. In the United States also and elsewhere, his work was cordially encouraged by the authorities. The fiery old man had become a great figure in English life.

Booth, William Bramwell (b. March 8, 1856, Halifax, Yorkshire, Eng.—d. June 16, 1929, London), second general of the Salvation Army (1912–29) and eldest son of William and Catherine Booth.

He became an active full-time collaborator in 1874 and, from 1880, was the Army's chief organizer. He carried into practice the social services plans outlined by his father. In 1885, together with William Thomas Stead, he stood trial at the Old Bailey on a technical charge connected with the successful attempt to secure legislation protecting young girls in moral danger, but he was acquitted. The trial—and Stead's vigorous press campaign—proved to a skeptical public that in 19th-century England

girls could be bought and sold for immoral purposes, not only without their consent but against their will. An able speaker and a tireless exponent of the doctrine of Christian perfection, he published nine books, of which *Echoes and Memories* (1925) and *These Fifty Years* (1929) are perhaps the best known. William Bramwell Booth was also an enthusiast for religious work among young people. He became general on his father's death.

Boothbay Harbor, town, Lincoln County, southern Maine, U.S., on a peninsula of the Atlantic coast, between the Sheepscot and Damariscotta rivers, 59 miles (95 km) east-northeast of Portland. Originally part of Boothbay (supposedly settled in 1630), it was set off and incorporated in 1889 and developed as a trading and shipbuilding centre. Boothbay Harbor is now the pivot of a popular resort and fishing area. Light manufactures include canvas goods, boats, and food products. There are railway and historical-society museums in the town, and the *Sherman Zwicker,* a Grand Banks fishing schooner, is preserved as a museum. The headquarters of the State Sea and Shore Fisheries Research Station is 3 miles (5 km) west at McKown's Point. Old schooners sail into the harbour en masse for the annual Windjammer Days (July). Pop. (1982 est.) 2,183.

Consult the INDEX *first*

Boothferry, district (borough), county of Humberside, England, at the head of the Humber Estuary. With an area of 250 square miles (647 square km), the borough centres on the port of Goole. The name recalls the old Booth ferry, replaced by a road bridge in 1928, across the River Ouse near the medieval market town of Howden.

The largely agricultural district is crossed by five rivers. Through drainage, diversion, and warping (silt reclamation), rich arable lands yield heavy crops of cereals, sugar beets, and vegetables. Goole has light industry, and the borough includes Epworth (the birthplace of John Wesley) and Howden, noted for its ancient minster. Pop. (1985 est.) 61,500.

Boothia Peninsula, northernmost portion of mainland North America, reaching 71°58′ N, in Franklin District, Northwest Territories, Canada. It was discovered in 1829 by Sir James Ross, who named it Boothia Felix in honour of Sir Felix Booth (the expedition's financier); Ross established the first location of the north magnetic pole on the peninsula's western coast (1831). Other explorers, namely Sir John Franklin and Roald Amundsen, visited Boothia Peninsula in later years. The peninsula is a treeless plateau with an area of 12,483 square miles (32,330 square km) and with a width of 120 miles (195 km). It extends 170 miles into the Arctic Ocean. The peninsula is sparsely populated; Spence Bay (with a notable garment [parka] industry) and Thom Bay in the south are the only settlements.

Booths, Feast of (Judaism): *see* Sukkoth.

bootlace worm: *see* ribbonworm.

bootlegging, in U.S. history, illegal traffic in liquor in violation of legislative restrictions on its manufacture, sale, or transportation. The word apparently came from the early American practice of concealing flasks of illicit liquor in boot tops when going to trade with the Indians. It became part of the American vocabulary during the national prohibition effected by the Eighteenth Amendment from 1920 until its repeal in 1933. Bootlegging was one aspect of the worldwide social dislocations that followed World War I, part of the American phenomenon of lawlessness and political corruption that accompanied profound changes in private mores and technological-economic institutions.

In a colourful era of speakeasies and nightclubs, illegal liquor production and distribution led to the establishment of organized crime, which persisted long after the repeal of prohibition.

The bootlegger flourished because the demand for alcohol reached an all-time high. Bootleggers used various means of circumventing the law. Smuggling across national borders was supplemented by fleets of foreign registry rum-running ships operating outside territorial waters. In addition, millions of bottles of "medicinal" whiskey were sold under real or forged prescriptions. Finally, bootleggers took to bottling their own concoctions of spurious liquor. After a decade of prohibition, disregard of the law had become widespread, and in 1933 the "noble experiment" was abandoned. The bootlegger did not become extinct, however. In the late 20th century, prohibition still existed in many U.S. counties and municipalities, and bootlegging continued to thrive as an illegal business. *See also* prohibition.

bop (music): *see* bebop.

Bophuthatswana, republic in southern Africa. It consists of seven territorial units, six of which are landlocked enclaves within north central South Africa; the seventh lies between South Africa and Botswana. Its total area was about 17,000 square miles (44,000 square km) in the early 1980s. Its capital, Mmabatho, is situated northwest of Mafikeng (formerly Mafeking), which became part of Bophuthatswana in 1980. The name of the republic means "that which binds" (*bophutha*) to the Tswana-speaking people. The Tswana settled in the area of what is now the republic of Bophuthatswana about 1600. The region suffered from war started by Shaka, the founder of the Zulu Empire and from famine between 1822 and 1837. The resulting migrations led to the formation of subgroups of Tswana and new settlements. In 1837 the Boers gained control of the region.

Formerly parts of the Transvaal, Cape Province, or Orange Free State in South Africa, Bophuthatswana was designated a Tswana "homeland" in the 1960s. The territorial assembly created in 1961 was replaced a decade later with a partly-elected, partly-appointed legislative assembly. The state became officially self-governing (1972) as one of South Africa's non-independent black states, with Lucas M. Mangope as chief minister. Bophuthatswana was declared an independent republic in December 1977. It had a new flag and a new constitution, and the newly-built town of Mmabatho served as the capital. Mangope became the first president, and his Bophuthatswana Democratic Party dominated the first national assembly. Only South Africa recognized Bophuthatswana as an independent state.

Located to the north and the west end of the Witwatersrand, Bophuthatswana has considerable mineral wealth. It is one of the world's major producers of platinum. There are also asbestos, chromium, gold, granite, iron ore, manganese, nickel, and vanadium deposits. Most of the semiarid terrain is used for grazing beef and dairy cattle. Scarce arable land supports corn (maize), sorghum, wheat, peanuts (groundnuts), fruits, and cowpeas. Small-scale industries produce beverages, processed tobacco, textiles, wood products, leather goods, plastic products, chemicals, paper, fabricated metal products, and machinery. Babelegi, about 25 miles (40 km) north of Pretoria, was selected as a site for industrial development in the 1970s. Mafikeng and the Witwatersrand are places of employment for many of Bophuthatswana's commuters and contract migrant workers. Casinos became a source of income after independence. Pop. (1983 est.) de facto, 1,395,000.

Bopolu, also called BOPORA, or BOPORO, town, western Liberia, Western Africa. Once the centre of the Mandingo-dominated Kondo Confederation—including the Gola, Vai, De (Dei), and Loma—the area surrounding Bopolu

Village outside Bopolu, Liberia
Charles Miller—Shostal/EB Inc.

probably reached its height under King Bosan (Boatswain; 1775–1836). Slaves, ivory, gold, and camwood from the north were sent by Bopolu traders to the coastal Vai and De in exchange for salt, tobacco, guns, and European cloth. Cultivation of rice and cassava is now the region's main economic activity, and there is some diamond prospecting in the area. Pop. (latest census) 500.

Bopp, Franz (b. Sept. 14, 1791, Mainz, Archbishopric of Mainz [now in W.Ger.]—d. Oct. 23, 1867, Berlin), German linguist who established the importance of Sanskrit in the comparative study of Indo-European languages and developed a valuable technique of language analysis.

Bopp
Bruckmann—Art Reference Bureau

His first important work, *Über das Conjugationssystem der Sanskritsprache* . . . (1816; "On the System of Conjugation in Sanskrit . . ."), foreshadowed his major achievement. In it he sought to trace the common origin of Sanskrit, Persian, Greek, Latin, and German, a task never before attempted. Concentrating on a historical analysis of the verb, he assembled the first trustworthy materials for a history of the languages compared. In 1820 he extended the study to include the other grammatical parts.

Professor of Oriental literature and general philology at the University of Berlin (1821–67), he published a Sanskrit grammar (1827) and a Sanskrit and Latin glossary (1830). His chief activity, however, centred on the preparation of his great work in six parts, *Vergleichende Grammatik des Sanskrit, Zend, Griechischen, Lateinischen, Litthauischen, Altslawischen, Gotischen und Deutschen* (1833–52; "Comparative Grammar of Sanskrit, Zend, Greek, Latin, Lithuanian, Old Slavic, Gothic, and German"). In this work he attempted to describe the original grammatical structure of the languages, trace their phonetic laws, and investigate the origin of their grammatical forms. He also produced a number of monographs, including studies of several European language groups, papers on the relation

of the Malayo-Polynesian (Austronesian) and Indo-European languages (1840), and on the accent in Sanskrit and Greek (1854).

Boquerón, department, northwestern Paraguay, bounded on the northwest by Bolivia, on the southwest by Argentina, on the east by Presidente Hayes department, and on the north by Nueva Asunción and Alto Paraguay departments. Until 1973 it was the country's largest department, with 64,877 sq mi (168,030 sq km), but in that year its area was reduced to 18,034 sq mi by the creation of the new departments of Canendiyú, Chaco, and Nueva Asunción and by the enlargement of the surrounding departments of Presidente Hayes and Olimpo (now Alto Paraguay). Established in 1944 and occupying the heart of the wild Chaco Boreal, a region of scrub forest and grassland, it is crossed by a network of unstable river courses. The principal river in the region is the Pilcomayo, a tributary of the Paraguay River, on the province's southern border. The climate is humid and tropical. Quebracho timber, the main product, yields hardwood and tannin and is shipped by narrow-gauge railways to ports on the Paraguay River. Other products of the region are soybeans, cotton, broomcorn (a type of sorghum used to make sweeping brooms), and peanuts (groundnuts). Pedro P. Peña is the capital of the department. Filadelfia town in the northeastern part of the department is largely inhabited by Mennonites who migrated from Canada in the early 20th century. Route 9 connects the southwestern part of the department with the main highway to Asunción. Wildlife includes jaguars, pumas, wild hogs, tapirs, and foxes. Pop. (1982 prelim.) 14,611.

Bor, town, capital of Junqalī *mudīrīyah* (province), Southern Region, southern Sudan, on the eastern bank of Baḥr (river) al-Jabal, and about 87 mi (140 km) north of Jūbā. Located at an elevation of 1,394 ft (425 m), it is an agricultural centre for the surrounding areas supporting grain production (mainly millet and sesame) and subsistence herding of livestock. Traditional handicrafts comprise leather and woodworking and primary processing of hides. It serves as a station for the Jūbā–Khartoum ferry service. Roads link it with Jūbā and Malakāl and it has a domestic airport. In 1840 Bor was the headquarters of the second expedition under Selim "Caputan" sent by Muḥammad 'Alī, the viceroy of Egypt, for the conquest of the southern Sudan. Bor had a school started by a Christian missionary society in 1905; it was taken over by the government after the expulsion of missionaries in 1962.

Bor, city, Gorky *oblast* (administrative region), western Russian Soviet Federated Socialist Republic, on the left bank of the Volga River opposite the city of Gorky, to which it is connected by a highway bridge (completed 1965). Industries include ship repair and the manufacture of ships' fittings, port equipment, and glass articles. Bor became a city in 1938. Pop. (1983 est.) 64,000.

Bor, city, eastern Serbia, Yugoslavia. Site of one of the largest copper mines in Europe, it has been a mining centre since 1904, when a French company began operations there. Situated on a side road, off a main road running south from Belgrade to Niš, the city is linked by a narrow-gauge railroad with Zaječar and Paraćin. A new copper mine has opened at the Bor Mining and Smelting Works (RTB Bor), the massive works producing copper, gold, silver, and, through the electrolytic refining of silver and gold, platinum and palladium as well. Nearby, at Veliki Krivelj, a large new deposit of high grade copper ore has recently been under development. Bor has a mining college and a mining museum. The town of Gamzigrad, with medieval remains, is nearby. Pop. (1981 prelim.) mun., 56,486.

bora, very strong, cold wind that blows from the northeast onto the Adriatic region of Italy and Yugoslavia. The word is Venetian dialect, from Latin *boreas,* "northwind." It is commonest in winter and occurs when cold air crosses the mountains from the east and descends to the coast so rapidly that it has little time to warm up. It often reaches speeds of more than 100 kilometres (60 miles) per hour and has been known to knock people down and overturn vehicles.

The name bora is given to similar winds in other parts of Europe, including Bulgaria, the Black Sea, and Novaya Zemlya in the Soviet Arctic.

Bora-Bora, volcanic island, Îles Sous le Vent (Leeward Group), Society Islands, French Polynesia, central South Pacific, 140 mi (225 km) northwest of Tahiti. The mountainous island, 4 mi long and 2½ mi wide, has Mt. Otemanu (Temanu; 2,385 ft [727 m]) and twin-peaked Mt. Pahia (2,159 ft) as its highest peaks. It is surrounded by coral reefs. On the west side of the island is a large lagoon in which an island strip protects a spacious harbour, popular with yachtsmen. Vaitape, the principal village, is on the west coast. Motu Mute islet on the northwest side of Bora-Bora's reef was a U.S. air base during World War II; the airstrip is still in use. Chief products are copra and mother-of-pearl. Pop. (1977) 2,572.

Borach, Fannie (comedienne): *see* Brice, Fanny.

boracite, colourless, glassy borate mineral, magnesium chloroborate ($Mg_3B_7O_{13}Cl$). It has been found as crystals embedded in sedimentary deposits of anhydrite, gypsum, and halite. A massive variety occurs as nodules in the salt-dome deposits at Stassfurt, E.Ger., where it has been mined as a source of boron. For detailed physical properties, *see* borate mineral (table).

borage (*Borago officinalis*), often grown for bee feeding, salads, and beverage flavouring;

Borage (*Borago officinalis*)
A to Z Botanical Collection—EB Inc.

a 60-centimetre (2-foot), hairy, annual plant with large, rough, oblong leaves and loose, drooping clusters of starlike, bright-blue flowers. It belongs to the family Boraginaceae. The five bright-yellow stamens form a cone at the star centre. Flowers are sometimes white or rose, and flowering stalks are usually reddish. The plant has a cool, cucumber-like bouquet and taste. The leaves are cooked as a vegetable in Europe. Dried or fresh leaves are used in seasoning stews and soups.

Borage was native to the eastern Mediterranean region and was used by the ancient Greeks. It is cultivated today in various parts of Europe, Great Britain, and North America.

Boraginaceae, family of annual plants, composed of at least 100 genera and about 2,000 species, chiefly of herbs but also including some trees and shrubs, characterized by hairy foliage. Members of the borage family are found in tropical and temperate areas and are most concentrated in the Mediterranean region. The leaves are usually alternate and simple; flowers are funnel-shaped or tubular and flaring, with five lobes, often nodding or in coiled sprays. The flowers are frequently

Virginia bluebell (*Mertensia virginica*)
Roche

distinguished for their bright blues, which sometimes show a shading of red.

Among the members of this order are several ornamental plants grown to a limited extent in gardens, including the Virginia bluebell (*Mertensia virginica*), forget-me-nots (*Myosotis* species), heliotropes (*Heliotropium* species), lungworts (*Pulmonaria* species), and borage (*Borago officinalis*). Somewhat lesser known are honeywort (*Cerinthe* species), hounds' tongue (*Cynoglossum* species), and viper's bugloss (*Echium* species). The blue devil, or blue weed (*E. vulgare*), tends to be a bristly, noxious weed and is difficult to eradicate. The few members known for other economic significance include borage, used as an herbal and bee plant; comfrey (*Symphytum officinale*), grown as an herbal plant; dyer's alkanet (*Alkanna tinctoria*), the roots of which yield a red colouring agent; and gromwell (*Lithospermum officinale*), the leaves of which can be used to make a tea.

Borah, William E(dgar) (b. June 29, 1865, Fairfield, Ill., U.S.—d. Jan. 19, 1940, Washington, D.C.), Republican U.S. senator from Idaho for 33 years, best known for his major role at the end of World War I (1918) in preventing the United States from joining the League of Nations and the World Court.

Borah
By courtesy of the Library of Congress, Washington, D.C.

Borah practiced law in Boise, Idaho, and in 1892 became chairman of the Republican State Central Committee. He first won election to the U.S. Senate in 1906 and was returned to office five times by large majorities, making his tenure one of the longest in U.S. history. Borah's distrust of government centralization limited his commitment to social reform, but he did sponsor bills establishing the Department of Labor as well as the federal Children's Bureau. He also strongly supported the federal income tax and fought the trusts.

Isolationism dominated Borah's attitudes toward foreign policy. He did, however, sponsor a congressional resolution (1921) calling for an international naval disarmament conference in Washington, D.C., resulting in the Naval Armament Limitation Treaty concluded Feb. 6, 1922. Assuming the chairmanship of the Senate Committee on Foreign Relations in 1924, he wielded enormous power in this area for the next 16 years.

Borah did not object to international compacts so long as the enforcement mechanism was limited to moral sanctions; thus he lent his support to the Kellogg–Briand Pact (Paris, 1928)—an ineffective multilateral agreement theoretically outlawing war as an instrument of national policy. He consistently upheld diplomatic recognition of the Soviet Union and also helped establish the Good Neighbor policy toward Latin America by advocating a fair deal for Mexico during the controversy over foreign-held oil properties (1926–28).

During the Great Depression of the 1930s, Borah supported many New Deal measures designed to relieve internal economic conditions. As European tensions mounted, however, he held fast to his isolationist stance by resisting all attempts to involve the U.S. on the side of the Allies.

BIBLIOGRAPHY. C.O. Johnson, *Borah of Idaho* (reprinted 1967); M.C. McKenna, *Borah* (1961); R.J. Maddox, *William E. Borah and American Foreign Policy* (1969).

Borah Peak, highest point (12,662 ft [3,859 m]) in Idaho, U.S., in Lost River Range, part of Challis National Forest, in Custer County, 50 mi (80 km) northeast of Hailey. It was named for William E. Borah, U.S. senator from Idaho.

borane, any of a homologous series of inorganic compounds of boron and hydrogen or their derivatives (*see* boron).

Borås, town, *län* (county) of Älvsborg, southwestern Sweden, on Viskan River, east of Göteborg. It was founded in 1622 by King Gustavus II Adolphus. Borås is Sweden's leading textile centre, with cotton and woollen mills, dye works, hosiery factories, and weaving colleges. It is also the main centre for ready-made clothing and for mail order firms. In the western part of town is an open-air museum, the buildings of which include the wooden Kinnarumma Church and old peasant houses. Pop. (1983 est.) mun., 100,715.

borate mineral, any of various naturally occurring compounds of boron and oxygen. Most borate minerals are rare, but some form large deposits that are mined commercially.

Borate mineral structures incorporate either the BO_3 triangle or BO_4 tetrahedron in which oxygen or hydroxyl groups are located at the vertices of a triangle or at the corners of a tetrahedron with a central boron atom, respectively. Both types of units may occur in one structure. Vertices may share an oxygen atom to form extended boron–oxygen networks, or if bonded to another metal ion consist of a hydroxyl group. The size of the boron–oxygen complex in any one mineral generally decreases with an increase of the temperature and pressure at which the mineral forms.

Two geological settings are conducive for the formation of borate minerals. The first is commercially more valuable and consists of an environment where an impermeable basin received borate-bearing solutions that resulted from volcanic activity. Subsequent evaporation caused precipitation of hydrated alkali and alkaline-earth borate minerals. With increased depth of burial resulting from additional sedimentation, beds of compositionally stratified borates crystallized as a consequence of temperature and pressure gradients. Because evaporation must occur for precipitation of the borates, such basin deposits usually occur in desert regions, as for example the Kramer

Borate minerals

name formula	colour	lustre	Mohs hardness	specific gravity	habit or form	fracture or cleavage	refractive indices	crystal system space group	remarks
boracite $Mg_3B_7O_{13}Cl$	colourless or white	vitreous	7–7½	2.9–3.0	isolated, embedded, cubelike crystals	conchoidal to uneven fracture	$\alpha = 1.658–1.662$ $\beta = 1.662–1.667$ $\gamma = 1.668–1.673$	orthorhombic (isometric above 265° C) Cmm	strongly piezoelectric and pyroelectric
borax $Na_2B_4O_7 \cdot 10H_2O$	colourless to white; grayish, bluish, greenish	vitreous to resinous	2–2½	1.7	short prismatic crystals	one perfect, one good cleavage	$\alpha = 1.445$ $\beta = 1.469$ $\gamma = 1.472$	monoclinic C_{2h}^{2} c	feeble, sweetish alkaline taste; diamagnetic
colemanite $Ca_2B_6O_{11} \cdot 5H_2O$	colourless; white, yellowish, gray	brilliant vitreous to adamantine	4½	2.4	short prismatic crystals; massive	one perfect, one distinct cleavage	$\alpha = 1.586$ $\beta = 1.592$ $\gamma = 1.614$	monoclinic P_{2}^{2} m	
inyoite $Ca_2B_6O_{11} \cdot 13H_2O$	colourless, becoming white and cloudy after partial dehydration	vitreous	2	1.7	short prisms and coarse crystal aggregates; geodes;drusy crusts; granular massive	one good cleavage	$\alpha = 1.492–1.495$ $\beta = 1.501–1.510$ $\gamma = 1.516–1.520$	monoclinic	
kernite $Na_2B_4O_7 \cdot 4H_2O$	colourless	vitreous	2½	1.9	very large crystals; fibrous, cleavable, irregular masses	two perfect cleavages	$\alpha = 1.454$ $\beta = 1.472$ $\gamma = 1.488$	monoclinic P_{2}^{2} c	
ludwigite $Mg_2Fe^{+3}BO_5$	dark green to coal black	silky	5	3.6 (lud) to 4.7 (paig)	fibrous masses; rosettes; sheaflike aggregates	no observed cleavage	$\alpha = 1.83–1.85$ $\beta = 1.83–1.85$ $\gamma = 1.97–2.02$	orthorhombic	forms a solid solution series with paigeite in which Fe^{+2} replaces Mg
priceite $Ca_4B_{10}O_{19} \cdot 7H_2O(?)$	white	earthy	3–3½	2.4	soft and chalky to hard and tough nodules	earthy to conchoidal	$\alpha = 1.569–1.576$ $\beta = 1.588–1.594$ $\gamma = 1.590–1.597$	triclinic(?)	
sussexite $MnBO_2(OH)$	white to straw-yellow	silky to dull or earthy	3–3½	2.6 (szai) to 3.3 (suss)	fibrous or felted masses or veinlets; nodules		$\alpha = 1.575–1.670$ $\beta = 1.646–1.728$ $\gamma = 1.650–1.732$	probably orthorhombic	forms a solid solution series with szaibelyite in which Mg replaces Mn; szaibelyite has the lower refractive indices
tincalconite $Na_2B_4O_5(OH)_4 \cdot 3H_2O$	white (natural); colourless (artificial)	vitreous		1.9	found in nature as a fine-grained powder; physical properties are given for artificial pseudocubic crystals	hackly fracture	$\omega = 1.461$ $\varepsilon = 1.474$	hexagonal R32	
ulexite $NaCaB_5O_9 \cdot 8H_2O$	colourless; white	vitreous; silky or satiny	2½	2.0	small nodular, rounded, or lenslike crystal aggregates; fibrous botryoidal crusts; rarely as single crystals	one perfect, one good cleavage	$\alpha = 1.491–1.496$ $\beta = 1.504–1.506$ $\gamma = 1.519–1.520$	triclinic	

district of the Mojave Desert and Death Valley in California where enormous beds of stratified kernite, borax, colemanite, and ulexite are recovered, primarily by stripping away the overburden and mining the borates by classical open-pit techniques. Other noteworthy evaporite deposits occur in the Inderborsky district of the Soviet Union and in Tuscany, Italy. The sequence of precipitating alkali borates can be duplicated in the laboratory because the temperatures and pressures of their formation are low and easily accessible. Solutions of the alkali borates and the addition of metal ions such as calcium and magnesium result in the precipitation of yet other borate compounds. Among the borates commonly found in evaporite deposits are borax, colemanite, inyoite, kernite, and tincalconite.

The second geologic setting for borate minerals is a metamorphic carbonate-rich environment where they are formed as a result of alteration of the surrounding rocks by heat and pressure; similar borates also occur as nodules in some deeply buried sediments. These compounds were formed at relatively high temperatures and usually consist of densely packed BO_3 triangles associated with such small metal ions as magnesium, manganese, aluminum, or iron. The origin of these borates is not as obvious as that of the evaporite varieties. Some were produced by the reaction of boron-bearing vapour derived from hot intruding granites during metamorphism; others are the recrystallization products of evaporite borates. Numerous borosilicates (*e.g.,* dumortierite and tourmaline) were formed under these conditions. Compounds of this type contain both BO_3 triangular units and SiO_4 tetrahedral units. Among the borate minerals associated with metamorphosed environments are boracite, ludwigite, and sussexite.

Boratynsky, Yevgeny Abramovich: *see* Baratynsky, Yevgeny Abramovich.

borax, also called TINCAL, sodium tetraborate decahydrate ($Na_2B_4O_7 \cdot 10H_2O$). A soft and light, colourless crystalline substance, borax is used in many ways: as a component of glass and pottery glazes in the ceramics industry; as a solvent for metal-oxide slags in metallurgy; as a flux in welding and soldering; and as a fertilizer additive, a soap supplement, a disinfectant, a mouthwash, and a water softener.

Borax has been known since early times, when it was obtained from saline lakes in Kashmir and Tibet and taken to Europe to be refined. It has been produced commercially from colemanite, kernite, tincalconite, and from the mineral borax by dissolving the ore in water, filtering out the clay, and evaporating the solution. Colemanite was the chief source until the 1930s, when it was supplanted by kernite, which was subsequently replaced by the mineral borax. About 50 percent of the world's supply of commercial boron compounds comes from southern California: the borax crusts and brine from Searles Lake, the large kernite and borax deposits near Kramer, and the colemanite deposits from Death Valley, formed by the evaporation of hot springs or saline lakes and playas. For detailed physical properties, *see* borate mineral (table).

Borba (Serbo-Croatian: "Struggle"), morning Yugoslavian newspaper published daily except Thursday in the Serbo-Croatian language, printed in the Cyrillic alphabet in Belgrade and in the Latin alphabet in Zagreb.

Borba was established in 1922 in Zagreb as the voice of the Yugoslav Communist Party, then was outlawed. In the guise of an independent journal, so that it would not be suppressed, *Borba* championed press freedom and attacked government policies of the 1920s until it was banned in 1929.

In 1941 during World War II the paper resumed publication underground and on the move, shifting its headquarters with Marshall Tito's partisans as they fought guerrilla actions against the Germans. In the early postwar years its influence and circulation soared while relations between the Soviet Union and Yugoslavia were deteriorating, and *Borba* was consistent in denouncing Soviet policies. In 1954 *Borba* became the organ of Tito's newly established Socialist Alliance of the Working People of Yugoslavia, instead of that of the Communist Party.

The paper is known for its lively treatment of historical and cultural matters and for its writing style. Now part of a large publishing enterprise and managed by a workers' council, *Borba*'s circulation has declined, but it retains much of its influence because of its international reporting and its high standard of writing and, not least, because its readership numbers the leaders of Yugoslav society and its highest earners.

Borbón, HOUSE OF, Borbón also spelled BORBONE: *see* Bourbon, House of.

Borda, Jean-Charles de (b. May 4, 1733, Dax, Fr.—d. Feb. 20, 1799, Paris), French mathematician and nautical astronomer noted for his studies of fluid mechanics and his development of instruments for navigation and geodesy, the study of the size and shape of the Earth.

Borda entered the French army at an early age and later transferred to the navy, where he attained the rank of *capitaine de vaisseau* ("post captain"), took part in several scientific voyages, and played a role in the U.S. War of Independence. Borda developed and used many instruments for measuring an arc of a meridian, or longitude line, and helped introduce the metric system into France. He applied his studies of fluid flow and fluid resistance to artillery, ships, and hydraulic pumps. He also developed a series of trigonometric tables in conjunction with his surveying techniques. In 1782, while commanding a flotilla of six ships, he was captured by the British but was immediately released on parole.

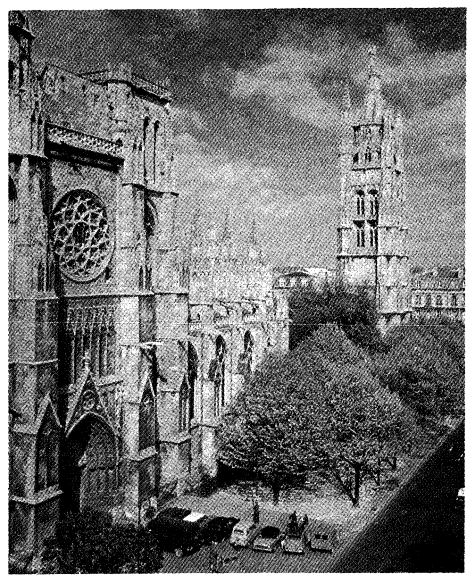
Bordaberry Arocena, Juan María (b. June 17, 1928, Montevideo), president of Uruguay, 1972–76.

Bordaberry was born into a wealthy ranching family and attended law school at the University of Montevideo before assuming management of the family ranch after his father's death. He entered political life during the upheaval that resulted from the blow to Uruguay's economy when world prices of beef and wool declined in the 1950's. This destroyed public confidence in the liberal Colorado party and brought the conservative National (Blanco) party, with which Bordaberry was affiliated, to power. He served on several agricultural boards during the late 1950's and early 1960's and was elected to the Senate on the Blanco ticket in 1962. In 1964 he headed the Federal League for Rural Action, representing landowners who successfully lobbied for constitutional reform and a strong executive. In 1969 Bordaberry switched to the Colorado party and was named Minister of Agriculture and Livestock by Pres. Jorge Pacheco Areco.

Inaugurated president in 1972, Bordaberry was soon (1973) forced to suspend the constitution and individual liberties, allowing the military free rein in stamping out the guerrilla forces (Tupamaros) which were terrorizing the country. By 1973 the president had become a virtual puppet of the military, passing actual control to a seven-man National Security Council. Under severe pressure from the armed forces, Bordaberry abolished the Congress, banned all Marxist parties, and acquiesced to press censorship and political repression. Economic conditions continued to worsen and Bordaberry was ousted by the military on June 12, 1976, after which he returned to the ranching business.

Bordeaux, city, capital of Gironde *département,* Aquitaine region, southwestern France, on the Garonne River 15 mi (24 km) above its junction with the Dordogne, 60 mi from its mouth.

As Burdigala, it was the chief town of the Bituriges Vivisci, a Celtic people. Under the Romans it was the capital of the province of Aquitania, which extended from the Pyrenees to the Loire, and it had a flourishing commerce with Spain and Britain. In the 4th century Burdigala, then the capital of Aquitania Secunda (one of the three parts into which the emperor Diocletian had divided Aquitania), was described by the writer Ausonius, a native of the city, as a square, walled town and one of the great educational centres of Gaul. In the decline of the Roman Empire, the region around Bordeaux entered a period of political instability from which it recovered only when the dukes of Aquitaine established themselves early in the 10th century.



Saint-André cathedral and (right) the Pey-Berland bell tower, Bordeaux, Fr.
Richard Chatagneau

As part of the inheritance of Eleanor of Aquitaine, Bordeaux, along with the rest of the duchy, became English upon the accession (1154) of her husband as Henry II. Edward the Black Prince, who for 20 years held court at Bordeaux and whose son, Richard (later King Richard II), was born there, is still honoured in the city. Under the English, Bordeaux was given unusual freedom—mayors were elected from 1235—and a thriving trade developed with England's ports. Neighbouring towns such as Saint-Émilion and Libourne joined a federation under the leadership of Bordeaux. After the French victory over the English at Castillon in 1453, the city was united to France; but the burghers of Bordeaux long resisted limitation of their municipal freedoms, and 120 of them were executed after the salt-tax rebellion in 1548.

The 17th century was a period of disturbance. There were massacres in the Wars of Religion, and trade withered. In the 18th century Bordeaux again prospered from the "triangular" trade: slaves from Africa to the West Indies, sugar and coffee back to Bordeaux, then arms and wines back to Africa. The Marquis de Tourny, *intendant* of Guyenne, made the city pleasing with squares and fine buildings. The Girondist Party of the French Revolution was formed in Bordeaux, which suffered severely during the Reign of Terror.

After suffering from the English blockade during the Napoleonic Wars, in 1814 the city declared for the Bourbons, prompting Louis XVIII to give his grandnephew the title of duc de Bordeaux. The French governments that fled Paris in 1870, 1914, and 1940 found refuge at Bordeaux, which during World War II was liberated largely by Free French forces (August 1944).

The Garonne (1,650–2,250 ft [500–690 m] wide), separating the city proper from the suburb of La Bastide, embraces a 5-mi crescent of broad quays, behind which rise tall warehouses, factories, and mansions. Outside the great city squares are characteristic low, white houses. Beyond the encircling boulevards lie the suburbs of Le Bouscat, Caudéran, Mérignac, Talence, and Bègles. La Bastide, on the right bank, is reached by a 19th-century bridge. Some gates of the old city wall remain, and there are ruins of a Roman amphitheatre. The Grand Théâtre (1775–80), with its statue-topped colonnade, is one of the finest in France; its imposing double stairway and cupola were later imitated by Garnier for the Paris Opéra. Farther down the quay is the Esplanade des Quinconces, one of the largest squares in Europe; it contains a monument to the Girondins and huge statues of Montesquieu and Montaigne (the latter's tomb is at the university, founded 1441). Bordeaux's ecclesiastical antiquities include two 15th-century bell towers: the Clocher Pey-Berland, near Saint-André's cathedral; and the Tour Saint-Michel, with a spire of 357 ft (109 m). A recent urban development plan called for the renovation of the city centre and extension of new districts northward around a large lake and along the west bank of the Gironde Estuary. An exhibition hall was built, as well as a large, modern bridge connecting the city with the nearby national highway (only one bridge formerly existed for foot and automobile traffic across the Garonne).

The great families of Bordeaux made their fortunes in shipping and trade, especially of the celebrated wines of Bordeaux. The prosperity of these wine-growing and wine-trading houses took a great leap at the time of the English domination. After a critical period during the 15th to 17th centuries, prosperity returned in the 18th century and has maintained itself ever since, despite problems of weather and parasites, the most critical of which was the phylloxera infestation of 1869. The modern extent of the vineyards is about half its former maximum area. The government of France and the local growers regard control of quality and quantity of these wines as essential to the preservation of a major export market. A 1974 scandal involving adulteration of these wines did not apparently do permanent damage to the market. The port area has had importance since the 18th century, but it is increasingly tranferring function to its five outports (seaward terminals for deep-draft vessels), especially of traffic with the Antilles, Africa, and the west coast of France. The major import in terms of tonnage handled in recent years has been petroleum. This trade has favoured the accumulation of capital, but has not fostered the growth of industry, although efforts have been made. To the traditional food-processing and furniture industries have been added in recent years petroleum refining, petrochemicals, pharmaceuticals, and a Ford automobile plant. Pop. (1982) 201,965.

Bordeaux I, II, and III, Universities of, French UNIVERSITÉS DE BORDEAUX I, II, ET III, coeducational, autonomous, state-financed institutions of higher learning at Bordeaux, France. The three universities were established in 1970 under the 1968 Orientation Act, reforming French education, to replace the original Université de Bordeaux, which was founded in 1441 and confirmed by papal bull during the reign of Charles VII. The university played an important role in politics and church affairs; it even sent representatives to the great church councils.

From the 15th to 18th century, it produced such renowned scholars as Montaigne (1533–92), French essayist and mayor of Bordeaux, and Montesquieu (1689–1755), French jurist and political philosopher. Its faculties of theology, canon and civil law, medicine, and arts were typical of European Renaissance universities. The university was suppressed during the French Revolution and replaced by faculties of the University of France. In 1896 Bordeaux was reconstituted as a university and given autonomy and state financing.

The modern universities have been restructured into study and research units, each having academic and administrative independence. Bordeaux I has units of law, economy, and sciences; it also has an observatory. Bordeaux II has units of medicine and human sciences, and affiliated research institutes. Bordeaux III has units of letters and arts, languages, and a research unit on man and his environment.

Bordeaux, Henri (-Charles-Ferdinand-Marie) Dieudonné (d'Artois), duc de (duke of): *see* Chambord, Henri (Charles-Ferdinand-Marie) Dieudonné (d'Artois), comte de (count of).

Bordeaux wine, also called CLARET, any of numerous wines of the region surrounding the city of Bordeaux, France. Bordeaux has a long history in wine culture; like Burgundy and the Rhine region, it was known in Roman times. During the English occupation of Bordeaux a charter was granted, first by Richard I and second by John in 1199, to the still-functioning *jurade*, a controlling body dating originally from the 12th century, which in its ceremonies still observes its medieval ritual and uses its traditional robes of the St. Emilion district for the supervision of wine making. Claret meant in those days a pale wine made by mixing reds and whites; the word claret is not used in modern French.

The modern Bordeaux region is the most important region making fine wines in the world. It is divided by the Bordeaux wine classification into 36 districts, which in turn are divided into communes. Within these communes, again, are certain individual vineyards, called châteaux in this region, that produce the finest wines. The châteaux bottle their own wine and label it under their names, thus guaranteeing it is not a blend. The château-bottled wines rated best are classified as *crus classés*, which in turn have five categories called growths. These five growths are not altogether based on excellence, which in fine wines remains always a matter of taste to some degree; other criteria, such as market price, exportation, and fame also formed these ratings. Rated in 1855, this classification is also outdated; nevertheless it has held up well over the years apart from excluding the possibility of improvement after 1855. After these *crus classés* are *crus exceptionnels*, comprising a half dozen wines, and several hundred wines named *crus bourgeois* and *crus artisans* or *paysans*. The last two categories are largely obsolete due to the growth of cooperative wineries, which have enabled small proprietors to use up-to-date wineries managed by expert vintners, thus raising the quality of less expensive wine in Bordeaux and elsewhere. Although strict labelling is in force in Bordeaux château-bottled wines, inferior wines are still sold as Bordeaux. Further, as a poor year produces wine of inferior quality, such wines must be known by vintage as well.

Wines of the Bordeaux region are labelled Bordeaux. Wines from specific districts of Bordeaux are usually of specific type and have more interest; they are labelled with the district name, as Médoc, or St. Emilion. Within the districts are communes, of specific wine type and of superior character; these are labelled with the name of the commune, St. Julien, or St. Estèphe. Of the 17 districts in Bordeaux, Médoc, Graves, St. Emilion, and Pomerol are best known. Médoc, Sauternes, and Barsac were classified in 1855, Graves in 1953, and St. Emilion in 1955.

Médoc. These wines are red, generally of light body and strong flavour. Médoc, 50 miles long and 3–7 mi wide, has a dozen communes, each possessing soil that produces wine of particular quality; Pauillac, Margaux, St. Julien, Cantenac, and St. Estèphe are of these. Of the 61 red wines classified *crus classés* in 1855, all but one were from Médoc. First growth châteaux are Lafite-Rothschild, Margaux, and Latour; other *crus classés* number among them Mouton-Rothschild and Kirwan.

Graves. The general reputation of Graves is for white wine, rich in taste and not too sweet. Actually Graves produces as much red as white. These balanced, fine-coloured, and rather fruity reds are sometimes rated finer than the whites. Château Haut-Brion was classified first growth in 1855; it is one of eight classified red wines of Graves in the 1959 official classification of Graves. Five châteaux were selected as classified white wines of Graves in 1959.

Sauternes and Barsac. The natural sweet wines, fruity with enduring rich flavour, of this district are usually considered the world's finest. To achieve their quality the grapes are left till overripe on the vines before harvesting, thus producing the ripeness known as *pourriture noble*, which leaves an abundance of sugar in the grape, sweetening the wine and producing a high alcoholic content. A label of Haut-Sauternes is also allowed for wines of this district, although no such area exists. Wines from the village area of Barsac, similar to Sauternes, are allowed the label of Sauternes or Barsac. Château d' Yquem is classified first superior growth, and 24 other châteaux are classed in the first and second growths.

St. Emilion. Sometimes called masculine wines, St. Emilions are full-bodied and of darker colour than Médocs. The 1955 classification listed 12 called first great growths of St. Emilion, among which are Château Cheval Blanc and Château Ausone, of long standing reputation. There were 63 châteaux rated as great growths. These classes, like those of Graves, are peculiar to these districts, not part of the 1855 Médoc classification.

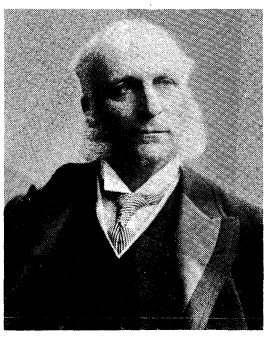
Other Bordeaux districts. White wines come from Sainte Foy, Entre-Deux-Mers, Langoiran. At their best the whites of Ste. Croix-du-Mont, Loupiac, and Cérons have characteristics of Sauternes. Good red and white wines are produced in Bourg, Blaye, Cadillac, and Camblanes-et-Meynac.

Vintages and age. Some wines prosper in generally bad years or fail in good years. Thus vintage charts are not a certain guide. Bordeaux reds are at their peak 8 to 23 years after vintage. They are long-lived, however, and full-bodied reds will last 50 years or more. Dry whites may be ready to drink in 1 to 2 years, but age faster than reds or sweet whites, fading sometimes after 7 years. Sweet whites may be drunk about 3 years after vintage, will be at their peak at 10 years and may last 30 years.

Borden, also called PORT BORDEN, town, Prince County, southern Prince Edward Island, Canada, on Northumberland Strait. Named Carleton Point by the English surveyor Samuel Holland in 1765, it was renamed (1916) after Sir Robert Laird Borden, then the Canadian prime minister. Although a fishing port, it is economically dependent upon its role as a transportation hub. Highways and a Canadian National Railway line to

Charlottetown (39 mi [63 km] east) and other provincial centres radiate from the harbour, where car ferries regularly dock, connecting the island with Cape Tormentine, N.B., 9 mi south. From a point near Borden to Cape Tormentine the first submarine telegraph cable in North America was successfully laid (1852). Inc. 1919. Pop. (1981) 485.

Borden, Sir Frederick William (b. May 14, 1847, Cornwallis, Nova Scotia—d. Jan. 6, 1917, Canning, Nova Scotia, Can.), Canadian statesman who, as Liberal minister of militia and defense (1896–1911), helped to create a Canadian navy.



Sir Frederick Borden, 1905
By courtesy of the Public Archives of Canada

Borden studied medicine at Harvard and practiced as a physician for some years in Canning. He was elected in 1874 as Liberal member of the Canadian House of Commons for Kings County and represented this constituency (except for the years 1882–87) until his defeat in 1911. He was knighted in 1902. As minister of the militia, he made improvements in training and discipline in the little-developed Canadian services. With the acquisition of naval establishments at Halifax, Nova Scotia, and Esquimalt, B.C., his department became responsible for developing the Canadian Navy and was influential in terminating the practice of appointing a British officer to command the Canadian militia.

Borden, Gail (b. Nov. 9, 1801, Norwich, New York, U.S.—d. Jan. 11, 1874, Borden, Texas), U.S. philanthropist, businessman, and inventor, who envisioned food concentrates as a means of safeguarding man's food supply. He was the first to develop a commercial method of condensing milk, and the dairy company founded by him (renamed Borden, Inc., in 1968) expanded and diversified to become an industrial empire.

Among Borden's first inventions was a meat biscuit that won a gold medal at the Great Council exhibition in London in 1851; it was commercially unsuccessful, however. Borden next developed a process for concentrating milk, receiving U.S. and British patents in 1856, and opened a condensery in 1861.

As a youth Borden helped survey the future city of Covington, Ky., where his family settled on their travels westward. He taught school in southern Mississippi and emigrated to Texas in 1829, where he prepared the first topographical map of Texas, helped write the first constitution of that state, was co-founder of the first long-lived Texas newspaper, and laid out the city of Galveston.

Borden, Lizzie (Andrew) (b. July 19, 1860, Fall River, Mass., U.S.—d. June 1, 1927, Fall River), suspected murderess of her stepmother and father, whose trial became a national sensation in the United States. A pretrial jingle celebrated her name: "Lizzie Borden took an ax/ And gave her mother forty whacks;/ And when she saw what she had done/ She gave her father forty-one."

Lizzie's mother died when she was three, and her father remarried in 1865. The father was reputedly dour and parsimonious—as well as eminently wealthy—and Lizzie and her sister Emma were ever at odds with him and their stepmother, often on financial matters. On a Thursday morning, Aug. 4, 1892, in Lizzie's 32nd year, Mr. Borden left home to conduct his morning business, leaving in the house, besides his wife, an Irish maid (Bridget Sullivan) and Lizzie. (Emma was away visiting.) On his return, he settled on a couch for a nap. At about 11:15 AM, Lizzie (according to her testimony) discovered her father dead, repeatedly struck in the head with a sharp instrument. Upstairs his wife's body was found, even more brutally mutilated; examination proved that her death had preceded her husband's by an hour or so. Soon after, Lizzie was observed burning a dress in a stove. Bridget Sullivan, later that evening, reportedly left the house carrying an unexamined parcel. No weapon was found.

Lizzie was arrested and tried for both murders in June 1893 but was acquitted, given the circumstantial evidence. She remained in Fall River until her death at age 66, largely ostracized by the community.

Borden, Sir Robert (Laird) (b. June 26, 1854, Grand Pré, Nova Scotia—d. June 10, 1937, Ottawa), eighth prime minister of Canada (1911–20) and leader of the Conservative Party (1901–20), who played a decisive role—notably by insisting on separate Canadian membership in the League of Nations—in transforming the status of his country from

Sir Robert Borden
National Film Board of Canada Phototheque

that of colony to that of nation. He was knighted in 1914.

Robert Borden was born in the small village of Grand Pré, Nova Scotia. He cut short his formal education before his 15th year, when he accepted the post of assistant master of the private school he was attending. His teaching career ended in 1874, when he became articled to a Halifax law firm. Admitted to the bar of Nova Scotia in 1878, he rose to a commanding position in legal circles, and after his marriage to Laura Bond (1889) he founded a law firm that subsequently acquired one of the largest practices in the Maritime Provinces. His friendship with Sir Charles Hibbert Tupper, son of one of the original "Fathers of Confederation," led him to accept the conservative nomination for Halifax in 1896. Borden's entry into politics coincided with the victory of the Liberal Party under the leadership of Sir Wilfrid Laurier. Though he remained an obscure backbench opposition member during his first term, Borden was invited by the caucus upon his reelection in 1900 to assume temporarily the leadership of the party. He accepted the post, and, despite repeated intrigues against his leadership and his own professions of distaste for it, he occupied it until 1911, when the Liberal decision to accept a reciprocal trade agreement with the United States led to Laurier's defeat.

As prime minister, Borden's major interest was Anglo-Canadian relations. He had long argued for the establishment of a Canadian voice in imperial policy. His naval policy prior to World War I—which involved a grant of $35,000,000 to Britain for the construction of three battleships—was a mixture of opportunism and wishful thinking about the extension of Canada's influence in the councils of empire. During the first two years of war Borden frequently referred to the necessity of Canadian participation in British decisions, but it was not until the British prime minister David Lloyd George created the Imperial War Cabinet (IWC) in 1917 that Borden was given a chance to express Canada's point of view. At the meetings of the IWC in London and its subsequent sessions in Paris during the negotiation of the Treaty of Versailles, Borden supported the Fourteen Points of U.S. president Woodrow Wilson and argued that Canada's interests demanded the closest possible alliance between the British Empire and the United States. (Borden saw nothing incompatible between insisting on the right to participate in shaping imperial policy and Canada's independent membership in the League of Nations. He seemed to envisage the empire-commonwealth as an alliance in which smaller members might have to defer to the interests of the great power, but only after a process of continuous consultation.)

Borden's Conservative administration confronted unprecedented administrative, financial, and political challenges during the years of World War I, and when, despite the voluntary recruitment of half a million Canadians for overseas service, conscription was required to maintain the Canadian forces at full strength, he initiated the formation of a coalition government. The electoral success of the Unionist forces in the election of 1917 ensured a continuation of Borden's policies of total commitment to the war effort and an international role for Canada—but at the price of antagonizing the French-Canadian population, who were unrepresented in the government and opposed to its policies.

Borden's preoccupation with Anglo-Canadian relations may partially account for his first administration's poor performance in domestic affairs. He dealt indecisively with his controversial minister of militia, Sam Hughes, whom he did not remove from office until the end of 1916. As charges of incompetence, patronage, and war profiteering were levelled against Borden's government, public confidence in him decreased. His decision, however, to form a coalition government in order to implement conscription gave him the opportunity to reconstruct his Cabinet and to surround himself with a group of able colleagues. With Arthur Meighen, his eventual successor as prime minister, to manage the House of Commons and with two liberals, Newton Rowell and Alexander K. Maclean, in charge of key Cabinet committees, Borden was free to concentrate on the larger questions under discussion in London and Paris. He supported the policy of Allied intervention in the Russian Civil War, in which he was anxious to have Canadian troops participate. Public opinion forced the return of a 3,000-man expeditionary force from Vladivostok, which Borden had hoped would establish a Canadian presence leading eventually to trade concessions. His policy of arresting the leaders of the Winnipeg General Strike (1919) and of charging them under a revised definition of sedition that was rushed through Parliament in the form of an amendment to the criminal code won him the enmity of labour. He resigned from office in July 1920.

In retirement he attended the Washington Naval Disarmament Conference (1921) as Canada's delegate and wrote *Canadian Constitutional Studies* (1922) and *Canada in the Commonwealth* (1929) He also published his *Memoirs* (1938) under the editorship of his nephew, Henry Borden. (J.T.C.)

BIBLIOGRAPHY. For a brief biographical sketch, see Craig Brown, "Sir Robert Borden, the Great War and Anglo-Canadian Relations," in John Moir (ed.), *Character and Circumstance* (1970). Harold A. Wilson, *The Imperial Policy of Sir Robert Borden* (1966), is an examination of Borden's quest for a voice in British foreign and imperial policy.

Bordentown, city, Burlington County, western New Jersey, U.S., on the Delaware River, just south of Trenton. Settled in 1682 by Thomas Farnsworth, a Quaker, it was early known as Farnsworth's Landing. In 1734 Joseph Borden (for whom the settlement was renamed) established a stage line and packet service, and a busy river trade developed. During the Revolutionary War the town was severely punished by the British for its role in the "mechanical keg" plot of 1778 (an attempt to blow up the anchored British fleet by floating a flotilla of gunpowder kegs downriver). Thomas Paine, the political pamphleteer, lived in Bordentown (1781–87), where he was visited by Benjamin Franklin, Gouverneur Morris, and other Revolutionary leaders. Paine was eventually forced to leave town because of his liberal and atheistic views. Joseph Bonaparte, oldest brother of Napoleon and exiled king of Spain, purchased about 1,500 ac (600 ha) on the outskirts of Bordentown which he developed (1816–39) into a "little kingdom," where he entertained many European notables; Bonaparte Park is a remnant of his estate.

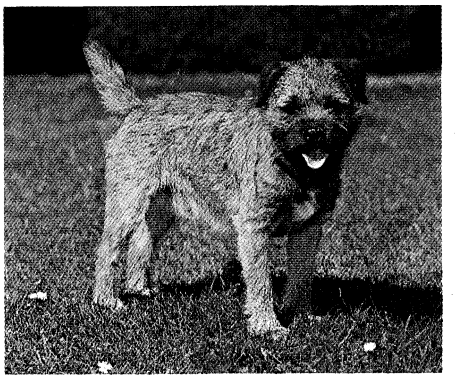
The Clara Barton Schoolhouse, dating from the Revolutionary period but organized in 1851 by Clara Barton (founder of the American Red Cross) as one of the nation's first free public schools, has been restored. Other historic buildings include Murat Row (reconstructed dwellings from Linden Hall, home of Prince Napoleon Murat, nephew of Joseph and Napoleon Bonaparte), Hopkinson House (home of Francis Hopkinson, a signer of the Declaration of Independence who was also known as a poet, political satirist, and composer), and Borden House (rebuilt by Joseph Borden's son to replace the one burned by the British in 1788).

During the 19th century, the city became the terminal of the Delaware and Raritan Canal, and New Jersey's first railroad shops were located there. Diversified farming and light manufacturing (sportswear, printing and box making machinery, and bricks) are current economic activities. Bordentown is known for its rehabilitation programs focussing on the E.R. Johnstone Training and Research Center (for the retarded) and a youth correctional institution. Inc. borough, 1825; city, 1867. Pop. (1980) 4,441.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

border ballad, type of spirited heroic ballad celebrating the raids, feuds, seductions, and elopements on the border between England and Scotland in the 15th and 16th centuries, where neither English nor Scottish law prevailed. Among the better known border ballads are "Johnny Cock," "Jock o' the Side," "Hobie Noble," and "The Bonny Earl of Murray." Though a few deal with events of historical importance, most are concerned with the personal retributions of the outlaws and robber clans who maintained their own grim code on the border. *See also* coronach.

border terrier, breed of terrier developed in the border country of England and Scotland to hunt and kill foxes that were preying on livestock. The border terrier stands about 13 inches (33 centimetres) and weighs 11 to 15 pounds (5 to 7 kilograms). It has a short, otter-like head, narrow shoulders, and a dense, weather-resisting coat of blue-gray and tan or golden or reddish brown.



Border terrier
Sally Anne Thompson—EB Inc.

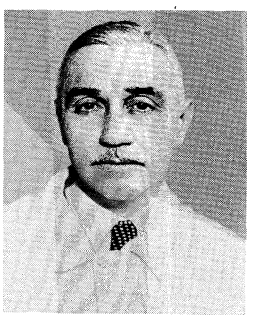
Borders, region of southeastern Scotland, created by the administrative reorganization of 1975, with an area of about 1,800 sq mi (4,660 sq km). It consists of the former counties of Berwick, Peebles, Roxburgh, and Selkirk and a small part of the former county of Midlothian and is divided into the districts of Tweeddale, Ettrick and Lauderdale, Roxburgh, and Berwickshire. The region's economy is primarily based on textiles and agriculture. Pop. (1982 est.) 101,000.

Bordes, Charles (b. May 12, 1863, Rochecorbon, near Vouvray, Fr.—d. Nov. 8, 1909, Toulon), French composer, choirmaster, and musicologist who played an important part in reviving Renaissance polyphonic choral music.

Bordes was a pupil of Franck. In 1890 he became chapelmaster of St. Gervais in Paris and made it the centre of the study and practice of 15th-, 16th-, and 17th-century vocal music. With the organist Alexandre Guilmant and the composer d'Indy, he founded (1894) the Schola Cantorum, a society that in 1896 became a school for church music with Bordes as professor. Its publication, *La Tribune de St. Gervais* (1895), became the main organ of French musicology. He also began publication of the *Anthologie des maîtres religieux primitifs,* which provided choral societies with invaluable material. By 1905 he had moved to Montpellier, where he started a provincial branch of the Schola Cantorum.

Also interested in folk song, Bordes toured the Basque country in 1889 to collect traditional melodies, 100 of which were published in *Archives de la tradition basque* (1889–90). As a composer he achieved particular success with his songs. He also wrote piano music, sacred and secular choral works, a *suite basque* for flute and strings, *Danses béarnaises,* and a symphonic poem for orchestra.

Bordet, Jules (-Jean-Baptiste-Vincent) (b. June 13, 1870, Soignies, Belg.—d. April 6, 1961, Brussels), Belgian bacteriologist and immunologist who received the Nobel Prize for Physiology or Medicine in 1919 for his discovery of immunity factors in blood serum; this was a development vital to the diagnosis and treatment of many dangerous contagious diseases.



Bordet
Harlingue—H. Roger-Viollet

His research on the destruction of bacteria and red corpuscles in blood serum, conducted at the Pasteur Institute, Paris (1894–1901), contributed significantly to the foundation of serology, the study of immune reactions in body fluids. In 1895 he found that two components of serum are responsible for the rupture of bacterial cell walls (bacteriolysis): one is a heat-stable antibody, found only in animals already immune to the bacterium; the other is a heat-sensitive substance that is found in all animals and is now known to be a complement. Three years later, Bordet discovered that foreign red corpuscles (erythrocytes) were also ruptured in blood serum. This process, which he called hemolysis, was analogous to bacteriolysis and also required complement.

In Brussels, where he founded and directed (1901–40) the Pasteur Institute of Brabant, Bordet continued his immunity research with Octave Gengou. Their work provided the basis of serological tests for many disease organisms, including those of typhoid fever, tuberculosis, and, most notably, syphilis (the Wassermann test).

After his discovery (with Gengou in 1906) of the bacterium responsible for whooping cough, now called *Bordetella pertussis,* Bordet became professor of bacteriology at the University of Brussels (1907–35), where he studied blood coagulation and bacteriophages (viruses that attack bacteria).

Bordighera, town, Imperia province, Liguria region, northwestern Italy, on the Riviera di Ponente coast between Ventimiglia and San Remo. The Institute of Ligurian Studies, formerly the Bicknell Museum, displays a unique collection of the flora of the Riviera, and the English library contains about 25,000 volumes. A leading winter resort, Bordighera exports flowers, olive oil, and palm branches for religious ceremonies during Holy Week at St. Peter's (Rome) and other churches. Pop. (1981 prelim.) mun., 11,896.

Bordinho, Maurício, Bordinho also spelled BORDINO, or BOURDIN: *see* Gregory (VIII) *under* Gregory (papacy).

Bordone, Paris (b. 1500, Treviso, Republic of Venice—d. Jan. 19, 1571, Venice), Venetian painter of the Renaissance, who painted pictures on religious, mythological, and other subjects but excelled as a portraitist.

He was invited to France either by Francis I in 1538 or by Francis II in 1559; he painted many portraits at the French court, though no trace of them is to be found in French collections, the two portraits at the Louvre being later acquisitions. He also is said to have visited Augsburg and worked for the Fuggers, probably in 1548.

His principal historical painting, signed and dated 1540, is the "Fisherman and Doge" at the Venice academy. The National Gallery, London, has a "Daphnis and Chloe" and a portrait of a lady.

Other important works are the "Madonna" in the Tadini Gallery at Lovere, the "Adoration of the Shepherds" in the Duomo of Treviso, two mythological pictures at the Villa Borghese and the Doria palace in Rome, the "Chess Players" in Berlin, "Christ Among the Doctors" in the Gardner Museum at Boston, and a "Baptism of Christ" in Washington, D.C.

Bordoni, Faustina (b. *c.* 1700, Venice—d. Nov. 4, 1781, Venice), Italian mezzo-soprano, one of the first great prima donnas, known for her beauty and acting as well as her vocal range and breath control.

Of a noble family, she studied with Michelangelo Gasparini, under the patronage of

Alessandro and Benedetto Marcello. In 1716 she made a sensational debut in Venice in Carlo Francesco Pollarolo's *Ariodante.* By 1722 her fame in Italy was such that a medal was created in Naples to honour her. In 1723 she made her first appearance in Munich in Pietro Torri's *Griselda.* After hearing her in the Vienna Court Opera in 1724, George Frideric Handel engaged her, and in 1726 she appeared in his *Alessandro,* performed by his opera company in London. There she and Francesca Cuzzoni, a leading soprano, became rivals, and devotees of both singers exacerbated their bitter relationship, which erupted in 1727 in a scandalous hair-pulling battle during a performance of Antonio Maria Bononcini's *Astianatte.* The two divas were subsequently satirized as Polly and Lucy in John Gay's *The Beggar's Opera* and its sequel, *Polly.* Bordoni created other Handel roles: Alcestis in *Admeto* and Pulcheria in *Riccardo Primo* in 1727 and Emira in *Siroe* and Elisa in *Tolemeo* in 1729. After marrying the composer Johann Adolf Hasse, Bordoni moved with her husband to Dresden where she performed in at least 15 of his operas. During long visits to Italy she performed more than 30 operas in Venice. In 1750 she sang at court in Paris. Still active in her seventies, she was heard in Vienna in 1775, before she retired to Venice.

bore, in guns, the interior diameter of the barrel of the firearm.

In guns that have rifled barrels, *e.g.*, rifles, pistols, machine guns, and artillery or naval guns, the measurement of the bore is termed the calibre. Calibre (or caliber) is measured in inches for cannons and hundredths of inches for small guns. In the metric system, millimetres and occasionally centimetres are the units of measurement. Calibre also designates the outside diameter of the projectile or ammunition used in the gun and is also expressed in inches or millimetres. Calibre is sometimes expressed in two figures, to indicate both the diameter and the length of the bullet. Thus, calibre 6×47 indicates a bullet 6 millimetres in diameter and 47 millimetres long.

The measurement of the bore in shotguns is expressed in terms of gauge. The gauge of a shotgun originally was expressed as the number of round lead balls of bore diameter necessary to make a total weight of one pound. Thus, if eight lead balls of bore diameter added up to one pound, the shotgun was designated an eight-gauge gun. The smaller the gauge number, therefore, the larger the bore. Gauge, however, later became standardized in terms of diameter and no longer relates directly to the original method of determination.

bore, also called TIDAL BORE, body of water that rushes up some rivers that empty into the sea at times of exceptionally high tides. Travelling upstream about two or three times as fast as the normal tidal current, a bore usually is characterized by a well-defined front of one or several waves, often breaking, followed by its main body, which rises higher than the water level at its front. The height of the bore is greater near the banks of a river than at midstream. Because of momentum, some bores continue to move upstream for about one-half hour after high water. Not arising in estuaries, tidal bores are formed at a position a short distance upstream, where the river channel has become sufficiently narrow or shallow to concentrate the momentum of the rising tide. Bores occur at spring tides and at several tides preceding and following spring tides but never at neap tides. The formidable tidal bore that occurs on the Lower Seine in France between Rouen and the sea is known as the Mascaret.

Boré, (Jean) Étienne (b. Dec. 27, 1741, French North America—d. Feb. 2, 1820, near New Orleans), founder of the sugar industry in Louisiana.

Of noble Norman ancestry, he was educated in France and served for 10 years in the household guard of Louis XV before he established himself as an indigo planter in Louisiana. When pests ruined the indigo crop in the early 1790s, he perfected a sugar-granulating process (1794 or 1795) and devoted his land (now within New Orleans) to raising sugar cane. Unlike many other agrarian experimenters, he profited greatly from his innovation. He was mayor of New Orleans under French and U.S. rule (1803–04).

Boreal Climatic Interval, period of Holocene climate (the Holocene Epoch began about 10,000 years ago and continues to the present). Radiocarbon dating indicates that the Boreal Climatic Interval began about 9,500 years ago and ended about 7,500 years ago. The Boreal followed the Pre-Boreal and preceded the Atlantic climatic intervals.

Climate during the Boreal was warm and dry. In Europe the Early Boreal is characterized by forests dominated by a hazel-pine assemblage, and sea levels were regressing. In the Late Boreal a hazel-oak forest was dominant, and the seas were again transgressing the land. Climates in both phases, however, remained warm and dry.

boreal forest: *see* taiga.

boreal forest moss: *see* feather moss.

Boreas, in Greek mythology, the personification of the north wind. He traditionally carried off the beautiful Oreithyia, a daughter of Erechtheus, king of Athens; they lived in Thrace as king and queen of the winds and had two sons, Calais and Zetes. To show his friendliness for the Athenians, Boreas wrecked the fleet of the Persian king Xerxes off the promontory of Sepias in Thessaly; in return the Athenians built him a sanctuary or altar near the Ilissus and held a festival (Boreasmos) in his honour. In works of art Boreas

Boreas abducting Oreithyia, detail of an Attic hydria, 5th century BC; in the Vatican Museum

Alinari—Art Resource/EB Inc.

was represented as bearded, powerful, draped against cold, and winged.

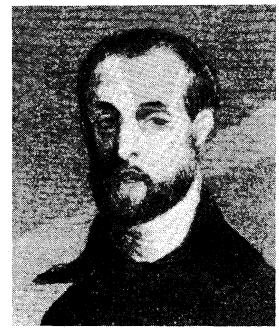
Borel, (Félix-Édouard-Justin-) Émile (b. Jan. 7, 1871, Saint-Affrique, Fr.—d. Feb. 3, 1956, Paris), French mathematician who created the first effective theory of the measure of sets of points and who shared with René Baire and Henri Lebesgue of France in launching the modern theory of functions of a real variable.

Appointed to the faculty of the École Normale Supérieure, Paris, in 1896, Borel discovered the elementary proof of Picard's theorem. This sensational accomplishment set the stage for his formulation of a theory of integral functions and the distribution of their values, a topic that dominated the theory of complex functions for the next 30 years.

As the creator of the first effective theory of the measure of sets of points, Borel helped launch the modern theory of functions of a real variable; although he was not the first to define a conventional sum of a divergent series (a series of numbers that does not approach a certain number), he was the first to conceive and develop a systematic theory of such series (1899). In 1909 he was appointed to the chair of theory of functions created for him at the Sorbonne. He completed a series of papers on game theory (1921–27) and became the first to define games of strategy.

Borel also served in the French Chamber of Deputies (1924–36) and as minister of the navy (1925–40). After his arrest and brief imprisonment under the Vichy regime in 1940 he returned to his native village and worked in the Résistance. For this work he was awarded the Résistance Medal (1945) to add to his Croix de Guerre (1918) and, later, the Grand Cross of the Légion d'Honneur (1950) and the first gold medal of the Centre National de la Recherche Scientifique (1955).

Borel, Petrus, original name JOSEPH-PIERRE BOREL, also called BOREL D'HAUTERIVE (b.



Petrus Borel, detail of an engraving after a portrait by C.-F. Nanteuil-Leboeuf, 1839

J.P. Ziolo

June 29, 1809, Lyon—d. July 1859, Mostaganem, Alg.), French poet, novelist, and critic who played a leading role in the Romantic movement.

The 12th of an ironmonger's 14 children, he was trained as an architect but turned to literature and became one of the most eccentric young writers of the 1830s, assuming the name of "Lycanthrope" ("Wolf-Man"). He became a leader of the group of daring writers known as Les Bousingos, among whom were Gérard de Nerval and Théophile Gautier. With the revival of interest in Classical style, he fell into poverty; however, he was able to obtain a post in the colonization of Algeria. Because of his proud and touchy nature, he was dismissed in 1855 and spent the rest of his life in a Gothic mansion in Mostaganem, where he lived as a ragged eccentric. His works, redolent of horror and melodrama, include *Rhapsodies* (1832), the short stories *Champavert, contes immoraux* (1833), and *Madame Putiphar* (1839), with a verse prologue that foreshadows the poet Charles Baudelaire's spiritual style.

Borelli, Giovanni Alfonso, original name GIOVANNI FRANCESCO ANTONIO ALONSO (b. Jan. 28, 1608, Naples—d. Dec. 31, 1679, Rome), Italian physiologist and physicist who was the first to explain muscular movement and other body functions according to the laws of statics and dynamics.

He was appointed professor of mathematics at Messina in 1649 and at Pisa in 1656. In 1667 he returned to Messina and in 1674 went to Rome, where he lived under the protection of Christina, queen of Sweden. His best known work is *De Motu Animalium* (1680–81; "On the Movement of Animals"), in which he sought to explain the movements of the animal body on mechanical principles; he thus ranks as the founder of the iatrophysical school.

Borelli also wrote many astronomical works,

including a treatise in 1666 which considered the influence of attraction on the satellites of Jupiter. In a letter published in 1665 under the pseudonym Pier Maria Mutoli, he was the first to suggest the idea that comets travel in a parabolic path.

borer beetle, any of the approximately 1,100 insects of the family Anobiidae (order Coleoptera). These beetles tend to be small (1 to 9 millimetres, or less than ½ inch) and cylindrical. When disturbed they usually pull in their legs and play dead.

The best known borers are the cigarette beetle, deathwatch beetle, drugstore beetle, and furniture beetle. They live in drugs, cereals, spices, wood, tobacco products, and upholstery materials, and still others live in fungi seeds, galls, and under bark.

The name borer beetle is also applied to tree-boring members of the family Scolytidae.

Borg, Björn (Rune) (b. June 6, 1956, Södertälje, Swed.), Swedish tennis player who was one of the finest competitors of the modern era. He was the first man to win the Wimbledon singles championship five successive times (1976–80) since Laurie Doherty (1902–06). He won the French Open men's singles championship an unprecedented four times in a row and six times in all (1974–75, 1978–81).

Borg learned to play tennis at a very early age, and, by the time he was 13, he was beating Sweden's top junior players. Noted for his powerful serve and two-handed backhand, Borg joined the professional circuit at age 14 and went on to win the Italian Open at 17 and the French Open at 18. In 1975 he helped Sweden win its first Davis Cup, and by that time he had won 16 consecutive cup singles, passing Bill Tilden's record of 12. By the spring of 1981, when he finally lost at Wimbledon to John McEnroe, Borg had won 41 singles matches and 5 championships in a row, a record never previously set.

In 1983 he announced his permanent retirement from professional tennis. He had earlier made his permanent home in Monaco, for tax purposes.

Borgå (Finland): *see* Porvoo.

Børgefjell National Park, Norwegian BØRGEFJELL NASJONALPARK, national park occupying an area of about 390 sq mi (1,000 sq km), straddling the border between northern Trøndelag and Nordland regions, Norway.

Designated a national park in 1970, Børgefjell consists mostly of granitic mountains with an alpine terrain of cirques and steep-walled valleys. Lower valleys, hills, and marshes occupy the remainder of the park. The highest peak is Kvigtind, at 5,587 ft (1,703 m) above sea level, and the largest lake is Simskarvatn. Several rivers cross the park, including the Jengel and the Or. Birches are the most common trees found in forested areas, and there are small evergreen stands in the south and southwest. Other vegetation includes blueberry heaths, sedge grass, willows, and snowbed plants.

Many birds inhabit the northern part of the park near the Simskar River, particularly blue throat, red-necked phalarope, long-tailed duck, bean goose, and Teminck's stint. Snow bunting, ptarmigan, rough-legged buzzard, golden eagle, and osprey live in the mountain areas. Mammals include moose, reindeer, wolverine, lynx, and bear. An abandoned settlement at Fagerneset, on Nams Lake, was inhabited for several hundred years by the Lapps, who raised reindeer.

Borgen, Johan (Collet Müller) (b. April 28, 1902, Kristiania (Oslo)—d. Oct. 16, 1979, Hvaler, Nor.), Norwegian novelist, short-story writer, dramatist, and essayist, one of 20th-century Norway's most important and versatile writers.

His principal work was a novel trilogy: *Lillelord* (1955; "Lillelord"), *De mørke kilder* (1956; "The Dark Springs"), and *Vi har ham nå* (1957; "Now We Have Him"), all three translated into English under the title *Lillelord* (1982). In these novels Borgen gives a picture of upper-middle-class life in Norway from 1917 through World War II; and in the figure of the protagonist, Wilfred Sagen, he draws a profound portrait of the kind of alienated and disaffected individual who, during the war, collaborated with the Nazis. The novel is equally valuable as a period study, with vignettes of the artist life in Copenhagen and Paris, and as a psychological study.

Borgen began his career as a short-story writer with the collection *Mot mørket* (1925; "Toward the Dark") and continued to do some of his best work in that genre. *Noveller om kjaerlighet* (1952; "Love Stories") was a great success both critically and with the general public, as was also the collection *Noveller i utvalg* (1961; "Selected Short Stories").

In his later, more experimental novels, Borgen continued to create fictions that posed questions concerning alienation and identity: *Jeg* (1959; "I"); *Blåtind* (1964; "Blue Mountain"); and *Den røde tåken* (1967; *The Red Fog*).

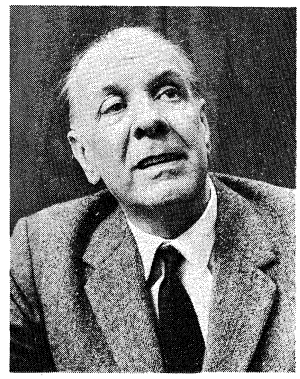
Borgen also wrote plays and over a long career developed a mastery of the short, witty essay. He won the Nordic Council's literary prize for a collection of short stories, *Nye noveller. Frydenberg* (1965; "New Stories. Frydenberg"). From 1954 to 1959, he was editor of the literary journal *Vinduet*. He was also a great critic, in the sense of being able to transmit his enthusiasm for books in lucid analyses. In this role he introduced many foreign writers to Norwegian readers.

Borger, city, Hutchinson County, northwestern Texas, U.S., in the Texas Panhandle, near the Canadian River Dam, 45 mi (72 km) northeast of Amarillo. Part of a tri-city industrial complex (Borger–Phillips–Bunavista) in an area producing oil and gas, it was founded in 1926 and incorporated the same year with the completion of the first oil well. Overnight it became a boomtown of tents and shacks; it was named for A.P. Borger, a land investor. Major industrial products include (in addition to petroleum and natural gas) carbon black, printer's ink, and synthetic rubber. With increased irrigation, diversified farming and cattle ranching have become economic assets. Nearby are Lake Meredith (formed by Sanford Dam) and Alibates Flint Quarries National Monument (1,333 ac [539 ha]), commemorating prehistoric Indian quarries. Frank Phillips College (1946) is in the city. Pop. (1980) 15,837.

Borges, Jorge Luis (b. Aug. 24, 1899, Buenos Aires—d. June 14, 1986, Geneva), Argentine poet, essayist, and short-story writer credited with establishing the modernist Ultraist movement in South America (*see* Ultraismo).

Life. Borges was reared in the then-shabby district of Palermo, the setting of some of his works. His family, which had been notable in Argentine history, included British ancestry, and he learned English before Spanish. The first books that he read—from the library of his father, a man of wide-ranging intellect who taught at an English school—included *The Adventures of Huckleberry Finn,* the novels of H.G. Wells, *The Thousand and One Nights,* and *Don Quixote,* all in English. Under the constant stimulus and example of his father, the young Borges from his earliest years recognized that he was destined for a literary career.

In 1914, on the eve of World War I, Borges was taken by his family to Geneva, where he learned French and German and received his B.A. from the Collège de Genève. Leaving there in 1919, the family spent a year in Majorca and a year in Spain, where Borges joined the young writers of the Ultraist movement, a group that rebelled against what it considered the decadence of the established writers of the Generation of '98.



Borges

By courtesy of Wellesley College, Wellesley, Massachusetts

Returning to Buenos Aires in 1921, Borges rediscovered his native city and began to sing of its beauty in poems that imaginatively reconstructed its past and present. His first published book was a volume of poems, *Fervor de Buenos Aires, poemas* (1923; "Fervour of Buenas Aires, Poems"). He is also credited with establishing the Ultraist movement in South America, though he later repudiated it. This period of his career, which included the authorship of several volumes of essays and poems and the founding of three literary journals, ended with a biography, *Evaristo Carriego* (1930).

During his next phase, Borges gradually overcame his shyness in creating pure fiction. At first he preferred to retell the lives of more or less infamous men, as in the sketches of his *Historia universal de la infamia* (1935; *A Universal History of Infamy*). To earn his living, in 1938 he took a major post at a Buenos Aires library named for one of his ancestors. He remained there for nine unhappy years.

In 1938, the year his father died, Borges suffered a severe head wound and subsequent blood poisoning, which left him near death, bereft of speech, and fearing for his sanity. This experience appears to have freed in him the deepest forces of creation. In the next eight years he produced his best fantastic stories, those later collected in the series of *Ficciones* ("Fictions") and the volume of English translations entitled *The Aleph and Other Stories, 1933–69.* During this time, he and another writer, Adolfo Bioy Casares, jointly wrote detective stories under the pseudonym H. Bustos Domecq (combining ancestral names of the two writers' families), which were published in 1942 as *Seis problemas para don Isidro Parodi* ("Six Problems for Don Isidro Parodi"). The works of this period revealed for the first time Borges' entire dreamworld, an ironical or paradoxical version of the real one, with its own language and systems of symbols.

When the dictatorship of Juan Perón came to power in 1946, Borges was dismissed from his library position for having expressed support of the Allies in World War II. With the help of friends, he earned his way by lecturing, editing, and writing. A 1952 collection of essays, *Otras inquisiciones (1937–1952)* (*Other Inquisitions, 1937–1952*), revealed him at his analytical best. When Perón was deposed in 1955, Borges became director of the national library, an honorific position, and also professor of English and American literature at the University of Buenos Aires. By this time, Borges suffered from total blindness, a hereditary affliction that had also attacked his father

and had progressively diminished his own eyesight from the 1920s onward. It had forced him to abandon the writing of long texts and to begin dictating to his mother or to secretaries or friends.

The works that date from this late period, such as *El hacedor* (1960; "The Doer," Eng. trans. *Dreamtigers*) and *El libro de los seres imaginarios* (1967; *The Book of Imaginary Beings*), almost erase the distinctions between the genres of prose and poetry. Later collections of stories included *El informe de Brodie* (1970; *Dr. Brodie's Report*), which dealt with revenge, murder, and horror, and *El libro de arena* (1955; *The Book of Sand*), both of which are allegories combining the simplicity of a folk storyteller with the complex vision of a man who has explored the labyrinths of his own being to its core.

Assessment. After 1961, when he and Samuel Beckett shared the prestigious Formentor Prize, Borges' tales and poems were increasingly acclaimed as classics of 20th-century world literature. Prior to that time, Borges was little known, even in his native Buenos Aires, except to other writers, many of whom regarded him merely as a craftsman of ingenious techniques and tricks. By the time of his death, the nightmare world of his "fictions" had come to be compared with the world of Franz Kafka and to be praised for concentrating common language into its most enduring form. Through his work, Latin-American literature emerged from the academic realm into the realm of generally educated readers throughout the Western world.

(E.R.-M.)

MAJOR WORKS. *Poems. Fervor de Buenos Aires* (1923); *Luna de enfrente* (1925); *Cuaderno San Martín* (1929); *Poemas* (1943); *Poemas 1923–1953* (1954); *Poemas* (1958); *Obra poética, 1923–1966* (1966; vol. 6 of Borges' *Obras completas*).

Prose. Essays: *Inquisiciones* (1925), miscellaneous essays; *El tamaño de mi esperanza* (1926), collected essays; *El idioma de los Argentinos* (1928), essays, one of which was revised and included in *El lenguaje de Buenos Aires* (1963); *Discusión* (1932); *Historia de la eternidad* (1936); *Aspectos de la literatura gauchesca* (1950); *El "Martín Fierro"* (1953); *Otras inquisiciones (1937–1952)* (1952; *Other Inquisitions, 1937–1952,* 1964); *Crónicas de Bustos Domecq* (1967), on aesthetics. Short stories and parables: *Historia universal de la infamia* (1935), translations, adaptations, original stories, and parables; *El jardin de senderos que se bifurcan* (1942), collected stories; *Ficciones 1935–1944* (1944; several later series, 6th enl. ed., 1966), stories; *El Aleph* (1949; *The Aleph and Other Stories, 1933–69,* ed. and trans. by Norman Thomas di Giovanni in collaboration with the author, 1970), collected stories; *La muerte y la brújula* (1951), collected stories; *El hacedor* (1960; *Dreamtigers,* 1964), collected stories, parables, and poems; *El libro de los seres imaginarios* (1967; *The Book of Imaginary Beings,* written by Borges with Margarita Guerrero, rev. and trans. by Norman Thomas di Giovanni in collaboration with the author, 1969). Biography: *Evaristo Carriego* (1930). Anthologies: Chosen by Borges from his own published and unpublished writings *Antología personal* (1961), stories, essays, and poems; trans. in *A Personal Anthology,* ed. by A. Kerrigan (1967). Other Eng. trans. in *Labyrinths: Selected Stories and Other Writings of J.L. Borges,* ed. and trans. by D.A. Yates and J.E. Irby (1962; rev. ed. 1970); *Fictions,* selections from the series of *Ficciones,* ed. and trans. by A. Kerrigan (1968); *Borges, a Reader: A Selection from the Writings of Jorge Luis Borges* (1981); *Borges at Eighty: Conversations* (ed. and with photographs by Willis Barnstone; 1982).

BIBLIOGRAPHY. Ana Maria Barrenechea, *La expresión de la irrealidad en la obra de Jorge Luis Borges* (1957; Eng. trans., *Borges, the Labyrinth Maker,* 1965), a critical study, with bibliography; Ronald Christ, *The Narrow Act: Borges' Art of Allusion* (1969), a perceptive analysis of one of Borges' key methods of creation; Martin S. Stabb, *Jorge Luis Borges* (1970), a superficial overall presentation; Emir Rodríguez-Monegal, *Borgès par lui-même* (1970), a critical introduction, with iconography, and *Jorge Luis Borges: A Literary Biography* (1978), which embraces the life, work, and criticism on Borges and contains a selective bibliography; Gene H. Bell-Villada, *Borges and His Fiction: A Guide to His Mind and Art* (1981).

Borghese FAMILY, a noble Italian family, originally from Siena, who first gained fame in the 13th century as magistrates, ambassadors, and other public officials. They moved to Rome in the 16th century and there, following the election (1605) of Camillo as Pope Paul V, rose in wealth and fame.

Among the early members, Galgano was papal ambassador to Naples (1456), Pietro was nominated senator by Leo X (pope 1513–21) in 1516, and Giambattista was a famed apologist for Clement VII (pope 1523–34).

The move to Rome was started by Marcantonio (1504–74), the father of Camillo Borghese, the future Pope Paul V. (*See* Paul V *under* Paul [Papacy].) Paul V bestowed privileges upon family members, first naming as cardinal his nephew Scipione Caffarelli (1576–1633), whom he adopted into the Borghese family.

Augmenting his wealth and influence, Scipione played a leading role in church politics. His chief interest, however, was the cultivation of the arts, to which he devoted the greater part of his life and wealth. Most importantly, he recognized and encouraged the talent of the young Gian Lorenzo Bernini (1598–1680), who later became the outstanding sculptor and architect of the Italian Baroque.

With the sizable income that he enjoyed from the several ecclesiastic offices that he held, Scipione financed the restoration and construction of many churches and palaces in the city of Rome. His major project was to have the Villa Borghese built in Rome, where he assembled an important collection of paintings and sculptures.

Pope Paul V also helped his nephew Marcantonio II (1601–58), who fathered the present branch of the Borghese family, whose wealth and estates he vastly augmented. Paul V obtained for Marcantonio the important principality of Sulmona and made him prince of Vivaro. Marcantonio married Camilla Orsini (1619), thereby acquiring the estates of the powerful Orsini family. He also arranged the marriage of his son Paolo (died 1646) to Olimpia, the Aldobrandini heiress.

Other family members who remained prominent in church affairs in Siena included Cardinals Pier Maria (1509–1642), Francesco (1697–1759), and Scipione (1734–82). Somewhat later, Marcantonio III became viceroy of Naples. The Borghese tradition of patronage of the arts was carried on by his nephew Marcantonio IV (1730–1800), who had the Villa Borghese renewed. He also enlarged the Borghese estates by his marriage to the wealthy and prominent Maria Salviati.

In the 19th century, Camillo Fillipo Ludovico (1775–1832) played an important role in Franco-Italian relations. Having married Napoleon's sister Marie Pauline (1803), he reached the rank of general in the army and was named governor of Piedmont (1807). After Napoleon's abdication, he concluded a surrender with the victorious Austrians and later maintained order during the transfer of power. Camillo won infamy for having sold to Napoleon the magnificent Borghese family art collection, part of which he recovered in 1815.

Camillo's brother Francesco (1776–1839) later became a general. Francesco's grandsons split the family into two branches. One, led by Paolo (1845–1920), retained the name Borghese; the other, led by Giulio (1847–1914), took the cognomen Torlonia.

Borghese Gallery, Italian GALLERIA BORGHESE, state museum in Rome distinguished for its collection of Italian Baroque painting and ancient sculpture. It is located in the Borghese Gardens on the Pincian Hill and is housed in the Villa Borghese, a building designed by the Dutch architect Jan van Santen (Giovanni Vasanzio) and built between 1613 and 1616.

The paintings were largely collected in the 17th century by Pope Paul V (Camillo Borghese) and his nephew Cardinal Scipione Borghese, while the antiquities were primarily obtained by Marcantonio Borghese in the 18th century and by Francesco Borghese in the 19th century. In 1902 the villa and its collection were acquired from the Borghese family by the Italian government.

Borgia FAMILY, Spanish BORJA, descendants of a noble line, originally from Valencia, Spain, that established roots in Italy and became prominent in ecclesiastical and political affairs in the 1400s and 1500s. The house of the Borgias produced two popes and many other political and church leaders. Some members of the family became known for their treachery.

Four Borgias became especially noteworthy in a historical sense. Alfonso de Borgia (1378–1458) established the family's influence in Italy and became Pope Calixtus III in 1455 (*see* Calixtus III). Rodrigo Borgia became a cardinal of the Roman Catholic Church and, later (1492), Pope Alexander VI (*see* Alexander VI *under* Alexander [Papacy]). As cardinal and pope, Rodrigo fathered a number of children by his mistress Vannozza Catanei. Cesare Borgia (*q.v.;* 1457–1507), son of Rodrigo, achieved political power while ruthlessly attempting to establish a secular kingdom in central Italy. Lucrezia Borgia (*q.v.;* 1480–1519), a daughter of Rodrigo and a patron of the arts, became famous for her skill at political intrigue.

The family produced many other persons of lesser importance. One, St. Francis Borgia (1510–1572), a great-grandson of Rodrigo, was canonized. The family began to decline in the late 1500s. By the middle of the 18th century it had disappeared.

Borgia, Cesare, DUC (duke) DE VALENTINOIS, Italian DUCA VALENTINO (b. *c.* 1475/76, probably Rome—d. 1507, near Viana, Spain), natural son of Pope Alexander VI. He was a Renaissance captain who, as holder of the offices of duke of the Romagna and captain

Cesare Borgia, oil painting; in the Uffizi, Florence

Alinari—Art Resource/EB Inc.

general of the armies of the church, enhanced the political power of his father's papacy and tried to establish his own principality in central Italy. His policies led Machiavelli to cite him as an example of the new "Prince."

Youth and education. Cesare Borgia was the son of his father's most famous mistress, Vannozza Catanei. His father, at that time Cardinal Rodrigo Borgia, was vice chancellor of the church and had had three earlier children by other mistresses. Cesare was, however, the oldest of the four children born to Vannozza and Rodrigo (the others being Juan, Lucrezia, and Jofrê) and was Rodrigo's second son. As was customary for second sons he was educated for a career in the church and in 1480 was dispensed from the slur of illegitimacy by Pope Sixtus IV so that he might hold ecclesiastical offices.

Although he was born in Italy and spent most of his life there, Cesare's family and cultural background was almost entirely Spanish. His elder half brother, Pedro Luis, was duke of Gandía, and all of his early benefices were in Spain. At the age of seven Cesare was made an apostolic prothonotary and canon of the cathedral of Valencia.

His early tutors were Paolo Pompilio and Giovanni Vera, both Catalans, and he was recognized as being exceptionally brilliant, as well as being, according to at least one observer, "the handsomest man in Italy." In 1489 he went to the University of Perugia to study law and then passed on to the University of Pisa, where he studied under the famous jurist Filippo Decio and gained a degree in canon and civil law. In 1491 he became bishop of Pamplona, and in 1492, after the accession of his father to the papal throne, he was made archbishop of Valencia.

Rise to power. The election of his father as pope in 1492 changed the fortunes of Cesare Borgia. Besides becoming an archbishop, he was also made a cardinal in 1493, with the titular church of Sta. Maria Nova; he was now one of his father's principal advisers. It was already clear, however, that he did not have a true religious vocation; he was better known at the papal court for his hunting parties, his amorous liaisons, and his magnificent clothes than for the meticulous observance of his ecclesiastical duties.

On the death of Pedro Luis in 1488 the title of duke of Gandía had by-passed him and gone to his younger brother Juan, and it was he who was made commander of the papal army in 1496 for the first of Alexander's campaigns against his rebellious nobility, the Orsini. Cesare was reputed to have been extremely jealous of his brother, and when Juan was mysteriously murdered in 1497 the rumour gradually spread that Cesare was the culprit. There is, however, no evidence that Cesare murdered his brother (who had many other enemies) beyond the fact that he was certainly capable of murder, as he subsequently proved.

After the death of Juan, Cesare's martial and political leanings and his father's need for a trustworthy secular lieutenant coincided, and in 1498 Cesare gave up his cardinalate. Plans were laid for an important dynastic marriage for him, and, after an abortive attempt to win the hand of Carlotta, daughter of the King of Naples, he travelled to France to marry Charlotte d'Albret, sister of the King of Navarre. At the same time he received from Louis XII, the French king, the title of duke of Valentinois, and from this title he derived his nickname—Il Valentino.

The French marriage of Cesare ensured for him and his father French assistance in their plans to reestablish control in the Papal States and, if possible, to carve out a permanent Borgia state in Italy for Cesare. In 1499 Cesare, as captain general of the papal army, assisted by a large contingent of French troops, began a systematic occupation of the cities of Romagna and the Marches, which had largely fallen under the control of semi-independent papal vicars.

The campaign of 1499 saw the conquest of Imola and Forlì; that of 1500–01 brought Rimini, Pesaro, and Faenza into Cesare's hands; finally, in 1502, he captured Urbino, Camerino, and Senigallia. It was in this last campaign that Machiavelli, as one of the Florentine ambassadors attached to Cesare's camp, was able to observe at first hand the methods of the man who was to figure so largely in his later writings.

The activities of Alexander and Cesare, although they conformed very much to a pattern established by earlier 15th-century popes, aroused immense opposition within the Papal States and from the other Italian states. The propaganda war waged against them was vitriolic and lastingly effective. Cesare was portrayed as a monster of lust and cruelty who had gained an unnatural ascendancy over his father after having supposedly killed his brother, the favourite son, Juan. It seems likely, however, that the two Borgias worked very much in harmony; Alexander was by far the more astute politician, and Cesare the more ruthless man of action. Ambitious and arrogant, he was determined to establish himself as an Italian prince before his father died and left him deprived of the political and financial support of the papacy. *Aut Caesar, aut nihil* ("Either Caesar or Nothing") was the motto he adopted to indicate the single-mindedness of his purpose. A number of political assassinations have been attributed to him, but the crime of which he was most clearly the author was the murder in August 1500 of his brother-in-law Alfonso, duke of Bisceglie, the second husband of Lucrezia. It seems likely that this was an act of personal vengeance rather than a politically motivated assassination, but it contributed greatly to the fear and loathing in which Cesare was held.

The best example of Cesare's methods was his third Romagna campaign (1502–03). He opened with a lightning march on unsuspecting Urbino, which surrendered without a shot being fired. He then turned on Camerino, which was also quickly subdued. At this stage his leading commanders, fearing his power, turned against him in the so-called Magione conspiracy. Cesare, stripped of most of his troops, was forced to fight defensively in the Romagna. With lavish use of papal funds, however, he managed to rebuild his army while at the same time working on the diplomatic front to break up the league of the conspirators. Having succeeded in breaking it up, he arranged a rendezvous for reconciliation with some of the conspirators at Senigallia and, having isolated them from their troops, he then arrested and executed them (December 1502).

Cesare, with a powerful army he could trust, now seemed to be at the zenith of his fortunes. It is probable that he was planning an attack on Tuscany, which would have provided him with the independent state he craved, when his father died on Aug. 18, 1503. He himself was also ill at the time, and this circumstance, together with the subsequent election of a bitter enemy of the Borgias, Giuliano della Rovere, as Pope Julius II, lessened his already slim chances of survival. Julius refused to confirm Cesare as duke of the Romagna or captain general of the church and demanded the restoration of the Romagna cities. Cesare was arrested, won a brief respite by agreeing to surrender his cities, and fled to Naples only to be arrested once more by Gonzalo de Córdoba, the Spanish viceroy, who refused to join him in a league against the Pope. Cesare was then taken to Spain and imprisoned, first in the castle of Chinchilla near Valencia, and then at Medina del Campo, from whence he escaped in 1506. Unable to see any immediate prospect of returning to Italy, he took service with his brother-in-law, the King of Navarre, and was killed in 1507 in a skirmish with Navarrese rebels outside Viana. He was buried in the church of Sta. Maria in Viana.

Assessment. Cesare Borgia was a man of extraordinary contrasts. Machiavelli found that he could be at times secretive and taciturn, at others loquacious and boastful. He alternated bursts of demonic activity, when he stayed up all night receiving and dispatching messengers, with moments of unaccountable sloth, when he remained in bed refusing to see anyone. He was quick to take offense and rather remote from his immediate entourage and yet very open with his subjects, loving to join in local sports and to cut a dashing figure.

There can be no doubt of the impact that he made in the Italy of his own day, but this impression was largely because of the backing he received from papal money and French arms. He was undoubtedly a master of politico-military manoeuvre, and it was a combination of daring and duplicity that brought him his striking successes and made him feared all over Italy. His abilities as a soldier and an administrator, however, were never really tested. He fought no major battles in his short military career, but this was perhaps a measure of his success as a planner. He had little time for the organization of the government of his Romagna duchy, but there are indications that he had plans for centralized government and bureaucratic efficiency, which to some extent justify the claims made for him as an administrator by Machiavelli. His interests tended to be scientific and literary rather than artistic, but once again time was too short for him to emerge as an important Renaissance patron. Leonardo da Vinci was for a short time his inspector of fortresses but executed no artistic commissions for him.

Machiavelli's apparent admiration for a man who was so widely feared and abhorred has led many critics to regard his portrayal of Cesare as an idealization. This interpretation, however, is not really the case. Machiavelli was well aware of the failings and limitations of Cesare Borgia, but he saw in him some of the qualities that he considered essential for the man who aspired to be a prince. The aggressiveness, the speed and ruthlessness of planning and execution, the opportunism of Cesare all delighted Machiavelli, who saw far too little of these qualities in the Italy of his day. Machiavelli was not attempting a rounded portrait of Cesare's character and qualities, which baffled him as much as they did most of his contemporaries.

(Mi.Ma.)

BIBLIOGRAPHY. The standard biography is still W.H. Woodward, *Cesare Borgia* (1913). More recent but less useful are C.E. Yriarte, *Cesare Borgia* (Eng. trans. 1947); C.M.L. Beuf, *Cesare Borgia: The Machiavellian Prince* (1942); and Sarah Bradford, *Cesare Borgia, His Life and His Times* (1976). On the background of the period and the family, see L. Collison-Morley, *The Story of the Borgias* (1932); and M.E. Mallett, *The Borgias* (1969), with the most complete bibliography.

Borgia, Saint Francis, Spanish SAN FRANCISCO DE BORJIA, original name FRANCISCO DE BORJA Y ARAGON, 4e DUQUE (4th duke) DE GANDÍA (b. Oct. 28, 1510, Gandía, Spain—d. Sept. 30/Oct. 1, 1572, Rome; canonized 1671; feast day October 10), Spanish nobleman who, as the third general of the Society of Jesus, was instrumental in spreading the Jesuits' influence throughout Europe.

Educated at Saragossa, Spain, he married Eleanor de Castro, a Portuguese noblewoman, in 1529. After holding various appointments in the court of King Charles I of Spain, he was made viceroy of the Spanish region of Catalonia (1539), where he tried to carry out badly needed social and economic reforms. He resigned in 1543 when he succeeded to his father's dukedom.

After Eleanor's death in 1546, Borgia entered the Society of Jesus. He founded the

Jesuit College in Gandía, which was made a university by papal bull in 1547. In 1550 he went to Rome, where he was received by St. Ignatius Loyola, and his entry into the society was made public. He returned to Spain (1551), where he was ordained a priest. Ignatius named him commissary general of the Spanish provinces in 1554, and he was chosen general of the society in 1565.

Under his leadership new provinces and colleges were established in Europe. Although his mission to Spanish Florida proved unsuccessful, the provinces of Peru and New Spain were established. He urged Pope St. Pius V to adopt two important policies for foreign missions: first, to centralize their government through a Roman congregation (similar to the later Congregation for the Propagation of the Faith); second, to insist that the civil rulers treat the native peoples humanely in order to win them to the faith.

In 1571 Pius sent Borgia to Spain, Portugal, and France to strengthen the league against the Turks. He fell ill on the return journey and died shortly after reaching Rome. A selection of Borgia's letters was edited in *Monumenta Historica Societatis Jesu, S. Franciscus Borgia*, 5 vol. (1894–1911). M. Yeo's *The Greatest of the Borgias* appeared in 1936.

Borgia, Lucrezia (b. April 18, 1480, Rome—d. June 24, 1519, Ferrara, Papal States), Italian noblewoman and a central figure of the infamous Borgia family of the Italian Renaissance.

Daughter of the Spanish cardinal Rodrigo Borgia, later Pope Alexander VI, and his Roman mistress Vannozza Catanei, and sister of Cesare, Lucrezia is often accused of sharing in their many crimes and excesses. In historical perspective, however, she seems to have been more an instrument for the ambitious projects of her brother and father than an active participant in their crimes. Her three successive marriages into prominent families helped augment the political and territorial power of the Borgias.

Lucrezia Borgia, detail from the fresco the "Dispute of St. Catherine," by Pinturicchio, 1492–94; in the Vatican

Alinari—Art Resource/EB Inc.

In 1491 the young Lucrezia was successively betrothed to two Spanish nobles. But after her father became pope in 1492, he sought an alliance with the Sforza family of Milan against the Aragonese dynasty of Naples. Accordingly, Lucrezia was in 1493 married to Giovanni Sforza, lord of Pesaro. When Alexander allied himself with Naples, and Milan with the French, Giovanni, fearing for his life, fled from Rome and became an enemy of the Borgias, later charging incestuous relations between Lucrezia and Alexander. Alexander annulled the marriage in 1497 on the dubious grounds of nonconsummation.

Seeking to strengthen his ties with Naples, the Pope in 1498 arranged a marriage between Lucrezia and the 17-year-old Alfonso, duke of Bisceglie, an illegitimate son of Alfonso II of Naples. Upon Cesare's alliance with the French king Louis XII (1499) and his subsequent campaign in the Romagna, which threatened Naples, Alfonso fled Rome in August but returned with Lucrezia in October. In July 1500 he was wounded by four would-be assassins on the steps of St. Peter's. While recovering, he was strangled by one of Cesare's servants. The murder provoked the desired rupture with Naples.

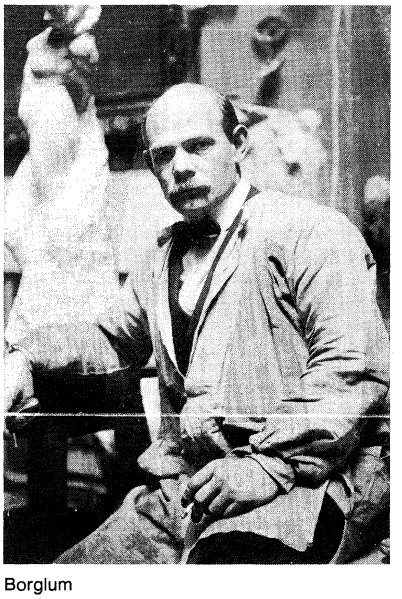
Lucrezia retired to Nepi, and during this period the mysterious Infans Romanus (Roman Infant) was first seen, the three-year-old boy named Giovanni, with whom Lucrezia appeared in 1501. Two papal bulls recognized the child as the illegitimate son first of Cesare, then of Alexander, who was probably the true father. The mysterious origin of the child as well as Lucrezia's presence at a celebrated night orgy at the Vatican have been used to support the rumours of incest in the Borgia family.

Alfonso d'Este, son of Ercole I, duke of Ferrara, married Lucrezia on Dec. 30, 1501, although he shunned the union for a time because of the Borgias' unsavoury reputation. This marriage was arranged by Cesare to consolidate his position in the Romagna. When Alexander VI died in 1503, Lucrezia ceased to play a political role and led a more normal life at the brilliant court of Ferrara, which became a centre for the arts and letters of the Italian Renaissance. She turned to religion in her last years and died at the age of 39.

Borglum, (John) Gutzon (de la Mothe) (b. March 25, 1867, St. Charles, Bear Lake, Idaho, U.S.—d. March 6, 1941, Chicago), U.S. sculptor who revived the ancient Egyptian and Mesopotamian practice of carving gargantuan political statues in immense natural formations of rock.

Borglum studied art in San Francisco, then, from 1890 to 1893, in Paris, at the Académie Julian. Both his painting and his sculpture were admitted to the officially recognized salon there, and in England he received important commissions and royal recognition.

In 1901 Borglum established himself in New York City, where he sculpted a bronze group called "The Mares of Diomedes," the first piece of American sculpture bought for the Metropolitan Museum of Art, New York City. With prodigal versatility he sculptured many portrait busts of patriots as well as such heroic figures as the twelve Apostles for the Cathedral of St. John the Divine, in New York City. But he soon turned toward what his wife, a scholar in cuneiform and other Middle Eastern scripts, described as "the emotional value of volume." From a six-ton block of marble he executed the colossal head of President Lincoln in the Capitol Rotunda at Washington, D.C. This suggested to some Southern women the idea of having a similar head of the Confederate general, Robert E. Lee. But Borglum was moved to begin instead a titanic sculptural procession of Lee and his staff and soldiers marching in the Stone Mountain Memorial, in Georgia. Disputes with his patrons led Borglum to abandon the enormous work, which was completed by others. He was then engaged on a government stipend to turn another mountain into a monument.



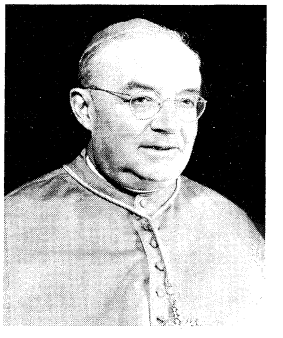
Borglum

By courtesy of the Library of Congress, Washington, D.C.

In the Mount Rushmore National Memorial, in South Dakota, Borglum carved the heads of Washington, Jefferson, Lincoln, and Theodore Roosevelt. His engineering prowess invented new methods that took advantage of the capacity of dynamite and pneumatic hammers to carve large quantities of stone quickly. The work was completed in 1941, the year of Borglum's death, although the last details were completed by his son, Lincoln.

Borgo Maggiore, town and seat of Borgo Maggiore *castello* (district), Republic of San Marino, located northeast of the city of San Marino, the republic's capital, on the slopes of Monte Titano, at an elevation of 1,706 ft (520 m) above sea level. It is considered a suburb of the city of San Marino and has most of the capital's shops and offices. Borgo Maggiore is the principal market town of the republic, and is also the seat of the Italian consulate. Historically it was incorporated into the city of San Marino but is now a separate town. Borgo Maggiore is connected to the capital by funicular and road and to Rimini, Italy, by helicopter service (in the summer) and highway. Pop. (1982 est.) 1,970.

Borgongini-Duca, Francesco (b. Feb. 26, 1884, Rome—d. Oct. 4, 1954, Rome), cardinal, Vatican dignitary, and author of the Lateran Treaty, which assured the Holy See independence from Italy and sovereignty in international relations.



Borgongini-Duca

Pontificia Fotografia Felici

Ordained priest on Dec. 22, 1906, Borgongini-Duca was, from 1907 to 1921, professor of theology at the Urban College of Propaganda, Rome. As a faculty member of the North American College, Rome, he taught many U.S. seminarians, including Francis Cardinal Spellman, who later translated into English his popular meditations as *The Word of God* (1921). Borgongini-Duca's greatest diplomatic achievement was probably his role in the negotiations that culminated in the Lateran Treaty of 1929, which he wrote and, with Pietro Cardinal Gasparri (secretary of state)

and Benito Mussolini, signed, as secretary of the Vatican's Congregation for Extraordinary Ecclesiastical Affairs. He then became the first papal nuncio to modern Italy.

On June 7, 1929, Pope Pius XI named Borgongini-Duca titular archbishop of Heraclea in Turkey, and he was consecrated on June 29 by Gasparri. In May 1951 he visited the U.S., and on Nov. 29, 1952, Pope Pius XII made him cardinal. Following the consistory (*i.e.,* solemn meeting of cardinals convoked and presided over by the pope) of Jan. 12, 1953, he was assigned the titular church of Santa Maria in Vallicella. He was named cardinal protector of the Ursuline Nuns on May 19, 1953. His *Le LXX settimane di Daniele e le date Messianiche* (1951; "The Seventy Weeks of Daniel and the Messianic Date") fixed the date of Jesus Christ's crucifixion as April 7, AD 30.

Borgu, also spelled BORGOU, inland region of West Africa, covering parts of what is now Benin and Nigeria and bounded northeast and east by the Niger River. Its name probably derives from the aquatic grass called *borgu,* a valuable cattle food. The tribes of the region formerly gave allegiance to the sultan of Borgu and the chief of Busa. After a dispute over the territory in 1894, an Anglo-French convention of 1898 declared the western part French and the eastern British. Nigerian areas of this region are protected game and forest reserves.

Borgu, traditional emirate, Kwara State, western Nigeria. After a race by the colonial developer Frederick Lugard, on behalf of the Royal Niger Company, in 1894 to beat the French to Nikki (now in Benin), the capital of the Borgu kingdom, to sign a commercial treaty, France and Britain settled their territorial claims to Borgu by a convention of 1898. Eastern Borgu, the area of which contained the 12,000-sq-mi (31,000-sq-km) Bussa, Kaiama, and Illo chiefdoms, was ceded to the British, who created Borgu Province in 1900, recognized Bussa chiefdom (founded *c.* 1730) as an emirate, and established Kaiama's Chief Mora Tsaude (Murata Sidi) as *amīr* of Kaiama. After Illo was transferred to Sokoto province in 1905, what remained of Borgu was given (1907) to Kontagora province; Borgu division was incorporated into Ilorin province in 1923. In 1954, when Kaiama's *amīr* resigned, Kaiama and Bussa emirates were joined; Muhammadu Sani, *amīr* of Bussa, then became the first *amīr* of Borgu. Today, the *amīr* functions in a traditional and religious capacity.

Borgu's area of plains and wooded savanna is drained by several small streams that flow eastward to the Niger River, the area's eastern boundary. Poor soils, low rainfall (especially in the dry season), and Fulani slave raids in the 19th century have made Borgu one of Nigeria's least populated regions. Most of the inhabitants are members of the Bargu (Borgu, Bariba, Borgenci), Busa (Bussa, Bussangi), Boko (Bokoboro), Reshe (Gungunci, Gungawa), Fulani, Kamberi, or Yoruba ethnic groups and are mainly engaged in cattle and poultry raising, subsistence farming (sorghum, millet, shea nuts, onions, corn [maize], peanuts [groundnuts], cotton, tobacco), and fishing. Gold mining, once important around Kaiama and Bussa, is no longer significant. The artificial Kainji Lake (1968) forced the evacuation of several towns along the Niger, including Bussa, the former spiritual headquarters of the Borgu kingdom. Kaiama, New Bussa (built in 1966; 24 mi [39 km] south of old Bussa), Okuta, and Wawa are the chief towns.

Borhyaenidae, family of extinct South American marsupial mammals occurring from the late Paleocene into the Pliocene (from about 5,000,000 to 55,000,000 years ago). It is named for the genus *Borhyaena;* hyena-like specimens of this genus, found in early Miocene rocks of Argentina (26,000,000 years ago), had large skulls and heavy crushing teeth. Not all borhyaenids, however, were hyenoid. *Thylacosmilus* was a Pliocene-aged marsupial counterpart of the sabre-toothed tiger. Many other forms were wolflike and foxlike.

boric acid (H_3BO_3), white crystalline, oxygen-bearing acid of boron found in certain minerals and volcanic waters or hot springs (*see* boron).

boride, any of a class of hard substances in which boron is chemically combined with various metals (*see* boron).

Borinage, coal-mining and industrial region of southwestern Belgium, Hainaut province, southwest of Mons. Borinage's development was based on coal extracted from the area since the Middle Ages. The mines are no longer operative; the principal industries are metallurgy (in the town of Jemappes) and glassmaking (at Boussu). The city and workshops of Grand Hornu constitute a remarkable reconstruction (begun *c.* 1820) of an ancient mine and its attendant industrial complex.

Boring, Edwin G(arrigues) (b. Oct. 23, 1886, Philadelphia—d. July 1, 1968, Cambridge, Mass., U.S.), U.S. psychologist first recognized for his experimental work but later known as a historian of psychology.

Boring studied engineering and psychology at Cornell University (Ithaca, N.Y.), receiving his Ph.D. in the latter in 1914. He taught at Clark University (Worchester, Mass.) and then went to Harvard (1922), where he became director (1924) of the Psychological Laboratory. From 1957 to 1968 he was professor emeritus of psychology.

Boring's experimental work focussed on sensory stimulation of the alimentary tract and the physiological consequences of dividing nerve fibres. However, his research also covered a vast number of other topics, giving him one of the widest backgrounds of any U.S. psychologist and preparing him to write his best known work, *A History of Experimental Psychology* (1929; 2nd ed., 1950), which established him as one of the first U.S. historians of the field. Boring also wrote *The Physical Dimensions of Consciousness* (1933) and *Sensation and Perception in the History of Experimental Psychology* (1942).

boring machine, device for producing smooth and accurate holes in a workpiece by enlarging existing holes with a bore, which may bear a single cutting tip of steel, cemented carbide or diamond, or may be a small grinding wheel. Single-point tools, gripped in a boring head attached to a rotating spindle, are moved circularly against the sides of the existing holes. The diameter of the hole swept out by the tool is controlled by adjustment of the boring head.

Grinding-wheel cutters have a planetary motion, rotating rapidly about their own axes, which in turn slowly rotate with the boring head about the spindle axis; the hole diameter is controlled by adjusting the distance between the wheel axis and the spindle axis. The spindles on boring machines may rotate about vertical or horizontal axes.

Boring machines used in toolmaking shops have one vertical spindle and a work-holding table that can be moved horizontally in two directions perpendicular to each other so that holes can be accurately spaced. On some machines the spacing error is less than 0.002 percent. In mass-production plants, special boring machines with multiple spindles are common.

Boris I, baptismal name MIKHAIL, English MICHAEL (d. May 2, 907, Preslav, Bulg.), khan of Bulgaria (852–889), whose long reign witnessed the conversion of the Bulgarians to Christianity; the founding of an autocephalous Bulgarian Church; and the advent of Slavonic literature and the establishment of the first centres of Slav-Bulgarian scholarship and education. Boris' active domestic and foreign diplomacy was of great importance in forming a united Bulgarian ethnical community, and it left lasting traces on Bulgaria's later development.

When Boris inherited the throne from his father, Bulgaria's territorial, military, and political potential had made it one of the largest states in Europe. Bulgaria's approximate frontiers were the Dnieper in the northeast; the Carpathians in the north; the Tisa (Tisza) in the northwest; the Adriatic in the west; and the Tomorr (Tomor), Belasica, Pirin, Rhodope, and Strandzha mountains in the south. Many Slavic tribes lived within the boundaries of the state, together with the proto-Bulgarians, a tribe of Turkic origin that had settled in the Balkan Peninsula at the end of the 7th century. In view of the religious, ethnic, and language difficulties between the Slavs and Bulgars, the introduction of a common and compulsory religion for all subjects was one of the principal preconditions for the formation of a united Bulgaria. Pagan Bulgaria needed to join the "family of Christian states," but the existence of two competing centres of Christianity—Rome and Constantinople—made it difficult for Boris to make his choice. Boris originally intended to accept Roman Christianity, but an unsuccessful war with the Byzantines forced Boris to adopt the Orthodox faith of Constantinople (864). Boris (at his baptism he took the Christian name Michael), his family, and the nobles who supported his policy were baptized one night in secret by a Byzantine bishop and priests who had been sent to Pliska, the Bulgarian capital. There was serious opposition by both the nobility and the common people to Boris' attempt to enforce mass Baptism. A pagan rebellion broke out, and Boris retaliated by executing 52 boyars, together with their families.

Negotiations took place between Boris and Photius, patriarch of Constantinople, on the status of the Bulgarian diocese but did not lead to the result expected by the Bulgarians. The Byzantines demanded that the Bulgarian church organization should be entirely subjected to Constantinople. Dissatisfied, Boris renewed his diplomatic contacts with the West. In 866 he sent embassies to Pope Nicholas I (858–867) and to King Ludwig of Germany. The Pope immediately responded by sending a mission to Bulgaria. The Roman clergy's stay (866–870) soon became a sore point in the acute rivalry between Rome and Constantinople. But since Pope Nicholas I and his successor, Adrian II, proved dilatory on the question of church organization in Bulgaria (they hesitated over the creation of an independent Bulgarian archbishopric), Boris again reopened negotiations with Constantinople. The Bulgarian church question was finally solved at the eighth ecumenical council in Constantinople in 869–870. Bulgaria was formally placed under the nominal ecclesiastical jurisdiction of the patriarch of Constantinople but received an independent archbishopric. The attempts of the popes to bring the Bulgarian ruler back into the Roman Church by pleas and promises of concessions continued until 882 but produced no results.

Boris was quite active in inculcating the Christian faith among the Bulgarian people, in organizing the Bulgarian Church as an independent institution, and in building churches throughout the country. In 886 he gave asylum to Clement, Nahum, and Angelarius, the disciples of Cyril and Methodius, missionaries to the Slavs, who had been driven out of Moravia. With Boris' active assistance and material support, these disciples founded cen-

tres of Slavic learning at Pliska, Preslav, and Ohrid. As a result of the intensive work of the Slav scholars, the Slavic language replaced Greek in church services and in literary life and became the country's official language.

In 889 Boris I abdicated and became a monk, but he retained the right to take an active part in the government of the state. Boris' eldest son and heir, Vladimir (889–893), abandoned his father's policy and became the instrument of a pagan reaction and a leader of the opponents of Slavic letters and literature. Boris then returned to active politics. With the aid of loyal boyars and the army, Boris drove his son from the throne. Vladimir was blinded, unfitting him for rule, and was replaced by Boris' third son, who ruled as Symeon the Great (893–927). Boris afterward retired to his monastery, making generous grants to the Bulgarian Church and patronizing Slav scholarship. He was canonized by the Orthodox Church, and his feast is celebrated on May 15 (new style; May 2, old style). (W.T.G.)

BIBLIOGRAPHY. Vasil Gjuzelev, *Knjaz Boris Părvi* (1969), the most recent and complete study in line with the achievements of modern historiography; Frantisek Dvornik, *Les Slaves, Byzance et Rome au IXe siècle* (1926), chiefly concerning the diplomacy of Boris I of Bulgaria with a view to relations between the churches of Rome and Constantinople; *The Photian Schism: History and Legend* (1948), a brilliant study in which the author gives an appreciation of the work of Boris I.

Boris III (b. Jan. 30, 1894, Sofia, Bulg.—d. Aug. 28, 1943, Sofia), king of Bulgaria from 1918 to 1943, who during the last five years of his reign headed a thinly veiled royal dictatorship.

The son of Ferdinand I of Bulgaria and Maria Luisa of Bourbon-Parma, Boris, despite his

Boris III, *c.* 1934
BBC Hulton Picture Library

Roman Catholic parentage, was brought up in the Orthodox faith for political and dynastic reasons. He succeeded his father as king of Bulgaria when he abdicated Oct. 4, 1918. An opponent of Bulgaria's political strongman, the Agrarian Union leader Aleksandŭr Stamboliyski, Boris is generally considered to have played some role in the coup that removed Stamboliyski from power in June 1923. During the following years he was the object of terrorist conspiracies; two attempts were made on his life within a few days in April 1925. His marriage to Princess Giovanna of Italy (1930) temporarily cemented Italian relations; but during the late 1930s he passed more into the German orbit and sought rapprochement with Yugoslavia. After the establishment of a military dictatorship in Bulgaria (1934), he worked gradually to reassert his power; by November 1935 he had successfully installed Georgi Kyoseivanov, a personal favourite, as prime minister. From 1938 until his death he was dictator in all but name.

After Bulgaria's adhesion to the Axis pact (March 1941), Boris maintained a modicum of independence; even after Bulgaria's entry into World War II on the side of the Axis and after participating in the invasion of Yugoslavia and Greece, he was able to resist declaring war against Russia. He died shortly after a stormy interview with Adolf Hitler. Whether his death was caused by heart attack or by assassination is uncertain.

Boris GODUNOV: *see* Godunov, Boris.

Borisoglebsk, city, Voronezh *oblast* (administrative region), southwestern Russian Soviet Federated Socialist Republic, on the left bank of the Vorona River, near its confluence with the Khoper. Founded in 1646 as a fortress against the Tatars, it now serves as a grain collection centre. Other industries are related to agriculture—*e.g.,* flour milling and meat packing. Railway repair shops are located in the city. There are teacher-training, medical, and music schools. Pop. (1983 est.) 67,000.

Borisov, city, Minsk *oblast* (administrative region), Belorussian Soviet Socialist Republic, on the Berezina River at its confluence with the Skha. Founded in the 12th century, Borisov has been at various times under Lithuanian, Polish, and Russian rule. Napoleon's disastrous retreat across the Berezina River in 1812 took place north of the city. An important communications centre at which the Moscow–Warsaw railway and highway cross the navigable Berezina, it is also a major timberworking city and produces plastics, electrical automobile equipment, cranes, and glassware. Pop. (1983 est.) 124,000.

Borja, Alfonso de (pope): *see* Calixtus III.

Borja, Rodrigo, also called RODRIGO DE BORJA Y DOMS: *see* Alexander VI *under* Alexander (Papacy).

Borja y Aragon, Francisco de: *see* Borgia, Saint Francis.

Borkou, also spelled BORKU, region in northern Chad, north central Africa, centred around the town of Faya (formerly Largeau). It is mostly a sandy desert of the southeastern Sahara, south of the Tibesti massif and west of the Ennedi plateau. Formerly a vassal state of Ouaddaï, a Muslim (Sanūsī) sultanate, it was ceded to France under an Anglo-French agreement (1899), but Sanūsī control over the region was not broken until 1913–14. French troops remained in Borkou (and neighbouring Ennedi and Tibesti) until 1965 because the area was considered hard to control. The more fertile oases grow dates, barley, and vegetables and support camels, donkeys, and goats. The area is drained underground by the Lake Chad Basin. The population consists of nomadic and semi-nomadic Tedas, Arabs, and Berbers. Pop. (latest census) 17,800.

Borkou-Ennedi-Tibesti, northernmost and largest *préfecture* of Chad, north central Africa, with an area of 231,795 sq mi (600,350 sq km). Its capital is Faya (formerly Largeau). The terrain is primarily arid desert with a sparse population of nomadic and semi-nomadic Arabs, Berbers, Tedas, and Nakazas. The region was historically important as a crossing place in the trans-Saharan trade between West Africa and Cyrenaica (Libya); the Islāmic pilgrimage route from West Africa to Mecca in Saudi Arabia also passed through it. In the early 1900s it came under French control when the resistance of the Sanūsī brotherhood was somewhat subdued. Nevertheless, the area was considered ungovernable, and, following Chad's independence in 1960, it remained under French military administration. In 1965 the French withdrew at Chad's request, and the region was incorporated into the Chad republic; but its nomadic tribes continued to resist the autocratic, southern-dominated central government. Pop. (1978 est.) 87,000.

Borlänge, town, *län* (county) of Kopparberg, central Sweden, on Dalälven (Dal River). In the Middle Ages a stronghold known as Borghnäs was located near the present site; its destruction in 1434 opened a war of liberation against the Danes. With the coming of railroads, beginning in 1875, Borlänge developed into an important commercial centre for the surrounding agricultural and industrial areas. In 1891 it became a municipality and in 1898 a market town. After absorbing the villages of Domnarvet and Kvarnsveden, it was chartered as a town in 1944.

Located near the rich Bergslagen mining region, Borlänge is an important ironworking and steel-milling centre. In addition, it has paper mills, sawmills, engineering works, foundries, printing establishments, slaughterhouses, power stations, and factories producing headgear and leather goods. It is also an important rail and bus junction. Domnarvet open-air museum contains 16th- and 17th-century buildings. Pop. (1983 est.) mun., 46,766.

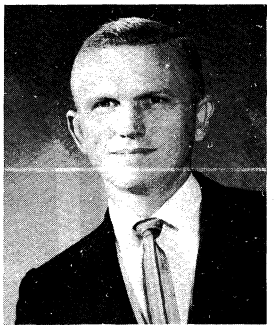
Borlaug, Norman Ernest (b. March 25, 1914, Cresco, Iowa, U.S.), American agricultural scientist, plant pathologist, and winner of the Nobel Prize for Peace in 1970. He was one of those who laid the groundwork of the so-called Green Revolution, the agricultural technological advance that promised to alleviate world hunger.

He studied plant biology and forestry at the University of Minnesota and earned a Ph.D. in plant pathology there in 1941. From 1944 to 1960 he served as research scientist at the Rockefeller Foundation's Cooperative Mexican Agricultural Program in Mexico. At a research station at Campo Atizapan he developed strains of grain that dramatically increased crop yields. Wheat production in Mexico multiplied threefold in the time that he worked with the Mexican government; "dwarf" wheat imported in the mid-1960s was responsible for a 60 percent increase in harvests in Pakistan and India. He also created a wheat–rye hybrid known as triticale.

Borlaug served as director of the Inter-American Food Crop Program (1960–63) and as director of the International Maize and Wheat Improvement Center, Mexico City, from 1964 to 1979. In constant demand as a consultant, Borlaug has served on numerous committees and advisory panels on agriculture, population control, and renewable resources.

Borman, Frank (b. March 14, 1928, Gary, Ind., U.S.), American astronaut who, with James A. Lovell and William A. Anders, made the first manned flight, in Apollo 8, around the Moon in December 1968. Three years earlier Borman and Lovell had made the Gemini 7 endurance flight in which they remained in space for 330 hours 35 minutes.

Borman graduated from the U.S. Military Academy, West Point, N.Y., in 1950, was commissioned in the Air Force, and served with the 44th Fighter Bomber Squadron in the Philippines between 1951 and 1956. He subsequently taught at the Air Force Fighter



Borman, 1964
By courtesy of the National Aeronautics and Space Administration

Weapons School. After taking his master's degree in aeronautical engineering (1957) at California Institute of Technology, Pasadena, Borman taught at West Point and at the Air Force Aerospace Research Pilots School. In 1962 he was chosen by the National Aeronautics and Space Administration (NASA) to be a member of the second group of astronauts. After the Apollo 8 flight he became deputy director of flight-crew operations for NASA.

In July 1970 Borman resigned from NASA to become senior vice president of Eastern Airlines. In 1975 he was named to the presidency, a post he retained when he became chairman of the board of directors in 1976.

Bormann, Martin (b. June 17, 1900, Halberstadt, Ger.—d. May 1945, Berlin?), powerful party leader in Nazi Germany, one of Adolf Hitler's closest lieutenants.

An avowed and vocal pan-German in his youth, Bormann participated in right-wing German Free Corps activities after the close of World War I. Bormann was imprisoned in 1924 for participation in a political murder, and after his release he joined the National Socialists. He became head of the Nazi press in Thuringia in 1926 and from 1928 held posts in the high command of the Sturmabteilung (Storm Troopers). In 1933 he became chief of staff to the deputy führer, Rudolf Hess. On May 12, 1941, Hitler appointed Bormann to fill the post of head of the party chancellery, succeeding Hess after the latter had made his quixotic flight to Scotland. Bormann thus became head of the administrative machinery of the Nazi Party, and through intrigue, party infighting, and his shrewd manipulation of Hitler's weaknesses and eccentricities, he became a shadowy but extremely powerful presence in the Third Reich. He controlled all acts of legislation and all party promotions and appointments, and he had a broad influence on domestic policy questions concerning internal security. He controlled the personal access of others to Hitler and drew up the Führer's schedule and appointments calendar, insulating him from the independent counsel of his subordinates. Bormann was a rigid and unbending guardian of Nazi orthodoxy; he was a major advocate of the persecution and extermination of Jews and Slavs, and he played a role in expanding the German slave labour program. He disappeared shortly after the death of Hitler, and it was presumed that he was either dead or in hiding. He was indicted Aug. 29, 1945, along with other Nazi leaders, on charges of war crimes and was found guilty and sentenced to death in absentia by the International Military Tribunal at Nürnberg on Oct. 1, 1946.

Later reports, especially in the 1960s, alleged that Bormann had escaped and had been living in South America, possibly Paraguay. However, early in 1973 a Berlin forensic expert established "with near certainty" that one of two skeletons unearthed during construction in West Berlin in December 1972 was that of Bormann, and on April 11, 1973, West German authorities officially declared him dead.

Born, Bertran de: *see* Bertran de Born.

Born, Max (b. Dec. 11, 1882, Breslau, Ger.—d. Jan. 5, 1970, Göttingen, W.Ger.), German physicist, winner of the Nobel Prize for Physics in 1954, with Walther Bothe of Germany, for his statistical formulation of the behaviour of subatomic particles.

In 1921, the year he became professor of theoretical physics at the University of Göttingen, Born produced a very precise definition of quantity of heat, the most satisfactory mathematical statement of the first law of thermodynamics. In 1926, after his student Werner Heisenberg had formulated the first

Max Born

By courtesy of Godfrey Argent; photograph, Walter Stoneman

laws of a new quantum theory, Born collaborated with him to develop the mathematical formulation that would adequately describe it. Somewhat later, when Erwin Schrödinger put forward his quantum mechanical wave equation, Born showed that the solution of the equation has a statistical meaning of physical significance. Born also introduced a useful technique, known as the Born approximation, for solving problems concerning the scattering of atomic particles. He and J. Robert Oppenheimer initiated a widely used simplification of the calculations dealing with electronic structures of molecules.

In 1933 Born fled the Nazis and became Stokes lecturer at the University of Cambridge. He was elected to the Tait chair of natural philosophy at the University of Edinburgh in 1936, becoming a British subject in 1939. After his retirement in 1953 Born returned to Göttingen. His *Selected Papers* appeared in 1963.

Consult the INDEX *first*

Borneo, one of the great islands of the world, situated southeast of the Malay Peninsula in the Greater Sunda group of the Malay Archipelago. The island is bounded by the South China Sea (northwest) and, clockwise, by the Sulu and Celebes seas, the Makassar Strait, and the Java Sea. The largest political segment of the island is Indonesian (until 1949 Dutch), known as Kalimantan. Along the northwest coast and northern tip lie Sarawak and Sabah (formerly North Borneo), which in 1963 joined the Malaysian federation, and between them, the Islāmic sultanate of Brunei. The population of the island in 1984 was estimated at 10,398,000, of which Kalimantan 7,564,000, Sabah and Sarawak 2,618,000, Brunei 216,000.

The article that follows is a summary of significant detail about Borneo; for full treatment, *see* MACROPAEDIA: East Indies; Southeast Asia, Mainland.

Borneo is roughly kidney-shaped, mountainous, and largely covered in dense rain forest. With a length of 830 mi (1,336 km) northeast–southwest and a maximum breadth of 600 mi, it has an area (including adjacent islands) of about 292,000 sq mi (755,000 sq km). A dorsal range, rising to its greatest height at 13,455-ft (4,101-m) Mt. Kinabalu, in the far northeast, extends southwest across the island into the Crocker, Nieuwenhuis, and Muller mountains.

A large part of Borneo is drained by navigable rivers, the principal and often the only lifelines of trade and commerce. Farther north, as the island narrows, few rivers are navigable for more than 100 mi, often much less, a condition largely responsible for the northern interior of Borneo remaining, until recently, one of the least known parts of the world. The climate is equatorial—hot and humid with a fairly distinct division into two seasons: the monsoon (*landas*) between October and March, and a relatively drier, calmer period of summer (*tedoh*) for the rest of the year. The average rainfall is about 150 in. (3,800 mm) a year. Both the floral and the faunal populations of Borneo are extremely varied. They include rafflesia (the largest flower in the world), the orangutan and gibbon, the clouded leopard, elephant, rhinoceros, and many insects.

The island is sparsely inhabited by Asian standards, with about 36 persons (1984 est.) per square mile. The population, of which three-fourths is in Indonesian territory, is varied. It includes the non-Muslim Dayaks, the Islāmic Malays, the Chinese, and a small minority of Europeans.

Borneo is poor in commercial mineral resources. Gold, diamonds, antimony, mercury, gypsum, and iron have all at some time since the beginning of the 19th century been exploited on an individual producer basis using small-scale methods. There are oil fields at Tanjung Balikpapan, in Brunei, and at more than a dozen other sites on the continental shelf off the north shore of the island. East coast development is centred on the Attaka area. Bauxite has been developed near Cape Datu (southwest) since 1958, and coal is mined in the southwest.

Generally, Borneo soils are poor, with a few exceptions of fertile volcanic areas. Rice, the staple food, is supplemented with corn (maize), cassava (manioc), cucumber, and pumpkin. Rubber is grown on small native plantations. Pepper is grown on a large scale by the resident Chinese. Newer markets are for the seeds of the shorea tree and for chicle. Coastal area exports are sago, copra, cutch (a dye extracted from mangrove bark), and marine products. Tobacco is grown in the uplands and traded to the lowlands. Experimental plantings of coffee, cocoa, and hemp have been made.

Borneo is first mentioned in Ptolemy's *Guide to Geography* of *c.* AD 150. Roman trade beads and Indo-Javanese artifacts have been discovered that give evidence of a flourishing civilization dating to the 2nd or 3rd century BC. Three rough foundation stones with an inscription recording a gift to a Brahman priest date from the early 5th century AD, found at Kutai, provide evidence of a Hindu kingdom in eastern Kalimantan. Brahmanic and Buddhist images in the Gupta style have been found in the valleys of the Kapuas and other rivers in western Kalimantan. Later Kalimantan rulers were probably feudatories of the Majapahit Empire of eastern Java (*c.* 1293–1520). With the arrival of Islām early in the 16th century, a number of Muslim kingdoms were founded, including the Banjarmasin, Sambas, Sukadana, and Landak. The Sukadana rulers owed allegiance to the Muslim Mataram kingdom of Java.

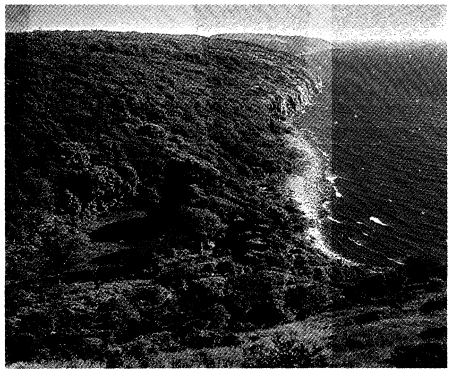
Modern European knowledge of Borneo dates from travelers who passed through Southeast Asia in the 14th century. The first recorded European visitor was the Franciscan friar Odoric of Pordenone, who visited Talamasim on his way from India to China in 1330. The Portuguese, followed by the Spanish, established trading relations on the island early in the 16th century. At the beginning of the 17th century the Portuguese and Spanish trade monopoly was broken by the Dutch, who, intervening in the affairs of the Muslim kingdoms, succeeded in replacing Mataram influence with their own. The coastal strip along the South China and Sulu seas was long oriented toward the Philippines and was often raided by Sulu pirates. British interests, particularly in the north and west, diminished that of the Dutch. The Brunei Sultanate was an Islāmic kingdom that at one time had controlled the whole island but by the 19th century ruled only in the north and northwest. Sarawak was split away on the southwest, becoming an independent kingdom and then a British colony; North Borneo (later Sabah) to the northeast was obtained by a British com-

pany to promote trade and suppress piracy, but was not demarcated until 1912. These losses left a much reduced Brunei, which became a British protectorate.

During World War II the Japanese invasions of Borneo (1941–42) quickly eliminated the token British and Dutch forces on the island, which was not retaken until 1945. In July 1946 both Sarawak and North Borneo were made British crown colonies. In Dutch Borneo a strong nationalist sentiment developed and led to fighting between Indonesian and Dutch forces as the latter attempted to reimpose Netherlands control. Sovereignty passed to the Indonesians in 1949, and the following year a new constitution proclaimed Dutch Borneo part of the Republic of Indonesia.

The British government relinquished its sovereignty over Sabah and Sarawak in 1963, when these territories joined the Malaysian federation. This marked the commencement of Indonesian hostilities in the form of guerrilla raids across the border. These raids ceased by agreement in 1966. Except for the period of Japanese occupation, Brunei was under British protection from 1888 to 1983. It became fully independent on Jan. 1, 1984.

Bornholm, Danish island and *amtskommune* (county), in the Baltic Sea, 105 mi (169 km) southeast of Copenhagen and 22 mi southeast of Sweden. Once a Viking stronghold, independent until the 10th century, it was controlled by Sweden and by Lübeck (a city of the Hanseatic League), then awarded to Sweden by the Treaty of Roskilde, before passing finally to Denmark in 1658. It was occupied by the Germans during World War II and was the only part of Denmark to be bombed (by the Russians in 1945 to hasten the German surrender). The island has an area of 227 sq mi (588 sq km). Its northern two-thirds is composed of granite with a rocky cliff coast and a hilly wooded interior. The more populous southern part forms an undulating surface of sandstone, limestone, and shale, with a dune coast. The moderately fertile soil supports grains, dairy farming, and pig rearing. Principal exports are fish (herring, salmon, and cod), granite, porcelain, and pottery. Tourism is also an important economic factor.

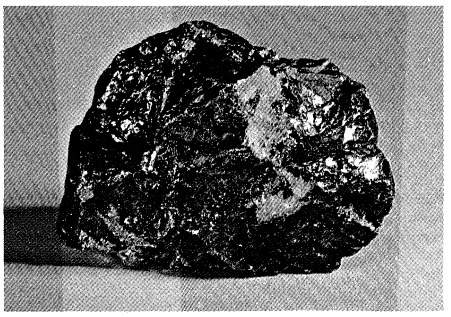


Coastal view, Bornholm, Denmark
G. Glase—Ostman Agency

Medieval remains include four of Denmark's six 12th-century round churches (fortress-churches) and the ruins of the imposing 13th-century castle of Hammershus (former stronghold of the bishops of Lund, Swed.), now a historical monument. There are also Viking relics. The island is centred on Rønne (its seat; dating from the 12th century) and Neksø. Pop. (1984 est.) 47,243.

Bornholm disease: *see* pleurodynia.

bornite, a copper ore mineral, copper and iron sulfide (Cu_5FeS_4). Typical occurrences are found in Mt. Lyell, Tasmania; Chile; Peru; and Butte, Mont. Bornite, one of the common copper minerals, forms isometric crystals, though it is seldom found in these forms. It alters readily upon weathering to chalcocite and other copper minerals. For detailed physical properties, *see* sulfide mineral (table).



Bornite from Butte, Mont.
By courtesy of the MacFall Collection; photograph, Mary A. Root—EB Inc.

Borno, formerly BORNU, state and traditional emirate, northeastern Nigeria. The state borders the Niger Republic to the north, Lake Chad (and the Republic of Chad) to the northeast, and Cameroon to the east; on the south and west it borders Gongola, Bauchi, and Kano states. With an area of 44,942 sq mi (116,400 sq km), it is Nigeria's largest state but also one of its most sparsely populated. It is the central fragment of the old Bornu Empire of the Kanuri (*q.v.*) people. Its name is said to mean Home of the Berbers. Bornu was originally the southernmost province of the Kanem Empire, an ancient kingdom that reached its peak in the 12th and 13th centuries. Toward the end of the 14th century the power of Kanem waned and the empire shrank until little was left of it except Bornu. Succeeding centuries saw the final dissolution of the Kanem kingdom by its hostile neighbours (*c.* 1380) and the rise of Bornu. In the early 16th century, Bornu managed to recapture Kanem and made it a protectorate. The reamalgamated kingdom of Kanem-Bornu probably reached its height in the reign of Mai Idris Alawma (ruled *c.* 1571–*c.* 1603).

Birni Ngazargamu, the capital of the Bornu kingdom, was captured in the *jihād* (holy war) conducted by Fulani tribesmen in 1808. Muḥammed (al-Amin) al-Kanamī, a member of the royal family who advised the *mais* ("emperors") of Bornu, founded Kukawa (80 mi north-northeast of Maiduguri) as the Kanuri capital in 1814 and restored Bornu's independence from Fulani domination in the 1820s. After the death of the Sefawa Mai Ali Dalatami in 1846, al-Kanamī's son Umar (Omar) proclaimed himself the first *shehu,* that is, sheikh, or sultan, of Bornu.

Bornu was defeated and Kukawa was destroyed by the Sudanese warrior Rābiḥ az-Zubayr (Rabah Zubayr) in 1893, and Dikwa (54 mi east-northeast of Maiduguri) served as Rābiḥ's headquarters until he was killed by the French in 1900. The French restored the al-Kanami dynasty in Dikwa; but, after the final partition of Bornu among the British, the French, and the Germans, Shehu Bukar Garbai fled in 1902 to Northern Nigeria and was recognized as the *shehu* of British Bornu. Bornu was thus acknowledged as an emirate but Garbai moved its headquarters from Monguno (65 mi north-northeast of Maiduguri) to Kukawa in 1904 and, finally, to Yerwa in 1907. The *shehu* of Bornu still resides at Yerwa and is officially recognized as Nigeria's second most important traditional Muslim leader, after the Fulanis' sultan of Sokoto. The state became part of Northern Nigeria after the division of Bornu between the British and the French at the turn of the century and became Borno State in 1967.

The vegetation in Borno State is mainly of the Sudan savanna type, which includes the acacia (a source of gum arabic), baobab, locust bean, shea butter, dum palm, and kapok trees; but there is a region of Sahel savanna, mostly thorn scrub and with sandy soils, in the north and northeast. Prominent physical features include the Bornu Plains, the volcanic Biu Plateau, and the *firki* ("black cotton") swamps south and southwest of Lake Chad. The state is drained by seasonal rivers flowing toward Lake Chad.

The Kanuri remain the dominant ethnic group; but the area also contains sizable clusters of Shuwa, Bura (Pabir), Tera, Margi (Marghi), Bolewa (Bole, Fika), Karekare, Ngizim, Ngamo (Gamawa), Gamergu, Auyokawa, Bade (Bedde, Bede), Manga, Koyam, Mober (Mobber), Beriberi, Buduma, and Kanembu peoples. The growing of sorghum, millet, peanuts (groundnuts), onions, corn (maize), sesame, *acha* ("hungry rice"), cotton, and indigo and the herding of cattle are the chief occupations, with fishing significant around Lake Chad. Donkeys, oxen, horses, and camels are used for local transport. Borno's chief exports are cattle, cow hides, goatskins, crocodile skins, sheepskins, finished leather products, peanuts, cotton, and gum arabic, which are trucked and railed (mostly from the railheads of Nguru and Maiduguri) south through Kano to Port Harcourt and Lagos. A considerable trade in natron, salt, and fish from Lake Chad exists, as well as trade in dates and figs. The lake is now connected to Maiduguri by a new road from Baga, a town on a peninsula extending into the lake. The Lake Chad Commission established (1964) by Cameroon, Chad, Niger, and Nigeria, is charged with regulating the use of the waters of the lake and the basin for the development of livestock, crop, fishery, and water resources. Nigeria also has established a Chad Basin Authority.

Maiduguri is the state capital, its main industrial centre, and by far its largest city. Nguru, Potiskum, Gashua, Biu, and Bama are also sizable market towns. Maiduguri has an airport and is served by a railway to Bauchi and the south, as well as by trunk roads to Potiskum, Bauchi, Yola, and Ndjamena (Chad). Pop. (1983 est.) 4,901,000.

Borobuḍur, one of the world's greatest Buddhist monuments, built in central Java about AD 800 under the Śailendra dynasty. The Borobuḍur monument combines the symbolic forms of the *stūpa* (originally a relic mound commemorating the Buddha), the temple mountain, and the *maṇḍala* (ritual diagram). Its style is influenced by Indian Gupta and post-Gupta art. The Borobuḍur *stūpa* was apparently neglected from about 1000 and overgrown with vegetation until restored by Dutch archaeologists in 1907–11. A second restoration was completed in the early 1980s.

The monument encloses a small hill and consists of five square terraces gradating in size, crowned by three successively smaller circular terraces, the whole topped by the main *stūpa* centred in the last terrace. The entire structure is set on a large plinth, with stairways in the centre of each side providing access to the

The *stūpa* complex of Borobuḍur, Indon.
Brian Blake—Rapho/Photo Researchers

upper terraces. There is no inner cell; each of the square terraces is enclosed by a high wall lined with narrative relief sculpture and figures of the five celestial Buddhas set in niches. The upper circular terraces are open and carry 72 bell-shaped *stūpas* containing meditative Buddhas half visible through the perforated stonework.

A series of reliefs on the walls of the monument represent the ascending stages of enlightenment toward nirvāṇa (spiritual freedom). Those on the lower level illustrate the effect of good and bad deeds in this life; on the second level are the events in the life of the historical Buddha and scenes from the *Jātaka*s (stories of his previous lives); on the upper level are reliefs illustrating more philosophical themes taken from Mahāyāna Buddhist scriptures.

Borodin, Aleksandr (Porfiryevich) (b. Nov. 12 [Oct. 31, old style], 1833, St. Petersburg, Russia—d. Feb. 27 [Feb. 15, O.S.], 1887, St. Petersburg), major Russian nationalist composer of the 19th century and also a scientist notable for research on aldehydes.

Aleksandr Borodin
Sovfoto

The illegitimate son of a Georgian prince and of the wife of an army doctor, he was reared in comfortable circumstances. He early showed marked gifts for languages and music, and as a schoolboy he learned to play the piano, flute, and cello and composed. From 1850 to 1856 he studied at the Medico-Surgical Academy, specializing in chemistry, and received his doctorate in 1858. From 1859 to 1862 he studied in western Europe. On his return to Russia he became "adjunct-professor" of chemistry at the Medico-Surgical Academy, and full professor in 1864. From this period dates his first important composition, the *Symphony No. 1 in E Flat Major* (1862–67), written as a result of his acquaintance with Mily Balakirev, of whose circle (known as "The Five") he was a member, along with Nikolay Rimsky-Korsakov, Modest Mussorgsky, and César Cui. Borodin began his *Symphony No. 2 in B Minor* in 1869, when he also began work on his operatic masterpiece, *Prince Igor* (completed posthumously by Rimsky-Korsakov and Aleksandr Glazunov). Act II of *Prince Igor* contains the frequently played "Polovtsian Dances." He also found time to write two string quartets, a dozen remarkable songs, the unfinished *Symphony No. 3 in A Minor*, and his tone poem *In the Steppes of Central Asia.*

Borodin's musical work was never more than relaxation from his scientific work. In addition to his research and teaching, he helped found medical courses for women in 1872. In the 1880s pressures of work and ill health left him little time for composition. He died suddenly while at a ball.

Borodin's compositions place him in the front rank of Russian composers. He had a strong lyric vein but also was noted for his handling of heroic subjects. He had an unusually fine rhythmic sense and excelled in the use of orchestral colour and in the evocation of distant places. In his symphonies and string quartets—among the finest of the Romantic era—he developed a formal structure in which the musical material of a movement was derived from a single initial motif. His melodies reflect the character of Russian folk melodies, and like other composers of the Russian national school he used striking harmonies unconventional in western European music.

Borodin, Mikhail Markovich, original name MIKHAIL GRUZENBERG (b. July 9, 1884, Yanovichi, Russia—d. May 29,1951, Siberia), chief Comintern agent in China in the 1920s, who built the loosely structured Kuomintang (Nationalist Party) of Sun Yat-sen into a highly centralized Leninist-style organization.

Borodin joined the Bolshevik Party in Russia in 1903. In 1906 he was arrested and exiled. The same year he emigrated to the U.S., attended Valparaiso University, Indiana, and later founded a school for émigrés in Chicago. After the Russian Revolution of 1917 he returned to the Soviet Union and was dispatched as a Communist agent to Scandinavia, Mexico, Spain, Turkey, and Great Britain. He went to China in 1923 as an adviser to Sun Yat-sen, after the Nationalist leader acquiesced in the Soviet wish that Chinese Communists be allowed to join the Kuomintang. Besides helping to restructure Kuomintang organization and ideology, Borodin gave the Chinese Nationalists Soviet aid in developing a party army, which made them a powerful force in Chinese politics. After Sun Yat-sen's death in 1925, Chiang Kai-shek, back from training in Moscow, became head of the army. In 1927 Chiang broke with the Communists, and Borodin left the country. Returning to Moscow, he served as deputy people's commissar for labour, deputy director of Tass news agency, and, from 1932, editor of the *Moscow Daily News*, published in English. He disappeared in February 1949 in a wave of arrests directed by Stalin against Jewish intellectuals. He died in 1951 in a Siberian labour camp.

Borodino, Battle of (Sept. 7 [Aug. 26, old style], 1812), bloody battle of the Napoleonic Wars, fought during Napoleon's invasion of Russia, about 70 miles (110 kilometres) west of Moscow, near the river Moskva, between Napoleon's 130,000 troops, with more than 500 guns, and 120,000 Russians with more than 600 guns. Napoleon's success allowed him to occupy Moscow. The Russians were commanded by Gen. M.I. Kutuzov, who had halted the Russian retreat at the town of Borodino and hastily built fortifications, to block the French advance to Moscow. Napoleon feared that an attempt to outflank the Russians might fail and allow them to escape, so he executed a crude frontal attack. From 6 AM to noon the fierce fighting seesawed back and forth along the three-mile (five-kilometre) front. By noon the French artillery began to tip the scales, but the successive French attacks were not strong enough to overwhelm Russian resistance. Napoleon, distant from, and perhaps unsure of, the situation on the smoke-obscured battlefield, refused to commit the 20,000-man Imperial Guard and 10,000 other practically fresh troops. Since Kutuzov had already committed every available man, Napoleon thus forfeited the chance of gaining a decisive, rather than a narrow, victory. Both sides became exhausted during the afternoon, and the battle subsided into a cannonade, which continued until nightfall. Kutuzov withdrew during the night, and a week later Napoleon occupied Moscow unopposed. The Russians suffered about 45,000 casualties, including Prince Pyotr Ivanovich Bagration, commander of the Second Russian Army. The French lost about 30,000 men. Although the Russian Army was badly mauled, it survived to fight again and, in the end, drove Napoleon out of Russia.

Borommatrailokanat (king of Siam): *see* Trailok.

boron (B), chemical element, semimetal of main Group IIIa (boron group) of the periodic table, essential to plant growth and of wide industrial application.

Properties, occurrence, and uses. Pure crystalline boron is a black, lustrous, semiconductor; *i.e.,* it conducts electricity like a metal at high temperatures and is almost an insulator at low temperatures. It is hard enough (9.3 on Mohs scale) to scratch some abrasives, such as carborundum, but too brittle for use in tools. Comprising about 0.001 percent by weight of the Earth's crust, boron occurs combined as borax, kernite, and tincalconite (hydrated sodium borates), the major commercial boron minerals, especially concentrated in the arid regions of California, and as widely dispersed minerals such as colemanite, ulexite, and tourmaline. Sassolite—natural boric acid—occurs especially in Italy.

Boron was first isolated (1808) by Joseph-Louis Gay-Lussac and Louis-Jacques Thenard and independently by Sir Humphry Davy by heating boron oxide (B_2O_3) with potassium metal. The impure, amorphous product, a brownish black powder, was the only form of boron known for more than a century. Pure crystalline boron may be prepared with difficulty by reduction of its bromide or chloride (BBr_3, BCl_3) with hydrogen on an electrically heated tantalum filament.

Limited quantities of elemental boron are widely used to increase hardness in making steel. Added as the iron alloy ferroboron, it is present in many steels, usually in the range 0.001 to 0.005 percent. Boron is also utilized in the nonferrous-metals industry, generally as a deoxidizer, in copper-base alloys and high-conductance copper as a degasifier, and in aluminum castings to refine the grain. In the semiconductor industry, small, carefully controlled amounts of boron are added as a doping agent to silicon and germanium to modify electrical conductivity.

In the form of boric acid or borates, traces of boron are necessary for growth of land plants and thus indirectly essential for animal life. Vegetable "brown heart" and sugar beet "dry rot" are among the disorders due to boron deficiency. In excess quantities, however, borates act as unselective herbicides.

In nature, boron consists of a mixture of two stable isotopes—boron-10 (19.8 percent) and boron-11 (80.2 percent); slight variations in this proportion produce a range of ±0.003 in the atomic weight. Because of the high thermal neutron cross section of the rarer isotope boron-10 (3,836 barns), boron and some of its compounds have been used as neutron shields. Pure boron exists in at least four crystalline modifications or allotropes.

Crystalline boron is almost inert chemically at ordinary temperatures. Boiling hydrochloric acid does not affect it, and hot concentrated nitric acid only slowly converts finely powdered boron to boric acid (H_3BO_3). Boron in its chemical behaviour is nonmetallic.

Compounds. In its compounds boron shows a valence of three. The first three ionization energies of boron, however, are much too high to allow formation of compounds containing the B^{3+} ion; thus in all its compounds boron is covalently bonded, with boron being either three or four-coordinated. The three coordinated derivatives are planar molecules that readily form donor-acceptor complexes (called adducts), with compounds containing lone pairs of electrons; in these adducts the boron atom is four-coordinated, the four groups being tetrahedrally disposed around it. The tetrahedral bonds result from the formation of anions or from the reception of an unshared

pair of electrons from a donor atom. This allows a variety of structures to form. Solid borates show five types of structures involving several anions (*i.e.*, BO_3^{3-}, formed of boron and oxygen) and shared-electron bonds. The most familiar borate is sodium tetraborate, commonly known as borax, $Na_2B_4O_7 \cdot 10H_2O$, which occurs naturally in salt beds. Borax has long been used in soaps and mild antiseptics. Because of its ability to dissolve metallic oxides, it has also found wide applications as a soldering flux.

Other boron compounds of diverse industrial applications inlcude boric acid, H_3BO_3. This white solid, also called boracic or orthoboric acid, is obtained by treating a concentrated solution of borax with sulfuric acid. Boric acid is commonly used as a mild antiseptic for burns and surface wounds and comprises a major ingredient in eye lotions. Among its other important applications is its use as a fire-retardant in fabrics, in solutions for electroplating nickel or for tanning leather, and as a major constituent in catalysts for numerous organic chemical reactions. Upon heating, boric acid loses water and forms metaboric acid, HBO_2; further loss of water from metaboric acid results in the formation of boron oxide, B_2O_3. The latter is mixed with silica to make heat-resistant glass (borosilicate glass) for use in cooking ware and certain types of laboratory equipment.

Boron combines with various metals to form a class of compounds called borides. The borides are usually harder, higher melting, chemically less reactive, and electrically more resistive than the corresponding pure metallic elements. Some of the borides are among the hardest and most heat-resistant of all known substances and their applications are based on these extreme characteristics. Aluminum boride (AlB_{12}), for example, is used in many cases as a substitute for diamond dust for grinding and polishing.

With nitrogen, boron forms boron nitride (BN), which, like carbon, can exist in two allotrophic (chemically identical but physically different) forms. One of them has a layer structure resembling that of graphite, while the other has a cubic crystalline structure similar to that of diamond. The latter allotrophic form, called borazon, is capable of withstanding oxidation at much higher temperatures and is extremely hard—properties which make it useful as a high-temperature abrasive. Boron reacts with all halogen elements to give monomeric, highly reactive trihalides. These so-called Lewis acids readily form complexes with amines, phosphines, ethers, and halide ions.

With hydrogen, boron forms a series of compounds called boranes, the simplest being diborane (B_2H_6). The molecular structure and chemical behaviour of these boron hydrides are unique among inorganic compounds. Typically, their molecular structure reveals some boron and hydrogen atoms closely surrounded by or bonded to more atoms than can be explained by an electron-pair bond for each pair of atoms. This variance led to the concept of a chemical bond consisting of an electron pair not localized between two atoms but shared by three atoms (three-centre bond). Diborane combines with a wide variety of compounds to form a large number of boron or borane derivatives, including organic boron compounds (*e.g.* alkyl- or aryl-boranes and adducts with aldehydes).

atomic number	5
atomic weight	10.811 ±0.003
melting point	2,300° C
boiling point	2,550° C
specific gravity	2.34 (20° C)
valence	3
electronic config.	2-3 or $1s^2 2s^2 2p^1$

boron group element, any of the five chemical elements comprising Group IIIa of the periodic table. The elements are boron (B), aluminum (Al), gallium (Ga), indium (In), and thallium (Tl).

A brief treatment of the boron group elements follows. For full treatment, *see* MACROPAEDIA: Chemical Elements. *See also* MICROPAEDIA for entries on each member of this element family.

All of the boron group elements are relatively rare, with the exception of aluminum, which ranks as the third most common element in the Earth's crust. None of these elements occurs uncombined in nature.

Boron, the lightest member of the family, is a nonmetal, whereas the others are silvery white metals. Every boron group element has three electrons in the outermost shell of its atomic structure. For this reason, the members of this group have maximum oxidation numbers of three and will form ions with three positive charges.

Bororo, South American Indian people found along the upper Paraguay River and its tributaries in the Brazilian Mato Grosso. They speak a language of the Macro-Ge group, of which there are two dialects: Bororo proper and Otuké. The Bororo have a western and an eastern division. They probably number fewer than 1,000 persons.

Bororo Indian dancers, Brazil
Art Resource—EB Inc.

The Bororo were originally nomadic hunters and gatherers who became sedentary agriculturists. Farming, however, has remained subordinate to hunting, gathering, and fishing among many Bororo groups. Slash-and-burn cultivation is practiced in the growing of cassava, corn (maize), and rice. Women sew and harvest the fields; men clear the fields and hunt. Collective hunts are conducted upon the favourable advice of shamans.

In the rainy season the Bororo abandon their villages and move away from the rivers to higher ground. The village, nevertheless, is their permanent home, and its organization mirrors the complex structure of Bororo society. Houses are built in a circle or semicircle around the men's house and a ceremonial plaza. The Bororo reckon kinship through the female line. A person's residence may also be determined by his membership in a particular clan or division.

The Bororo social structure is based on age, kinship, and sex. Society is made up of moieties (dual divisions), clans, and associations determined by age and sex. Four to seven clans may compose a moiety. Clans may have a traditional hierarchical ranking; they may be differentiated by their animal or plant ancestors and emblems, by the privileges and prohibitions relating to the technique and style of manufactured objects, and by their particular ceremonies, rites, songs, and proper names. The possible permutations in such a system allow for a breadth and variety of groups and relationships rivalled in South America only by the Ge (*q.v.*), to whom the Bororo are culturally related.

Borotra, Jean (b. Aug. 13, 1898, Arbonne, Fr.), prominent French tennis player of the 1920s. In 1927, as one of the Four Musketeers (the others being René Lacoste, Henri Cochet, and Jacques Brugnon), he helped France win the Davis Cup for the first time.

Nicknamed the Bounding Basque from Biarritz because of his quick dashes and energetic acrobatic play, Borotra won Wimbledon in 1924 and 1926, the Australian championship in 1928, and the French title in 1931. He was also victorious in numerous doubles and mixed doubles matches and was celebrated by fans for his ever-present blue beret. Borotra played for the French Davis Cup team in 1922, 1924–37, and as late as 1947. He was elected to the International Tennis Hall of Fame in 1976.

borough, in Great Britain, incorporated town with special privileges or a district entitled to elect a member of Parliament. The medieval English borough was an urban centre identified by a charter granting privileges, autonomy, and later, incorporation. From the 16th century the importance of boroughs as units of local government declined, but they gained a new importance as parliamentary constituencies. The reform of municipal corporation in 1835 gave English boroughs a uniform constitution and transformed them into modern units of local government. The Local Government Act of 1888 established county boroughs, which, unlike municipal boroughs, were empowered to act independently of administrative counties. In 1974, however, the British government abolished county boroughs in its reorganization of local government.

In America the word appeared occasionally in colonial Virginia but was not widely used after the Revolution. Village, town, and city were the names most commonly applied to municipal units. The U.S. city corresponded most closely to the English borough as a full-fledged urban unit. In a few states where borough was officially recognized, it indicated an incorporated town or village of lesser status than a city. The New York legislature adopted the name in 1897, when it combined five large municipal areas known as the boroughs of Manhattan, Brooklyn, Queens, the Bronx, and Richmond, to form the city of Greater New York.

borough-English, the English form of ultimogeniture, the system of undivided inheritance by which real property passed intact to the youngest son or, failing sons, to the youngest daughter. Ultimogeniture was the customary rule of inheritance among unfree peasants from Anglo-Saxon times and continued in English boroughs after the Norman Conquest. The name borough-English became the accepted legal term for the custom after a famous case in 1327 drew attention to the fact that in the French borough of Nottingham, which had grown up beside the English borough, land passed to the eldest son, whereas in the English borough it passed to the youngest son. As a system of undivided inheritance, borough-English applied mostly to unfree peasants and, like primogeniture, acted to preserve the manorial unit; among free peasants land tended to pass by equal division among sons and daughters. The custom continued in many rural manors until abolished by the Administration of Estates Act of 1925.

Borovichi, also spelled BOROVIČI, administrative centre, Borovichi *rayon* (district), Novgorod *oblast* (region), northwestern Russian Soviet Federated Socialist Republic, on the Msta River. A town since 1770, it has a varied economy. In addition to an old handicraft in-

dustry, especially hosiery, there are ceramics, paper, and wood-using industries. Borovichi has medical and teacher-training schools. Pop. (1983 est.) 62,000.

Borovský, Havel (Czech author): *see* Havlíček Borovský, Karel.

Borowski, Tadeusz (b. Nov. 12, 1922, Zhitomir, Ukrainian S.S.R.—d. July 3, 1951, Warsaw), Polish fiction writer and poet.

In German-occupied Warsaw, Borowski published an illegal collection of poems entitled *Gdziekolwiek ziemia* (1942; "Where E're the Land"). During 1943–45 he was one of the many inmates of the German concentration camps at Auschwitz (Oświęcim) and Dachau. After the war he published in Munich a volume entitled *Imiona nurtu* (1945; "The Names of the Undercurrent").

In Poland under Communist rule, Borowski in 1948 turned to publishing prose. Two series of stories, *Pożegnanie z Marią* ("Farewell to Maria") and *Kamienny świat* ("World of Stone"), deal mainly with life in Nazi concentration camps and explore the depths of human depravity and degradation. He started collaborating with the new regime by joining the Communist Party and was a co-founder of the Young Intellectuals' Club; but he soon felt alienated by the police state and committed suicide.

Borromean Islands, Italian ISOLE BORROMEO, four tiny (about 50 ac [20 ha]) islands in Lake Maggiore, off Baveno and Stresa, Novara province, Piemonte (Piedmont) region, northwestern Italy. Geologic continuations of the Pallanza promontory, the islets are named for the Borromeo family, to whom they have belonged since the 12th century. Isola Bella, named for Isabella, countess Borromeo, is known for its château and terraced gardens, built by Count Vitaliano Borromeo (died 1690). To the northeast is Isola Madre, the largest of the group, with a palazzo and gardens; to the north, off Pallanza, is the smallest, Isola di San Giovanni. The westernmost is Isola Superiore, or Isola dei Pescatori, occupied by a picturesque fishing village. Pop. (1971) 208.

Borromeo, Saint Charles, Italian SAN CARLO BORROMEO (b. Oct. 2, 1538, Arona, Duchy of Milan—d. Nov. 3, 1584, Milan; canonized 1610; feast day November 4), cardinal and archbishop who was one of the most important figures of the Counter-Reformation in Italy.

Borromeo received a doctorate in civil and canon law from the university of Pavia in 1559. The following year his uncle, Pope Pius IV, appointed him a cardinal and archbishop of Milan. Chief among his curial functions was heading the Consulta, a position that made him secretary of state to Pius.

The Pope leaned upon him heavily in directing the third convocation of the Council of Trent (1562–63). When the council closed, Borromeo served in executing its decrees and was largely instrumental in bringing out the Roman catechism in 1566. Also at this time he was actively sponsoring the conversion of Swiss Protestants. Upon the death of his uncle, Borromeo took part in the conclave that elected Pius V (1566).

Thereafter, he resided at Milan, where serious administrative problems confronted him. He regularly visited his more than 1,000 widely scattered parishes, which fell under the jurisdictions of King Philip II of Spain and also of Venice, Genoa, and Novara. Borromeo fostered clerical education by establishing seminaries and colleges at Milan and in the Italian cities of Inverigo and Celano. Colleges for lay students also were erected and entrusted to the Jesuits. The archbishop's last undertaking was the opening of the college at Ascona, Switz., in 1584.

Political and other turmoils beset Borromeo. He became embroiled with the Milanese Senate and with Gov. Luis de Requesséns y Zúñiga as well as with the rebellious canons of Sta. Maria della Scala and the order of the Humiliati (The Humble Ones). Borromeo nevertheless had the support of many religious congregations, including his own Oblates of St. Ambrose. In 1569 one of the Humiliati, the priest Girolamo Donato Farina, attempted to assassinate Borromeo. Despite the archbishop's pleas for leniency, Farina and his accomplices were tortured and executed.

Borromeo's heroic behaviour during the plague of 1576–78 won him much respect.

BIBLIOGRAPHY. G.P. Giussano, *The Life of St. Charles Borromeo* (Eng. trans. 1884); Louis M. Stacpoole-Kenny, *St. Charles Borromeo* (1911); Margaret Yeo, *Reformer: St. Charles Borromeo* (1938); Cesare Orsenigo, *Life of St. Charles Borromeo* (Eng. trans. 1947).

Borromini, Francesco, original name FRANCESCO CASTELLI (b. Sept. 25, 1599, Bissone, Duchy of Lombardy—d. Aug. 2, 1667, Rome), Italian architect who was a chief formulator of Baroque architectural style. Borromini (who changed his name in about 1627) secured a reputation throughout Europe with his striking design for a small church, S. Carlo alle Quattro Fontane, Rome. He differed from Gian Lorenzo Bernini and other contemporaries in basing his designs on geometric figures (modules) rather than on the proportions of the human body.

Interior of the dome of the church of S. Ivo della Sapienza, Rome, by Francesco Borromini, 1642–60
GEKS

Youth and education. Born to Giovanni Domenico Castelli and Anastasia Garogo, Borromini was introduced to the craft specialities of architecture when his father sent him to Milan (1608 or 1614) to learn stonecutting. After several years training in the skills and technology of both architecture and sculpture, he collected a debt owed to his father and, without informing his parents, fled to Rome in 1620. There he became a draftsman and stonemason in the office of his kinsman, Carlo Maderno, who had established himself as the major practicing architect in Italy.

Celibate and irascible, Borromini dedicated himself to the discipline of architecture. Maderno quickly recognized Borromini's potential. The aging master and his young pupil worked together closely on various problems at St. Peter's, whose fundamental plan was revised by Maderno. For the Palazzo Barberini, Maderno determined a basic concept, then entrusted Borromini with the realization of specifics. A convergence of both talents produced the facade design of S. Andrea della Valle, and Borromini was permitted to undertake the lantern of the church's dome himself. Borromini's personality is apparent in these projects, though Maderno's style dominates them. A facade to be attached to the late 16th-century oval church of S. Anna dei Palafrenieri was Borromini's personal project. His attempt to integrate a five-bay front and two towers with the existing oval dome prefigured his S. Agnese in Agone (in Piazza Navona) in its placement of plastic volumes in space. Equally significant was his transformation of Maderno's plan for S. Ignazio. Through his use of pairs of free-standing columns, he suggested an articulation of space, a major characteristic of his style. Space in his structures is not merely a void but rather something corporeal, an element in itself, molded by the surrounding shell of the building. Later he would develop this concept by replacing the enclosing wall with an extensively penetrated framework, as in the Re Magi chapel.

Maderno died in January 1629, three months after construction had begun at the Palazzo Barberini. The famous Gian Lorenzo Bernini was put in charge of this project, though his architectural abilities were underdeveloped. Borromini continued in a key position, working out the specifics of Maderno's plan and collaborating successfully with Bernini. The patron, however, began to draw heavily on the advice of a third designer, Pietro da Cortona, and eventually abandoned Maderno's project for the east facade of the palace. Unable to work with Cortona and despairing of these changes, Borromini left the project in 1631. Together with Bernini he dedicated himself entirely to the task of designing the baldachin in St. Peter's, which was conceived as a monumental canopy raised over the tomb of St. Peter, recalling the canopy that is traditionally supported over the pope when he is carried in state through the church. The enormous bronze baldachin was realized through the closest cooperation between Borromini and Bernini; the huge, S-shaped volutes that crown four corkscrew columns are their most important common creation. Bernini was in command of all enterprises at St. Peter's, but he paid Borromini a substantial sum from 1631 to 1633 for this work, indicating the great importance of his contribution.

An independent architect. The baldachin was completed in 1633. The year before, on the commendation of Bernini and Cardinal Francesco Barberini, Borromini was awarded the office of university architect. With his new position as support, he began to seek patronage as an independent architect. His first independent commission represented an extraordinary challenge to tradition; it was the Roman church and monastery of S. Carlo alle Quattro Fontane, begun in 1638. No larger inside than the dimensions of a single pier at St. Peter's, the small church electrified Rome, and its reputation spread like wildfire through Europe. Borromini began by stacking together three distinct units that normally would have been employed only in separate buildings: a curious, undulating lower zone; a middle one suggesting the standard Greek-cross plan; and an oval dome, a relatively new and still little-used form. This audacious combination of precedent and novelty is integrated by complex, interweaving rhythms. Bold, illusionistic effects, achieved by calculated lighting, intensify the space. The dome appears to be floating above the interior of the church like a hallucinatory vision because its springing point and light sources are concealed by the zone below.

Borromini established contacts with the eminent Spada family and was also sponsored by Pope Innocent X for a decade, but his relations with patrons were frequently stormy and at times reached an impasse because of his intransigent, defiant attitude. Though bitterly resentful of what he felt to be a lack of just recognition, he was indifferent toward wealth and rejected the fashions of normal dress. Intractable and melancholic, he was infamous for his fits of rage. On one of his building sites he was infuriated to discover a man damag-

ing some materials and had him so violently beaten that he died.

Given Borromini's gloomy disposition, it is not surprising that a conflict developed with the famous and popular Bernini. While they were working together, the relationship between the two artistic giants had been mutually profitable: Borromini's style was injected with a new vitality under Bernini's influence, and Bernini was strongly impressed by Borromini's novel formulations of architectural detail. Later, however, a bitter conflict arose between them. Perhaps Borromini's subordinate position at St. Peter's sufficiently rankled him to provoke his departure. He definitely felt this way later in life, claiming that Bernini had begged him not to abandon him on the work at St. Peter's and had promised to recognize his many labours with a worthy reward. Borromini said that after he had carried out the work, Bernini withheld the remunerations and rewards and never gave him anything except good words and grand promises.

Divergent characters, disparate backgrounds, and different attitudes toward life presumably provoked the antagonism. Bernini worked easily with the aristocratic and powerful; immensely successful as a sculptor and painter as well as an architect, he was outgoing, charming, and witty. Borromini, on the other hand, was a lonely, withdrawn man; he prided himself on his highly specialized training, and he resented his modest degree of recognition. Conflict between the two became public in 1645 over the decision to eliminate the towers Maderno had designed for the facade of St. Peter's. Maderno left them as substructures, and in 1636 Bernini submitted a proposal for completing them. After one was erected, however, technical deficiencies halted further construction in 1641, and four years later a commission decided on its removal. Borromini emerged as Bernini's most effective and destructive critic, accusing him of incompetence. Bernini seldom indulged in professional envy, however, but, during his Paris visit of 1665, he accused Borromini of abandoning the anthropometric basis of architecture. Because the body of Adam was modelled not only by God but also in his image and likeness, it was argued, the proportions of buildings should be derived from those of the body of man and woman. Borromini, however, based his buildings on geometric configurations in an essentially medieval manner that he probably learned in Lombardy, where medieval building procedures had been handed down from generation to generation. Borromini's approach consisted of establishing a geometric figure for a building or room, then articulating this figure by means of geometric subunits. He thus stood accused of denying the basis of good architecture. He never divorced himself completely from the anthropometric basis of design, however; he insisted, at least once, that his architecture contained human references. The concave facade of St. Philip Neri represented to him the welcoming gesture of outstretched arms: the central unit stood for the chest, the two-part wings for arm and forearm.

The bizarre quality of Borromini's designs was as unsettling as his departure from anthropomorphism. Even his supporters felt uneasy with his novel creations. Presumably his license departed too far from orthodox interpretations of antiquity, which were accepted at this time as the fundamental standards of form for architecture. This seems paradoxical because he was an avid student of the ancient world: his drawings of antique fragments demonstrate a critical contact with Roman architecture, and his evocations of classical thought on the project for the Villa Pamphili at San Pancrazio are recorded with philological exactness. Nevertheless, the notion was in the air that it was possible to use and then progress beyond the achievements of antiquity, and Borromini strongly identified with this attitude. He said that he certainly would never have given himself to architecture with the idea of being merely a "copyist," and he invoked the example of Michelangelo, who said that he who follows others never goes ahead. Borromini declared antiquity and nature to be his points of departure (although he included the work of Michelangelo as well), but he actually spurned the regular and orthodox compositional motifs of the ancient world. Instead he turned to novel, curious, and marvelous interpretations, such as could be found in Hadrian's Villa at Tivoli, and to Roman structural achievements, such as their brickwork and their use of bevelled corners for vault supports.

Just as Borromini's attitude toward antiquity was uncommon, so too were his historical roots in medieval architecture in an era that had rejected medieval culture as corrupt. Yet his tendency toward the annulment of the wall, his use of structural ribwork to strengthen vaults, his designs derived from geometric configurations, his use of decorative motifs, and perhaps even his awareness that light can be given major compositional importance, all represent ideas that originated in the medieval experience. Closer to his own time, Borromini investigated certain formal qualities found in both Florentine architecture of the 15th century and Mannerist architecture of the 16th century, especially in that of Michelangelo, whose architecture was of decisive importance and suggested Borromini's still more radical experiments. The manner in which space seemed to expand and contract in a number of Michelangelo's designs indicated to Borromini the dynamic potential of this medium. Responding to the past with greater freedom than his contemporaries, Borromini employed those elements that suited his purposes.

This broad selection of styles was complemented by his understanding of structures and materials. The artisan tradition of Lombardy stressed technical excellence, which provided Borromini with the knowledge to approach a full range of structural problems. It gave him a firm base for his technical virtuosity, which is demonstrated by a long list of achievements. Among these achievements are: the careful balancing of his towers for the facade of St. Peter's; the supporting metal cage for a barrel vault in the Palazzo Pamphili in Piazza Navona; the precise brickwork of the Oratory of St. Philip Neri; and his inventive domes and vaults, such as those of S. Ivo della Sapienza or the Re Magi chapel. He used the building yard as an extension of his drafting table and as a place where he could experiment and improvise to generate a fruitful exchange between design and execution. At S. Carlo alle Quattro Fontane, for example, the three-dimensional curve of the arches opening to the chapel vaults, as well as other features, could not have been realized without Borromini's personal guidance of the stonecutters on the site.

Borromini's urban sensibilities were also highly developed, as one of his unexecuted schemes demonstrates. He wished to create a dynamic setting for the facade of S. Giovanni in Laterano by means of a piazza. The street passing through this space was to be surrounded by 24 uniform building fronts, establishing a large-scale, tightly organized arrangement of spaces. Always alert in his commissions to contextual interpretations, he displayed a deep sensitivity to the relationship of his buildings to the surrounding urban fabric. The bell-tower facade of St. Philip Neri, for example, is composed to conclude and monumentalize the street running up to it.

Later years and influence. Even late in his life, Borromini's innovations continued to be as energetic and radical as ever. For the Re Magi chapel in the Collegio di Propaganda Fide, on which he worked until his death, he designed six pairs of colossal pilasters to define a generally rectangular space with bevelled corners.

In the 1660s, Borromini's fortunes tragically declined. He was increasingly frustrated by the fame and success of his rival, Bernini. His only disciple, Francesco Righi, and his most sympathetic patron, Padre Virgilio Spada, both died early in the decade. His major commission of S. Agnese in Agone, in Piazza Navona, was taken from him; work on another of his projects, S. Andrea delle Fratte, came to a halt; and his facade of St. Philip Neri was disfigured by lateral extensions. Suffering severe melancholia, he travelled to Lombardy, but when he returned to Rome his melancholy returned to him, and he spent whole weeks without ever leaving his house. Borromini burned all of his drawings in his possession. Taken ill, his condition was made worse by hypochondriac hallucinations and, when he suffered fits, it was decided that he should be denied all activity so that he might sleep. On a hot summer's night, unable to rest and forbidden to work, he arose in a fury, found a sword, and fell upon it. Borromini recovered a lucid mind after mortally wounding himself, repented, received the last sacraments of the church, and wrote his will before he died. At his own request, he was buried anonymously in the grave of his teacher and friend, Maderno. It has been suggested that Borromini's suicide was the result of an increasing schizophrenia and that this pathological process is reflected in his architecture, but this contention is impossible to demonstrate. His career appears to have been successful until the disillusionments of the last years.

In denying the restrictive, enclosing qualities of wall in order to treat space and light as architectonic components, Borromini confronted his architectural inheritance with its most complete and compelling challenge. Scores of designers would capitalize upon this revolutionary legacy. Borromini's works from the first had created an uproar in Rome, and his influence proved highly suggestive for design in northern Italy and in central Europe over the course of the next century. Later, as Neoclassical attitudes gained force, he was increasingly despised. Largely forgotten during most of the 19th century, Borromini's architecture has again been recognized in the 20th century as the creation of genius.

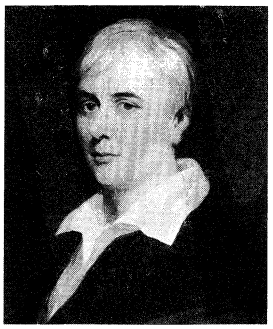
(C.F.O.)

MAJOR WORKS. All works are in Rome—S. Andrea della Valle (with Maderno, *c.* 1622); Palazzo Barberini (with Bernini, 1629–31); St. Peter's (with Bernini, baldachin, 1631–33; facade design to 1645); Oratory of St. Philip Neri (begun 1637); S. Carlo alle Quattro Fontane (1638–41); S. Ivo della Sapienza (1642–60); Palazzo Pamphili (vault, 1645–50); Collegio di Propaganda Fide (1646–67, including the Re Magi chapel [1662–64]); S. Giovanni in Laterano (reconstruction, 1647–50); S. Agnese in Agone (continuation, begun 1652; Piazza Navona); S. Andrea delle Fratte (exterior, 1653–65); Biblioteca Alessandrina in S. Ivo della Sapienza (1659–61).

BIBLIOGRAPHY. *Opera del Borromini* . . . (1720) and *Opus architectonicum* (1725), Borromini's discussion and engravings of S. Ivo della Sapienza and the monastery of St. Philip Neri—both reprinted in the critical edition by Paolo Portoghesi, *Opera and Opus architectonicum* (1964). The Graphische Sammlung Albertina in Vienna holds more than 450 Borromini drawings.

Eberhard Hempel, *Francesco Borromini* (1924), the first complete monograph (in German), still basic to any study of Borromini and his work, though outdated in some respects; Paolo Portoghesi, *Borromini* (1967; Eng. trans. 1968), not distinguished by its scholarship but a most exhaustive monograph, with a thorough bibliography.

Borrow, George (Henry) (b. July 5, 1803, East Dereham, Norfolk, Eng.—d. July 26, 1881, Oulton Broad), English traveller, linguist, and one of the most imaginative prose writers of the 19th century.



Borrow, detail of an oil painting by Henry W. Phillips, 1843; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Borrow was the son of a professional soldier and led a wandering childhood as his father's regiment was moved around the British Isles; these peregrinations inspired memorable passages in his masterpiece, *Lavengro* (1851). Between 1815 and 1818 he attended grammar school at Norwich, and it was here that he began to acquire a smattering of many languages. An attempt to apprentice him to the law proved unsuccessful, and early in 1824 he decided to try his luck in London. There he remained for about a year. At length his health collapsed, and he went on a long bohemian pilgrimage through rural England. His adventures, including many contacts with Gypsies, provided some of the background for *Lavengro* and *The Romany Rye* (1857). He strayed back again, however, to Norwich, where he completed *Romantic Ballads,* translated from the Danish (1826). In Spain, while working for a Bible society, he found his literary homeland, whence came the raw materials for *The Zincali: An Account of the Gypsies in Spain* (1841) and for his brilliantly picturesque, yet highly informative, travel book *The Bible in Spain* (published 1842; title page date 1843). Its success was "instantaneous and overwhelming."

Borrowdale Volcanic Series, thick sequence of Ordovician volcanic rocks that occur in the Lake District of England (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years). Borrowdale rocks consist of volcanic ashes and breccias that alternate with lava sheets as well as dikes and intrusive masses. The lavas are andesitic; rhyolites and tuffs are abundant as well. A broad Borrowdale outcrop belt extends northeast to southwest across the central portions of the Lake District and attains an estimated thickness of 3,600 metres (12,000 feet); a Llanvirn–Llandeilo age is indicated.

Borsa, Roger: *see* Roger *under* Roger (Apulia).

borsch, also spelled BORSCHT, BORSHT, or BORTSCH, beet soup of the Slavic countries. Although borsch is important in Russian and Polish cuisines, the Ukraine is frequently cited as its place of origin. Borsches are eaten hot or cold; some are clear and light, others thick and substantial.

Ukrainian borsch is a hearty soup of beef and a variety of vegetables in which root vegetables and cabbage predominate, and the soup takes its characteristic colour from beets. The soup is often eaten with a sour cream garnish and with *pirozhki,* turnovers filled with beef and onions. A meatless beet soup is made with a stock flavoured with forest mushrooms; this Polish *barszcz* is served with tiny mushroom-filled dumplings, *uszka. Borshchok* is a light soup in which beets are the major ingredient. Some Russian borsches are made with *kvas,* a mild beer fermented from grain or bread.

Borsippa, modern BIRS, or BIRS NIMRUD, ancient Babylonian city southwest of Babylon in al-Ḥillah *muḥāfaẓah* (governorate), Iraq. Its patron god was Nabu, and the city's proximity to the capital, Babylon, helped it to become an important religious centre. Hammurabi (reigned 1792–50 BC) built or rebuilt the Ezida temple at Borsippa, dedicating it to Marduk (the national god of Babylonia); subsequent kings recognized Nabu as the deity of Ezida and made him the son of Marduk, his temple becoming second only to that of Marduk in Babylon.

During Nebuchadrezzar II's reign (605–562 BC) Borsippa reached its greatest prosperity. An incomplete and now ruined ziggurat built by Nebuchadrezzar was excavated in 1902 by the German archaeologist Robert Koldewey. The ziggurat appears to have been destroyed by an extremely hot fire, probably caused by the spontaneous combustion of reed matting and bitumen originally placed in the core of the structure for internal support. Borsippa was destroyed by the Achaemenian king Xerxes I in the early 5th century and never fully recovered.

Borsod-Abaúj-Zemplén, *megye* (county), northern Hungary, with an area of 2,798 sq mi (7,248 sq km). The terrain is mostly hilly with riverine lowlands created by streams flowing north–south from Slovakia to the Tisza River. Several of these in upper Borsod have been dammed for flood control and storage. At Aggtelek is one of Europe's largest underground cave systems, with subterranean lakes and limestone formations. The flat plain land, Bodrogköz, in the east, is the most arable. Peas and lentils are grown. The Tokaj district is famous for its wines. Borsod-Abaúj-Zemplén is one of the most populous and industrialized counties in Hungary. West of industrialized Miskolc (*q.v.*), the *megye* seat, is Lillafüred, a well-known spa and resort with summer and winter sports facilities. Leninváros is a rapidly developing town with a chemical works and an oil refinery. The Library of the Reformed Church (258,000 vol.) is housed in Sárospatak in what was the Calvinist College (founded 1531). There are also a 12th-century fortress and a Renaissance castle. Sátoraljaújhely, just north of Sárospatak, is a commercial centre with Baroque houses and a *c.* 13th-century Piarist Church. In the southwest of the *megye* is the Matyó area, centred on Mezőkövesd, where quaint ornate local costumes survive. On the Mohi lowlands, to the south of the Bükk Mountains, King Béla IV's Magyar army was routed by the Mongol invaders in 1241. Pop. (1983 est.) 803,000.

Borstal system, English reformatory system designed for youths between 16 and 21, named after an old convict prison at Borstal, Kent. The system was introduced in 1902 but was given its basic form by Sir Alexander Paterson, who became a prison commissioner in 1922. Each institution consists of houses containing, ideally, not more than 50 young offenders, with a housemaster or housemistress and house staff. Training is exacting, based on a full day's hard and interesting work. There are vocational training courses, with six hours a week of evening education either in the Borstal or in local technical colleges.

The period of training, governed by the progress of the inmate through a grade system, averages about 15 months. On release, the inmate comes under the supervision of the Central Aftercare Association and may be recalled for further training if necessary. Brendan Behan's *Borstal Boy* (1958) gives a humorous, grim picture of life in a Borstal.

bort, one of the varieties of industrial diamond (*q.v.*).

bortsch (beet soup): *see* borsch.

Boruca, also called BRUNCA, Indians of western Panama and Costa Rica, one of a group known as Talamancan. Other Talamancan peoples are the Bribrí, Cabecar, Changuena, Dorasque, Terraba, Guetar, Voto, Rama, Guatuso, and—marginally—the Guaymí. Their languages are similar and belong to the Chibchan family. The Boruca, of whom comparatively little is known, have much in common with the Bribrí and the well-studied Guaymí (*qq.v.*).

Borūjerd, also spelled BURŪJIRD, or BARŪJIRD, chief town, *shahrestān-e* (township of) Borūjerd, Lorestān *ostān* (province), western Iran, 5,500 ft (1,700 m) above sea level, below high mountains, in a wide, fertile valley. Borūjerd is a flourishing regional centre on the main highway from the Persian Gulf and Khūzestān to Tehrān; it has good communication to Hamadān and Kermānshāhān *ostāns.* The district has many traces of ancient settlement in the form of *tappehs,* or mounds. Pop. (1976) 100,103.

bōryokudan (Japanese: "tough gang"), Japanese criminal gangs of centuries-long tradition, which combined in the 20th century into Mafia-like organizations. Members, often called *yakuza* ("good-for-nothing") or *gyangu* ("gangster"), adopt samurai-like rituals and often bear elaborate body tattoos. They engage in extortion, blackmail, smuggling, prostitution, drugs, gambling, loan sharking, day-labour contracting, and other rackets and control many restaurants, bars, *pachinko* parlours, trucking companies, talent agencies, taxi fleets, factories, and other businesses in major Japanese cities.

The *bōryokudan* date to the 16th century, when unemployed samurai turned to banditry, often gathering into small gangs. By the late 20th century their numbers exceeded 150,000 (according to police estimates), organized into more than 2,000 gangs—most of them affiliated under the umbrella of one of a dozen or fewer conglomerate gangs. The largest conglomerate is the Yamaguchi-gumi, founded about 1926 by Yamaguchi Harukichi but fully developed and aggrandized only after World War II by Taoka Kazuo (*q.v.*).

The leader of any gang or congolmerate of *yakuza* is known as the *oyabun* ("boss") and the followers are known as *koban* ("proteges" or "apprentices"); the rigid hierarchy and discipline of the *bōrykudan* are usually matched by a right-wing, ultranationalistic ideology. *Kobun* take a blood oath of allegiance, and a member who breaks the *yakuza* code must show penance—often ritualistically by cutting off his little finger with a sword and presenting it, wrapped in a silk scarf, to his *oyabun.*

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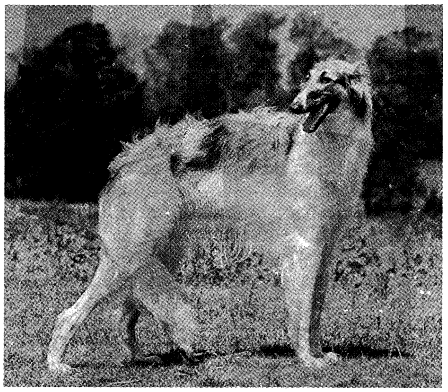
borzoi, breed of hound dog developed in Russia to pursue wolves. It is descended from the Arabian greyhound and a collie-like Russian sheepdog. The borzoi—formerly known as the Russian wolfhound—is a graceful, strong, and swift dog, attaining a height of about 26 to 31 inches (66 to 79 centimetres) and a weight of 55 to 105 pounds (25 to 48 kilograms). It has a long, narrow head, small ears, a deep but narrow chest, long, muscular hindquarters, and a long, curved tail. The silky coat is flat or slightly curled and usually white with



Borzoi
Sally Anne Thompson—EB Inc.

darker markings. The dog is noted for its elegant appearance.

Borzov, Valery (b. Oct. 20, 1949, near Lvov, Ukrainian S.S.R.), Soviet sprinter who won gold medals for both the 100- and 200-metre races in the 1972 Olympic Games at Munich.

Borzov began competition as a postgraduate student at the Kiev State Institute of Physical Culture. In 1969 and in 1974–75, he set European records; he was also European and U.S.S.R. champion from 1969 to 1976. In the 1976 Olympic Games at Montreal he won the bronze medal in the 100-metre race and was a member of the silver-medal-winning 4 × 100-metre relay team.

He was made a Soviet honoured master of sport in 1970 and a member of the Communist Party in 1972. In 1977, he married Lyudmila Turishcheva, a Soviet gymnast.

Bosanquet, Bernard (b. June 14, 1848, Alnwick, Northumberland, Eng.—d. Feb. 8, 1923, London), philosopher who helped revive in England the Idealism of Hegel and sought to apply its principles to social and political problems.

Made a fellow of University College, Oxford in 1870, Bosanquet was a tutor there until 1881, when he moved to London, to devote himself to philosophical writing and to work on behalf of the Charity Organisation Society. He was professor of moral philosophy at St. Andrews University, Fife, Scotland (1903–08).

Although Bosanquet owed much to Hegel, his first writings were influenced by the 19th-century German philosopher Rudolf Lotze, whose *Logik* and *Metaphysik* he had edited in English translation in 1884. The fundamental principles of such early works as *Knowledge and Reality* (1885) and *Logic* (1888) were further explicated in his *Essentials of Logic* (1895) and *Implication and Linear Inference* (1920), which stress the central role of logical thought in systematically addressing philosophical problems.

Bosanquet's debt to Hegel is more evident in his works on ethics, aesthetics, and metaphysics. Having translated in 1886 the introduction to Hegel's *Philosophy of Fine Art,* he proceeded to his own *History of Aesthetic* (1892) and *Three Lectures on Aesthetic* (1915). Both reflect his belief that aesthetics can reconcile the natural and the supernatural worlds. As elsewhere in his work, Bosanquet revealed his distaste for the Materialism of his day and favoured the Neo-Hegelian antidote, which held that everything considered to be real is a manifestation of a spiritual Absolute.

Bosanquet's ethical and social philosophy, particularly the practical work *Some Suggestions in Ethics* (1918), shows a similar desire to view reality coherently, as a concrete unity in which pleasure and duty, egoism and altruism are reconciled. He asserted that the same passion shown by Plato for the unity of the universe reappeared in Christianity as the doctrine of the divine spirit manifesting itself in human society. Social life requires a communal will that both grows out of individual cooperation and maintains the individual in a state of freedom and social satisfaction. This view is expounded in *Philosophical Theory of the State* (1899) and in *Social and International Ideals* (1917).

Basing his metaphysics on Hegel's concept of the dynamic quality of human knowledge and experience, Bosanquet emphasized the interrelated character of the content and the object of human thought. Thought, he wrote in *Three Chapters on the Nature of Mind* (1923), is "the development of connections" and "the sense of the whole."

The popularity of Bosanquet's views declined after intense criticism by the British philosophers G.E. Moore and Bertrand Russell. In 1924 his wife, Helen, wrote *Bernard Bosanquet.* Other works about him include J.H. Muirhead's *Bernard Bosanquet and His Friends* (1935) and F. Houang's *Néo-Hégélianisme en Angleterre: La Philosophie de Bernard Bosanquet* (1954).

Boscán Almogáver, Juan, Catalan JOAN BOSCA I ALMOGÀVER (b. *c.* 1490, Barcelona—d. Sept. 21, 1542, Barcelona), Catalan poet who wrote exclusively in Castilian and adapted the Italian hendecasyllable to that language. Though a minor poet, Boscán is of major historical importance because of his naturalizing of Italian metres and verse forms, an experiment that induced one of the greatest of all Spanish poets, Boscán's younger friend Garcilaso de la Vega, to follow his example. Their works appeared together posthumously in 1543, and the tide of Petrarchanism dominated over Spanish poetry for the next century and a half.

Boscawen, Edward, byname OLD DREADNOUGHT (b. Aug. 19, 1711—d. Jan. 10, 1761, Hatchlands Park, Surrey, Eng.), British admiral who played a distinguished part in the Seven Years' War.

The third son of Hugh, 1st Viscount Falmouth, he entered the navy at an early age, serving under Vice Adm. Francis Hosier in the West Indies in 1726 and under Adm. Vernon at Porto Bello (1739) and at Cartagena (1741). On his return he married Fanny Glanville, a noted "bluestocking" (an intellectual woman of the 18th century), whose conversation, said Dr. Samuel Johnson, was the best of any woman he had met.

Boscawen became member of Parliament for Truro in 1742 but continued to serve at sea, notably at the battle off Cape Finisterre in May 1747 when the French squadron suffered an overwhelming defeat. He was then sent out in command of a fleet in India. His premature capture of the French ships "Alcide" and "Lys" off Newfoundland in April 1755 helped to precipitate the outbreak of the Seven Years' War. In 1758 he was promoted admiral and in cooperation with Jeffrey Amherst and James Wolfe captured Louisburg, Cape Breton.

The next year, when in command of the Mediterranean fleet, he chased a French fleet off Lagos, took three ships and burned two, thus defeating the proposed concentration of the French fleet at Brest for an invasion of Great Britain. As a reward, in December 1760 he was given the lucrative post of general of marines, but his death the following month cut short a brilliant career.

Bosch, Carl (b. Aug. 27, 1874, Cologne—d. April 26, 1940, Heidelberg, Ger.), industrial chemist who developed the Haber–Bosch process for high-pressure synthesis of ammonia and received, with Friedrich Bergius, the Nobel Prize for Chemistry for devising chemical high-pressure methods. While working for Badische Anilin- und Soda-Fabrik AG (later I.G. Farbenindustrie AG, of which he became president), Bosch adapted Fritz Haber's laboratory method of synthesizing ammonia to the industrial scale and searched out suitable metallic catalysts. He also invented the Bosch

Carl Bosch
Bavaria-Verlag

process for preparing hydrogen on a large scale by passing a mixture of steam and water gas over a catalyst at high temperature.

Bosch, Hiëronymus, also spelled JHERONIMUS BOS, pseudonym of JEROME VAN AEKEN, also spelled AQUEN, or AKEN, also called JEROEN ANTHONISZOON (b. *c.* 1450, 's Hertogenbosch, [Bois-le-Duc], Brabant—d. Aug. 9, 1516, 's Hertogenbosch), brilliant and original painter of the late Middle Ages whose work reveals an unusual iconography of a complex and individual style. Although at first recognized as a highly imaginative "creator of devils" and a powerful inventor of seeming nonsense full of satirical meaning, Bosch demonstrated insight into the depths of the mind and an ability to depict symbols of life and creation.

Bosch was a pessimistic and stern moralist who had neither illusions about the rationality of human nature nor confidence in the kindness of a world that had been corrupted by man's presence in it. His paintings are sermons, addressed often to initiates and consequently difficult to translate. Unable to unlock the mystery of the artist's works, critics at first believed he must have been affiliated with secret sects. Although the themes of his work were religious, his choice of symbols to represent the temptation and eventual ensnarement of man in earthly evils caused many critics to view Bosch as a practitioner of the occult arts. More recent scholarship

"The Crowning with Thorns," oil painting by Hiëronymus Bosch, late period; in the National Gallery, London.
By courtesy of the trustees of the National Gallery, London

views Bosch as a talented artist who had deep insight into human character and as one of the first artists to represent abstract concepts in his work. Many exhaustive interpretations of Bosch's work have been put forth in recent years, but there remain many obscure details.

An exact chronology of Bosch's surviving work is difficult because, of the approximately 35 to 40 paintings attributed to him, only 7 are signed and none are dated. There exists little documentary information on the early life of the artist, other than the fact that he was the son and grandson of accomplished painters. His name does appear on the register of the Illustre Lieve-Vrouwe Broederschap (Brotherhood of Our Lady), located in the city of his birth, and there is mention of him in official records from 1486 until the year of his death, when he was acclaimed an *Insignis pictor* ("distinguished painter"). In addition to painting he undertook decorative works and altarpieces and executed designs for stained glass.

Works attributed to his youthful period show an awkwardness in composition and brushwork somewhat limited in its scope. Such paintings as "The Cure of Folly" (Prado, Madrid), the "Crucifixion" (Musées Royaux des Beaux-arts, Brussels), "The Adoration of the Magi" (Johnson Collection, Philadelphia), "The Seven Deadly Sins" (Prado), "The Marriage at Cana" (Boymans-van Beuningen Museum, Rotterdam), "Ecce Homo" (Städelsches Kunstinstitut, Frankfurt am Main), and "The Conjurer" (Musée Municipal, Saint-Germain-en-Laye, near Paris) are representative.

The presence of certain motifs, expanded in the more sophisticated works of the artist's middle period, and a limited technique, unsure yet bold, provide a beginning from which to view Bosch's artistic origins. Between the first painting in this early group, "The Cure of Folly" and the last, "The Conjuror," a steady development can be seen. The iconography of the latter is more complex, and the allusive themes seem to herald the symbolism of the great masterpieces of his final period. The development seen in Bosch's work seems to support the theory of a relatively autonomous artistic development. His paintings deal with the traditional early themes of the century and recall the works of the Master of Flémalle.

In "The Seven Deadly Sins" Bosch painted on a tabletop four small circles containing the "four last things" (Death, the Last Judgment, Paradise, and Hell), which flank a larger circle, compartmentalized and showing the ordinary men and women of Bosch's day revelling in their own particular moral evil: envy, sloth, anger, pride (vanity), lust, covetousness, or gluttony. In the centre of the large circle, within a "pupil" surrounded by a wide golden band scored to resemble the iris, Bosch painted the resurrected Christ and the inscription *"Cave, cave, Deus videt"* ("Beware, beware, God sees thee"). The tondo form symbolizes the world, and the three circles with the seven sins represent the eye of God, with the pupil representing Christ—all symbols that appear later in a broader context.

To Bosch's fruitful middle period belong the great panoramic triptychs such as the "Hay Wain" (in the Prado, Madrid), "The Temptation of St. Anthony" (Museu Nacional de Arte Antiqa, Lisbon), and the "Garden of Earthly Delights" (Prado). His figures are graceful and his colours subtle and sure, and all is in motion in these ambitious and extremely complex works. The laws of nature have collapsed, and distinctions between the plant and animal kingdoms, between living and dead, real and unreal, true and false have blurred. He has provided glimpses into a Godless, frightening pandemonium.

During this period Bosch elaborated on his early ideas, and the few paintings that survive establish the evolution of his thought. Bosch's disconcerting mixture of fantasy and implacable reality is further developed in the "Hay Wain," the outside wings, or cover panels, of which recall the scenes of "The Seven Deadly Sins." The cursive style that he worked out for the triptych resembles that of watercolour. In the central panel, a rendition of the Flemish proverb "The world is a haystack from which each takes what he can," Bosch shows the trickery of the demon who guides the procession of people from the earthly paradise depicted on the left wing to the horrors of hell shown on the right one.

Bosch's "Temptation of St. Anthony" displays his ascent to stylistic maturity. The brushstrokes are sharper and terser, with much more command than before. The composition becomes more fluid, and space becomes a shifting series of illusionistic details. His figures are graceful, and his colours are subtle and sure. His mastery of fine brush-point calligraphy, permitting subtle nuances of contour and movement, is fully evident. Bosch portrays man's struggle against temptation, as well as the omnipresence of the Devil, in his "St. Anthony," one of the best keys to the artist's personal iconography. The hermit saint in this work is cast as the heroic symbol of man. Anthony is pictured in the centre of the composition. The whirling movement is focussed on two additional centres placed in symmetrical relationship to him. One of the figures represents Christ in a tiny chapel pointing out the crucifix to Anthony. The other is the figure of a magician (or devil) crouching near a wall. Bosch's use of alchemy for inspiration probably came as a result of its popularity in medieval thought. His development of the theme—the charlatan deceives man, taking his salvation—finds wide implications in the "St. Anthony," with its abstract image of heresy and the seductions of false doctrines.

The "Garden of Earthly Delights," representative of Bosch at his mature best, shows the earthly paradise with the creation of woman, the first temptation, and the fall. The painting's beautiful and unsettling images of sensuality and of the dreams that afflict the people who live in a pleasure-seeking world express Bosch's iconographic originality with tremendous force. The chief characteristic of this middle phase of Bosch's art is the dreamlike quality evident in his paintings; weightless ghosts seem to float in a receding landscape, and all the elements come together to produce a perfect, harmonious whole.

Bosch's late works are fundamentally different. The scale changes radically, and, instead of meadows or hellish landscapes inhabited by hundreds of tiny beings, he painted densely compacted groups of half-length figures pressed tight against the picture plane. In these dramatic close-ups, of which "The Crowning with Thorns" (versions in the National Gallery, London, and at El Escorial, near Madrid) and the "Carrying of the Cross" (Museum voor Schone Kunsten, Ghent) are representative, the spectator is so near the event portrayed that he participates in it physically and psychologically. The figures themselves often embody several levels of symbolism. The four executioners surrounding Christ in "The Crowning with Thorns," for example, may be said to represent the four ages of man, the four temperaments, or the four variations of human cruelty.

Bosch's preoccupation in much of his work with the evils of the world did not preclude his vision of a world full of beauty. His adeptness at handling colour harmonies and at creating deeply felt compositions is readily apparent. Though a spate of imitators tried to appropriate his visual style, its uniqueness prevented his having any real followers.

Bosch, Johannes, graaf van den (count of) (b. Feb. 2, 1780, Herwijnen, Neth.—d. Jan. 28, 1844, The Hague), statesman who instituted the Dutch East Indies Culture System, by which vast riches in export crops were extracted from 1830 to about 1860.

In his early years (1798–1810) he served in the army in Batavia in the Dutch East Indies, and on this experience he based his *Nederlandsche bezittingen in Azia, Amerika, en Afrika* (1818; "Dutch Possessions in Asia, America, and Africa"), in which he argued against a liberal colonial system and for a strongly paternalistic one, claiming that people unaccustomed to a work ethic needed strong guidance. In 1830 he was named governor general in the Dutch East Indies, and he instituted a "Culture System" that made Indonesian noblemen semiautonomous rulers, exacted compulsory labour from villagers, and required each village to devote at least one-fifth of its land to export crops. The system proved such a profitable success that abuses crept in, tending to give both the system and Bosch a bad name in later years.

Bosch (Gaviño), Juan (b. June 30, 1909, La Vega, Dominican Republic), Dominican writer, scholar, and politician elected president of the Dominican Republic in 1962 but deposed less than a year later.

Bosch, an intellectual, early opposed Rafael Trujillo's regime. He went into exile in 1937, and in 1939 founded the leftist Partido Revolucionario Dominicano (PRD). The PRD was the first organized political party of the Dominican Republic, and the only one with a constructive program ready to step in after Trujillo's death. Bosch, a dazzling and charismatic orator, won a landslide victory in the elections of Dec. 20, 1962. He was the first politician to directly address the peasantry, a heretofore ignored group that gave Bosch an overwhelming majority in the election, and he appealed not only to the poor but cut across class lines to win the favour of the middle class and intellectuals.

Bosch, entering office on Feb. 27, 1963, faced severe problems at the outset of his term. The United States was frightened and dismayed by the Castro government in Cuba and leery of the slightest whiff of leftist politics in the Caribbean. This fear was fed by damaging reports of the new regime from an openly hostile U.S. ambassador in the Dominican Republic. And Bosch's constitution of April 29, liberal and democratic, alienated four powerful groups in the country—landholders, even small ones, were frightened by his prohibition against latifundia; the church was angered by the secular nature of the constitution; industrialists felt the constitution was worker-oriented; and the military felt its powers were curtailed. On Sept. 25, 1963, the military deposed Bosch, if not with the active help of the United States, certainly with the knowledge that the United States would not in any way oppose their plans.

After a two-year exile in Costa Rica (September 28, 1963–September 1965), Bosch was allowed to return and reluctantly agreed to take part in the new elections. Fearful for his safety, Bosch campaigned half-heartedly, making no public appearances, and lost to Joaquín Balaguer, the conservative candidate with heavy backing from the United States. Bosch and his party abstained from participating in the 1970 elections, but by 1973 the PRD wanted to rejoin the political process. Bosch resigned from the PRD and formed a third party, Partido de la Liberación Dominicana (PLD), now the third party of the Dominican Republic.

His term in office was too short to judge his effectiveness as a president, but Bosch's contribution to his country's political development is of paramount importance. After 31 years of dictatorship, Bosch created a genuine political party, forcing the opposition to do the same,

and enabling his country to have legitimate, representative elections.

Bosch is considered an excellent historian and essayist, having written mostly on Dominican and Caribbean politics. He also wrote novels and a biography, *Simón Bolívar* (1960).

Bosch, Robert (August) (b. Sept. 23, 1861, Albeck, near Ulm, Württemberg—d. March 9, 1942, Stuttgart, Ger.), engineer and industrialist who was responsible for the invention of the spark plug and magneto for automobiles and whose firm produced a range of precision machines and electrical equipment in plants throughout the world.

Trained in the U.S., where he worked with Thomas A. Edison and his colleague the German electrical engineer Siegmund Bergmann, Bosch founded the manufacturing company that bears his name in Stuttgart in 1886. In 1902 his co-worker G. Honold invented the Bosch spark plug, which greatly aided the development of the automobile. Bosch himself developed the Bosch magneto, a device used to generate current for the ignition in internal-combustion engines, and he worked on automobile lamps, horns, and oil-pump devices.

Bosch's social views were advanced for his time. He introduced an eight-hour day in 1906 and advocated industrial arbitration and free trade. He wrote *Die Verhütung kunftiger Krisen in der Weltwirtschaft* (1932; *The Prevention of Future Crises in the World Economic System,* 1937).

Bosch GmbH, in full ROBERT BOSCH, GMBH, West German-based company that is Europe's largest auto parts manufacturer and one of the world's leading makers of auto ignition, fuel injection, and lighting equipment. The company also produces industrial hydraulics and pneumatics equipment, communications equipment, power tools, household appliances, radios, television sets, audio-visual equipment, and medical equipment. Headquarters are in Stuttgart.

Robert Bosch, (*q.v.*) founded the company in 1886 to repair electrical equipment. Two inventions—Bosch's magneto and his partner's spark plug—became the basis for the company's line of auto parts, which now includes technologically advanced fuel injection equipment developed by Bosch engineers.

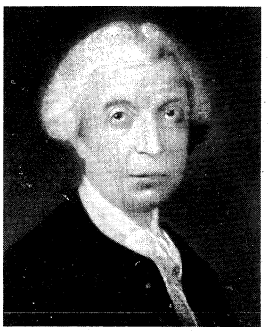
Bosch began making auto parts in the United States in the early 1900s, but in 1918 most of Bosch's U.S. properties were expropriated by the Alien Property Custodian. Some auto parts made by that company are still sold in the U.S. under the name "American Bosch." Bosch's remaining U.S. business was taken over during World War II, but in 1974 the company opened a new factory in the United States.

The company, whose stock was publicly held between 1917 and 1937, is now solely owned by descendants of Robert Bosch.

Bosco, Saint John, Italian in full SAN GIOVANNI MELCHIOR BOSCO, byname DON BOSCO (b. Aug. 16, 1815, Becchi, near Turin, Piedmont, Kingdom of Sardinia—d. Jan. 31, 1888, Turin; canonized April 1, 1934; feast day January 31), pioneer in educating the poor and founder of the Salesian Order.

Bosco was ordained priest (1841) in Turin and, influenced by St. Joseph Cafasso, began to work to alleviate the plight of boys who came to seek employment in the city. Working in borrowed premises, Bosco provided boys with education, religious instruction, and recreation; eventually he headed a large establishment containing a grammar and a technical school and a church, all built through his efforts. He also achieved a local reputation as a popular preacher. He and 22 companions founded (1859) in Turin the Society of St. Francis de Sales (Salesians of Don Bosco; *q.v.*), which before his death had spread to England, France, Spain, and South America. With St. Mary Mazzarello he founded the Daughters of Our Lady Help of Christians (*see* Salesian Sisters), a congregation of nuns dedicated to similar work among girls.

Boscovich, Ruggero Giuseppe, Croatian RUDJER JOSIP BOŠKOVIĆ (b. May 18, 1711, Ragusa, Dalmatia—d. Feb. 13, 1787, Milan), astronomer and mathematician who gave the first geometric procedure for determining the equator of a rotating planet from three observations of a surface feature and for computing the orbit of a planet from three observations of its position.



Boscovich, detail of a portrait by an unknown artist; in Dubrovnik cloister, Yugos.

Archiv fur Kunst und Geschichte, West Berlin

Boscovich entered the Society of Jesus in 1726 and studied mathematics and physics at the Collegium Romanum, Rome, where he was appointed professor of mathematics in 1740. One of the first scientists of continental Europe to accept Newton's gravitational theory, he published nearly 70 papers on optics, astronomy, gravitation, meteorology, and trigonometry.

A pioneer in geodesy, the science concerned with the size and shape of the Earth, he measured a meridian arc between Rome and Rimini, Italy, in 1750 in order to test his theory of the shape of the Earth. He accepted the chair of mathematics at the University of Pavia in 1764 and also served as director of the Brera Observatory in Milan. In 1769 he led an expedition to California to observe a transit of Venus. When the Jesuits were suppressed in Italy in 1773, Boscovich accepted an invitation from the King of France to settle in Paris as director of optics for the navy. He returned to Italy in 1783.

Bose, Sir Jagadis Chandra (b. Nov. 30, 1858, Mymensingh, Bengal, India—d. Nov. 23, 1937, Giridih, Bihār), Indian plant physiologist and physicist whose invention of highly sensitive instruments for the detection of minute responses by living organisms to external stimuli enabled him to anticipate the parallelism between animal and plant tissues noted by later biophysicists.

Bose's experiments on the quasi-optical properties of very short radio waves (1895) led him to make improvements on the coherer,

Sir Jagadis Chandra Bose

By courtesy of the Bose Institute, Calcutta

an early form of radio detector, which have contributed to the development of solid-state physics.

With a degree from Cambridge University (1884), he became professor of physical science at Presidency College, Calcutta (1885–1915), which he left to found and direct (1917–37) the Bose Research Institute, Calcutta. To facilitate his research, he constructed automatic recorders capable of registering extremely slight movements; these instruments produced some striking results, such as Bose's demonstration of an apparent power of feeling in plants, exemplified by the quivering of injured plants. Among his books are *Response in the Living and Non-Living* (1902) and *The Nervous Mechanism of Plants* (1926).

Bose, Satyendra Nath (b. Jan. 1, 1894, Calcutta—d. Feb. 4, 1974, Calcutta), Indian mathematician and physicist noted for his collaboration with Albert Einstein in developing a theory regarding the gaslike qualities of electromagnetic radiation (*see* Bose–Einstein statistics).

Bose, a graduate of the University of Calcutta, taught there in 1916, at the University of Dacca (1921–45), then again at Calcutta (1945–56). Bose's numerous scientific papers (published from 1918 to 1956) contributed to statistical mechanics, the electromagnetic properties of the ionosphere, the theories of X-ray crystallography and thermoluminescence, and unified field theory. Bose's *Planck's Law and the Hypothesis of Light Quanta* (1924) led Einstein to seek him out for collaboration.

Bose, Subhas Chandra, byname NETAJI (Hindi: Respected Leader) (b. *c.* Jan. 23, 1897, Cuttack, Orissa, India—d. Aug. 19, 1945, Taiwan?), Indian revolutionary who led an Indian national force against the Western powers during World War II.

Bose made regular broadcasts from Radio Berlin and, later, with Japanese support, led an army of Indian volunteers from Rangoon into India. The force was defeated, and he disappeared. Described as a "patriot of patriots" by Mahatma Gandhi, Bose fought for Indian independence with courage and devotion. But his role in the Indian struggle was different from that of Gandhi himself, for Bose's most spectacular gestures were military ones.

Bose was the son of a prominent lawyer. As a boy Subhas Chandra sought an ideal to which he could devote his life, poring over the letters and speeches of Swami Vivekananda, a Hindu saint and religious leader of the late 19th century. He later enjoyed a career at the University of Calcutta, proceeding thence to Cambridge. In 1920 he passed the Indian civil service examination, but soon after he resigned to fight for his people and hurried back to India.

The Non-cooperation Movement had been started by Mahatma Gandhi, who had made the Indian National Congress a powerful, though nonviolent, organization. Bose was advised by Gandhi to work under C.R. Das (Indian politician, founder, and leader of the Swaraj [Self-rule] Party) in Bengal. There he became a youth educator, journalist, and commandant of the Bengal Congress volunteers. His activities led to his imprisonment in December 1921. When the Swaraj Party was formed in 1923, Bose was a devoted adherent. In 1924 he was appointed chief executive officer of the corporation of Calcutta, with Das as mayor. Bose was soon after deported to Burma, suspected of connections with secret revolutionary movements. Released in 1927, he returned to find Bengal Congress affairs in disarray after the death of Das.

Gandhi now resumed his Congress activity, and Bose was elected president of the Ben-

gal Congress. In 1928 he was general officer commanding the Congress volunteers in the Indian National Congress session at Calcutta. His imposing figure, leading a parade of disciplined youth in military formation, gave people visions of a national militia, which was at odds with Gandhi's philosophy. In the Congress session Bose moved a resolution demanding India's independence. He did not get a majority this time, but in the 1929 session Gandhi himself sponsored the independence resolution. It received overwhelming support. When the civil disobedience movement was started in 1930, Bose was already in detention. Released and then rearrested, he was finally allowed to proceed to Europe after a year's detention. In enforced exile, he wrote *The Indian Struggle, 1920–34* and pleaded India's cause with European leaders. He returned from Europe in 1936, was again taken into custody, and released after a year. In 1938 he was elected president of the Indian National Congress and formed a national planning committee, which formulated a policy of industrialization. This did not harmonize with Gandhian economic thought, which clung to the spinning wheel as a symbol. Bose's vindication came in 1939, when he defeated a Gandhian rival for reelection. Nonetheless, the "rebel president" felt bound to resign because of the lack of Gandhi's support. He founded the Forward Bloc, hoping to rally radical elements, but was again incarcerated in July 1940. His refusal to remain in prison at this critical period of India's history was expressed in a determination to fast to death, which frightened the British government into releasing him. Though closely watched, he escaped from his residence in disguise and reached Germany, hoping to exploit the international situation in favour of India.

In Germany Bose raised a body of Indian volunteers to fight against the Western powers. After the Japanese attack on Pearl Harbor and the fall of Singapore to the Japanese, he thrilled the East by arriving at Penang Island off the west coast of Malaya after about three months' hazardous passage in a German submarine. He then flew to Tokyo, planning to strengthen the independence struggle in India by obtaining Japanese aid against the British. Indian soldiers of the British Indian Army in Japanese captivity were set free to join him, and Indians from Singapore and other places in Southeast Asia also volunteered. He formed a trained army of three active divisions, each consisting of 10,000 soldiers and 20,000 volunteers. In October 1943 he proclaimed the establishment of an independent Indian government, and his Indian National Army, enjoying equal status with the Japanese Army, advanced to Rangoon and thence overland into India, reaching Kohīma and the plains of Imphāl (near the Burmese border, about 200 miles north of the Bay of Bengal). In a stubborn battle the army, lacking Japanese aerial support, was defeated and forced to retreat but for some time succeeded in maintaining its identity as the liberation army of India. Bose was unbroken in defeat and reportedly died in a Japanese hospital after a plane crash.

By his actions Bose proved that Indians in the British Indian Army could also be inspired by patriotic fervour, and by his work he influenced the conference that led to Indian independence. (N.K.S.)

BIBLIOGRAPHY. Subhas Chandra Bose, *An Indian Pilgrim; or, Autobiography of Subhas Chandra Bose, 1897–1920* (1948); *The Indian Struggle, 1920–1934* (1935); *The Indian Struggle, 1920–1942,* compiled by the Netaji Research Bureau (1964), perhaps the best account of India's freedom movement up to 1942 (also gives an idea of Bose's revolutionary ardour and his troubled though affectionate relationship to Gandhi); J.S. Bright (ed.), *Important Speeches and Writings of Subhas Bose* (1946), valuable source material; D.K. Roy, *Subhas As I Knew Him* (1946), an intimate character study; Hugh Toye, *The Springing Tiger* (1959), a study of Bose emphasizing his reckless courage, enthusiasm, and inspiration and criticizing some traits of his character.

Bose–Einstein statistics, one of two possible ways in which a collection of indistinguishable particles may occupy a set of available discrete energy states. Aggregation of particles in the same state, characteristic of particles obeying Bose–Einstein statistics, accounts for the cohesive streaming of laser light and the frictionless creeping of superfluid helium. The theory of this behaviour was developed (1924–25) by Albert Einstein and the Indian physicist Satyendra Nath Bose, who recognized that a collection of identical and indistinguishable particles can be distributed in this way.

In contrast to Fermi–Dirac statistics (*q.v.*), the Bose–Einstein statistics apply only to those particles not limited to single occupancy of the same state—that is, particles that do not obey the restriction known as the Pauli exclusion principle (*q.v.*). Such particles are named bosons, after the statistics that correctly describe their behaviour.

Boselli, Paolo (b. June 8, 1838, Savona, Piedmont, Kingdom of Sardinia—d. March 10, 1932, Rome), statesman who headed the Italian government that declared war on Germany in World War I.

The first professor of financial science at the University of Rome, Boselli served as a deputy for half a century from 1870 to 1921, representing the right centre, and as a senator from 1921. He was minister of education in the government of Francesco Crispi in 1888, reorganized the Bank of Italy as minister of the treasury under Premier Luigi Pelloux in 1899, and was a minister in the government of Sidney Sonnino in 1906. Favouring Italy's entry into World War I against Austria-Hungary (1915), he made an important speech in the chamber in support of a bill giving full powers to Premier Antonio Salandra. When Salandra's government fell after the Austrian offensive of May–July 1916, the 78-year-old Paolo Boselli became premier, forming a coalition government. After recovering territory lost in the Austrian offensive, Boselli's government declared war on Germany on Aug. 28, 1916. The following year Italy's disastrous defeat at Caporetto brought about Boselli's resignation on Oct. 30, 1917. After Mussolini's accession to power in 1922, Boselli declared his allegiance to the new regime. In March 1929 he acted as government spokesman in the senate for the bill to approve the Lateran treaties between Italy and the Vatican. He was president of the Italian Historical Institute and founded the Museum of the Risorgimento in Rome.

Bösendorfer, Ignaz (b. July 28, 1796, Vienna—d. April 14, 1859, Vienna), Austrian builder of pianos and founder of the firm that bears his name.

Bösendorfer experimented with a variety of actions (mechanisms whereby the finger's pressure is transmitted to a padded hammer and thence imparted to the strings), using different action designs for his smaller and largest grand pianos. The imperial grand, his largest size, had the extraordinary compass of eight octaves; later, it was shortened to the standard seven and one-half. The modern Bösendorfer concert grand is over nine feet (three metres) long and is highly prized for its tone.

Bösendorfer was succeeded in his business by his son Ludwig, who in 1872 built the Bösendorfer Hall in Vienna, a centre for the performance of chamber music and piano recitals. After Ludwig's death in 1919 the business passed into other hands.

boshan xianglu (Chinese censer): *see* po-shan hsiang-lu.

Boskop skull, human fossil remnant consisting of a portion of a skull dome unearthed in 1913 by labourers on a farm near the village of Boskop in the Transvaal, South Africa. The specimen consisted of the greater part of the frontal and parietal bones and a small portion of the occipital. Excavations at the site a year later disclosed a nearly complete temporal bone, most of the body of the left side of a poorly preserved mandible (with a second molar), and a number of fragments of limb bones. No animal or cultural remains were found in direct association except for a single unusual stone artifact. No geological age can be assigned to the skull.

The frontal bone is rounded and narrow with a constriction above the nonprotruding, thin supraorbital ridges. Some degree of parietal bulging is present, and the thickness of the skull varies from 6 to 13 millimetres. Cranial capacity is high (1,800 millilitres), and the skull is narrow (205 mm long by 150 mm wide).

The skull has been called Neanderthaloid, Cromagnoid, Negroid, pre-Bush (*i.e.*, Bushman and Hottentot), and pre-Negro. Many anthropologists have associated the Boskop skull with a hypothetical Boskop race because of discoveries of apparently similar skulls at other sites in Africa. It has been pointed out, however, that the Boskop skull is of Bushman–Hottentot nature. Further, accurate data concerning its discovery are not available (investigators were not even able to ascertain its exact position when found), which minimizes its significance. It presents no primitive features, and there is no justification for utilizing the term Boskop race.

Bošković, Rudjer Josip: *see* Boscovich, Ruggero Giuseppe.

Bosman, Herman Charles (b. Feb. 5, 1905, Kuils River, near Cape Town, S.Af.—d. Oct. 14, 1951, Edendale), South African short-story writer and essayist who is esteemed primarily for his portrayal of rural Afrikaner character and life. His "Oom Shalk Lourens" stories are both frank and affectionate in their treatment of a people poorly understood even by their English-speaking countrymen.

Bosman, the son of Afrikaner parents, had an English education at Jeppe Boy's High School and at Witwatersrand University, Johannesburg. Although he had published stories (under a pseudonym) in a Sunday journal while still in high school, he took his degree in education. Perhaps because of official disapproval of his brief association with the Young Communist League, his teaching post was at remote Groot Marico in the northwest Transvaal. It was a providential assignment: Bosman drew on the experience for the rest of his life.

His teaching at Marico was terminated abruptly when, home on a visit, he shot and killed his stepbrother. Bosman was sentenced to death; the sentence was commuted to 10 years, of which he actually served four. The earliest of the Oom Shalk stories were written in prison, and later Bosman wrote *Stone Cold Jug* (1949), a collection of sardonic, comic prison sketches.

Published in various journals, his stories were first collected in *Mafeking Road* (1947). Most were posthumously published in *Unto Dust* (1963), *The Best of Bosman* (1967), *Jurie Steyn's Post Office* (1971), and *A Bekkersdal Marathon* (1971), all edited by Lionel Abrahams (who in large measure is responsible for Bosman's emergent reputation).

At their best, the early stories show a brilliant adaptation of the short-story form of Edgar Allen Poe (whom Bosman idolized) and O. Henry to the circumstances of the harsh Transvaal veld. The Afrikaner shrewdness as well as ignorance are vividly portrayed; the worst and best characteristics are shown in the same economical and ironic style. Later sto-

ries and sketches are often more open ended, and Oom Shalk gave way to a newer, more uncertain generation following the triumph of the National Party in 1948.

Though avowedly apolitical, Bosman shared Afrikaner distaste for British domination in South Africa; yet he was even more bitterly contemptuous of the Nationalist racial policies emerging in the last years of his life. His stories and sketches are, as a result, often topical. Yet his skill and his senses of irony and comedy give his fiction enduring appeal.

Bosna River, also spelled VOSNA, Bosnia and Hercegovina, Yugoslavia, rising from a spring at the foot of Mt. Igman and following a 168-mi (271-km) course to enter the Sava River. Its course is entirely within Bosnia and Hercegovina. Tributaries are the Željeznica, Miljacka, Fojnica, Lašva, Gostović, Krivaja, Usora, and Spreča rivers, all noted for freshwater fishing. Major river cities are Sarajevo, Zenica, and Doboj. A trunk rail line follows it from Sarajevo, and since World War II industry—especially metallurgical industry—has expanded along the river valley.

Bosnia and Hercegovina, officially SOCIALIST REPUBLIC OF BOSNIA AND HERCEGOVINA, Serbo-Croatian SOCIJALISTIČKA REPUBLIKA BOSNA I HERCEGOVINA, one of the six republics of Yugoslavia. The name Bosnia (Serbo-Croatian Bosna) is derived from that of the Bosna River and is probably of Illyrian origin. Hercegovina, the southern part of the republic, takes its name from the title *herceg* (German *Herzog,* "duke"), assumed in the 15th century by a local ruler.

The following article summarizes the republic's geography and history; for additional treatment, *see* MACROPAEDIA: Yugoslavia.

The republic is roughly triangular, bounded by Serbia and Montenegro (east and southeast) and by Croatia (north and west). Its area of 19,741 sq mi (51,129 sq km) is mostly mountainous. The coastline stretches 13 mi (20 km) along the Adriatic Sea, but there are no harbours. The land is drained by the Sava and Neretva rivers and their tributaries. The southwest is characterized by karst (limestone areas with crevices, sinkholes, and pits) topography, with small depressions containing cultivable soils. In the central and eastern parts of Bosnia (the northern region), there are forests of pine, beech, and oak. Arable land represents about one-half of the republic's area, but the fertile soils are mainly in the north.

The capital of the republic is Sarajevo, the seat of the head of all Muslims in Yugoslavia and also of a Serbian Orthodox metropolitan and of a Roman Catholic archbishop. The other main towns are Mostar and Banja Luka, each of which is the seat of a Serbian Orthodox and a Roman Catholic bishop; Tuzla, the seat of a Serbian Orthodox bishop; and Travnik, the seat of a Roman Catholic bishop.

The ancient inhabitants of Bosnia and Hercegovina were Illyrians, an Indo-European people who overran the northwestern part of the Balkan Peninsula. Traces of Paleolithic life, however, have been found at the mouth of the Usora River, and considerable Neolithic remains have been unearthed at Donja Mahala, Klakar Donji, Kakanj, Novi Seher, and, most important, Butmir. In Hercegovina the main Neolithic site is at Lisičići, near Konjic. The Bronze and Iron ages are also represented, the most important Iron Age sites being Donja Dolina, Glasinac, and Ripač.

After the Roman conquest the country was included in the Roman province of Illyricum, except for the region along the Sava, which belonged to the province of Pannonia. Slav settlement began in the 7th century. After 960 Bosnia was detached from the rest of Serbia and became a separate political entity. The Hungarian encroachment on Bosnia came in the middle of the 12th century. László II, son of Béla II of Hungary, is described as ruling in Bosnia in 1137. The Turks invaded Bosnia in 1386, and after many battles it became a Turkish province in 1463. Under the Turks Bosnia declined economically. During the 16th and 17th centuries Bosnia was an important Turkish outpost in the constant warfare with the Habsburgs and with Venice. At the Congress of Berlin after the Russo-Turkish War of 1877–78, Bosnia and Hercegovina were assigned to Austria-Hungarian occupation, though they were still nominally two Turkish provinces. Annexation to the Austro-Hungarian Empire came on Oct. 7, 1908. A new constitution divided the electorate into three electoral colleges and assigned in each a fixed proportion of seats to the Orthodox, Roman Catholics, and Muslims. This antagonized growing Serbian nationalism and culminated in the assassination (June 28, 1914) of the Austrian archduke Francis Ferdinand at Sarajevo by a Bosnian Serb student, Gavrilo Princip. Bosnia and Hercegovina were annexed to Serbia on Oct. 26, 1918, as part of the Kingdom of Serbs, Croats, and Slovenes, and in 1946 it became one of the six people's republics of Yugoslavia.

The republic's economy is predominantly agricultural. The chief crops are grain, vegetables (mostly potatoes), sugar beets, flax, and tobacco. Forestry and sheep raising are also important. Industrial products are lumber, iron and steel, tobacco, leather, and sugar. Agriculture is most developed in the Sava and Drina valleys. Fruit (chiefly plums) is raised in central and northern Bosnia; vineyards are found in Hercegovina. Minerals include coal (near Sarajevo and Mostar), iron (near Vares and Ljubija), copper (near Gornji Vakuf), and also manganese, lead, mercury, and silver. Pop. (1982 est.) 4,181,000.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bosnian crisis of 1908, state of severe international tension caused by the annexation by Austria-Hungary of the Balkan provinces of Bosnia and Hercegovina. Although the Congress of Berlin (1878) had given Austria-Hungary the right to occupy and administer Bosnia–Hercegovina temporarily, the provinces officially remained possessions of the Ottoman Empire. Nevertheless, the Austrian administration tried mightily and at great expense to improve the strategically valuable region economically and to link it closely with the Austro-Hungarian Empire. When in July 1908 the Young Turks staged a revolution in Constantinople, established a constitutional government, and inaugurated a reform program, the Austrian foreign minister Aloys, Graf Lexa von Aehrenthal resolved to annex Bosnia–Hercegovina before the new Turkish regime could regain control over them.

To that end Aehrenthal met the Russian foreign minister, Aleksandr P. Izvolsky, at Buchlau, in Moravia, and on Sept. 16, 1908, Izvolsky agreed that Russia would not object to the annexation; Aehrenthal pledged that in return Austria would not object to opening the Bosporus and Dardanelles straits to Russian warships, an advantage that had been denied to Russia since 1841. By a rescript of Oct. 7, 1908, Austria-Hungary annexed Bosnia–Hercegovina.

Izvolsky, unprepared for such immediate action, could not control the strong popular opposition to the annexation that developed in Russia. Furthermore, Serbia, which was closely related to Bosnia–Hercegovina geographically and ethnically, was outraged by the annexation. It demanded that Austria cede a portion of Bosnia–Hercegovina to Serbia, and Izvolsky, pressed by anti-Austrian opinion in Russia, was forced to support the Serbian claims. Austria, however, firmly supported by its ally, Germany, threatened to invade Serbia if that country persisted in its demands. Russia, having failed to secure equally strong support from its ally, France, could not risk a war against both Austria-Hungary and Germany for Serbia's sake, and in March 1909 Izvolsky notified Germany that Russia accepted Austria's annexation.

Although the crisis was resolved without immediate warfare, the resulting embittered relations between Serbia and Austria-Hungary and Russia's resentment at having been deceived and humiliated by the Dual Monarchy produced a hostile tension that contributed to the outbreak of World War I.

Boso, French BOSON (d. Jan. 11, 887, Vienne, Fr.), king of Lower Burgundy, or Provence (from 877).

Son of Buvin (or Beuves), count of Ardennes, Boso was given the governance of Lombardy (876) by his brother-in-law Charles II the Bald, king of the West Franks (France), and received the title of duke. During the minorities of the West Frankish kings Louis III and Carloman, he demonstrated his ambition by convoking the bishops of Provence and having them proclaim him their king (Oct. 15, 879) and thereafter proceeded to expand his domains. The territory over which he usurped royal authority included not only Provence but many lands to the north, as far as Autun—an enlarged Burgundy. In succeeding years, especially 880–882, he lost many of the marginal northern lands to the French and German Carolingians, reestablishing their authority. He was succeeded by his son, Louis, who in 901 became the emperor Louis III.

Bōsō-hantō (Japanese: Bōsō Peninsula), peninsula, coextensive with Chiba Prefecture, Honshu, Japan. It extends for 81 mi (130 km) into the Pacific Ocean, enclosing Tōkyō-wan (Tōkyō Bay) on the west. The peninsula has a maximum width of 66 mi and an area of 1,944 sq mi (5,034 sq km). Marked by low hills, such as the Bōsō Hills in the south, it is dominated by the southern extension of the Jōsō Tableland, which decreases in height from southeast (330 ft [100 m]) to northwest (98 ft) and is dissected by wide valleys. The coastal plain of Kujūkuri stretches along the Pacific in the northeast, and the floodplain of the lower Tone-gawa (Tone River) constitutes the peninsula's northern border.

bosom bottle, generally a thin, flattish bottle containing water and fresh flowers and tucked into the bosom of the dress by women in the late 17th century. The glass or metal bosom bottle sometimes had a decorative neck, since this part was often visible, and was usually covered with ribbon.

As coiffure bottles they were also used in the elaborate headdresses worn by women of that period. In recent times a tube-like version with a pin attached has been known as an orchid holder.

boson, any of a class of subatomic particles considered to be carriers of basic physical forces. In theory such a force is transmitted from one particle to another by a carrier field, which is embodied in a corresponding boson. The principal types of bosons are gravitons, photons, gluons, and intermediate vector bosons, or weakons (namely, the W and Z particles). The long-range gravitational interaction between two masses is thought to be mediated through the exchange of gravitons, whereas the electromagnetic force is exchanged via photons. Similarly, gluons transmit the so-called colour force that binds together quarks, the fundamental constituents of such particles as protons and neutrons that comprise the atomic nucleus. The intermediate vector bosons carry the nuclear weak

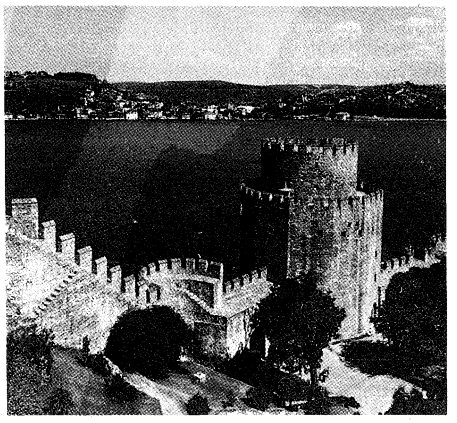
force, which is the force that mediates certain particle transformations, for example, the beta decay of radioactive isotopes.

Each of the bosons has an integral spin (*i.e.*, angular momentum in quantum-mechanical units of 0, 1, etc.), and obeys the Bose–Einstein statistics (*q.v.*). Moreover, all of these field particles are massless except for the intermediate vector bosons, which appear to have a very large mass—about 80–90 times that of the proton. See also graviton; photon; quark; W particle.

Bosorra, also spelled BOSORA (ancient Syria): *see* Bozrah.

Bosporus, also spelled BOSPHORUS, Turkish İSTANBUL BOGAZI, KARADENİZ BOGAZI, or BOGAZIÇI, strait (*boğaz,* "throat") uniting the Black Sea and the Sea of Marmara and separating parts of Asian Turkey from European Turkey. It is 19 mi (30 km) long, with a maximum width of 2.3 mi at the northern entrance and a minimum width of 2,450 ft (750 m) between Rumelihisarı and Anadoluhisarı. Its depth varies from 120 to 408 ft in midstream. In its centre a rapid current flows from the Black Sea to the Sea of Marmara, but a countercurrent below the surface carries saline water from the Sea of Marmara to the Black Sea. The Bosporus is heavily fished, since the channel is a seasonal migration route for fish to and from the Black Sea. Both shores are well wooded and are dotted with villages, resorts, and fine residences and villas.

Bosporus literally means "ox ford" and is traditionally connected with the legendary figure Io, who in the form of a heifer crossed the Thracian Bosporus in her wanderings. Because of its strategic importance for the defense of Istanbul, straddling the southern end of the strait, the Byzantine emperors and later the Ottoman sultans constructed fortifications along its shores, especially on the European side. Two noteworthy examples of Ottoman fortifications are the castles of Anadoluhisarı, constructed on the Asian shore by Bayezid I in 1390–91, and Rumelihisarı, built directly across the strait by Mehmed II in 1453. With the growing influence of the European powers in the 19th century, rules were codified (in treaties of 1841 and 1871) governing the transit of commercial and naval vessels through the strait. An international commission assumed control of the strait after the Ottoman defeat in World War I; Turkey resumed control in 1936. A bridge spanning the Bosporus was completed in 1973.



The castle of Rumelihisarı on the European shore of the Bosporus, looking toward the Asian shore, Turkey

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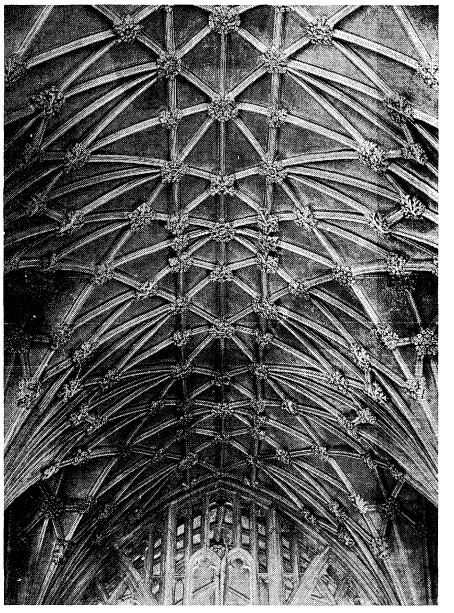
Bosporus, Kingdom of the, also called CIMMERIAN BOSPORUS, ancient Greek state on Kerchensky Proliv (Straits of Kerch) in the present southern Ukrainian S.S.R., which reached its peak of power in the 4th century BC. Its major city, Panticapaeum (modern Kerch), was ruled by the Archaeanactid dynasty (480–438 BC), then by the Spartocid dynasty (438–110 BC), which annexed to Panticapaeum other Greek colonies; *e.g.,* Nymphaeum, which had been founded in the region in the 7th and 6th centuries. After the second half of the 5th century, Athenian influence was strong among the Bosporus cities; Athens controlled local trade until 404 BC and remained the chief customer of the Bosporus throughout the 4th century. The Spartocids suppressed piracy in the Black Sea, and through their management of trade in grain, fish, and slaves, Bosporus prospered. Dynastic and financial decline began in the middle of the 3rd century, and after 110 BC the kings of Pontus controlled the region. A new dynasty, established in the 1st century AD, ruled for 300 years under the protection of the Roman Empire. After AD 342 the country was alternately under barbarian and Byzantine control.

boss, in medieval architecture, keystone used in vaulting to provide a junction for intersecting ribs and to cover the actual complex of mitred joints. In medieval England it was highly developed, but in France it was less developed because of the greater height of French naves. By the 13th century, decorative bosses with naturalistic carving were widely used in England; *e.g.,* in the nave at Westminster Abbey, London, and at Ely cathedral. In the 14th century bosses comprising a series of narrative scenes appeared, and in the 15th, fan vaulting was developed with long, pendant-like bosses.



Bosses decorating the ceiling of the Lady chapel, Gloucester cathedral, Gloucestershire, England, 14th century

By courtesy of Maurice H. Ridgway and the Courtauld Institute of Art, London; photograph, F.H. Crossley

Boss, Lewis (b. Oct. 26, 1846, Providence, R.I., U.S.—d. Oct. 12, 1912, Albany, N.Y.), U.S. astronomer best known for his compilation of star catalogs.

In 1876 Boss became director of Dudley Observatory at Albany, and in 1882 he led an expedition to Chile to observe a transit of Venus. About 1895 Boss began to plan a general catalog of stars, giving their positions and motions. The project was supported by the Carnegie Institution, Washington, D.C., after 1906. With an enlarged staff he observed the northern stars from Albany and the southern stars from Argentina. With the new data, he corrected catalogs that had been compiled in the past and in 1910 published the *Preliminary General Catalogue of 6,188 Stars for the Epoch 1900.* Though he died leaving his work unfinished, his son Benjamin completed it in 1937 (*General Catalogue of 33,342 Stars for the Epoch 1950,* 5 vol.).

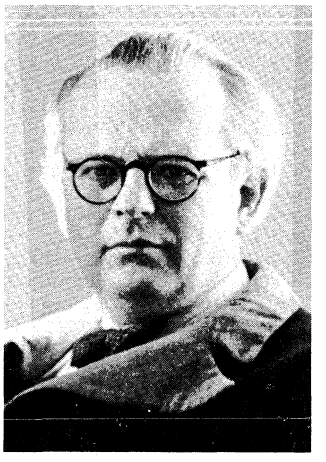
bossa nova (Portuguese: "new trend"), Brazilian popular music that evolved in the late 1950s from a union of samba (a Brazilian dance and music) and cool jazz. The music is in syncopated $\frac{2}{4}$ time. Instrumentation is varied and purposely simple, limited to a few rhythm instruments; *e.g.,* guitar, *marimbau* (musical bow), drum, or a single-note piano accompaniment. In vocalized passages the musical background becomes more subdued to allow the singer greater range for improvisation. As a dance, bossa nova differs little from the samba, requiring the same subtle body rhythm and two-step foot movement. Leading exponents of bossa nova include Baden Powell, Zimbo Trio, Antônio Carlos Jobim, Stan Getz, Herbie Mann, and João Gilberto.

Bosse, Abraham (b. 1602, Tours, Fr.—d. 1676, Paris), notable engraver, painter, and architect of the Baroque period in France. Under the influence of a mathematician, Girard Desargues, he mastered perspective, of which he became a professor at the Academy of Painting. Elected an honorary academician, he was later expelled because of his serious quarrels with colleagues. His prints—mostly of allegories, genre scenes, frontispieces, and costumes—include "The Ages of Man" (1636) and "The Marriage of Ladislas IV" (1645). One of his best-known writings is *Traité des manières de dessiner les ordres de l'architecture antique* (1664; "Treatise on the Ways of Designing the Orders of Classical Architecture"). His paintings, which are rare, include "The Foolish Virgins." Contributing to the development of caricature and cartoon, Bosse also lampooned trades and professions with dispassionate woodcuts and engravings.

Bossert, Helmuth Theodor (b. Sept. 11, 1889, Landau, Ger.—d. Feb. 5, 1961, Istanbul), German philologist and archaeologist who excavated the 8th-century-BC Hittite fortress city at Karatepe (Black Mountain), Tur., and discovered bilingual inscriptions permitting the translation of virtually all but the most archaic examples of Hittite hieroglyphics.

He devoted himself to private scholarship and publication from 1919 until 1934, when he was appointed professor of Near Eastern languages and culture at the University of Berlin and director of the institute for studies in the same fields at Istanbul University.

Around 1930 he turned to the determination of the phonetic values of Hittite hieroglyphics and the general structure of the language.



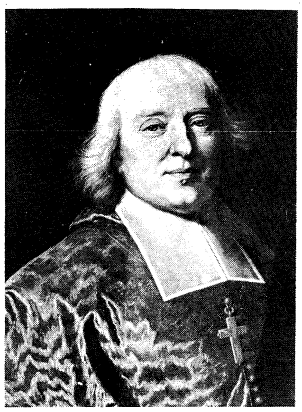
Bossert, 1940

By courtesy of Eva-Maria Fischer-Bossert

In Turkey he studied the ancient Anatolian cultures in the course of many expeditions. In February 1946 he first visited Karatepe, observing its sculptures, inscriptions, and fragments of reliefs. In 1947, under his direction, an excavation of Hittite architectural remains and relief sculptures began. During this work Bossert discovered the long-sought bilingual key to the Hittite language.

His published works include *Die Ausgrabungen auf dem Karatepe (Erster Vorbericht)* (1950; "The Excavation of Karatepe—Preliminary Report"); *Altanatolien* (1942; "Ancient Anatolia"); *Altsyrien* (1951; "Ancient Syria"); and *Geschichte des Kunstgewerbes aller Völker und Zeiten,* 6 vol. (1928–35; "History of the Arts and Crafts of All People and Times").

Bossuet, Jacques-Bénigne (b. Sept. 25, 1627, Dijon, Fr.—d. April 12, 1704, Paris), bishop and most eloquent and influential spokesman for the rights of the French church against papal authority. He is chiefly remembered for his literary works including funeral panegyrics for great personages.



Bossuet, detail of an oil painting by Hyacinthe Rigaud, 1698; in the Uffizi, Florence

Alinari—Mansell

Early life and priesthood. Bossuet was born of a family of magistrates. He spent his first 15 years in Dijon and was educated at the Jesuit college there. Intended early for an ecclesiastical career, he was tonsured at the age of 10. In 1642 he went to study in Paris, where he remained for 10 years, receiving a sound theological education at the Collège de Navarre. He was deeply impressed by the interest that was then developing among many of the clergy in renewing the ideal of the priesthood; the simple eloquence of St. Vincent de Paul, the founder of hospitals and missionary orders, in particular exerted an influence on him. At the same time he frequented scientific and intellectual circles and was an eyewitness of the Fronde, an uprising in Paris against the absolutism of the King. In 1652 he was ordained priest and received his doctorate of divinity. Refusing a high appointment offered him at the Collège de Navarre, he chose instead to settle in Metz, where his father had obtained a canonry for him.

Though Bossuet belonged to the Metz clergy until 1669, he divided his time between Metz and Paris from 1656 to 1659, and after 1660 he left Paris hardly at all. When in Metz, he zealously performed his duties as canon. His main concerns, however, were preaching and controversy with the Protestants, and it was at Metz that he began to master these skills. His first book, the *Réfutation du catéchisme du sieur Paul Ferry* ("Refutation of the Catechism of Paul Ferry"), was the result of his discussions with Paul Ferry, the minister of the Protestant reformed church at Metz. Bossuet's reputation as a preacher spread to Paris, where his "Panégyrique de l'apôtre saint Paul" (1657; "Panegyric of the Apostle Saint Paul") and his "Sermon sur l'eminente dignité des pauvres dans l'Église" (1659; "Sermon on the Sublime Dignity of the Poor in the Church") were particularly admired.

Lenten sermons and funeral orations. Bossuet's career as a great popular preacher unfolded during the next 10 years in Paris. He preached the Lenten sermons of 1660 and 1661 in two famous convents there—the Minims' and the Carmelites'—and in 1662 was called to preach them before King Louis XIV. The Lenten sermons, abundant with biblical citations and paraphrases, epitomize Baroque eloquence; yet, while they exhibit the majesty and the pathos of the Baroque ideal, the exaggeration and mannerism are conspicuously absent. He was summoned in 1669 to deliver the funeral orations that were customary after the death of an important national figure. These first "Oraisons funèbres" ("Funeral Orations") include panegyrics on Henrietta Maria of France, queen of England (1669), and on her daughter Henrietta Anne of England, Louis XIV's sister-in-law (1670). Masterpieces of French classical prose, the orations display dignity, balance, and slow thematic development, with emotionally charged passages but organized according to logical argumentation.

Apart from his work as a preacher, Bossuet, as a doctor of divinity, felt compelled to intervene in the controversy over Jansenism, a movement in the Catholic Church emphasizing a heightened sense of original sin and the role of God's grace in salvation. Bossuet tried to steer a middle course in the quarrel caused by the movement, devoting himself to his controversy with the Protestants.

In 1669 Bossuet was designated bishop of Condom, a diocese in southwest France, but had to resign the see in 1670 after his appointment as tutor to the Dauphin, the King's eldest son. This post brought about his election to the Académie Française. Thoroughly absorbed in the duties of his new office, Bossuet found time to publish a work against Protestantism, *Exposition de la doctrine de l'église catholique sur les matières de controverse* (1671; "Exposition on the Doctrine of the Catholic Church on the Matters of Controvery"). He preached only occasionally thereafter. Primarily concerned with religious and moral instruction, he also taught Latin, history, philosophy, and politics. He wrote several treatises on divine Providence for his pupil. His major political work, the *Politique tirée des propres paroles de l'Écriture sainte* ("Statecraft Prawn from the Very Words of the Holy Scriptures")—which uses the Bible as evidence of divine authority for the power of kings—earned Bossuet his reputation as a great theoretician of absolutism. In the *Politique,* he developed the doctrine of divine right, the theory that any government legally formed expresses the will of God, that its authority is sacred, and that any rebellion against it is criminal. But he also emphasized the dreadful responsibility of the sovereign, who was to behave as God's image, govern his subjects as a good father, and yet remain unaffected by his power.

Bossuet became in 1681 bishop of Meaux, a post he held until his death. In this period he delivered his second series of great funeral orations, including those of Princess Anne de Gonzague (1685), the chancellor Michel Le Tellier (1686), and the Great Condé (1687). Though he kept in close touch with the Dauphin and the King, he was not primarily a court prelate; he was, rather, a devoted bishop, living mostly among his diocesans, preaching, busying himself with charitable organizations, and directing his clergy. His excursions outside the diocese were in relation to the theological controversies of his time: Gallicanism, Protestantism, and Quietism.

The Gallican controversy. In the Gallican controversy, Louis XIV maintained that the French monarch could limit papal authority in collecting revenues of vacant sees and in certain other matters, while the Ultramontanists held that the pope was supreme. An extraordinary general assembly of the French clergy was held to consider this question in 1681–82. Bossuet delivered the inaugural sermon to this body and also drew up its final statement, the *Déclaration des quatre articles* ("Declaration of Four Articles"), which was delivered, along with his famous inaugural sermon on the unity of the church, to the assembly of the French clergy in 1682. The articles asserted the king's independence from Rome in secular matters and proclaimed that, in matters of faith, the pope's judgment is not to be regarded as infallible without the assent of the total church. They were accepted by all parties of the assembly, and his role in this controversy remained perhaps the most significant of Bossuet's life.

Concurrently he was engaged in the controversy with the Protestants. Though he opposed persecution and endeavoured to convert the Protestants by intellectual argument, Bossuet supported the King's revocation in 1685 of the Edict of Nantes, an action that in effect prohibited French Protestantism. In 1688 he published a history of variations in the Protestant churches, *Histoire des variations des églises protestantes,* which was followed by information and advice to Protestants, *Avertissements aux protestants* (1689–91). He maintained an ecumenical correspondence with the great German philosopher Leibniz.

Although Bossuet had displayed moderation in the Gallican quarrel and in the controversy with the Protestants, he showed himself less tolerant in other cases, condemning the theatre as immoral, for example. Above all, he led an attack on the form of religious mysticism known as Quietism, which was being practiced by the archbishop of Cambrai, François Fénelon. He wrote such harsh works against the "new mystics" as his statement on Quietism, *Instruction sur les états d' oraison* (1697; "Instructions on the Calling of Oration") and the *Relation sur le quiétisme* (1698; "Report on Quietism"). After a duel of pamphlets and some unpleasant intrigue, he obtained Fénelon's condemnation in Rome in 1699.

Reputation. In the centuries since his death, Bossuet's reputation has been the subject of much controversy. The only point of agreement is the excellence of his style and eloquence. From a political point of view, he was praised by nationalists and monarchists, but spurned by the liberal tradition. From a religious point of view, he was often quoted as a master of French Catholic thought, but he is opposed by the Ultramontanists, Catholic progressives and modernists, and many of Fénelon's numerous admirers. His emphasis on immutability of doctrine and the perfection of the church made him seem old-fashioned in the atmosphere of Catholicism after the second Vatican Council.

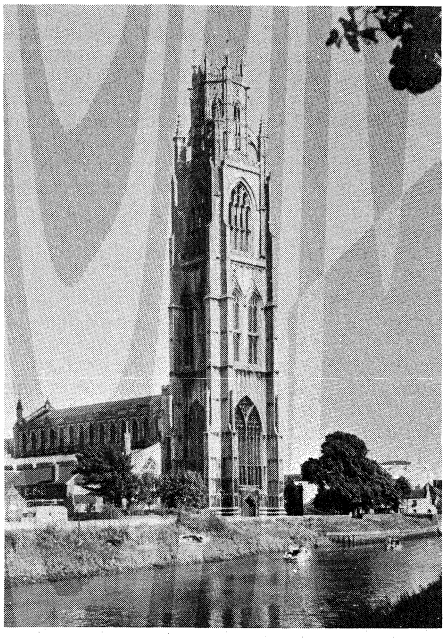
BIBLIOGRAPHY. An important study in English is Sister G. Terstegge, *Providence As idée maîtresse in the Works of Bossuet: Theme and Stylistic Motif* (1948). In French, the most accessible book is J. Calvet, *Bossuet,* 2nd ed. reviewed by J. Truchet (1968), with a detailed bibliography.

Boston, district (borough), county of Lincolnshire, England, on the River Witham on the northern margin in the Fens. It has an area of 138 sq mi (360 sq km).

Boston has served as a small port since the 13th century, when, as a member of the Hanseatic League, it traded in wool and wine. With the progressive silting of the river and changing patterns of trade, the town's prosperity declined.

Boston's church is a landmark for the surrounding flat country of the Fens. The tower,

known as Boston Stump, is 272½ ft (83 m) high. The church itself is a Decorated-style building extensively restored since 1931. It was from Boston that many of the Puritans set forth for the New World. The contemporary



St. Botolph's Church on the River Witham, Boston, Lincolnshire
A.F. Kersting

importance of Boston derives from its continued modest function as a port and from the presence of agricultural and cattle markets. Industries are based largely on agricultural processing. Pop. (1981 prelim.) town, 26,425; (1982 est.) district, 52,500.

Boston, city, capital of the state of Massachusetts, and seat of Suffolk County, in the northeastern United States. It is a major seaport at the head of Massachusetts Bay, an arm of the Atlantic Ocean, and is the historical, cultural, commercial, and industrial centre of New England.

The following article treats briefly the modern city of Boston. Fuller treatment is provided in the following MACROPAEDIA articles. For history and contemporary life, *see* Boston; for additional perspective on the city in its national context, *see* United States of America.

Boston and its sheltered deepwater harbour are ringed by rolling terrain. The site of the original settlement (1630), the hilly Shawmut Peninsula, was almost completely surrounded by water and connected to the mainland by the narrow Roxbury neck. To the east of the city was the harbour; to the west were the Charles River and expanses of salt marshes and mud flats known as Back Bay. Over the years the face of the peninsula changed dramatically. The hills were cut down (except for what remains of Beacon Hill) to provide material to fill in marshes and coves. The former peninsula is now an indistinguishable part of the mainland. Boston's climate is generally temperate and humid, but with continental extremes characterized by a wide annual range of temperatures.

Banking, insurance, investment management, and other financial and business-service activities are the chief elements in the economic life of the city. The Federal Reserve Bank of the New England district is located there. Industries include food processing, clothing manufacture, printing, and metal fabrication.

The centre of the colonial town was at the present Old State House (1711–47). Although the original centre and the colonial South End have become commercial districts, some 18th-century buildings, such as Faneuil Hall (1742–1805) and the Old Corner Book Store (1711), survive. The Paul Revere House (*c.* 1680) and Christ Church (1723) stand in the North End section. The handsome residential district of Beacon Hill, which includes Louisburg Square, has been designated as the Beacon Hill Historic District. To the south lie the public acres of the Boston Common.

The changing face of the original peninsula allowed for a great amount of expansion. The flats of the former Back Bay were laid out as the Public Garden and the Parisian-styled Commonwealth Avenue; both were part of what was to become a continuous park system. The city eventually absorbed most of the earlier surrounding communities except for Cambridge and Brookline. In the centre of the city many high-rise office and residential buildings, such as the Prudential Center and the John Hancock tower, were constructed in the 1960s and '70s. Some planners, however, chose renewal over wholesale rebuilding, examples of which include the Faneuil Hall Marketplace. Street markets and narrow, winding routes are traditional features of the central city.

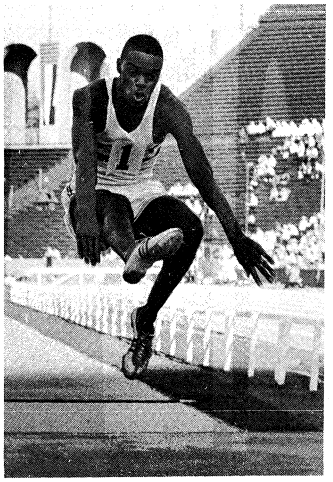
The Boston area has an abundance of colleges and universities; a partial listing includes Harvard University (1636), Radcliffe College (1879), Boston University (1869), the Massachusetts Institute of Technology (1861), and the Tufts–New England Medical Center (originally the medical school of Tufts University; 1852). In addition, medical research centres and major hospitals, museums, libraries, and historical societies abound.

Boston's subway system, begun in 1897, was the first in the country and has been designated as a historic place; railroad passenger service, however, has deteriorated. Logan International Airport is located in East Boston. Area city, 46 sq mi (119 sq km); metropolitan area (SMSA), 1,232 sq mi (3,191 sq km). Pop. (1980) city, 562,994; metropolitan area (SMSA), 2,712,982.

Boston (card game): *see* Boston Whist.

Boston, Ralph (b. May 9, 1939, Laurel, Miss., U.S.), U.S. world-record holder in the long (broad) jump, the first man to jump over 27 ft (8.23 m).

On Aug. 12, 1960, he jumped 26 ft 11¼ in. (8.21 m), breaking by 3 in. the world record set by Jesse Owens 25 years earlier. He then won the gold medal at Rome. On July 16,



Ralph Boston, 1964
UPI—EB Inc.

1961, during a U.S.–Soviet meet in Moscow, he jumped 27 ft 1¾ in. (8.28 m). In 1964 he tied the world record set by the Soviet jumper Igor Ter-Ovanesyan with a jump of 27 ft 3 in. (8.31 m) and on May 29, 1965, made his longest jump, 27 ft 4¾ in. (8.35 m). Boston won the silver medal at the 1964 Olympic Games at Tokyo and the bronze medal at the 1968 Olympic Games at Mexico City, where Bob Beamon shattered his world record. Later that year he was suspended by the Amateur Athletic Union for taking a job as a television sports commentator. After his track career ended, Boston was an administrator at the University of Tennessee (Knoxville). Boston also excelled in the high and low hurdles, the high jump, and the triple jump.

Boston, Siege of (April 1775–March 1776), successful siege by American troops of the British-held city of Boston during the U.S. War of Independence. After the battles at Lexington and Concord (April 19, 1775), Boston was besieged by American militiamen. By June, 15,000 raw, undisciplined, ill-equipped colonials—by then called the Continental Army—surrounded a force of 6,500 British regulars commanded by General Gage.

After the Battle of Bunker Hill (June 17, 1775), Washington assumed command of American forces, while, in October of that year, General Howe succeeded Gage as British commander. Fighting remained stalemated for months, with both sides hesitant to attack. Finally, on March 4, 1776, Washington seized Dorchester Heights and trained his cannon—newly arrived from Fort Ticonderoga—on the city and harbour. Howe was forced to evacuate Boston by ship (March 17), and the siege ended.

Boston and Maine Railroad, largest of the New England railroads, operating in central and northern Massachusetts, southeastern Maine, and New Hampshire, with a few miles in Vermont and New York. The railroad was incorporated in New Hampshire in 1835, and the Boston and Maine Railroad Company was created in 1841. The first section of track, from Wilmington, Mass., east, was opened in 1836.

Ultimately 111 companies were absorbed into the Boston and Maine. The 4.73-mile Hoosac Tunnel, acquired along with the Fitchburg Railroad, was built in the 1860s through the Hoosac Mountains of Massachusetts, occasioning the first use of pneumatic drills in the United States. At the time it was completed in 1876, the Hoosac Tunnel was the longest in the United States.

Although the Boston and Maine went bankrupt in the 1970s, it continued to operate 1,416 miles of main and branch lines while undergoing reorganization. Its largest sources of freight revenues were paper, chemicals and plastics, and food and grain mill products. It sold 279 miles of its commuter lines to the Massachusetts Bay Transportation Authority in the 1970s. In 1982 the railroad was bought by Timothy Mellon, great-grandson of the financier and philanthropist Andrew Mellon.

Boston Athenaeum, in Boston, independent research library containing about 600,000 volumes and housing an art gallery featuring the works of Boston-area artists and artisans. The library was founded in 1807. It moved into its present building on Beacon Street in 1847 and was expanded several times. Special collections include Confederate state imprints, the King's Chapel collection (1698), and the Charles E. Mason Print collection.

Its conservation department was one of the first established in the United States. The art gallery, founded in 1827, features 18th- and 19th-century Boston and New England prints.

Boston Globe, The, daily newspaper published in Boston, the city's largest and one of the most influential of U.S. newspapers.

Founded in 1872, the *Globe* grew slowly at first, reaching a circulation of about 8,000 in 1877, when it was purchased by Charles H.

Taylor. Under Taylor as publisher, the *Globe* began to publish an evening as well as a morning edition, to increase its coverage of New England and local news, and to feature big headlines, especially on sensational stories of crime and catastrophe. Taylor laced the local and regional news as heavily as possible with subscribers' names.

The Boston Globe has long been ranked one of the top papers in the United States. In the 20th century the *Globe,* still under Taylor and then his sons, continued to stress local and regional news but devoted increasing attention to national and international news coverage while maintaining a generally liberal editorial stance. The modern *Globe* is recognized for its makeup, for its investigative reporting, and for its wide range of comment on subjects ranging from art and music to politics and medicine. In the early 1980s it was still under the management of the Taylor family.

Boston ivy, also called JAPANESE IVY (*Parthenocissus,* or *Ampelopsis, tricuspidata*), clinging woody vine of the grape family (Vitaceae). Native to East Asia, the plant has been introduced to other regions, particularly as a climbing ornamental on stone and brick facades. The vine grows to a length of about 18 metres (about 60 feet). The alternate leaves, which are either simple and three-lobed or compound with three leaflets, turn bright scarlet in the autumn. The inconspicuous flowers grow in clusters opposite the leaves. The small, bluish-black fruit is sought by birds.

Boston Latin School, public secondary school, the oldest existing school in the United States. Its establishment in 1635 as the Latin Grammar School, open to all boys regardless of social class, set a precedent for tax-supported public education. Based on the English grammar school, its purpose was to educate young men in the classics as a preparation for university entrance. In 1789 the Latin School curriculum was changed from that of its English model by reducing the course from seven years to four. In 1877, 242 years after the start of the boys' school, the strictly college preparatory Girls' Latin School was established. Among famous graduates of the Boston Latin School were John Hancock, Samuel Adams, Robert Paine, and William Hooper, all signers of the Declaration of Independence.

Boston Marathon, a 42,195-metre (26-mile-385-yard, standard marathon distance) footrace from Hopkinton, Mass., to the Back Bay section of Boston. The race, held first in 1897 and annually thereafter on Patriot's Day (originally April 19; from 1969 the third Monday in April). It is among the most famous of the world's marathon races and is sponsored by the Boston Athletic Association. Runners, numbering more than 5,000 in the 1980s, as opposed to about 200 in 1960, come from all over the world to participate. Two runners, Clarence DeMarr (1922–24) and Bill Rodgers (1978–80), won three consecutive marathons. In 1981 Toshihiko Seko set a record time of 2 hr 9 min 26 sec, and Allison Roe set a women's course record of 2 hr 26 min 46 sec. The Boston Marathon was the first marathon race to admit women runners, in 1972.

Boston Massacre (March 5, 1770), skirmish between British troops and a crowd in Boston, Mass.; widely publicized, it contributed to the unpopularity of the British regime in America in the years before the American Revolution. The incident was the climax of a series of brawls in which local workers and sailors clashed with British soldiers quartered in Boston. Harassed by a mob, the troops opened fire. Crispus Attucks, a black sailor and former slave, was shot first and died along with four others. Sam Adams, a skillful propagandist of the day, shrewdly depicted the affair as a battle for American liberty.

Boston Mountains, range extending east–west for 200 mi (320 km) in northwestern Arkansas and northeastern Oklahoma, U.S. The highest section of the Ozarks, they are bounded by the White River (which has its source there) and by the Arkansas River. Several peaks, including Turner Ward Knob and Brannon Mountain, exceed 2,400 ft (730 m). The rugged mountains, 30 to 35 mi wide with gorgelike valleys, embrace a division of the Ozark National Forest, Buffalo National River, and Devil's Den State Park, Arkansas.

Boston Police Strike (1919), strike of about 80 percent of Boston's police force in protest of opposition to their attempt to organize a union. The Boston police force, which had sought affiliation with the American Federation of Labor after World War I, was denied the right to unionize by the city's police commissioner. On September 9, 1919, the police went on strike.

Without police protection, the city was quickly engulfed in robberies and riots. Mayor Andrew J. Peters called in Boston companies of militia, restoring order and breaking the strike. Later, Gov. Calvin Coolidge—who had refused to act earlier to prevent the strike—sent in the entire Massachusetts militia even though the situation was then under control. The troops fired on a mob, killing two people.

Coolidge came to be regarded as the hero of the entire episode. Declaring "There is no right to strike against the public safety by anybody, anywhere, anytime," Coolidge gained a national reputation as a staunch supporter of law and order. His role in the Boston police strike led largely to his nomination for vice-president on the 1920 Republican ticket (he succeeded to the presidency following Warren G. Harding's death in 1923).

Boston Public Library, library, one of the most famous in the world and one of the great scholarly U.S. libraries open to the public. Founded in 1852, the Boston Public Library was the first American city public library to be entirely supported by taxation; it became a model for urban libraries for the remainder of the 19th century.

The library, which contains more than 4,400,000 volumes, specializes in Shakespeare, Americana, and Spanish literature. Among its special collections are the New England library collected by the Rev. Thomas Prince before 1758; the private library of U.S. president John Adams, one of the best existing collections of original letters regarding the U.S. anti-slavery movement; works of Benjamin Franklin, as well as books printed by him and books from his library; early and important children's books; and an extensive Walt Whitman collection. The present building, erected in 1888–95, is in the Italian Renaissance style and contains notable murals by John Singer Sargent, Pierre Puvis de Chavannes, and Edwin A. Abbey.

Boston Strong Boy, The (boxer): *see* Sullivan, John L(awrence).

Boston Tea Party (Dec. 16, 1773), incident in Boston Harbor preceding the U.S. War of Independence in which rebellious American colonists, under cover of darkness and disguised as Indians, destroyed a valuable shipment of tea owned by the British East India Company. It was the most defiant outburst of colonial resistance to the Tea Act, which was passed by Parliament in April 1773 and imposed a much-resented tax on this popular beverage. In retaliation, Parliament passed the series of punitive measures known in the Colonies as the Intolerable Acts (*q.v.*), including the Boston Port Bill, which shut off the city's sea trade pending payment for the destroyed tea.

Boston terrier, breed of dog developed in the latter half of the 19th century in Boston, Mass. Bred from the English bulldog and a white English terrier, the Boston terrier is one of the few breeds to have originated in the United States. It has a terrier-like build, dark eyes, a short muzzle, and a short, fine coat of black or brindle, with white on the face, chest, neck, and legs. At maturity, it stands 14 to 17 inches (35.5 to 43 centimetres); weight may range from less than 15 to about 25 pounds (7 to 11 kilograms). The breed is characteristically gentle and affectionate.

Boston Whist, also called BOSTON, card game, comprising elements of Whist and Quadrille, which is said to have been invented by French naval officers during the siege by the British Navy of Boston, Mass., in 1775–76. The bids grand misere (a bid to lose 13 tricks) and little misere (a bid to lose 12 tricks) were supposedly named after two small islands in Marblehead harbour, where the French were anchored. It has also been claimed that the game was invented in France, where it was played, often for high stakes, until the mid-19th century. It was also played to a lesser extent elsewhere in Europe and in the United States.

Boston Whist is played by four persons as individuals. Two 52-card decks are used, one for play and the other for naming trump. Each player is dealt 13 cards, four rounds of 3 cards and a single round of 1. The bidding is begun by the player to the dealer's left, and bids range from Boston, the lowest bid, in which the bidder asserts he can take at least five tricks. A player may bid to take up to 13 tricks or to lose 12 or 13 tricks. Trump (first preference suit) is arbitrarily set by cutting the second deck and turning the top card of the bottom part. The other suit of the same colour as trump is called second preference. The remaining two suits are plain. The bidder leads, and tricks are taken by the highest card of the suit led or by the highest trump.

The chief characteristics of Boston Whist are an extremely complicated system of scoring and payments for bids, overtricks, and undertricks.

Bostra (ancient Syria): *see* Bozrah.

Bostum (Iran): *see* Bastām.

Bosumtwi, Lake, lake, Ashanti Region, Ghana, West Africa. The only true inland lake in the country, it has no surface outlet and was formed either by volcanic eruption or by the impact of a meteorite. With an area of 18.5 sq mi (49 sq km) and a depth of 230–240 ft (70–73 m), the lake is fed by small streams, which tumble down the steep sides (500–1,400 ft above water level). Development of tourist facilities on the lake shore in 1976 led to the resettlement of the residents of Abonu.

Boswell, James (b. Oct. 29, 1740, Edinburgh—d. May 19, 1795, London), Scottish friend and biographer of Samuel Johnson (*Life of Johnson,* 2 vol., 1791). The 20th-century publication of his journals have proved him to be also one of the world's greatest diarists.

Edinburgh and London. His father, Alexander Boswell, advocate and laird of Auchinleck in Ayrshire from 1749, was raised to the bench with the judicial title of Lord Auchinleck in 1754. The Boswells were an old and well-connected family, and James was subjected to the strong pressure of an ambitious family.

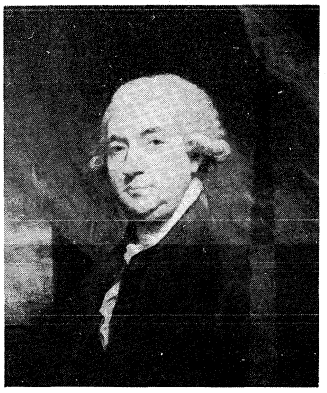
Boswell hated the select day school to which he was sent at the age of 5, and from 8 to 13 he was taught at home by tutors. From 1753 to 1758 he went through the arts course at the University of Edinburgh. Returning to the university in 1758 to study law, he became enthralled by the theatre and fell in love with a Roman Catholic actress. Lord Auchin-

leck thought it prudent to send him to the University of Glasgow, where he attended the lectures of Adam Smith. In the spring of 1760 he ran away to London and made his submission to the Roman Catholic Church. He was soon introduced to various ladies of the town and became passionately fond of metropolitan culture, and gregarious, high-spirited, sensual, and attractive women; London offered just the combination of pleasures that seemed to fulfill him. At this time he contracted gonorrhea, an affliction that he was to endure many times in the course of his life.

From 1760 to 1762 Boswell studied law at home under strict supervision and sought release from boredom in gallantry, in a waggish society called the Soaping Club, and in scribbling. His publications (mostly in verse) give no indication of conspicuous talent.

When Boswell came of age, he was eager to enter the foot guards. Lord Auchinleck agreed that if he passed his trials in civil law, he would receive a supplementary annuity and be allowed to go to London to seek a commission through influence. Boswell passed the examination in July 1762.

Anticipating great happiness, he began, in the autumn, the journal that was to be the central expression of his genius. His great zest



Boswell, detail of an oil painting from the studio of Sir Joshua Reynolds, 1786; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

for life was not fully savoured until life was all written down, and he had a rare faculty for imaginative verbal reconstruction. His journal is much more dramatic than most because he wrote up each event as though he were still living through it, as if he had no knowledge of anything that had happened later. People in his journal talk and are given their characteristic gestures.

Boswell's second London visit lasted from November 1762 to August 1763. Soon after his arrival, he was informed of the birth in Scotland of a son, Charles, for whom he arranged Anglican Baptism. The mother (Peggy Doig) was probably a servant. He met Oliver Goldsmith, the novelist, playwright, and poet, as well as John Wilkes, the radical politician and polemicist. And on May 16, 1763, in the back parlour of the actor and bookseller Thomas Davies, he secured an unexpected introduction to Samuel Johnson, whose works he admired and whom he had long been trying to meet. Johnson was rough with him, but Boswell kept his temper, went to call a week later, and found himself liked—a great friendship was initiated. Johnson was 53 years old when they met, Boswell 22. There was condescension on both sides on account of differences in rank and intelligence. Having become genuinely convinced that the scheme to join the guards was not practicable, Boswell capitulated to his father and consented to become a lawyer. It was agreed that he should spend a winter studying civil law at Utrecht and should then make a modest foreign tour.

Continental tour. Boswell had been deeply affected by Johnson's piety and on Christmas Day, in the ambassador's chapel at The Hague, received communion for the first time in the Church of England. His pious program proved stimulating for a time but palled when it had lost its novelty. He received word that his little boy had died. In the depression that ensued he had recurring nightmares of being hanged. He was discouraged to find that dissipation brought him more happiness than chastity and hard work, and he soon lapsed into his former promiscuity.

From Utrecht Boswell travelled to Berlin in the company of the old Jacobite Earl Marischal, friend and counsellor of Frederick the Great, but he was never able to meet the King. Passing through Switzerland (December 1764), he secured interviews with both Rousseau and Voltaire. Boswell stayed nine months in Italy, devoting himself systematically to sightseeing. At Naples he established an intimacy with Wilkes (then outlawed) and travelled with Lord Mountstuart, eldest son of the Earl of Bute, the chief target of Wilkes's scurrilities.

The most original act of his life followed when he made a six weeks' tour of the island of Corsica (autumn 1765) to interview the heroic Corsican chieftain Pasquale de Paoli, then engaged in establishing his country's independence of Genoa. Paoli succumbed to his charm and became his lifelong friend. On his return to the mainland, Boswell sent off paragraphs to the newspapers, mingling facts with fantastic political speculation.

Scottish lawyer and laird. Back in Scotland, Boswell was admitted to the Faculty of Advocates on July 26, 1766, and for 17 years practiced law at Edinburgh with complete regularity and a fair degree of assiduity. His cherished trips to London were by no means annual and until 1784 were always made during the vacations. He was an able courtroom lawyer, especially in criminal cases, but in Scotland neither fortune nor fame could be won in the criminal court.

In February 1768 Boswell published *An Account of Corsica, The Journal of a Tour to That Island; and Memoirs of Pascal Paoli* and stepped into fame. France had unmasked its intention of annexing the island, and people were greedy for information about Corsica and Paoli. Motives of propaganda caused him to present himself in the book as completely naive and to cut the tour to a mere frame for the memoirs of Paoli, but the result is still pleasing. Paoli, probably wisely, is presented in a manner reminiscent of that which Plutarch employed in his lives of great men.

Between 1766 and 1769 Boswell amused himself with various well-hedged schemes of marriage, maintaining meantime a liaison with a young Mrs. Dodds. Their daughter, Sally, like Charles, seems to have died in infancy. He ended by marrying (November 1769) the only woman he had ever wanted to marry, his first cousin, Margaret Montgomerie.

During the first few years of his marriage, Boswell was on the whole happy, hard-working, faithful to his wife, and confident of getting a seat in Parliament, a good post in the government, or at the very least a Scots judgeship. Paoli visited him in Scotland in 1771; in 1773 he was elected to The Club, the brilliant circle that Sir Joshua Reynolds had formed around Dr. Johnson; and later in the year Johnson made with him the famous tour of the Hebrides. He ultimately had five healthy and promising children. He was made an examinator of the Faculty of Advocates and one of the curators of the Advocates' Library; he served twice as master of the Canongate Kilwinning Lodge of Masons and declined nomination for the grand mastership of Scotland. But by 1776 he began to feel strong intimations of failure. A headlong entry into Ayrshire politics had ranged him in opposition to Henry Dundas, who was then emerging as a political despot in the management of the Scottish elections. His practice was not becoming more notable. He began to drink heavily to replenish his spirits, not, as formerly, to give them vent. He returned to his old traffic with women of the town when separated from his wife by distance, by her pregnancy, or by her frequent complaints. As early as 1778 it was obvious that she was critically ill with tuberculosis.

Between 1777 and 1783 he published in *The London Magazine* a series of 70 essays, significantly entitled *The Hypochondriack,* which deserve to be better known, though they do not engage his full powers. At the end of 1783, in the hope of attracting the attention of Pitt's new government, he published a pamphlet attacking the East India Bill that had been introduced by Charles James Fox, Pitt's great rival. Pitt sent a note of thanks but made no move to employ him. Boswell succeeded to Auchinleck in 1782 and managed his estate with attention and some shrewdness. But he thought he could be happy only in London and encouraged himself in the groundless notion that he could be more successful at the English than at the Scottish bar.

Life of Johnson and London. Johnson died on Dec. 13, 1784. Boswell decided to take his time in writing the *Life* but to publish his journal of the Hebridean tour as a first installment. In the spring of 1785 he went to London to prepare the work for the press. The Hebridean journal tops all the others published later. It comes from the soundest and happiest period of Boswell's life, the narrative of the tour is interesting in itself, and it provides us with 101 consecutive days with Johnson. The book was a best-seller, but it provoked the scornful charge of personal fatuity that has dogged Boswell's name ever since. His intelligence was not really in question. But he deliberately defied the basic literary rule that no author who wishes respect as a man may publish his own follies without suggesting compensatory strengths of character. Boswell analyzed and recorded his own vanity and weakness with the objectivity of a historian, and in his Johnsonian scenes he ruthlessly subordinated his own personality, reporting the blows that Johnson occasionally gave him without constantly reassuring the reader that he understood the implications of what he had written.

In 1786 Boswell was called to the English bar from the Inner Temple and moved his family to London. Thereafter he had almost no legal practice. His principal business was the writing of the *Life of Johnson,* which he worked at irregularly but with anxious attention.

Though straitened in income, he gave his children expensive educations. He visited Edinburgh only once after his emigration and then almost surreptitiously. His wife pined for Auchinleck and insisted on being taken there when her health grew desperate. Boswell felt that he had to be in London in order to finish the *Life* and to be at the call of the Earl of Lonsdale, who had given him unexpected encouragement and caused him to be elected recorder of Carlisle. When she died (June 4, 1789), he was not at her side; and when he tried to detach himself from Lonsdale, he was treated with shocking brutality.

The Life of Samuel Johnson, LL.D. was published on May 16, 1791. Contemporary criticism set the pattern of acclaim for the work and derision for its author. Boswell took intense pleasure in his literary fame but felt himself to be a failure. His later years were prevailingly unhappy. His eccentricities of manner seemed merely self-indulgent in a man of 50 or more; people were afraid to talk freely in

his presence, fearing that their talk would be reported; and his habit of getting drunk and noisy at other people's tables (he was never a solitary drinker) made him a difficult guest in any case. His five children, however, loved him deeply, and he never lost the solicitous affection of a few friends, including his editor, Edmond Malone, who recognized his worth and his need. He saw the second edition of the *Life* through the press (July 1793) and was at work on the third when he died in 1795.

Assessment. For long it was believed that Boswell's private papers had been destroyed shortly after his death, but the bulk of them were recovered in the 1920s at Malahide Castle near Dublin and sold to an American collector, Ralph H. Isham, by Boswell's great-great-grandson, Lord Talbot de Malahide. These papers, as well as others found at Malahide Castle during the 1930s, were united with another portion discovered by a professor, Claude Colleer Abbott, in Aberdeenshire in the home of descendants of Boswell's executor and sold to Yale University, which began a systematic program of their publication.

The *Life of Johnson* will always be regarded as Boswell's greatest achievement, although, since the publication of his papers, its unique values can be seen to be derivative. It is the stretches of Johnson's conversation that make it superior, and those conversations were lifted bodily from the journal, sometimes with so little change that the journal leaves served as printer's copy. The extended commercial publication of the journal, by proving his ability to compete with 20th-century authors on their own terms, has confirmed and added to Boswell's stature as artist. It also for the first time gives the general reader a properly complex portrait.

MAJOR WORKS. *An Account of Corsica, The Journal of a Tour to That Island; and Memoirs of Pascal Paoli* (1768); *The Hypochondriack* (1777–83); *The Journal of a Tour to the Hebrides, with Samuel Johnson, LL.D.* (1785); *The Life of Samuel Johnson, LL.D.*, 2 vol. (1791); *Letters of James Boswell*, 2 vol., ed. by C.B. Tinker (1924). The *Private Papers of James Boswell from Malahide Castle*, ed. by Geoffrey Scott and F.A. Pottle, 18 vol. (1928–34, index 1937), is a virtual autobiography. The commercially published volumes of the Yale editions, beginning with *Boswell's London Journal, 1762–63* (1950, eight subsequent volumes published), present the journal for the general reader.

BIBLIOGRAPHY. F.A. Pottle in *The Literary Career of James Boswell* (1929, reprinted 1966) and in the article on Boswell in *The New Cambridge Bibliography of English Literature*, vol. 2 (1971), provides a detailed bio-bibliography and selected list of works about Boswell. Biographical studies include F.A. Pottle, *James Boswell: The Earlier Years, 1740–69* (1966), the first biography to draw on all the recovered papers; D.B. Wyndham Lewis, *The Hooded Hawk* (1946; reprinted as *James Boswell: A Short Life*, 1952), warmly pro-Boswellian; and C.B. Tinker, *Young Boswell* (1922), a charming portrait.

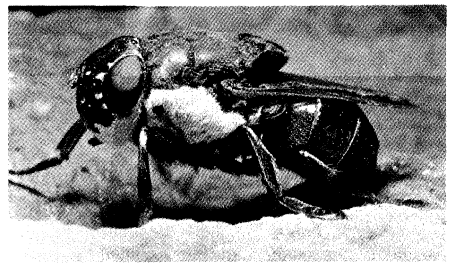
Critical studies (chronologically arranged) are: T.B. Macaulay, "Essay on Boswell's Life of Johnson," *Edinburgh Review*, vol. 54 (1831), brilliant but wrongheaded; Thomas Carlyle, "Biography" and "Boswell's Life of Johnson," in *Critical and Miscellaneous Essays* (1839), a masterly assessment of Boswell's literary virtues; Geoffrey Scott, introductions to vol. 1–5 of *Private Papers* and vol. 6, *The Making of the Life of Johnson* (1928–29), a modern view of Boswell by a great stylist; F.A. Pottle, "The Life of Boswell," *Yale Review*, 35:445–460 (1946); and "Boswell Revalued," in Carroll Camden (ed.), *Literary Views* (1964), Boswell first of all a writer, his style that of the 20th century; W.K. Wimsatt, "Boswell: The Man and the Journal," in his *Hateful Contraries* (1965), Boswell not to be liked or disliked but valued; J.N. Morris, *Versions of the Self* (1966), Boswell modern in his anxiety; R.W. Rader, "Literary Form in Factual Narrative: The Example of Boswell's Johnson," in *Essays in Eighteenth-Century Biography*, ed. by P.B. Daghlian (1968), the *Life* organized by a coherent idea of Johnson; and F.A. Pottle, "The Life of Johnson: Art and Authenticity," in J.L. Clifford (ed.), *Twentieth Century Interpretations of Boswell's Life of Johnson* (1970), the conversations in the *Life*, the quintessence of Boswell's view of Johnson.

Bosworth (England): *see* Hinckley and Bosworth.

Bosworth Field, Battle of (Aug. 22, 1485), battle in the English Wars of the Roses, fought 12 miles west of Leicester and 3 miles south of Market Bosworth, between the forces of the Yorkist King Richard III and the Lancastrian contender for the crown, Henry Tudor. It was in effect the last battle of the wars, and it established the Tudor dynasty on the English throne. Henry, returning from exile, landed at Milford Haven (August 7) and marched toward Richard at Leicester. Early on August 22 Richard's army reached a superior position on Ambien Hill. An ill-organized engagement on its slopes became decisive when Thomas, Lord Stanley (later 1st earl of Derby) and his brother Sir William Stanley, who had privately pledged support for Henry, moved against the Yorkist flanks, and the Earl of Northumberland, who commanded Richard's rear, failed to intervene. The Yorkist army melted away, while Richard, preferring death, was unhorsed and killed in the bog.

bot fly, any member of several small insect families of the order Diptera. The adults are beelike in appearance, hairy but without bristles; the larvae are parasitic on mammals.

Horse bot flies (family Gasterophilidae) include species of *Gasterophilus*, a serious horse pest. The adult horse fly, often known as a



Rodent bot fly (*Cuterebra*)
William E. Ferguson

gad fly, deposits between about 400 and 500 eggs (nits) on the horse's forelegs, nose, lips, and body. The larvae remain in the eggs until the horse licks itself. With the stimulus of moisture and friction the larvae emerge, are ingested, and attach themselves to the lining of the horse's stomach or intestine, obtaining all their nourishment and oxygen from the horse's alimentary canal. The larvae mature after 8 to 11 months and are eliminated with excrement.

In the family Oestridae are the North American and European deer nose bot flies (*Cephenomyia*); perhaps the swiftest flying insects, they can fly approximately 50 miles per hour. Another important nose fly (family Oestridae) is the sheep bot fly (*Oestrus ovis*). Active larvae, deposited in the nostrils of the sheep, often cause a nervous condition called blind staggers.

The important rodent bot flies (family Cuterebridae) are *Cuterebra cuniculi*, which infects rabbits and *C. emasculator*, which attacks the scrotum of squirrels, sometimes emasculating them. The human bot fly (*Dermatobia hominis*) of the family Cuterebridae attacks livestock, deer, and man. The female attaches her eggs to mosquitoes, stable flies, and other insects that carry the eggs to the actual host. Body warmth causes the eggs to hatch, and the tiny larvae penetrate the skin. In tropical America *Dermatobia* is responsible for loss of beef and hides.

Botanic Garden of the University of Copenhagen, one of the notable botanical gardens of Europe. Founded in 1759 on part of the ancient fortifications of Copenhagen, the garden occupies more than 9 hectares (24 acres) and has about 15,000 kinds of plants, both under glass and outdoors. The outdoor plantings are surprisingly rich, considering the northern climate (latitude 55° N); except for summer annuals, all plants, including many handsome specimen trees, are perennials. A large greenhouse-conservatory covering 3,000 sq. metres (32,000 sq. feet) displays exceptionally large collections of orchids from Thailand, begonias, and ferns. The garden also has a special air-conditioned greenhouse that can re-create environments suitable for Arctic plants. The university's botanical museum and herbarium are housed in a building situated within the garden, giving the garden staff ready access to reference works and more than 2,000,000 dried plant specimens.

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botanical garden, also called BOTANIC GARDEN, originally, a collection of living plants designed chiefly to illustrate relationships within plant groups. In modern times, most botanical gardens are concerned primarily with exhibiting ornamental plants, insofar as possible in a scheme that emphasizes natural relationships. Thus, the two functions are blended: eye appeal and taxonomic order. Plants that were once of medicinal value and extremely important in early botanical gardens are now chiefly of historical interest and are not particularly represented in contemporary collections. A display garden that concentrates on woody plants (shrubs and trees) is often referred to as an arboretum. It may be a collection in its own right or a part of a botanical garden.

A major contemporary objective of botanical gardens is to maintain extensive collections of plants, labelled with common and scientific names and regions of origin. Plant collections in such gardens vary in number from a few hundred to several thousand different kinds, depending on the land area available and the financial and scholarly resources of the institution.

As world populations become more urbanized, botanical gardens are increasingly recognized as among the important cultural resources of industrialized nations. Botanical gardens offer the city dweller part of the natural environment he no longer has access to; furthermore, they offer a mental escape from population pressure and suggest new interests and hobbies having to do with the natural world.

What can be called the roots of the botanical garden as an institution are traceable to ancient China and many of the countries bordering the Mediterranean. These actually were centres for the raising of fruit trees, vegetables, and herbs used in making the crude medicines of the time. After the discovery of printing, manuscripts on plants, which had been in existence for centuries, became more widely circulated, and these stimulated further publication of descriptive works called herbals. The herbalists and their herbals, in turn, stimulated the founding of botanical gardens. By the end of the 16th century there were five such gardens in Europe, and by the mid-20th century several hundred. The first two were in Italy, at Padua and Pisa (1545). At first, such gardens were associated with the medical schools of universities. Professors of medicine were mainly the botanists of that time, and their "physic gardens" served for the training of

students as well as for growing plants to make medicines. But they served in other ways as well. Carolus Clusius, a noted botanist of the 16th century, for example, brought together an extensive collection of flowering bulbs at the botanical garden in Leiden, Neth., which proved to be the beginning of the Dutch bulb industry.

In the early 1800s Jean Gesner, a Swiss physician and botanist, noted that by the end of the 18th century there were 1,600 botanical gardens in Europe. During the 18th and 19th centuries, the science of botany took form, and many of the important botanists of the period were directors of the botanical gardens of their day. Since that time, the classical botanical garden as a teaching and medicinal garden declined, to be replaced by gardens devoted mainly to plant culture and the display of ornamental plants and plant groups of special interest.

The larger collections of living plants constitute a formidable resource for professional scholars; but, more importantly, they provide a rich opportunity for the general public to learn more about plants and how to grow them. Some gardens offer popular-level short courses on plants and plant cultivation each year, both for adults and for children.

Botanic gardens constitute reservoirs of valuable heritable characteristics, potentially important in the breeding of new varieties of plants. Longwood Gardens, near Kennett Square, Pa., in collaboration with the U.S. Department of Agriculture, has in recent years sent out several expeditions to collect species that have promise as breeding stock or, in some instances, are already attractive ornamental plants. Historically, England's Royal Botanic Gardens at Kew are most famous for their collecting expeditions and the distribution of economic plants to parts of the world where they could be grown most successfully. Kew is responsible for the wide popularity and spread of such plants as the rubber tree (*Hevea brasiliensis*), pineapple, banana, tea, coffee, cacao, various timbers, and cinchona (yielding quinine) and other drug producers.

Still another function of botanical gardens is the training of gardeners. Canada has long had such a program at the Niagara Falls Parks Commission's School of Horticulture. Such training programs at Kew, Edinburgh, Dublin, and the Royal Horticultural Society's garden at Wisley have produced many able gardeners for supervisory positions in many countries.

Botanical gardens and arboretums differ from parks in that they are generally laid out according to the scientific relationships of their plant collections, rather than exclusively for landscape effect or for playing fields or other essentially recreational endeavours. The traditional practice in laying out a botanical garden is, for example, to gather the trees and shrubs together in an arboretum section of the garden. Oftentimes, though, trees and shrubs are used to enhance landscape effects by interspersing them throughout the garden, in their respective taxonomic groups, with herbaceous collections.

Botanical gardens, or parts of them, are sometimes planned according to the geographic origin of plants. Not infrequently the layout is based on small, special gardens within the greater garden, such as rose, iris, rock, wildflower, and Japanese landscape gardens. Botanical gardens may range in size from a few acres to as many as 2,000.

Although the layouts mentioned above often preclude the possibility of arranging plants strictly according to their taxonomic relationships, this is still possible for certain groups. The genus *Rosa,* for example, includes a great many species and hundreds of named man-made hybrids. In addition to the genus *Rosa,* there are many other genera in the rose family (Rosaceae), with their species and innumerable cultivars. The rose family would be a typical taxonomic grouping for a botanical garden, though the tree species would be grown separately from the rose bushes. The same general principle of taxonomic groupings holds for other plant families and genera.

Usually associated with botanical gardens are the service or display greenhouses in which to propagate plants or to grow those that may not survive seasonal changes. In temperate climates, where the winters are cold, for example, tropical orchids must be greenhouse grown. The same is true of tropical ferns, bromeliads, economic plants of the tropics or near-tropics, many cacti and other succulents, African violets, and begonias. Hotbeds as well as greenhouses serve for starting seedling plants that are to be set outdoors as soon as the weather is warm enough.

A botanical garden that aspires to large plant collections must also have storage areas that provide temperature conditions favourable to certain species at particular seasons. Cold frames may serve this purpose for many kinds of plants and for the wintering over of younger plants that need a cold period but will not tolerate freezing temperatures. Houses built of lathing may also be important for the temporary storage of some species in semishade or even for the growing of certain plants that are intolerant of the hot summer sun.

Many gardens possess herbaria, or collections of a few to many thousands of dried plant specimens mounted on sheets of paper. The species thus mounted have been identified by experts and labelled by their proper scientific names, together with information on where they were collected, how they grew, and so on. They are filed in cases according to families and genera, always available for ready reference. Herbaria, like living plant collections, are the "dictionaries" of the plant kingdom, the reference specimens essential to the proper naming of unknown plants.

Many botanical gardens associated with universities possess extensive libraries, herbaria, and laboratory research facilities. Such gardens offer essential services for the professional plant taxonomist. Some large urban botanical gardens provide classroom and greenhouse workshop facilities for the novice gardener, and the trend for popular-level instruction is growing.

Most large botanical gardens publish technical journals and popular brochures. Books of general appeal and films are produced by some of the larger botanical gardens.

The prime consideration in maintaining plant collections is, of course, good plant-culture practices. Skilled lawn maintenance is particularly important for botanical gardens in cities; the discerning citizen judges a garden more by its general appearance than by the excellence of its plant collections. Tree and shrub collections require systematic pruning, and no important tree should go for more than two years without such attention. Older trees require special pruning attention and care of wounds so that decay does not set in. Spraying for control of pests and diseases is often necessary.

In the early years of botanical gardens, new kinds of plants could be secured only by sending out knowledgeable collectors on expeditions, often to distant places. They would seek out new species growing in the wild and bring back samples of the plants desired. But the nursery industry has now become so great that many smaller firms specialize in particular groups of plants; thus, numerous species and cultivars can be purchased directly from nursery firms, ready for planting. Exchanges of seeds as well as rare plants are often carried out between botanical gardens. Some gardens issue seed-exchange lists annually.

Equipment for the care of plant collections depends upon the size of the operation. Aside from a building adequate to take care of physical needs of the gardening staff and housing space for tools and equipment, attractive and efficient classroom space is essential for gardens with an educational program. A section of a greenhouse arranged for practical work by students (*i.e.,* a greenhouse classroom) is also desirable.

Staff needs depend upon the specific objectives of a botanical garden as well as upon the resources available, the climate, and the area to be cared for. At least one gardener should be a skilled propagator or nursery man. The head gardener, with advanced horticultural training and experience, supervises the entire operation. If the physical plant is of sufficient size, a combination of skilled craftsmen and a superintendent is required to look after all structures and oversee the cleaning, heating, and other routine services.

Professional staff needs also depend upon an institution's objectives as well as financial resources. A general botanist is essential. A taxonomist is basic for the herbarium, as is a librarian, if the book and journal collection is of any size. The taxonomist usually has supervision over the making and placing of plant labels. A plant pathologist, or specialist in plant diseases, is desirable if the plant collections are large. If a teaching program for adults and children is part of the educational pattern of the institution, at least a skeleton force of teachers or part-time instructors who come in and conduct classes is necessary. The total botanical garden program, from gardening through professional staff, is coordinated by a director, who, in turn, is responsible to a board of trustees if the garden is a private corporation. A garden that is part of a university is generally the primary responsibility of a professor of botany or horticulture and is operated as an adjunct of his particular department. Gardens that are government supported usually operate under a director and advisory group.

Some botanical gardens are independently established and financially provided for through endowments set up by wealthy persons. Gardens directly operated by government agencies are usually supported by tax monies. Private colleges and universities with botanical gardens are privately supported and often receive financial assistance by organized, dues-paying-membership groups or by endowment funds established in their behalf.

Botanical Garden, German BOTANISCHER GARTEN, botanical garden founded in 1914 by the great German botanist Karl von Goebel in Munich. The garden's vast array of greenhouses, completed in 1958, include 17 for display and 8 for service functions. The palm house is particularly notable. Other significant greenhouse collections are composed of alpine plants, insectivorous plants, cacti, African succulents, Crassula, and Mesembryanthemeae. The 20-hectare (50-acre) outdoor gardens contain about 10,000 plant species. Although of great intrinsic botanical importance, the plants are arranged for maximum aesthetic effect. The various plantings consist of a large rock garden featuring alpine species, an extensive systematic garden for instruction on plant evolution, several attractive display gardens for the public, and a series of wild gardens in which both indigenous species, including annuals, perennials, bulbs, and trees, and shrubs from other geographic areas, are grown. The garden also maintains the outstanding herbarium of Bavaria (the Botanische Staatssammlung), which contains about 1,500,000 reference specimens of dried plants.

Botanical Garden and Herbaria of the Komarov Botanical Institute, Russian BOTONICHESKY INSTITUT IMENA V. L. KOMAPOVA, major botanical research centre in Leningrad. The 22-hectare (54-acre) gar-

den has about 6,700 species of plants, many of which were obtained through a series of plant-collecting expeditions sent to all parts of the world. Its most important collections include those featuring cycads, palms, rhododendrons, mangroves, lilies, tulips, and lianas. The garden has 27 greenhouses; 22 are for display, and five are for service functions. It also has a sizable arboretum. The botanical garden was founded in 1715 by Peter the Great as a source of medicinal plants for his army, but since that time it has been expanded into an important centre of botanical studies with a large library and an herbarium consisting of more than 5,000,000 reference specimens, among which are numerous collections of special importance from the U.S.S.R. and northern and central Asia. The Komarov Botanical Institute, created by the union of the botanical garden and the city's botanical museum in 1931, published a monumental 30-volume study on the flora of the U.S.S.R. The institute has produced several other important publications, including one on the flora of arctic regions of the U.S.S.R.

Botanical Garden of Central University, Spanish JARDÍN BOTÁNICO DE LA UNIVERSIDAD CENTRAL, state-supported tropical garden occupying a 65-hectare (160-acre) site in Caracas. Founded in 1920, the garden has excellent collections of palms, cacti, aroids, bromeliads, *pandanus,* and other groups of tropical plants of considerable botanical interest; also important is a large, untouched tract of the original mountainside vegetation. The herbarium maintained by the research centre comprises about 100,000 reference specimens, many of which represent plants native to Venezuela and its neighbouring countries. Serial publications of the institution are *Acta botânica venezuelica* and *Flora de Venezuela.*

Botanical Garden of Rio de Janeiro, Portuguese JARDIM BOTÂNICO DO RIO DE JANEIRO, one of the great tropical botanical gardens and arboretums of the world. It was founded in 1808 by John, prince regent of the United Kingdom of Brazil and Portugal (later King John VI), for introducing and acclimatizing economically beneficial plants brought in from other tropical regions of the world. The garden, located on a 54-hectare (133-acre) site below high sandstone peaks, has a collection of more than 7,000 species of tropical plants. Native Brazilian plants such as aroids, palms, and woody members of the legume family predominate. A striking feature of the garden is its spectacular avenues of royal palms that measure about 61 metres (200 feet) high. The garden maintains an herbarium that has approximately 165,000 reference specimens, a fine library, and well-equipped research laboratories.

Botanical Gardens of Indonesia, Indonesian KEBUN RAYA INDONESIA, tropical garden in Bogor. The 87-hectare (215-acre) garden was first used by the Dutch for introducing tropical plants from other parts of the world into the region. In 1817 it was officially converted into a botanical garden and served as a training ground for specialists in tropical botany. A large area of the original rain forest on which the garden was founded has been preserved in its natural state, providing excellent specimens for scientific study. The garden also has outstanding collections of palms, bamboos, cacti, orchids, and ornamental trees. In addition to maintaining more than 10,000 different plant species, the garden has a large herbarium comprising approximately 1,500,000 reference specimens. The Kebun Raya administers two other gardens, the Purwodadi Botanic Garden, consisting of an 85-hectare (210-acre) garden and enormous forest reserve in the southeastern province of Lawang, and the Tjibodas Mountain Garden at Singdanglaja, situated on the slopes of the twin volcanoes Mt. Gedeh and Mt. Pangerango.

Botanischer Garten und Botanisches Museum Berlin-Dahlem: *see* Berlin Botanical Garden and Botanical Museum.

botany, the branch of biology that deals with plants. It involves the study of the structure, properties, and biochemical processes of all forms of plant life, including trees. Also included within its scope are plant classification, plant diseases, and the interactions of plants with their physical environment. Over the years various specialized branches of botany have developed, among which are bacteriology, mycology (the study of fungi), algology (the study of algae), and paleobotany (the study of fossil plants). The principles and findings of botany, moreover, provide the base on which such applied plant sciences as agriculture, horticulture, and forestry depend.

Botany is treated in a number of articles in the MACROPAEDIA. For the history and principal treatment of the discipline, *see* Biological Sciences, The. For the primary subjects of study, *see* Biochemical Components of Organisms; Cells; Tissues and Fluids; Organs and Organ Systems of Living Things; Coloration, Biological; Photosynthesis; Metabolism; Growth and Development; Reproduction and Reproductive Systems; Genetics and Heredity, The Principles of; Evolution, The Theory of; Ecosystems. For the practical applications of botany, *see* Agricultural Sciences; Farming and Agricultural Technology; Gardening and Horticulture; Forestry and Wood Production.

For a description of the place of botany in the circle of learning and for a list of both MACROPAEDIA and MICROPAEDIA articles on the subject, *see* PROPAEDIA: Part Ten, Division III.

Botany Bay, inlet of the Tasman Sea (Pacific Ocean), indenting New South Wales, Australia. Roughly circular, about 5 mi (8 km) across and 1 mi wide at its mouth (between the La Perouse and Kurnell peninsulas), it receives the Georges and Cooks rivers. The bay was the site in 1770 of Capt. James Cook's first landing in Australia. He named it Stingray Harbour but later changed the name because of the variety of new plants found there by his expedition's naturalist, Joseph (later Sir Joseph) Banks. Plans were made for Capt. Arthur Phillip, of the Royal Navy, to establish a convict settlement there, but, when he arrived in 1788, he found the bay area unsuitable for habitation and moved the colony 5 mi north to Port Jackson (later Sydney). Jean La Perouse, a French mariner, explored the bay that same year. Its shores are now ringed by the suburbs of Sydney, with Kingsford-Smith Airport to the northwest and an oil refinery on the south; the Bunnerong power station and several national nature reserves also border the inlet. Port Botany has been dredged and made safer for ships by means of a breakwater, and its use by container ships is double that of Sydney Harbour.

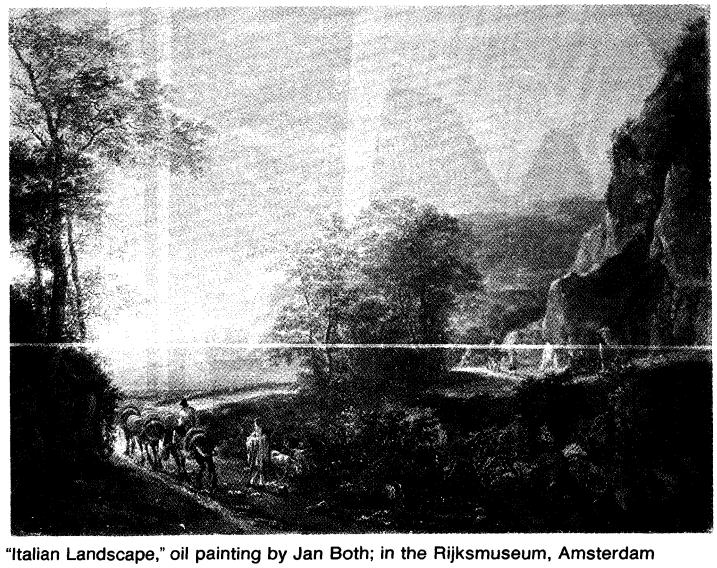
Boteti River, formerly BOTLETLE RIVER, river of Botswana, southern Africa. It emerges near Maun and the Thamakalane River, developing from the outflow of the Okavango Delta, Botswana. It flows in a southeasterly direction to Lake Xau (Dow), then north to enter the Makgadikgadi Pans after a course of 190 mi (305 km).

Botev, Khristo (b. Jan. 5, 1848, Kalofer, Rumelia, Ottoman Empire—d. May 20, 1876, near Mt. Veslez, Bulg.), patriot and poet, one of the heroes of the Bulgarian national revolutionary movement against Turkish rule.

In 1863 he was sent to complete his education in Russia, where he was much influenced by nihilist ideas. He returned to Bulgaria in 1867 but then fled to Romania. There he lived in poverty, devoting himself to the Bulgarian liberation movement through journalistic, literary, and organizational activity. A collection of his patriotic verses, *Pesni u stihove* ("Songs and Verses"), appeared in 1875. During the Bulgarian rising of early May 1876 he reentered Bulgaria with a small band of rebels, but he was killed by regular Turkish troops within a few days of his return.

Both, Jan (b. *c.* 1618, Utrecht, Neth.—buried Aug. 9, 1652, Utrecht), Baroque painter and etcher, the leading master of the "Italianate" trend of Dutch landscape painting in the 17th century.

He first studied with his father, Dirck Both, a glass painter, and then with Abraham Bloemaert. From 1638 to 1641 he lived in Rome with his brother Andries; in the latter year he returned to Utrecht, where he became a prominent member of the painters' guild. His views of the mountains and wooded surroundings of Rome, filled with golden sunlight and enlivened with figures of Italian peasants, show the influence of Claude Lorrain and Pieter van Laer, both of whom he undoubtedly met in Rome (*e.g.*, "Artists Sketching in an Italian Landscape," Rijksmuseum, Amsterdam). He shared van Laer's and the Bamboccianti's interest in contemporary genre, although his primary concern was with landscape, in which human activity was incidental. Rather than



"Italian Landscape," oil painting by Jan Both; in the Rijksmuseum, Amsterdam

By courtesy of the Rijksmuseum, Amsterdam

the idealized classical compositions of Claude, with their generalized treatment of light and atmosphere, Both's depiction of nature was more specific and naturalistic, emphasizing observation over imagination.

The tradition according to which the figures in many of his paintings were done by his brother has not been borne out; in fact, no works of Jan prior to 1641, when Andries died, have been identified. The figures in his known landscapes were usually painted by himself, although in a few cases by Cornelis van Poelenburgh, who also painted Both's portrait. Both's etchings, based on some of his paintings, are most delicately done; good impressions have become rare.

Both, Pieter (b. *c.* 1550, Amersfoort, Neth.—d. February 1615, Mauritius), Dutch colonialist who was the first governor general of the Netherlands East Indies.

After sailing as an admiral in the Indies (1599–1601), he was sent in November 1609 to govern the colony, with instructions to see to it that the Netherlands had the entire monopoly of the trade with the islands and that no other nation had any share whatever. He began by establishing trading posts at Bantam and Jacatra (1610; renamed Batavia in 1619, later called Jakarta). This exclusionist policy meant driving out the English, which Both set out to do and which his successors had largely completed by the 1630s. Both drowned in a shipwreck off Mauritius and was succeeded as governor general by the celebrated Jan Pieterszoon Coen.

Botha, Louis (b. Sept. 27, 1862, near Greytown, Natal—d. Aug. 27, 1919, Pretoria, Transvaal, Union of South Africa), soldier and statesman who was the first prime minister of the Union of South Africa and a staunch advocate of a policy of reconciliation between Boers and Britons so as to form a united South African nation.

The son of a voortrekker (pioneer settler of the interior), he grew up in the Orange Free State, where he received his only formal education at a German mission school. In 1884 he helped to found the New Republic in the Vryheid district in Zululand (now northern Natal). There he purchased a farm and married Annie Emmett, granddaughter of an Irish patriot. When the New Republic became part of the South African Republic (1888), Botha became politically active and held a number of posts before he was elected to the Volksraad (parliament) in 1897. There he sided with the moderates against Pres. Paul Kruger's hostile policy toward the Uitlanders (non-Boer, mostly English, settlers).

With the outbreak of the South African War in 1899, Botha rose rapidly to command the southern force besieging Ladysmith. Leading an ambush, he captured an armoured train; Winston Churchill was among the prisoners. When Piet Joubert, the commandant general of the Transvaal forces, died (March 1900), Botha was named to succeed him. Despite his talents as a general, he could not hold back the overwhelming numbers of British reinforcements. After the surrender of a large Boer army at Paardeberg and the fall of Pretoria, Botha organized a guerrilla campaign, but Britain eventually forced him to negotiate. He was one of the signatories at the Peace of Vereeniging (May 1902).

Louis Botha, oil painting by Sir James Guthrie, late 19th century; in the Scottish National Portrait Gallery, Edinburgh

By courtesy of the Scottish National Portrait Gallery, Edinburgh

The war over, Botha returned to politics as chairman of a new party, Het Volk (The People); and when the Transvaal was given self-government (1907), he was chosen prime minister. A national convention selected him to serve as the first prime minister of the Union of South Africa in 1910, a post he held until his death with patience, tact, and a determination to bring Boer and Briton together.

In 1911 Botha established the South African Party, designed to unite the antiimperialist parties of the Transvaal, Orange Free State, and Cape Colony. The Unionist Party, backed largely by the English-speaking element, was the official party of opposition, but Botha's program of continued conciliation caused a split among his own followers. Concerned with the survival of their Afrikaner heritage, they formed the Orangia-Unie (Orangia Union), headed by J.B.M. Hertzog and others. Differences were exacerbated after the outbreak of World War I, when Botha acceded to the British request to conquer German South West Africa. After successfully putting down an Afrikaner rebellion led by Christiaan Rudolf de Wet and Christiaan Beyers, he went on to defeat the Germans in a well-organized and well-executed campaign (1915) that he personally led. Throughout the rest of the war, Botha managed to survive the bitter political attacks of the Afrikaner nationalists. In 1919 he participated in the Versailles Peace Conference, where, drawing on his own earlier experiences, he advocated leniency for the former enemies.

Botha, P(ieter) W(illem) (b. Jan. 12, 1916, Paul Roux, S.Af.), prime minister (1978–84) and (from September 1984) first state president of South Africa.

A native of the Orange Free State, he studied law at the University of Orange Free State at Bloemfontein from 1932 to 1935 but left without graduating. Already active in politics in his teens, he moved to Cape Province at age 20 to become a full-time organizer for the National Party. He was elected to Parliament in the National landslide of 1948. By 1958 he was deputy minister of the interior, and thereafter (1961–80) he was successively minister of commercial development, Coloured affairs, public works, and defense. He succeeded to the prime ministry upon the resignation of B.J. Vorster in 1978.

Botha's government faced serious foreign and domestic difficulties. The coming to power of black governments in Mozambique, Angola, and Zimbabwe gave new energy to black South African nationalists and the South West African People's Organization (SWAPO). Other and related developments led to frequent black student and labour unrest in South Africa itself, especially in 1980. Botha responded with a military policy that included frequent South African raids combined with support for anti-government groups in the border states, seeking to weaken the Angolan, Mozambican, and Zimbabwean governments. Botha also refused to withdraw from Namibia, though he continued negotiations on the question.

He combined this foreign policy with a program of reforms at home—such as the policy of granting "independence" to various black homelands—that were meant at once to mollify international public opinion while dividing his nonwhite domestic opposition. A key point in this program was the promulgation of a new constitution, which granted very limited powers to Asians and Coloureds but which made no concessions to the black majority. Though the proposed reforms maintained white supremacy, to which Botha was fully committed, the right wing of the National Party split away in protest in 1982 to form the Conservative Party. Botha was still able to get the constitution passed by referendum of whites in 1983. The following year he was elected under the new constitution as state president by an electoral college selected from the racially segregated, white-dominated Parliament.

Bothe, Walther (Wilhelm Georg) (b. Jan. 8, 1891, Oranienburg, Ger.—d. Feb. 8, 1957, Heidelberg, W.Ger.), German physicist who shared the Nobel Prize for Physics in 1954 with Max Born for his invention of a new method of detecting subatomic particles and for other resulting discoveries.

Bothe taught at the universities of Berlin (1920–31), Giessen (1931–34), and Heidelberg (1934–57). In 1925 he and Hans Geiger used two Geiger counters to gather data on the Compton effect—the dependence of the increase in the wavelength of a beam of X-rays upon the angle through which the beam is scattered as a result of collision with electrons. Their experiments, which simultaneously measured the energies and directions of single photons and electrons emerging from individual collisions, refuted a statistical interpretation of the Compton effect and definitely established the particle nature of electromagnetic radiation.

With the astronomer Werner Kolhörster, Bothe again applied this coincidence-counting method in 1929 and found that cosmic rays are not composed exclusively of gamma rays, as was previously believed. In 1930 Bothe discovered an unusual radiation emitted by beryllium when bombarded with alpha particles. This radiation was later identified by Sir James Chadwick as the neutron.

During World War II Bothe was one of the leaders of German research on nuclear energy. He did theoretical work on neutrons and their role in atomic reactions and was responsible for planning and building Germany's first cyclotron, which was completed in 1943.

Bothnia, Gulf of, Swedish BOTTNISKA VIKEN, Finnish POHJAN LAHTI, northern arm of the Baltic Sea, between Sweden (west) and Finland (east). Covering an area of about 45,200 sq mi (117,000 sq km), the gulf extends for 450 mi (725 km) from north to south but only 50 to 150 mi from east to west; it is nearly closed off by the Åland (Ahvenanmaa) Islands (south). Its maximum depth is 965 ft (295 m) in the west central portion; its average depth is only about 200 ft. Because it receives the water of so many rivers, including the Ångerman, Ume, Lule, Torne, Kemi, and Oulu, its salinity is extremely low, and, in consequence, ice cover is maintained for up to five months in the winter. There are many small islands, making navigation difficult. The main gulf ports are Pori, Vaasa (Vasa), and Oulu in Finland and Luleå, Härnösand, Sundsvall, and Gävle in Sweden. Many coastal sawmills process the vast forest resources of the hinterland, which was formerly called Bothnia (Botten), whence the gulf's name. The northern portion of the gulf is often called Bottenviken (Swedish) or Perämeri (Finnish), whereas its southern portion is called Bottenhavet (Swedish) or Selkämeri (Finnish).

Bothriolepis, also spelled BOTHRYOLEPIS, extinct genus of fishes of the order Antiarcha (*q.v.*), class Placodermi, characteristic of the Middle and Late Devonian (the Devonian Period began 395,000,000 years ago and lasted 50,000,000 years). The front end of *Bothri-*

olepis was very heavily encased in bony armour. The eyes were located on top of the head shield and situated very close to the light-receptive pineal eye. The shield was separated into two parts, one for the head, the other for the thorax. The posterior portions of the body were naked, lacking even scales. Very strongly developed bony spines in the shoulder region appear to have had a serrated edge and were movable. The genus apparently had functional lungs, indicating that lungs are very ancient structures. It is probable that *Bothriolepis* was a bottom-dwelling animal inhabiting streams and lakes and pulled itself about along the bottom with its hooklike arms. With its weakly developed mouth, *Bothriolepis* was clearly not an active predator.

Bothwell, Francis Stewart Hepburn, 5th earl of (d. before July 1614, Naples), nephew of the 4th earl; by his dissolute and proud behaviour he caused King James VI of Scotland (afterward James I of Great Britain) gradually to consider him a rival and a threat to the Scottish crown and was made an outlaw. Through his father, John Stewart, prior of Coldingham, he was a grandson of King James V and was thus related to Mary, Queen of Scots, and the regent Moray.

Created earl of Bothwell in 1581, he became lord high admiral of Scotland and was a person of some importance at the court of James VI during the time when the influence of the Protestants was uppermost. He was eager that Mary Stuart's death should be avenged by an invasion of England, and in 1589 he suffered a short imprisonment for his share in a rising. By this time he had completely lost the royal favour. Again imprisoned, this time on a charge of witchcraft, he escaped from captivity in 1591 and was deprived by Parliament of his lands and titles; as an outlaw his career was one of extraordinary lawlessness. In 1591 he attempted to seize Holyroodhouse, and in 1593 he captured the King, forcing from him a promise of pardon. But almost at once he reverted to his former manner of life, and, although James failed to apprehend him, he was forced to take refuge in France about 1595. He died at Naples in extreme poverty. He had three sons, but his titles were never restored.

Bothwell, James Hepburn, 4th earl of, DUKE OF ORKNEY AND SHETLAND (b. 1535?—d. April 4, 1578, Dragsholm, Sjaelland, Den.), third husband of Mary, Queen of Scots. He evidently engineered the murder of

4th Earl of Bothwell, miniature by an unknown artist, 1566; in the Scottish National Portrait Gallery, Edinburgh

By courtesy of the Scottish National Portrait Gallery, Edinburgh

Mary's second husband, Henry Stewart, Lord Darnley, thereby precipitating the revolt of the Scottish nobles and Mary's flight to England, where she was imprisoned by Queen Elizabeth I and eventually executed.

The son of Patrick Hepburn, 3rd earl of Bothwell, Hepburn succeeded to his father's title in 1556. Although a Protestant, he supported the Catholic Mary of Lorraine, who was regent for the young queen Mary Stuart, in her struggle against the Protestant Scottish nobles. Upon the death of Mary of Lorraine in 1560, Mary Stuart assumed control of the government, and in 1561 Bothwell became a member of her Privy Council. But he was soon embroiled in a feud with the powerful but deranged Earl of Arran. Accused by Arran of plotting to kidnap the Queen, Bothwell was imprisoned in Edinburgh Castle in March 1562. He escaped the following August and, after a period of detention in England, reached France in September 1564.

The following year Bothwell was recalled to Scotland to help suppress the rebellion of Mary's half-brother, James Stewart, earl of Moray, who had opposed her marriage (in July 1565) to Lord Darnley. Bothwell then won the Queen's affection by acting with loyalty and resourcefulness during the critical events surrounding the murder on March 9, 1566, of her secretary, David Riccio, at the instigation of Darnley. By the end of the year Mary had made Bothwell the most powerful noble in southern Scotland, and she encouraged him to become her husband.

When Darnley was murdered in 1567, public opinion immediately accused Bothwell of perpetrating the crime with Mary's complicity. He was acquitted at an obviously rigged trial, and, already living with Mary, he early in May divorced his first wife. Mary and Bothwell were married by Protestant rites on May 15, the day after his creation as duke of Orkney and Shetland. The couple soon faced revolts by a coalition of Protestant and Catholic nobles, who considered Bothwell a usurper. The Queen's forces met the rebels at Carberry Hill near Edinburgh on June 15, and, when her troops refused to fight, she surrendered on the condition that Bothwell be allowed to escape. He fled north, first to Orkney and Shetland, then to Denmark, where he was taken into custody by King Frederick II. In June 1573, after the collapse of Mary's cause in Scotland, Bothwell was placed in solitary confinement in a castle at Dragsholm, where he died, insane, five years later. Mary had obtained an annulment of their marriage in 1570.

Botletle River (Botswana): *see* Boteti River.

Boto, Eza: *see* Beti, Mongo.

Botocudo, South American Indian people who lived in what is now the Brazilian state of Minas Gerais. They spoke a language of the Macro-Ge group. Their culture was similar to that of other nomadic tribes of the forests and mountains of eastern Brazil. Hunting bands of from 50 to 200 members were led by men considered most powerful in the supernatural realm. The Botocudo believed that spirits inhabited the sky and interceded in human affairs through the mediation of shamans, persons to whom were granted extraordinary powers. Interband conflicts were common, but these were usually resolved by duels between pairs of opponents using long sticks. Resistance to white expansion met with a policy of ruthless extermination. The few remaining Botocudo are descendants of those who took to agriculture and came to terms with the colonial advance.

Botoşani, *judeţ* (district), northeastern Romania, occupying an area of 1,946 sq mi (4,965 sq km), bounded on the north by the Ukrainian S.S.R. and on the east by the Moldavian S.S.R. of the Soviet Union. The Prut and Siret rivers are, respectively, the eastern and western borders. Both rivers drain southeastward. Botoşani (*q.v.*) city, a textile centre, is the district capital. Other towns include Truşeşti, Nicolae Bălceseu, Dorohoi, Săveni, and Darabani. The area of the district characterized by rolling hills was formerly included in feudal Moldavia. Agricultural activities include cereal growing and livestock raising. Bucecea town has a sugar refinery. A museum, located in Dorohoi town, is dedicated to the composer Georges Enesco (1881–1955), who was born in the commune of Liveni (now Georges-Enesco town). A 15th-century church and the Adîncata Forest are other features of Dorohoi. Mihail Eminescu (1850–89), the poet, was born in Ifoleşti village and a museum there commemorates his life. The Dragomirna Monastery, located near Itcani village, was built in 1609 by Anastase Crimca, metropolitan of Moldavia and a painter of miniatures. The monastery, fortified in 1627 by Prince Miron Barnevschi, contains a collection of manuscripts decorated by illuminators who were trained in the school that Crimca founded. Stefănesti village is the birthplace of Ştefan Luchian (1868–1916), the painter. Highways and railway connections extend through Botoşani and Dorohoi. Pop. (1982 est.) 459,774.

Botoşani, city, capital of Botoşani *judeţ* (district), northeastern Romania. It lies in a rich farming area of northern Moldavia, near the Soviet Union. As a settlement, it was first documented in 1439. The Popăuţi Church dates from 1496. Long known as a market centre for agricultural produce and wines, Botoşani has also become an industrial centre, particularly in textiles. Pop. (1982 est.) 83,316.

botrytis blight, also called BOTRYTIS ROT, or GRAY MOLD BLIGHT, disease of plants growing in humid areas that is usually caused by the fungus *Botrytis cinerea.* Most vegetables, fruits, flowers, and woody plants are susceptible; injured, old, and dead plant parts become infected first. Soft, tan to brown spots or blotches become covered with a dusty mold in moist weather. Seedlings, young shoots, or leaves may wither and collapse; buds rot; flowers become flecked and spotted; older flowers and fruit turn brown and rot. *Botrytis* commonly follows injury by ozone, an air pollutant.

Control involves the removal of infected parts. Proper cultivation, including spacing for ventilation, judicious fertilizing, and watering at the soil line are helpful in reducing the chances of botrytis blight. Harvested fruits and vegetables should be stored as close to 32° F (0° C) as practical and sprayed with a fungicide at least weekly in damp, cool weather.

Botsaris, Markos, Italian MARCO BOZZARI (b. *c.* 1788, Soúli, Greece, Ottoman Empire—d. Aug. 21, 1823, Karpenisíon), an important leader early in the Greek War of Independence.

Botsaris' early years were spent in the struggle between the Souliots of southern Epirus and Ali Paşa, who had made himself ruler of Ioánnina (Janina) in Epirus in 1788. After Ali Paşa succeeded in capturing the Souliot strongholds in 1803, Botsaris and most of his surviving clansmen fled to Corfu. He remained there for 16 years, serving in an Albanian regiment under French command. Strongly influenced by the European ideas of national independence and identity, he joined the patriotic society Philikí Etaireía in 1814.

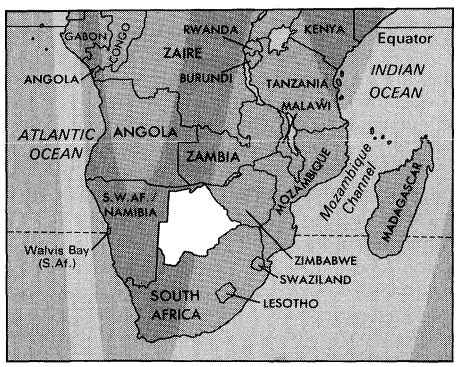
Botsaris returned to Epirus with the Souliots in 1820 to join his former enemy Ali Paşa of Ioánnina in his revolt against the Turkish government and, after Ali Paşa was defeated, committed the Souliots to the Greek struggle for independence that had broken out in April 1821. After serving in the successful defense of the town of Missolonghi (Mesolóngion) during the first siege in 1822–23, he led a band of a few hundred Souliot guerrillas on the night of Aug. 21, 1823, in a bold attack on 4,000 Albanians encamped at Karpenisíon.

The Albanians, who formed the vanguard of a Turkish army advancing to join the siege, were routed, but Botsaris, who had proved to be one of the most promising commanders of the Greek forces, was killed. When Botsaris died, his command of the Souliots passed to

his friend Lord Byron, who formed 50 of them into a personal bodyguard at Missolonghi.

Botswana (people): *see* Tswana.

Botswana, officially REPUBLIC OF BOTSWANA, formerly BECHUANALAND, landlocked country in southern Africa, covering an area of 224,596 sq mi (581,700 sq km). The capital is Gaborone. Consisting mostly of the Kalahari (desert), the country has a maximum length from north to south of about 580 mi (933 km) and a maximum width from east to west of about the same; it is bordered on the south and southeast by South Africa, on the west and northwest by South West Africa/Namibia, on the north by Zambia, and on the



Botswana

northeast and east by Zimbabwe. The Chobe River in the northwest and the Molopo River in the south mark Botswana's boundaries with South West Africa/Namibia and South Africa, respectively. The population in 1983 was estimated at 1,000,400.

The article that follows is a summary of significant detail about Botswana. Fuller treatment is provided in the following MACROPAEDIA articles. For geography and history, *see* Southern Africa; for information about the country in its continental setting, *see* Africa.

For current history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the *Britannica Book of the Year.*

The land. Botswana, forming a part of the southern African Plateau, is almost entirely flat (mean elevation 3,300 ft [1,000 m] above sea level) except in the southeast where the terrain is hilly (4,600 ft) and broken. A vast plateau (4,000 ft) running north–south, divides the country into two distinct topographic regions: in the east, hilly grasslands (veld) traversed by ephemeral watercourses and in the west the Okavango Swamps (4,000 sq mi [10,000 sq km]) and the Kalahari desert. The Kalahari is largely a semidesert with grass and acacia thorn scrub, and only in the southwest, where there are sand dunes, do true desert conditions prevail. The only sources of permanent surface water are the Chobe River, with a drainage basin of 56,000 sq mi (in the north); the Okavango River, with a basin of 53,000 sq mi (in the northwest); and the Limpopo River, with a basin of 30,000 sq mi (in the east). Most of southern Botswana is without surface drainage.

Much of the country has a subtropical climate, though it is subject to continental extremes. The summer (October–March) temperatures may rise to 100° F (38° C), and winter (April–September) temperatures fall to below 32° F (0° C). Mean annual precipitation (most falling from December to April) is about 18 in. (460 mm), varying from 25 in. in the north to 15 in. in the east, and to less than 5 in. in the southwest. Rainfall is highly variable and severe droughts and famines, often lasting several years, are frequent. Favourable conditions for farming and cattle raising exist in the moderate rainfall region of eastern Botswana (Limpopo drainage basin), which has some of the best grazing grounds in the country. Drought-resistant sorghum, corn (maize), millet, and beans are the chief subsistence crops, and cotton, peanuts (groundnuts), and sunflowers are the chief cash crops.

About four-fifths of the country's land area is covered by sparse savanna-type vegetation. Vegetation, corresponding to rainfall patterns, gradually changes from sparse grasses and thorn scrubs in the southwest eastward and northward to a bush and then to a tree savanna. True forests occur only on the banks of the Chobe River. Even the Kalahari contains adequate vegetation to support numerous herds of wild animals. The rich and varied animal life, including lion, elephant, leopard, hippopotamus, giraffe, various antelopes, crocodile, and several species of snakes, is well protected in the several national parks and game reserves, of which Central Kalahari Game Reserve is the largest (21,000 sq mi).

Botswana does not have abundant mineral resources, but it has begun to develop its diamond, nickel-copper, and coal deposits. The diamond mines of Orapa, Lethakane, and Jwaneng had a total reserve of 125,000,000 carats, second only to that of Zaire, in the early 1980s. Large reserves of coal are located near Morupule and Serowe in the east, and deposits of salt, soda ash, and potash exist in the Makgadikgadi salt pans in the northeast.

The people. The people of Botswana belong to eight principal ethnic groups, most of which are historically and culturally interrelated; they are Tswana people, or Batswana, whose name the country bears; Bakwena; Bangwaketse; Bangwato; Bakgatla; Bamalete; Barolong; and Batlokwa. Each group occupies its own separate territory with its own traditional chiefs and retains an inalienable communal ownership over its tribal lands. Associated with each of the dominant tribes are smaller related tribes. The nomadic San (Bushmen) of the Kalahari and the few thousand Europeans are not included in this traditional system. The original inhabitants were the San, known locally as the Sarwa or Masarwa, who, though they now make up only a small proportion of the population, still follow a nomadic way of life in the Kalahari, where they move seasonally across the South West Africa/Namibia border. They are divided into the Naron, Auen, Kung, and Heikum groups. The Batswana group, who include the Ngwato and other tribes described above, are composed of a cluster of tribes closely related in culture and language to the western Sotho. The next largest two tribes are the Kwena and the Ngwaketse, who live in the southeast, near Gaborone. The smaller tribes are the Kgatla, the Malete, and the Tlokwa, who live on the South West Africa/Namibia border. The European population, mainly from South Africa, totals only about 4,000; it consists of farmers, traders, public officials, missionaries and teachers. Coloureds, or Eurafricans, who are of mixed descent, number about 3,500, and there are a few Asians. The two official languages are Tswana (Setswana or Siswana) and English.

The majority of the people are nominal Christians. Between 20 and 30 percent are practicing Christians. The majority of these are Anglicans, Congregationalists, Methodists, and Presbyterians; these four groups have united in Botswana. There are other smaller Protestant and Roman Catholic communities.

The country is sparsely populated because of the shortage of water. The population density is 4.5 persons per sq mi (2.6 per sq km). The southeast is the most densely populated area, with 40 persons per sq mi (15 per sq km), of Botswana. By comparison, the Ghanzi and Kgalagadi districts are the least populous with only 0.5 persons per sq mi (0.2 per sq km). The capital, Gaborone, had a 1983 population of 72,200, and has grown rapidly into an administrative centre since becoming the capital. Serowe, the Bamangwato (Ngwato) capital, lies 35 mi from the nearest railhead. Francistown is the commercial centre of the Tati Concession area, which is dominated by Europeans, mainly from South Africa. Lobatse, the nearest of the six towns to Mafikeng (formerly Mafeking), at the South African border, is another centre of commerce.

Life expectancy at birth is 52 years for males and 58 years for females. The birth rate is 44 per 1,000 population. The urban population accounts for about a fifth of the total population. In 1980, 48 percent of the people were under 15 years of age; at the time of the 1971 population census, infant mortality was about 100 per 1,000 births.

The economy. Botswana has a developing mixed economy in which both the public and private sectors participate. The economy is dependent on the raising of livestock and the mining of diamonds, copper, and nickel, and has been heavily subsidized by South Africa, the European Economic Community (EEC), and various international agencies. Manufacturing industries are virtually nonexistent. The gross national product (GNP) totalled U.S. $730,000,000 in 1980; the GNP per capita, which has grown much more rapidly than the population, was $910.

Agriculture accounts for approximately one-fourth of the GNP and employs three-fourths of the work force. The raising of cattle is the chief agricultural activity and is dominated by a small group of households. Most cattle are sold to the Botswana Meat Commission at Lobatse. Exports of meat to the EEC are favoured by the Lomé Conventions, but have been imperilled by outbreaks of foot-and-mouth disease. Production of sorghum, corn (maize), and millet, which are the chief staples, frequently falls short of domestic demand as a result of unpredictable rainfall. Cash crops include cotton, peanuts (groundnuts), and sunflower seeds.

Mineral industries are dominated by the production and export of diamonds, copper, and nickel, and are a major source of foreign exchange and public revenue. Diamonds are jointly mined by the government and De Beers Consolidated Mines of South Africa. The government owns an interest in the production of copper and nickel. More than 300,000 tons of coal are mined annually and are used domestically to generate electricity. Production of electricity reached 473,000,000 kW-hr in 1980. Numerous workers from Botswana are employed in South African mines and there is a shortage of skilled labour.

Botswana belongs to the South African Customs Union, and the South African rand was its currency until 1976. Principal trading partners are members of the South African Customs Union, which supplied 88 percent of Botswana's imports in 1979; the United Kingdom; and other members of the EEC.

Administrative and social conditions. Botswana is a republic with a parliamentary government. Its 1966 constitution vests legislative authority in the unicameral National Assembly, consisting of 32 directly elected members, 4 specially elected members, and the attorney general. Members serve a five-year term. The House of Chiefs, an elected body representing the principal tribes, serves as an advisory body to the government; legislation affecting tribal affairs must be referred to the House before passage in the National Assembly. Executive power is vested in the president, who is directly elected to a five-year term. The president governs with the assistance of an appointed Cabinet, which is responsible to the National Assembly. The Botswana Democratic Party has been the dominant party since independence. Botswana has a small army and air force.

Health conditions are poor. There is no social security system, but health care is free to children under 11 years of age. A marked increase in government health expenditures in the 1970s financed the extension of health services, the great majority of the population now has access to health care, primarily through mobile clinics, though a shortage of hospitals and personnel prevails. Infant and childhood disease is a major health problem, as reflected in the infant mortality rate of close to 100 per 1,000 live births. The country is plagued by malaria, tuberculosis, gastroenteritis, and pneumonia, and malnutrition is widespread.

Close to 70 percent of the population, however, is literate. Free primary education was introduced in 1980. More than 80 percent of school-aged children attend primary schools, although less than 20 percent attend secondary schools. Higher education is available at University College of Botswana in Gaborone.

Cultural life. The life of the majority of the people is still strongly influenced by tribal institutions and cultures; there is a rich tradition of folklore, music, and dancing. There is also the beginning of a modern literary tradition.

History. The region was earliest inhabited by the San. Sotho peoples migrated into present-day Botswana around 1600. An early European expedition explored the region in 1801, and the London Missionary Society established a mission on the Kuruman (Kudumane) River in 1813. In 1821 Robert Moffat took charge of the mission. About the same time thousands of refugees, fleeing Zulu armies, roamed the countryside pillaging and plundering. The Ndebele peoples, led by Mzilikazi, broke away from the Zulu and settled in western Transvaal. From there they raided Botswana for many years, even after their defeat by the Boers in 1837. Boers reached the frontiers of Botswana during the Great Trek from the Cape Colony (1835).

In 1867 gold was discovered near the Tati River. In 1884 the region became the British Bechuanaland Protectorate. The next year the area south of the Molopo River became a crown colony and was annexed by the Cape Colony a decade later. Bechuanaland itself remained a British protectorate until the 1960s.

In 1961 executive and legislative councils were introduced to supplant the traditional resident commissioner. A 1965 constitution led to the first general elections in which the Bechuanaland (later Botswana) Democratic Party (BDP) won 28 of 31 legislative seats. On Sept. 30, 1966, the Republic of Botswana was proclaimed as an independent member of the British Commonwealth and became a member of the United Nations.

Throughout the 1970s Botswana attempted to maintain a delicate balance between its economic dependence on South Africa and its foreign relations with the surrounding black African countries. In the late 1970s an important highway link was completed with Zambia. During the same period Botswana became a haven for Rhodesian refugees and guerrillas of the Zimbabwe People's Revolutionary Army, especially before Zimbabwe gained independence in 1980.

Botta, Carlo Giuseppe Guglielmo (b. Nov. 6, 1766, San Giorgio del Canavese, Piedmont—d. Aug. 10, 1837, Paris), Italian-born French historian and politician who supported Napoleon.

Having graduated in medicine at Turin in 1786, he was in his youth inspired by the ideas of the French Revolution. Arrested as a spy for the French in 1794, he left Italy for France the following year and from 1796 to 1798 served as a physician in Napoleon's campaigns in Italy and Corfu. He published a history of Corfu in 1799 and in the same year became a member of the Franco-Italian government of Piedmont.

An ardent supporter of Napoleon, though he later contributed to the Emperor's fall, he was elected vice president of the French legislative assembly in 1808. In 1815 he became a French citizen and was subsequently appointed rector of the academies of Nancy and Rouen.

His main work is a fanciful history of the American Revolution, though it is based on contemporary documents and material supplied by Lafayette. An English translation, *History of the War of the Independence of the United States of America,* was published in Philadelphia (1820–21).

Articles are alphabetized word by word, not letter by letter

Botta, Paul-Émile (b. Dec. 6, 1802, Turin, Piedmont—d. March 29, 1870, Achères, Fr.), French consul and archaeologist whose momentous discovery of the palace of the Assyrian king Sargon II at Dur Sharrukin (modern Khorsabad), Iraq, in 1843, initiated the large-scale field archaeology of ancient Mesopotamia.

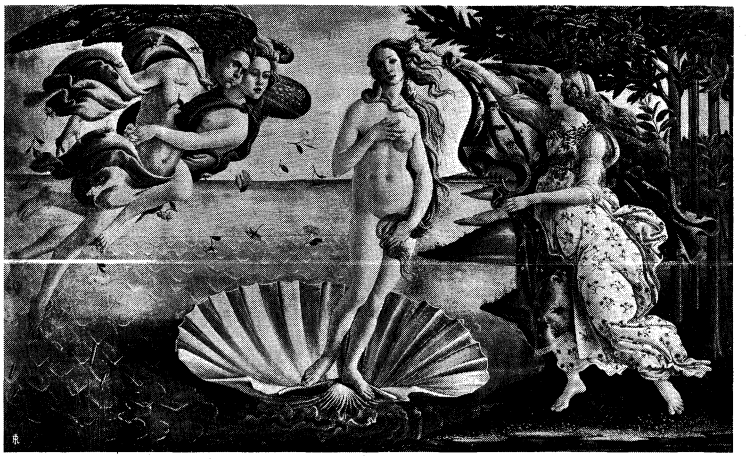
The son of a distinguished Italian historian, Carlo Botta, he was educated as a physician. In 1842 he secured an appointment as consul at Mosul, Ottoman Mesopotamia (modern Iraq), to secure a vantage point for discovering the vanished cities of Assyria, known at that time only from conflicting accounts of ancient writers and from biblical references. He started to excavate at Quyunjik, opposite Mosul on the east bank of the Tigris River, and he might have unearthed Nineveh had he not been drawn by what appeared to be richer prospects at Khorsabad. A week's digging there revealed the remains of the great palace of Sargon, with its famed winged figures, relief sculptures, and cuneiform inscriptions. After Botta reported to Paris his mistaken belief that he had discovered Nineveh, government support financed further excavation, and the artist E.N. Flandin was dispatched to make on-site drawings of the remains, some of which tended to disintegrate quickly after being unearthed. One shipment of antiquities was sunk in transit, but another reached Paris and the Louvre. *Monuments de Ninive* . . . (1849–50; "Monuments of Nineveh . . . ") consisted of a volume of Botta's text and four volumes of Flandin's illustrations. Botta subsequently devoted himself to cuneiform scholarship and was consul in Jerusalem (1846) and Tripoli, in Syria (1868).

Botticelli, Sandro, original name ALESSANDRO DI MARIANO FILIPEPI (b. 1445, Florence—d. May 17, 1510, Florence), Florentine early Renaissance painter whose "Birth of Venus" (*c.* 1485) and "Primavera" (1477–78) are often said to epitomize for modern viewers the spirit of the Renaissance. His ecclesiastical commissions included work for all the major churches of Florence and for the Sistine Chapel in Rome. His name is derived from his elder brother Giovanni, a pawnbroker who was called Il Botticello (Little Barrel).

Early development. Reliable biographical information concerning Botticelli is, unfortunately, in short supply. Documentary evidence indicates that he was still in school in 1458 at the relatively advanced age of 13. Giorgio Vasari, a biographer of Renaissance Italian artists, reports that Botticelli's earliest training was in a goldsmith's shop. Of Botticelli's subsequent apprenticeship to the painter Fra Filippo Lippi there is no doubt; most of Botticelli's earliest works have at one time or another carried an attribution to Lippi or his school, and in many cases the final attribution is still under debate. From Lippi, Botticelli learned a more intimately conceived version of the monumental and generalizing manner of the great innovator of Florentine painting Masaccio; the style that Botticelli learned owed much to Masaccio's handling of light and shade but was more concerned with detail and was directed to a softer sentiment. The influence of his Florentine contemporary Andrea del Verrocchio also is felt in Botticelli's earlier painting.

By 1470 Botticelli had his own workshop. In that year he painted the "Fortitude" for the hall of the Arte di Mercanzia. By January 1474 Botticelli had finished the "St. Sebastian." From the beginning of the decade, the development of Botticelli's painting was characterized by a steady progression away from a full three-dimensional conception of a figure, lighted with softly blurred shadows, toward a conception based on low relief, bounded by continuous and rhythmic outline, the figure being lighted with bright and steady illumination. The "St. Sebastian" represents an early phase of this latter style.

The culmination of his career. "The Primavera," or "Allegory of Spring," painted about 1477, illustrates the next stage of Botticelli's development and "The Birth of Venus" (*c.* 1485) its culmination. Both were painted for the villa of Lorenzo di Pierfrancesco de' Medici at Castello; both are now in the Uffizi (Florence). The influence of the International style, a late 14th-century Gothic style in which natural details were rendered with vivid colour and realism, is a great part of the conception of "The Primavera" but is softened and subjected to Botticelli's new understanding of the art of antiquity. These three paintings—"Fortitude," "The Primavera," and "The Birth of Venus"—present Botticelli's art at its most familiar and most famous and are expressive of that quality for which it has always



"The Birth of Venus," oil on canvas by Sandro Botticelli, *c.* 1485; in the Uffizi, Florence
Anderson—Alinari from Art Resource/EB Inc.

been primarily valued, whether characterized as "grace" as it was by Vasari in the 16th century, or described in terms of linear rhythm, as it was first by the English critic John Ruskin and later by art historians of the 20th century.

From the summer of 1481 until the spring of 1482, Botticelli was in Rome at the invitation of Pope Sixtus IV to paint some of the papal portraits and three of the large frescoes on the wall of the Sistine Chapel, a commission in which such eminent painters as Perugino, Ghirlandajo, Cosimo Rosselli, Signorelli, Pinturicchio, and Piero di Cosimo also took part. His new acquaintance with the art of ancient Rome is strikingly evident in the frescoes, especially in the "Punishment of Korah"; in it a pedantic presentation of Roman forms and schemata (akin to Pinturicchio) is combined with harsh naturalism and monumentality.

Botticelli returned to Florence by October 1482 with Perugino and Ghirlandajo. In 1483 Botticelli designed and supervised the painting of four panels for two wedding chests (cassoni) commissioned for the marriage of Giannozzo Pucci to Lucrezia Bini; and, at about the same time, he was again at work on a major fresco cycle with Perugino, Ghirlandajo, and Filippino Lippi, for Lorenzo the Magnificent's Villa della Spadaletto near Volterra. Through the 1480s he executed a number of frescoes and paintings in Florentine chapels and churches.

In 1491 Botticelli served on a committee to decide upon a design for the facade of the Duomo of Florence. In 1494 he and his brother Simone bought a house and some land near the gate of San Frediano. In the summer of 1496 he painted a "St. Francis" in the convent of Sta. Maria di Monticelli near San Frediano, and in 1497 he was at work with some assistants on decorations for Lorenzo di Pierfrancesco's villa at Castello. He was living in Florence, in the quarter of Sta. Maria Novella, in 1498, and in the following year he joined the Arte dei Medici e degli Speziali.

Late style and last years. Botticelli's late style—that is, his work of the last decade of the 15th century and the first decade of the 16th—is difficult to define, and its development is difficult to trace, in part because of the scarcity of fixed dates as points of reference. Early in the 1490s Botticelli worked to a grandeur of scale and conception that brought him very near to the High Renaissance style.

Although Botticelli's carefully orchestrated sequences of formal and emotional themes and responses reflect the influence of Leonardo da Vinci, the latter's treatment of light and deep shadow, his sfumato, did not interest him. Particularly revealing in this respect are two paintings of the "Pietà," one in Munich (Alte Pinakothek) and the other in Milan (Museo Poldi Pezzoli). In these examples Botticelli's use of colour and light, his handling of masses, and his low-relief style much more closely anticipate the youthful manner of Michelangelo, as exemplified by his "Doni Madonna," than the manner of Leonardo.

The extraordinary "Mystic Nativity," drawing upon the apocalyptic vision of the Book of Revelations, occupies a pivotal point in Botticelli's development. It shows him at work on a smaller scale, working with a richer and more deeply saturated colour scheme. His brushwork is looser, his forms more abstractly modelled, and space is conceived in a conventionalized manner, which has been described as archaic but which also, together with his new colour scheme, owes something to a renewed interest in the art of northern Europe. This painting, dated 1501, has been cited as evidence of Botticelli's involvement with Savonarola's theology (which also was apocalyptic), an argument that is fortified by the account of Botticelli's sympathy with Savonarola in his brother's diary and by Vasari's statement that he was a follower of him. The issue is not settled, however, for the painting bears important iconographical parallels with the Flemish Hugo van der Goes's "Portinari Altarpiece," and the identification of the Madonna with the Apocalyptic Woman, moreover, is commonplace in 15th-century Italian art. Thus, the notion that Botticelli is creating a mystic style on Savonarolan example must remain suspect.

From a point in the mid-1490s, when he seemed on the verge of achieving a style in the "grand manner," Botticelli inexplicably retreated, beginning with "The Calumny of Apelles" of *c.* 1495 and ending with the latest paintings known to be by him, the series devoted to the life of St. Zenobius. His progression is marked by an increasing diminution of scale and the adoption of consciously old-fashioned formats modelled on northern examples and on the conventions of the painters of his youth. He uses expressively and decoratively distorted figures conceived with no regard for anatomical verisimilitude. Also evident in his later work is the more deeply saturated colour scheme, based on rainbow hues. Nothing, however, quite anticipates the St. Zenobius panels. In them Botticelli painted a series of visions in which the stylistic characteristics outlined above may be applied roughly but with significant modifications: the settings are rendered in a way that recalls the clarity of the earlier architectural perspectives attributed to the architect Luciano Laurana, and the works are painted in purely abstract and non-naturalistic colour planes that resemble the early 15th-century paintings of Fra Angelico. Botticelli peopled these panels with figures of the most intense simplicity and emotion.

In November 1502 Botticelli was accused of sodomy, but the charges were evidently dropped. He was a member of a commission appointed in 1504 to decide where to place the "David" of Michelangelo. That his financial situation was less than prosperous during the last decade of his life is demonstrated by the fact that, between 1503 and 1505, when he settled the account, he was behind in his payment of dues to the Compagnia di San Luca, the artists' confraternity. Botticelli died in 1510 and was buried in the church of the Ognissanti, Florence.

The evidence clearly indicates that Botticelli had a successful career, following conventional lines, which brought him important patrons and financial rewards. The slight indications of financial unsteadiness from the last decade of his life tend to support Vasari's claim that Botticelli was careless of his money. His ecclesiastical commissions included work for all the major churches of Florence and were crowned by his being summoned to Rome on a papal commission to take part in the decoration of the Sistine Chapel; his private commissions included work for the Palazzo della Signoria, the administrative centre of Florence, and works for various members of the Medici family. His chief patron was Lorenzo di Pierfrancesco, for whom, in addition to the works mentioned above, he undertook an important series of illustrations for Dante's *Divina commedia.*

Posthumous reputation. Botticelli lived in a time that saw a rapid and profoundly considered change in painting. Because he was of an older generation than the great fathers of the High Renaissance style, he cuts rather a poor figure in the criticism and historical accounts of the centuries following his death, insofar as he is mentioned at all. Not until the late 19th-century were his due merits recognized and acclaimed by such Pre-Raphaelite artists as Dante Gabriel Rossetti. The critics of that day and afterward, such as John Ruskin, Walter Pater, and Bernard Berenson, wrote the pioneering accounts analyzing his style, and these still form the foundation of modern criticism.

In the 20th century a great amount of scholarly attention has been concentrated on the complex problem of Botticelli's subject matter. Scholars have sought to isolate its sources in particular poetic and philosophical texts and in the understanding of these texts by the Humanists of the Medici circle. This done, they have gone on to seek an understanding of Botticelli's art through the measurement of the system of thought expressed in these texts against their expression in the style of Botticelli's paintings.

The most brilliant example of this approach was an essay by the German art historian Aby Warburg, which, of itself, established an entire school of art history. In an attempt to understand the historical and psychological import of the linear style of Botticelli and his contemporaries, Warburg subjected the texts behind "The Primavera" and "The Birth of Venus" to close philological scrutiny and then incorporated his findings into an analysis of Renaissance formulas for expressing emotion. Subsequent studies sought the basis of Botticelli's pictures in the poetry, philosophy, and scholarship of humanists contemporary with him.

Although the complexities of the imagery of Botticelli's paintings with religious subject matter have been fully appreciated, if not completely understood, primary attention has been focussed upon his paintings with Classical and mythological subject matter—in particular "Mars and Venus," "The Primavera," and "The Birth of Venus." The precise significance of the subjects of these paintings still remains a matter of vigorous debate, but this much can be said with confidence. The approach to the subject matter of these paintings is as new and as radically conceived as any of the contemporary innovations in style. The paintings are not mere illustrations of particular texts; rather, each depends upon several texts and upon attempts to define fully the particular nature of the subject depicted. Therefore, in "The Calumny of Apelles," some elements derive from the ancient Greek satirist Lucian, some derive from Guarino Veronese's translation of Lucian, and some derive from Leon Battista Alberti's paraphrase of Lucian, and other sources may be ascertained as well. Thus, Botticelli's conception of the painting may be seen to depend upon the disciplined gathering and collation of several texts.

MAJOR WORKS. "The Madonna of the Guides of Faenza" (*c.* 1468; Louvre, Paris); "Judith and Holofernes," two panels (*c.* 1469; Uffizi, Florence); "Fortitude" (1470; Uffizi); "St. Sebastian" (1474; Staatliche Museen Preussischer Kulturbesitz, West Berlin); "The Adoration of the Magi" (*c.* 1475; Uffizi); "The Primavera" ("Allegory of Spring"; 1477–78; Uffizi); "Portrait of a Young Man" (National Gallery, London); "Giuliano de' Medici" (probably after 1478; National Gallery of Art, Washington, D.C.); "Madonna of the Eucharist" (Isabella Stewart Gardner Museum, Boston); Sistine Chapel frescoes (1481–82; Vatican); "The Adoration of the Magi" (1482; National Gallery of Art, Washington, D.C.); "Pallas and the Centaur" (*c.* 1485; Uffizi); "The Madonna of the Magnificat" (*c.* 1485; Uffizi); "Mars and Venus" (*c.* 1485; National Gallery, London); "The Birth of Venus" (*c.* 1485; Uffizi); "Virgin and Child with St. John the Baptist and St. John the Evangelist" (1484–85; Staatliche Museen Preussischer Kulturbesitz); "The Madonna of the Pomegranate" (*c.* 1487; Uffizi); "The Annunciation" (1488–90; Uffizi); "Coronation of the Virgin" (1490; Uffizi); "The Calumny of Apelles" (*c.* 1495; Uffizi); "St. Augustine in His Cell" (*c.* 1495; Uffizi); "The Tragedy of Lucretia" (*c.* 1499; Isabella Stewart Gardner Museum); "The Story of Virginia Romana" (1499; Accademia Carrara, Bergamo, Italy); "Magdalene at the Foot of the Cross" (*c.* 1500; Fogg Art Museum, Cambridge, Mass.); "Scenes from the Life of St. Zenobius" (*c.* 1500–05, including his latest known works; Gemäldegalerie, Dresden; National

Gallery, London; and Metropolitan Museum of Art, New York City); "Mystic Nativity" (1501; National Gallery, London).

BIBLIOGRAPHY. The principal monographic studies are: Heinrich Ulmann, *Sandro Botticelli* (1893), in German; Herbert Horne, *Alessandro Filipepi, Commonly Called Sandro Botticelli, Painter of Florence* (1908); Wilhelm Bode, *Sandro Botticelli* (1921), in German; and August Schmarsow, *Sandro del Botticello* (1923); Yukio Yashiro, *Sandro Botticelli,* 2nd ed., 3 vol. (1929); Adolfo Venturi, *Botticelli* (1925), in Italian; Jacques Mesnil, *Botticelli* (1938), in French; Sergio Bettini, *Botticelli* (1942); G.C. Argan, *Botticelli* (1957); Roberto Salvini, *Tutta la pittura del Botticelli,* 2 vol. (1958; *All the Paintings of Botticelli,* 1965); and Michael Levey, *The Complete Paintings of Botticelli* (1969).

bottle, narrow-necked, rigid or semi-rigid container primarily for liquids and semiliquids, usually having a close-fitting stopper or cap to protect the contents from spills, evaporation, or contact with foreign substances.

Although early bottles were made from such materials as gourds and animal skins, glass eventually became the major material employed. Before 1500 BC the Egyptians produced glass bottles by covering silica paste cores with molten glass and digging out the core after the bottle hardened. By 200 BC glass blowing was in use in China, Persia (modern Iran), and Egypt. Except for making the finest and most costly decorative bottles, hand methods were eventually replaced by processes employing metal molds, and automatic equipment for continuous manufacture of bottles was introduced commercially in 1903.

Glass bottles afford highly effective protection of their contents, and are attractive because of their transparency and high gloss and the variety of shapes attainable. Fragility is a major disadvantage, and only coloured glass protects those products sensitive to the action of light. Returnable glass bottles, which can be reused a number of times, are the least expensive to manufacture on a per use basis; although repeated handling costs may dissipate any saving. Lightweight, nonreturnable types achieved popularity in the 1960s, but by the 1970s returnable bottles were being promoted as one means of combatting the ecological problem of disposal of solid wastes.

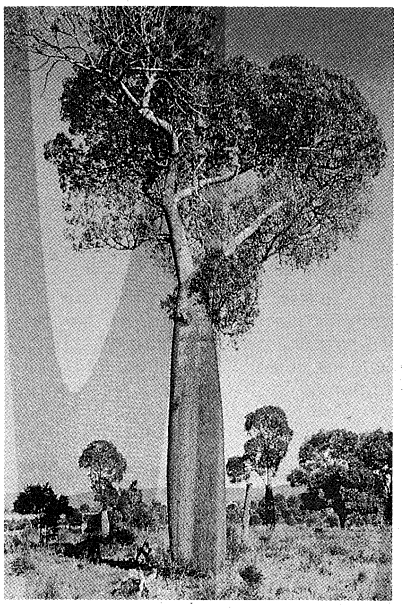
Plastic bottles, made from raw materials derived from petroleum and manufactured much like glass types, offer the advantage of breakage resistance and lightness, and their contents often can be dispensed by squeezing. In some applications they are less effective than glass in product protection, and lack the attractive gloss and transparency of glass. Disposal contributes to pollution, because few plastic containers disintegrate upon exposure to the elements.

bottle gourd, also called WHITE-FLOWERED GOURD, or CALABASH GOURD (*Lagenaria siceraria*), running or climbing vine, of the gourd family (Cucurbitaceae), native to the Old World tropics but cultivated in warm climates for centuries for its ornamental and useful hard-shelled fruits.

Many forms of the bottle gourd have been cultivated for specific purposes, and the sizes of the vines, leaves, and flowers, as well as the sizes and shapes of the fruits, vary greatly. The forms are named for the shape of the fruit—*e.g.,* club, dipper, dolphin, kettle, trough.

A bottle gourd vine is quick-growing, with a hairy stem, long forked tendrils, and a musky odour. The large, showy white flowers and dense foliage make it a popular screen and ornamental plant. The hard-shelled fruits, edible when young, are made into water bottles, dippers, spoons, pipes, and many other utensils and containers. They also are fashioned into birdhouses, fancy ornaments, lamps, and musical instruments. The fruits of some cultivated varieties may be more than one metre (about three feet) long. Bottle gourds may be grown easily from seed but require a long, hot growing season to mature.

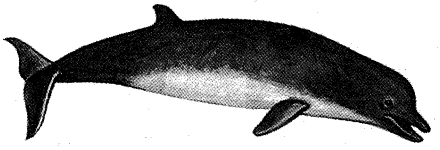
bottle tree, any of various trees of the genus *Brachychiton*, within the cacao, or chocolate, family (Sterculiaceae), native to Australia. They grow to a height of 18 metres (60 feet). They are cultivated in other warm regions as ornamentals. The name refers to the peculiar shape of the trunk.



Bottle tree (*Brachychiton rupestris*)
G.R. Roberts

bottlenose (bird): *see* puffin.

bottlenose whale, any of four species of beaked whales belonging to the family Ziphiidae, distinguished by the bulbous forehead that drops sharply to the base of the beak. The giant bottlenose, *Berardius bairdii*, about 12.8 metres (42 feet) long, is the largest beaked whale. Giant bottlenose whales have two pairs of teeth in their lower jaws, while the other bottlenoses, *Hyperoodon* species, have only one pair. They eat squid, fish, and bottom-dwelling creatures and are capable of long, deep dives.



Northern bottlenose whale (*Hyperoodon rostratus*)
Painting by Richard Ellis

The North Atlantic bottlenose, *H. ampullatus,* migrates south from the pack ice in winter, following the cuttlefish it preys on. This species usually travels in pods of 5–15 whales. Because the pod will not abandon a disabled group member, it is extremely vulnerable to hunters. The giant bottlenose is also hunted.

Bottniska Viken (Baltic Sea): *see* Bothnia, Gulf of.

bottom water, dense, lowermost layer of ocean water that can be distinguished clearly from overlying waters by its characteristic temperature, salinity, and oxygen content. Most bottom waters of the South Pacific, southern Indian Ocean, South Atlantic, and portions of the North Atlantic are formed near Antarctica during the southern winter. The partial freezing of seawater over the Antarctic continental shelf, particularly in the Weddell and Ross seas, produces saltfree ice and residual brine with a salinity of 34.62 parts per thousand and a temperature of −1.9° C (28.6° F). The high density of the brine, 1.02789 grams per cubic centimetre, causes it to sink. It is warmed somewhat during sinking by mixing with other waters, but its temperature is still −0.9° C when it reaches the deep seafloor and continues to flow northward along the bottom. Traced by this temperature, Antarctic bottom water crosses the Equator in the Atlantic and is observed as far north as 45° N latitude, in the vicinity of the Grand Bank.

The Arctic Ocean is less important as a source of bottom water because it is isolated by topographic barriers. The Bering Sill prevents flow into the Pacific, and submarine ridges and banks between Greenland and the British Isles block its entry into the Atlantic. Some bottom water is produced near Greenland from the cooling to −1.4° C of saline Gulf Stream surface water. This water flows southward along the sea floor of the western Atlantic. The oxygen that is dissolved in seawaters at the surface sites of origin of bottom water—in concentrations of 4 to 6 millilitres per litre—is the sole source of this element for benthic life. Sparse deep-sea benthos respire very little oxygen; the concentrations diminish with increased distance of travel of the bottom water away from its source, however, and this trend may be used to identify the sources and estimate the flow velocity of the water. Bottom waters flow very slowly, at velocities of 1 to 2 centimetres per second (0.4 to 0.8 inches per second), except along the western margins of the ocean basins, where velocities of 10 cm/sec have been calculated.

bottomry, a maritime contract (now almost obsolete) by which the owner of a ship borrows money for equipping or repairing the vessel and, for a definite term, pledges the ship as security—it being stipulated that if the ship be lost in the specified voyage or period, by any of the perils enumerated, the lender shall lose his money. A similar contract creating a security interest in the cargo is called a respondentia.

Bottrop, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, at the northern edge of the Ruhr industrial region, on the Rhine-Herne-Kanal, north of Essen. Although mentioned in the Middle Ages, it remained a small peasant community until coal was discovered there in the latter part of the 19th century. Most of its churches and public buildings date from 1860, although the city was not chartered until 1921.

The annexations in 1975 of Kirchhellen and Gladbeck nearly doubled the population of the city. An industrial section lies to the south; extensive park and woodland (Köllnischer Wald) stretch to the north. Coal mining and coking dominate the economy; manufactures include chemical by-products of coal, machinery, and structural steel. Pop. (1983 est.) 113,712.

Botucatu, city, central São Paulo state, Brazil, near the Rio Pardo in the Serra de Botucatu at 2,549 ft (777 m) above sea level. It was given town status in 1855 and was made the seat of a municipality in 1876. Crops (including coffee, cotton, rice, sugarcane, *feijão* [beans], and potatoes) grown in the region are processed in the city, which also has foundries, textile mills, bakeries, and factories for manufacturing agricultural and industrial machinery. Goods are shipped by railroad and highway to São Paulo, the state capital, 184 mi (296 km) southeast, and to neighbouring communities in the state. Botucatu also has an airfield. Pop. (1980 prelim.) 56,316.

botulism, poisoning by the toxin, called botulinus toxin or botulin, produced by *Clostridium botulinum* bacteria. This poisoning results

most frequently from the eating of improperly sterilized canned foods containing the toxin. *C. botulinum* bacteria cannot survive in the presence of oxygen and normally live in the soil, where they form heat-resistant spores that may contaminate fresh food to be canned. The spores survive if the food is not cooked at a high enough temperature for a sufficient length of time. Then, inside the sealed can, the spores germinate and release the bacteria, and, as the bacteria multiply, they secrete their toxin, a protein that is one of the most potent poisons known. Unlike the spores, the toxin is readily destroyed by heat; it remains potent if the contaminated food is not heated before it is eaten. Once ingested and absorbed, the toxin damages the autonomic nervous system by blocking the transmission of nerve impulses.

The first symptoms of poisoning, nausea and vomiting, usually appear six hours or less after the contaminated food is eaten, depending upon the amount of toxin ingested. The poisoned person becomes tired and may complain of headache and dizziness. Often his vision is blurred, and he may see double. The mucous membranes of the throat may become dry; the affected person may feel a constriction in the throat, soon associated with difficulty in swallowing and speaking; and a general muscle weakness occurs. The respiratory muscles become involved. Early tracheotomy—the cutting of an emergency air passage into the windpipe—and the prompt use of mechanical aids to respiration may be lifesaving; about half the deaths from botulism result from paralysis of the respiratory muscles. Usually a person recovers completely if he survives the paralysis. With early diagnosis, the chance of a person's surviving is greatly enhanced by the prompt administration of botulism antitoxins—substances that neutralize the toxin in the body. Often, however, the severe symptoms do not develop until the poison has already damaged the nervous system; at this stage, it is ordinarily too late for the antitoxins to be fully effective.

Botulism most commonly originates with home-canned foods, rather than with foods that have been canned commercially.

Botvinnik, Mikhail Moiseyevich (b. April 17 [April 4, old style], 1911, St. Petersburg, Russia), Soviet Chess master who won the world championship in a 1948 tournament held to choose a successor to Alexander Alekhine, whose death in 1946 had left the title vacant.

At the age of 14, less than a year after he had learned the moves of Chess, Botvinnik defeated the then current world champion, José Raúl Capablanca, in one game of an exhibition in which Capablanca played simultaneously against several opponents; and just 10 years later he finished ahead of Capablanca in a major tournament.

Botvinnik lost the title in 1957 to Vasily Smyslov but regained it the following year; in 1960 he was challenged successfully by Mikhail Tal but once more regained the championship in 1961. After losing to Tigran Petrosyan in 1963, he abandoned competition for the world title, though he continued to play in important tournaments and to write on Chess.

Botvinnik's style of play was eclectic. His training for serious Chess included physical conditioning and practice in noisy, smoke-filled rooms to make himself less susceptible to distraction.

He graduated as an electrical engineer (1932) from the Leningrad Polytechnic Institute and from 1955 was an associate of the All-Union Scientific Research Institute of Electrical Energy.

Bou Saâda, town, M'Sila *wilāyah* (province, or *département*), Algeria, between the Chott el-Hodna (a salt lake) and the Saharan Atlas. Although north of the Sahara, Bou Saâda is a true oasis, spread along the left bank of the Oued (stream) Bou Saâda and standing in pleasant contrast to the nearby barren Monts (mountains) des Ouled Naïl and the often dry salt marsh. The old walled quarter (*ksar*) of arched, winding alleyways lies north of the modern French-built sector. Farther north, thousands of date palms are watered from the steep-banked, permanent stream. Long an important caravan centre between West Africa and the Mediterranean, the town supports a daily market of jewelry, metalworks, carpets, and the long, tapering *bousaadi* knives. Both Arab and Berber nomads frequent the town to trade and rest. The charm of Bou Saâda (meaning "place of happiness") has been recorded by French artists and poets, notably Etienne Dinet (1861–1929), whose tomb is located in the old town, and it is a popular winter resort. A textile mill is located in the new quarter. Pop. (1977 prelim.) mun., 50,104.

Bouaflé, town, administrative centre (since 1969) of Bouaflé *département*, central Ivory Coast, on the north bank of the Bandama Rouge River. It is the chief trade centre (coffee, yams, manioc, and plantains) of a transitional zone of dense forest and savanna, which is mainly inhabited by the agricultural Guro (Gouro) and Gagu (Gagou) peoples. A government hospital (1963) is in the town. Pop. (1975) town, 17,188; *département*, 268,087.

Bouaké, city, administrative headquarters of Bouaké *département*, central Ivory Coast, on the road and railroad from Abidjan (the national capital) to Ouagadougou, Burkina Faso (formerly Upper Volta). Bouaké was established as a French military post in 1899; it became an autonomous municipality in 1969. The city is the nation's second largest community and the commercial and transportation hub of the interior. Cotton, tobacco, sisal, and rice are processed here; the nearby Gonfreville Establishment is the oldest (1922) and largest textile mill in the country. The chief trade centre (rice, yams, livestock) of the Baule (Baoule) people since the completion of the railway in 1912, the city is also a collecting point for various goods that are sent to Abidjan, 238 mi (383 km) south-southeast, for export. Bouaké has a government hospital, a radio station (1966), and textile and veterinary research institutes; it is also the seat of a Roman Catholic bishop, Catholic and Protestant churches, a Benedictine monastery, and several mosques. Masks, bronzes, Senufo (Senoufo) or Dahomean fabrics, "canaris" (earthenware vessels), and other objects are marketed in Bouaké. Pop. (1981 est.) city, 240,000; (1975) *département*, 804,955.

Bouchardon, Edme (b. May 29, 1698, Chaumont, Fr.—d. July 27, 1762, Paris), French sculptor who was an early precursor of Neoclassicism. His statues are characterized by a skillful combination of classical Roman techniques and contemporary motifs.

Bouchardon went to Rome with his teacher Guillaume Coustou and in 1722 won the Rome prize. For the next nine years he stayed in Rome, executing marble replicas of antique statues as well as numerous portrait busts.

Upon returning to France he became sculptor to Louis XV and produced significant work during that period. Though he began his career as an artist committed to classicism, Bouchardon did produce work with Rococo characteristics. The "Fontaine de Grenelle" (1739–45) is an elaborate, two-storied architectural piece decorated with reliefs and statues of the seasons and a personification of Paris. The putti ornamentation shows the influence of the Rococo.

"Cupid Cutting His Bow from the Club of Hercules" (1739–50) is a classical piece now exhibited at the Louvre. His bronze equestrian statue of Louis XV once stood in the centre of the Place de la Concorde but is now destroyed.

Boucher, François (b. Sept. 29, 1703, Paris—d. May 30, 1770, Paris), painter, engraver, and designer whose works are regarded as the perfect expression of French taste in the Rococo period.

Trained by his father, a lace designer, Boucher won the Prix de Rome in 1723. He was influenced by the works of Tiepolo, Rubens, and his teacher François Le Moine (Le Moyne). Boucher's first important commission was for engravings of 125 drawings by Antoine Watteau. After doing illustrations for an edition of Molière's works, he drew cartoons of farmyard scenes and chinoiserie for the Beauvais tapestry factory.

Boucher first won fame with his sensuous and light-hearted mythological paintings and pastoral landscapes. He executed important decorative commissions for the Queen at Versailles and for his friend and patron, Mme de Pompadour, at Versailles, Marly, and Bellevue. He became a member of the Royal Academy in 1734, and then became the principal producer of designs for the royal porcelain factories, as well as director of the Gobelins tapestry factory. In 1765 he became director of the Royal Academy and held the title of first painter to King Louis XV.

"Spring," detail of a painting by François Boucher for Mme de Pompadour, 1755; in the Frick Collection, New York City

Copyright The Frick Collection, New York City

During the 1740s and '50s Boucher's elegant and refined but playful style became the hallmark of the court of Louis XV. His work was characterized by the use of delicate colours, gently modelled forms, facile technique, and frivolous subject matter. Boucher is generally acclaimed as one of the great draftsmen of the 18th century, particularly in his handling of the female nude.

Although immensely successful, Boucher lost his artistic preeminence toward the end of his life; overproduction, poor translations of his paintings into tapestries, the growing sterility of his own work, and the emergence of Neoclassicism caused him to lose favour, both with the public and with such leading art critics as Diderot.

Boucher (de Crèvecoeur) de Perthes, Jacques (b. Sept. 10, 1788, Rethel, Fr.—d. Aug. 5, 1868, Abbeville), French archaeologist and writer who was the first to develop the idea that prehistory could be measured on the basis of periods of geological time.

From 1825 Boucher de Perthes was director of the customhouse at Abbeville, near the mouth of the Somme River, and began devoting his leisure to archaeological searches

in the Somme Valley. In 1837 he discovered flint hand axes and other stone tools, some imbedded with the bones of extinct mammals, in gravels deposited during the Pleistocene Epoch, or Ice Age (concluded about 10,000 years ago).

Though not the first to find evidence of Stone Age culture, Boucher de Perthes was the first to draw the attention of the scientific world to its revolutionary significance, because 4004 BC was then still thought to be the year of the creation. In 1838 the tools he presented in evidence before the scientific society of Abbeville met with disbelief, and his monograph on primitive toolmaking (1846) was ignored. At first he thought that the hand axes were made at the time of the deluge described in Genesis, but he subsequently concluded that, even if the gravels had resulted from but one deluge, the creators of the tools ("Antediluvian Man") must have existed prior to it.

In 1859, the year that Darwin's *Origin of Species* was published, Boucher de Perthes's conclusions were at last upheld by a group of eminent British scientists, including Charles Lyell, who visited the excavated sites. His archaeological writings include *Antiquités celtiques et antédiluviennes,* 3 vol. (1847–64; "Celtic and Antediluvian Antiquities").

Boucher-Desnoyers, Auguste-Gaspard-Louis: *see* Desnoyers, Auguste-Gaspard-Louis, Baron.

Boucherville, town, Montréal region, southern Quebec province, Canada, on the east bank of the St. Lawrence River, opposite Île de Montréal (Montreal Island) and northeast of Montreal city. Founded in 1668 by Pierre Boucher, after whom it is named, the town has long been a market-gardening centre. Since World War II it has developed rapidly into a residential suburb linked to Montreal by the LaFontaine Bridge-Tunnel of the Trans-Canada Highway. Food canning and the manufacture of clothing are the main industries. The birthplace of Sir Louis Hippolyte LaFontaine (a premier of United Canada), Boucherville is also the site of a 17th-century manor house built by its founder. Inc. 1957. Pop. (1981) 29,704.

Bouches-du-Rhône, *département,* region of Provence-Alpes-Côte-d'Azur, southeastern France, at the *bouches* ("mouths") of the Rhône, formed (1790) from the southern part of Provence; with an area of 1,974 sq mi (5,112 sq km), it is bounded on the north by the Durance River, and its southern boundary fronts the Mediterranean coast for 120 mi (193 km), from the Rhône Delta to the rocky shore beyond La Ciotat. The marshy delta triangle below Arles, called the Camargue (*q.v.*), is devoted to rice growing and horse herding. East of the Rhône's main channel is the flat, irrigated, boulder-strewn tract of the Crau, stretching as far north as the Alpilles, a westward prong of the Alps. The Crau's vegetable and fodder plantings are sheltered from the mistral by belts of cypress. Elsewhere, the traditional Mediterranean trilogy prevails: wheat, wine, and olives. The western part of the *département* consists of lowland basins set amid scarped limestone hills. They include the Étang de Berre, a shallow coastal lagoon, connected to the sea by a narrow channel and to Marseille by the Tunnel du Rove, which tunnels through Mont Nerthe.

Economic enterprises include rice milling at Arles, naval shipbuilding at La Ciotat, ceramic manufacture at Aubagne, and cement making at La Bédoule. Although bauxite, named for the feudal Alpilles town of Les Baux, was first discovered and exploited in the Bouches-du-Rhône, production has shifted to the adjacent Var *département.* The great port city of Marseille dominates the *département's* commercial and industrial life. The oil port of Lavéra was established after World War II on the Étang de Berre to service the Marseille shore refineries, and petrochemical industries followed. Brine evaporation has for long been a coastal activity. The construction of the industrial complex at Fos-sur-Mer (steel and petrochemicals) introduced heavy industry to France's Mediterranean littoral.

The ancient Roman cities of Aix and Arles are tourist centres. The paintings of Cézanne and van Gogh have made known the sun-baked, terraced landscape of the region, which is traversed by the Roman Via Aurelia, a route to the Riviera and Italy, now followed by modern highways. Marseille, capital of the *département* and of the Provence-Alpes-Côte-d'Azur economic planning region, is also the seat of an *arrondissement,* as are both Aix and Arles. Pop. (1982) 1,724,199.

Boucicault, Dion, original name DIONYSIUS LARDNER BOURSIQUOT (b. Dec. 26, 1820/22, Dublin—d. Sept. 18, 1890, New York City), Irish–U.S. playwright and actor, a major influence on the form and content of American drama.

Educated in England, Boucicault began acting in 1837 and in 1840 submitted his first play to Mme Vestris at Covent Garden; it was rejected. His second play, *London Assurance* (1841), which foreshadowed the modern social drama, was a huge success and was frequently revived into the 20th century. Other notable early plays were *Old Heads and Young Hearts* (1844) and *The Corsican Brothers* (1852). In 1853 Boucicault and his second wife, Agnes Robertson, arrived in New York City, where his plays and adaptations were long popular. He led a movement of playwrights that produced in 1856 the first copyright law for drama in the United States. His play *The Poor of New York,* based on the panics of 1837 and 1857, had a long run at Wallack's Theatre in 1857 and was presented elsewhere as, for example, *The Poor of Liverpool. The Octoroon; or, Life in Louisiana* (1859) caused a sensation with its implied attack on slavery.

Boucicault and his actress wife joined Laura Keene's theatre in 1860 and began a series of his popular Irish plays—*The Colleen Bawn* (1860), *Arrah-na-Pogue* (1864), *The O'Dowd* (1873), and *The Shaughraun* (1874). Returning to London in 1862, he provided Joseph Jefferson with a successful adaptation of *Rip Van Winkle* (1865). In 1872 Boucicault returned to the U.S., where he remained, except for a trip to Australia that resulted in his third marriage (for which he renounced the legitimacy of his second marriage). Among his associates in the 1870s was the young David Belasco. At the time of his death he was a poorly paid teacher of acting in New York City.

About 150 plays are credited to Boucicault, who, as both writer and actor, raised the stage Irishman from caricature to character. To the American drama he brought a careful construction and a keen observation and recording of detail. His concern with social themes prefigured the future development of drama in both Europe and America.

Boucicaut, Jean II le Meingre (b. *c.* 1366—d. 1421, Yorkshire, Eng.), marshal of France, French soldier, and champion of the ideals of chivalry.

He was the son of Jean I le Meingre (d. 1368), also called Boucicaut and likewise a marshal of France. After the younger Boucicaut had served in several campaigns, Charles VI made him a marshal in 1391. During an expedition to Hungary in 1396, he was captured at Nicopolis (now Nikopol, Bulgaria) and ransomed by the Turks. In 1399, with troops and a fleet from the West, he defended the Byzantine Empire by defeating a Turkish fleet at Gallipoli and preventing the capture of Galata. After holding off the Turks from Constantinople for a year, he returned to France for volunteers. He was sent instead to strengthen the French administration in Genoa, which he temporarily secured after a skirmish with Venice; the Genoese, however,

Boucicaut, detail of an engraving by an unknown artist

By courtesy of the Bibliotheque Nationale, Paris

ousted the French in 1409 while Boucicaut was away.

Founder of the Dame Blanche à l'Écu Vert (White Lady of the Green Shield), an order to defend the female relatives of absent knights, he was skilled in the tournament. Boucicaut was taken prisoner in the Battle of Agincourt in 1415 and died in England.

Boudewijn (Dutch personal name): *see under* Baldwin.

Boudewijn I (king of Belgium): *see* Baudouin I.

Boudicca, also spelled BOADICEA (d. AD 60), ancient British queen who in AD 60 led a revolt against Roman rule.

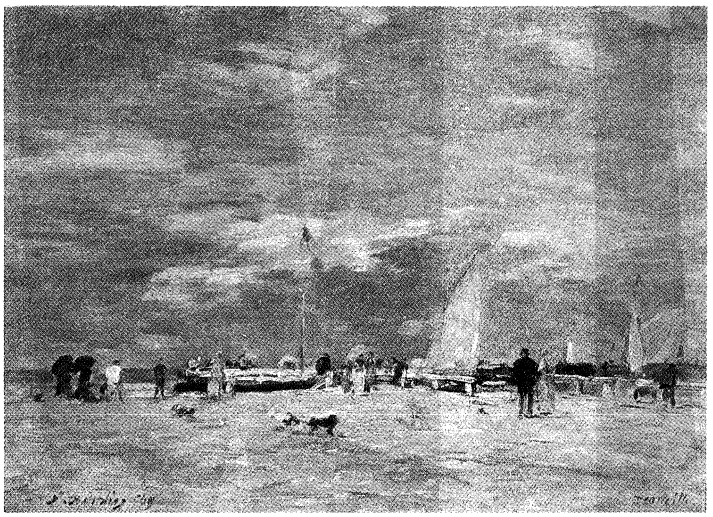
Boudicca's husband, Prasutagus, was king of the Iceni (in what is now Norfolk) as a client under Roman suzerainty. When Prasutagus died in 60 with no male heir, he left his private wealth to his two daughters and to the emperor Nero, trusting thereby to win imperial protection for his family. Instead, the Romans annexed his kingdom, humiliated his family, and plundered the chief tribesmen. While the provincial governor Suetonius Paulinus was absent in 60, Boudicca raised a rebellion throughout East Anglia. The insurgents burned Camulodunum (Colchester), Verulamium, the mart of Londinium (London), and several military posts; massacred (according to Tacitus) 70,000 Romans and pro-Roman Britons; and cut to pieces the Roman 9th Legion. Paulinus met the Britons at a point thought to be near present-day Fenny Stratford on Watling Street and in a desperate battle regained the province. Boudicca took poison or died of shock.

Boudin, Eugène (b. July 12, 1824, Honfleur, Fr.—d. Aug. 8, 1898, Deauville), one of the first French landscape painters to paint in the open air, directly from nature. His numerous beach scenes form a direct link between the carefully observed Naturalism of the early 19th century and the brilliant light and fluid brushwork of late 19th-century Impressionism.

Encouraged at an early age by the French landscape artist Jean-François Millet, Boudin studied briefly in Paris, where he became enamoured of the paintings of Jean-Baptiste-Camille Corot. Back on the Atlantic coast in 1853, Boudin began to paint the sea, his lifelong passion, making careful annotations on the backs of his paintings of the weather, the light, and the time of day. In 1858 he met Claude Monet, then only 18 years old, and persuaded him to become a landscape painter, helping to instill in him a love of bright hues and the play of light on water later evident in Monet's Impressionist paintings.

Boudin exhibited with the Impressionists in

1874 but was not an innovator, and from 1875 onward he exhibited in the official Salon. Although his beach scenes sold well, he received little recognition until 1888, when the French government began to buy a few of his works for the Luxembourg Gallery. He eventually was generally recognized as a master and in 1892, when he was 68 years old, received the Legion of Honour.



"On the Beach of Deauville," painting on wood by Eugène Boudin, 1869; in the Louvre, Paris

Giraudon—Art Resource/EB Inc.

boudinage (from French *boudin,* "sausage"), cylinderlike structures making up a layer of deformed rock. Seen in cross section, the cylinders, or boudins, are generally barrel-shaped but may be lenslike or rectangular. They commonly lie adjacent to each other and are joined by short necks to give the appearance of a string of sausages (hence their name). The thickest boudins are about 20 metres (65 feet) thick, and the thinnest about one centimetre (0.39 inch).

Boudinage of calc-silicate layers in marble, near Weldon, Sierra Nevada, California

L.E. Weiss

Boudinage results from the stretching of a firm but flexible stratum, as during slip or flexure-slip folding. The exact method of formation is not clearly understood. Generally the boudins lie parallel to the fold axes, but occasionally two sets of mutually perpendicular boudins may occur in the same stratum, one set parallel to the fold axes, the other perpendicular to them. Adjacent weak strata may flow into the necks of the boudins, or the necks may be filled with recrystallized minerals such as quartz, feldspar, or calcite. Boudinage occurs in a variety of rock types and is one of the more common structures found in folded rocks.

Boudjedra, Rachid (b. 1941, Aïn Beida, Alg.), prolific and revolutionary Algerian writer whose first novel, *La Répudiation* (1969; "The Repudiation"), gained notoriety because of its explicit language and frontal assault on Muslim traditionalism in contemporary Algeria. He was hailed as the leader of a new movement of experimental fiction.

Boudjedra was given a traditional Muslim upbringing in Algeria and Tunisia, then continued his education in Spain, Algeria, and Paris, where he obtained a degree in philosophy at the Sorbonne. He later taught philosophy in Paris and at Rabat, Mor., and worked for the Algerian Bureau of Cinematography.

La Répudiation draws upon Boudjedra's difficult youth. Conventional values and the smug complacency of the established powers in newly independent Algeria are rejected by Boudjedra, whose unorthodox sexual fury and lyrical savagery defied traditional morality. Boudjedra's next novel, *L'Insolation* (1972; "Sunstroke"), evoked experimental states of mind, confounding dream with reality. His later works employed different styles. *Topographie idéale pour une agression caractérisée* (1975; "Ideal Topography for a Marked Aggression") takes as its protagonist an illiterate Berber peasant drawn to the city by the prospect of work; lost in the capital's subway, he finds himself bombarded by a host of bewildering scenes and events. In *L'escargot entêté* (1977; "The Stubborn Snail") a petty bureaucrat exposes his mediocre life and values, symbolizing the incompleteness of the Algerian revolution. With *Les 1001 Années de la nostalgie* (1979; "1001 Years of Nostalgia") Boudjedra created a satire of an imaginary Saharan village confronted with what he viewed as the newest symbol of contemporary cultural imperialism, an American film company.

Boué, Ami (b. March 16, 1794, Hamburg—d. Nov. 21, 1881, Vienna), Austrian geological pioneer who fostered international cooperation in geological research.

Boué, lithograph by Thierry Frères after a portrait by J. Bully, 1830

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

While studying medicine in Edinburgh, Boué became interested in geology through the influence of the noted Scottish geologist Robert Jameson. Boué studied the volcanic rocks in various parts of Scotland and the Hebrides and later published his findings in *Essai géologique sur l'Écosse* (1820; "Geological Essay on Scotland").

Although he received his M.D. in 1817 and continued his medical studies on the Continent, he ultimately decided to devote himself to geology. He settled in Paris in 1830 and was one of the founders of the Société Géologique de France. For the next four years he published reports on geological progress in other countries in the *Bulletin de la Société Géologique de France* ("Bulletin of the Geological Society of France").

In 1835 he moved to Vienna. He later made three trips to Turkey and published his geological findings in *La Turquie d'Europe* (1840; "European Turkey"). He then returned to Vienna, and in 1845 he finished his comprehensive overview of geology, *Essai de carte géologique du globe terrestre* ("Essay on a Geological Map of the World").

Bouea (Cameroon): *see* Buea.

Bouenza, *région* of southern Congo, west central Africa, bordering Zaire. It covers an area of 4,750 sq mi (12,312 sq km) and includes six districts: Madingou, Loudima, Nkayi, Boko-Songho, Mfouati, and Mouyandzi. Its capital is Madingou.

It lies in the valley of the upper Niari River and its tributary, the Bouenza River. The *région* is a densely populated area of modern commercial farming. Half the cattle in the Congo are raised on Bouenza's government and private farms and ranches. A huge sugar plantation east of Loudima was developed after 1950 and nationalized in 1970. Irrigation for new cotton plantations was undertaken near Madingou in the 1970s. Rice, coffee, and market fruits and vegetables are also grown, using modern techniques, and both Loudima and Madingou have agricultural research stations. Industrial products include cement at Loutété, sawed lumber at Madingou, and (since 1976) processed copper, lead, and zinc at Mfouati. The industrial town of Nkayi (*q.v.*) is an administratively distinct commune within the boundaries of Bouenza. Pop. (1980 est.) 128,800.

Boufarik, town, Blida *wilāyah* (province, or *département*), Algeria, in the centre of the irrigated Mitidja plain. Founded by Gov. Bertrand Clauzel in 1836 on malarial swampland, the settlement successfully adopted intensive cultivation methods. Built on a rectangular plan with long, straight, shaded streets, the town is bounded by the Oued (stream) el-Khemis (west), the Oued Bouchemla (east), low-lying coastal hills (north), and the first ridges of the Tell Atlas (south). An agricultural economy prevails based on grapes, citrus fruits, cereals, tobacco, and truck crops. Flowers are also raised and distilled for perfume. Boufarik has a cooperative wine distillery and a cattle market. Pop. (1977 prelim.) mun., 50,006.

Boufflers, Louis-François, duc de (duke of) (b. Jan. 10, 1644, Cagny, Fr.—d. Aug. 22, 1711, Fontainebleau), a leading French general in the wars of King Louis XIV.

Born into an ancient Picard family, he entered the French Army in 1662 and distinguished himself as a commander of the royal dragoons during the Dutch War (1672–78). Boufflers became a marshal of France in 1693 during the War of the Grand Alliance (1689–97) between France and other major European powers. The following year he was created a duke. In 1695 he defended Namur for two months against Anglo-Dutch forces under William III of Orange; 8,000 Frenchmen perished before he finally surrendered the garrison.

Shortly after France went to war against the British, Austrians, and Dutch (War of the Spanish Succession, 1701–14), Boufflers was given the French command in the Spanish Netherlands. He dealt the Dutch a sharp blow before Nijmegen (1702) but was driven from Dutch soil by the British commander John Churchill, 1st duke of Marlborough. In 1704 he was appointed commander of the royal bodyguard.

The Duc de Boufflers, engraving by Claude-Augustin Duflos, 17th century

By courtesy of the Bibliotheque Nationale, Paris

In 1708 Boufflers defended Lille for three months before being forced to surrender to the British and Austrians. Despite his age and infirmities, he offered to serve under Marshal Villars in Flanders the following year. When Villars fell wounded at the Battle of Malplaquet (September 11), Boufflers executed a masterly retreat that saved his army from annihilation.

Boufflers, Stanislas-Jean, chevalier de (knight of) (b. May 31, 1738, Nancy, Fr.—d. Jan. 18, 1815, Paris), French writer, soldier, and academician remembered chiefly for his picaresque romance, *Aline, reine de Golconde* ("Aline, Queen of Golconde").

His mother, the Marquise de Boufflers, became the mistress of Stanisław Leszczyński, king Stanisław I of Poland and duke of Lorraine, and brought her son up at the ducal court at Lunéville. The boy was destined for a career in the church but proved temperamentally unsuited, and, while studying theology at Saint-Sulpice in Paris, he wrote his masterwork, *Aline,* a charming tale of a milkmaid who, after a series of improper adventures, becomes queen of Golconda. The story won its author immediate fame but caused his expulsion from Saint-Sulpice.

By joining the Knights of Malta, Boufflers managed to combine qualification for ecclesiastical benefices in Lorraine with the military career more suited to his taste. For the next 24 years he fought in campaigns in Europe, with frequent returns to the salons of Paris, where he established a reputation for wit and fell in love with the Comtesse de Sabran.

Stanislas de Boufflers, lithograph by F.-S. Delpech

By courtesy of the Bibliotheque Nationale, Paris; photograph, J.P. Ziolo

After serving as governor of the new French colony of Senegal, he returned to France and won election to the Académie Française (1788). In 1789 he was elected deputy for the nobility of Nancy to the States General, but the Revolution alarmed him, and he emigrated to Germany in 1791. The loss of his benefices permitted him to abandon his vow of celibacy and marry Mme de Sabran at Breslau. In 1800, with Napoleon's rise to power, Boufflers returned to Paris and supervised the edition of his complete works (1803).

Bougainville, Louis-Antoine de (b. Nov. 11, 1729, Paris—d. Aug. 31, 1811, Paris), French navigator who explored areas of the South Pacific as leader of the French naval force that first sailed around the world (1766–69). His widely read account, *Voyage autor du monde* (1771; *A Voyage Round the World,* 1772), helped popularize a belief in the moral worth of man in his natural state, a concept of considerable significance in the French thought of his day.

Entering the army at age 24, he went to Canada (1756) as aide-de-camp to Gen. Louis-Joseph de Montcalm and distinguished himself against the British in the French and Indian War. Having left the army for the navy in 1763, he voyaged the next year into the Atlantic near the tip of South America to establish a colony for France in the Falkland Islands. The colony was ceded to Spain in 1767.

Bougainville, engraving by Émile Lassalle after Maurin

By courtesy of the Bibliotheque Nationale, Paris

Commissioned by the French government to circle the Earth in a voyage of exploration, he put to sea in December 1766, accompanied by naturalists and other scientists. After passing through the Strait of Magellan, he went northwest through the South Pacific and visited Tahiti. Sailing west, he touched Samoa and the New Hebrides and then continued west into waters not previously navigated by any European ship. On the fringes of the Great Barrier Reef, he turned north without sighting Australia, passed the edge of the Solomon Islands, and went on to New Britain. Because his men were by then suffering from scurvy, and the ships needed refitting, he stopped at Buru in the Moluccas (September 1768) and at Batavia (now Jakarta) in Java. He returned to Saint-Malo, in Brittany, in March 1769, having lost seven men.

Bougainville became secretary to Louis XV (1772) and served as *chef d'escadre* (commodore) in operations of the French fleet off North America (1779–82) in support of the American Revolution. After a French defeat off Martinique (April 12, 1782), he was court-martialled. During the French Revolution, he escaped the massacres of Paris in 1792 and settled on his estate in Normandy. Napoleon I made him a senator, count, and member of the Legion of Honour. Named for him are the largest of the Solomon Islands, a strait in the New Hebrides group, and the plant genus *Bougainvillea.*

Bougainville Island, largest of the Solomon Islands, near the northern end of that chain, in the Solomon Sea, southwestern Pacific. Together with Buka and the Kilinailau, Tauu, Nukumanu, Nuguria, and Nissan groups, it comprises the 3,600-sq-mi (9,300-sq-km) province of the North Solomons, Papua New Guinea. Measuring 75 mi (120 km) long and 40–60 mi wide, Bougainville has a total land area of 3,880 sq mi. The Emperor Range, with its highest peaks at Balbi (9,000 ft [2,743 m]) and Bagana (6,560 ft), both active volcanoes, occupies the northern half of the island, while the Crown Prince Range, with its highest peak at Takuan (7,358 ft), occupies the southern half. Coral reefs fringe the shore.

The island and the passage between it and Choiseul Island (southeast) were discovered in 1768 by the French navigator Louis-Antoine de Bougainville, after whom both were named. Placed under German administration in 1898 as the result of an Anglo-German treaty on Samoa, it was occupied by Australian forces in 1914 and included in an Australian mandate in 1920. The Japanese occupied the island early in 1942. Although U.S. troops had essentially overtaken it by March 1944, remnants of the Japanese garrison remained until the end of the war. Bougainville was made part of the UN Trust Territory of New Guinea after the war and passed to Papua New Guinea when that country achieved its independence in 1975; there has been an active secessionist movement on the island.

Arawa is the administrative headquarters, although Kieta supports most of the commercial enterprise of the area. Copra, together with some cocoa and timber, is exported from Kieta. Copper deposits at Panguna are the basis for one of the world's largest open-cut mines; production began in 1972 and by the early 1980s accounted for more than half of Papua New Guinea's total export earnings. Aropa airport, just south of Kieta, has regular air service to Rabaul, New Britain. Pop. (1980 est.) 109,000.

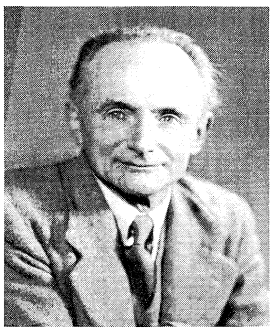
Bougainvillea, genus of about 14 species of shrubs, vines, or small trees, in the four-o'clock family (Nyctaginaceae), native to South America. Many species are spiny. Only the woody vines have attained wide popularity; several species have produced very showy cultivated varieties often grown indoors and in conservatories.

The inconspicuous flowers are surrounded by brightly coloured papery bracts, for which one species, *B. glabra,* from Brazil, is called paperflower; the bracts are purple or magenta to lighter tints in certain varieties. *B. peruviana,* from Colombia to Peru, has rose to magenta bracts. *B.* × *buttiana,* a probable hybrid of *B. glabra* and *B. peruviana,* has given rise to varieties having lemon yellow ("Golden Glow"), orange ("Louis Wathen"), and crimson ("Mrs. Butt") bracts. Bougainvilleas are hardy in warm climates.

Boughton, Rutland (b. Jan. 23, 1878, Aylesbury, Buckinghamshire, Eng.—d. Jan. 25, 1960, London), composer of operas, the principal English advocate of the theories of music drama expounded by Richard Wagner.

Boughton studied at the Royal College of Music in 1900 but was otherwise self-taught. He had the idea of writing a series of music dramas based on Arthurian legends and of creating a festival theatre for their performance at Glastonbury. (A few performances took place in 1914.) His most notable success was the tuneful Romantic opera *The Immortal Hour* (1913), which ran for 216 performances in

London. His other operas include *The Queen of Cornwall* (1924), *The Lily Maid* (1934), and *Galahad* (1944). With Reginald Buckley, his partner in the Glastonbury scheme, he



Boughton
The Mansell Collection

published a book, *The Music Drama of the Future* (1908).

Bouguer, Pierre (b. Feb. 16, 1698, Le Croisic, Fr.—d. Aug. 15, 1758, Paris), versatile French scientist best remembered as one of the founders of photometry, the measurement of light intensities.

Bouguer was a prodigy trained by his father, Jean Bouguer, in hydrography and mathematics. Upon his father's death, Pierre—at age 15—succeeded the elder Bouguer as royal professor of hydrography. During the 1720s he made some of the earliest measurements in astronomical photometry, comparing the apparent brightness of celestial objects to that of a standard candle flame. In 1735 he set off on an expedition with C.M. de la Condamine to measure an arc of the meridian near the Equator in Peru; he used the results obtained to make a new determination of the Earth's shape. He gave a full account of his researches in *La Figure de la terre* (1749; "The Shape of the Earth"). Bouguer measured gravity by pendulum at different altitudes and was the first to attempt to measure the horizontal gravitational pull of mountains. He observed the deviation of the force of gravity, measured on a high plateau, from that calculated on the basis of the elevation, and he correctly ascribed the effect to the mass of matter between his station and mean sea level. He made tables of atmospheric refraction, investigated the absorption of light in the atmosphere, and formulated Bouguer's law (sometimes called Lambert's law), regarding the attenuation of a light beam in a transparent medium. This law and his photometric work he published in his *Essai d'optique sur la gradation de la lumière* (1729; *Optical Treatise on the Gradation of Light*).

Bouguer devoted much of his life to the study of nautical problems. He wrote on naval maneuvers and navigation and, in ship design, derived a formula for calculating the metacentric radius, a measure of ship stability.

Bouguereau, William-Adolphe (b. Nov. 30, 1825, La Rochelle, Fr.—d. Aug. 19, 1905, La Rochelle), French painter, a dominant figure in his nation's academic painting during the second half of the 19th century.

Bouguereau entered the École des Beaux-Arts in 1846 and was awarded the Prix de Rome in 1850. Upon his return to France from four years' study in Italy, he attracted a wide following with his mythological and allegorical paintings, although his portrait paintings are perhaps held in higher esteem today. His work was characterized by a highly finished, technically impeccable realism and a sentimental interpretation of his subject matter. Bouguereau received many honours in the 1860s and '70s as his career progressed; he exhibited regularly at the Salon for several decades, and became for a time the most famous French painter of his day. As a proponent of official orthodoxy in painting, he played a major role in the exclusion of the works of the Impressionists and other experimental painters from the Salon. In his later years he decorated the chapels of several Parisian churches and painted religious compositions in a Pre-Raphaelite style. He exerted a wide influence, not only in France but in other countries, particularly the United States. In 1876 he was made a member of the Academy of Fine Arts.

Modern critics tend to assess Bouguereau as a painter who sacrificed boldness of technique and originality of outlook for a highly polished but conventional treatment of the human form.

bouillabaisse, complex fish soup originating on the Mediterranean coast of France, one of the glories of Provençal cuisine. Recipes for *bouillabaisse* abound, but the Marseilles formulation is generally acknowledged as the most authentic; it contains, besides fish and shellfish, olive oil, onions, tomatoes, garlic, parsley, saffron, fennel, thyme, bay leaf, and orange peel. True bouillabaisse must be made with Mediterranean fish, including the essential *racasse* (a bony rock fish), plus whiting, conger eel, mullet, chapon, saint-pierre, and a number of others. Spiny lobsters and crabs are used, as are mussels in the Parisian version of the dish. All the ingredients must be quickly boiled together. *Rouille,* a paste of garlic, red pepper, bread crumbs, and fish stock, is added at table as a condiment to heighten the flavour. Bouillabaisse has inspired literary praise in verse and prose, notably a ballad by William Makepeace Thackeray on his enjoying a bouillabaisse in Paris.

Bouillaud, Jean-Baptiste (b. Sept. 16, 1796, Garat, Fr.—d. Oct. 29, 1881, Paris), French physician and medical researcher who was the first to establish clinically that the centre of speech is located in the anterior lobes of the brain. He was also the first to differentiate between loss of speech resulting from the inability to create word forms and remember them and that resulting from the inability to control the movements involved in speech. Bouillaud further made important contributions in cardiology, establishing the connection between the occurrence of heart disease and acute articular rheumatism. He helped explain the mechanism and significance of the normal heart sounds and was the first to describe several abnormal heart sounds and pulse rhythms. He was among the first to recognize the value of the drug digitalis as "the opium of the heart."

Bouillaud's medical education was interrupted when he joined Napoleon's army during the Hundred Days (1815), but he returned to study in Paris after Waterloo. His rise to prominence was rapid. He became a professor of clinical medicine at the Charité in Paris in 1831, publishing an important book about the diseases of the heart four years later and another about rheumatism and the heart the following year. He was the first to accurately describe endocardium and endocarditis and introduced these terms for them into medicine.

Not all of his theories were medically sound. Sometimes called "the last of the great bloodletters," he favoured rapid bleeding as treatment for fever. Nevertheless, Bouillaud was an able diagnostician.

Bouillon, ancient town in Luxembourg province, Belgium, on the Semois River in the Ardennes. It was long known for the ducal title connected with it. Bouillon in the 11th century was held by the counts of Ardennes, whom the German kings invested with the dukedom of Lower Lorraine. Because Bouillon was their chief stronghold, it became usual to designate these dukes, loosely, as dukes of Bouillon, though Bouillon was not yet a duchy. In 1096 the bishopric of Liège received the town, and the bishops thereafter often styled themselves dukes of Bouillon. One Guillaume de La Marck received Bouillon in 1482; and, although Liège took it back twice in the following century, Bouillon—now formally a dukedom—eventually descended, by marriage, to Henri de La Tour d'Auvergne in 1591. The duchy remained in this line until 1794, when Bouillon declared itself a republic (it was annexed by France the next year). On the defeat of Napoleonic France, the victorious powers in November 1815 gave the sovereignty, with Luxembourg, to The Netherlands. The ducal title was adjudged in 1816 to Charles-Alain-Gabriel de Rohan, duc de Montbazon (a descendant of Henri de La Tour d'Auvergne), in whose family it remains. On the partition of Luxembourg in 1831, Bouillon became Belgian. Pop. (1983 est.) 5,427.

Bouira, town and *wilāyah* (province, or *département*), north central Algeria. Bouira town is the capital (since 1974) of the *wilāyah* and is situated southwest of the Djebel (ridge) Djurdjura, a valley of the Tell Atlas. It lies near the watershed of the *oudis* (streams) Isser and Soummam (58 mi [93 km] southeast of Algiers city). Bouira is a market centre for a low-yield olive- and cereal-producing area. The name in Arabic means "the small wells."

Bouira *wilāyah* lies mostly within the ranges and valleys of the Tell Atlas. Created in 1974, it has an area of 1,744 sq mi (4,517 sq km). The *wilāyah* is bounded by the *wilāyāt* of Tizi Ouzou and Alger (north), Bejaïa (northeast), Blida (northwest), Sétif (east), M'Sila (south), and Médéa (west). It is principally a region of low-yield olive and cereal cultivation; there are vineyards near Aïn Bessem in the north. Sour el-Ghozlane in the drier south is a trading centre for horses, cattle, and sheep. The town of Lakhdaria has a varnish factory. Pop., town (1977 prelim.) 22,412; province (1984 est.) 454,805.

Boujdour, Cape: *see* Bojador, Cape.

Boulaida, el- (Algeria): *see* Blida.

Boulainvilliers, Henri de, COMTE DE (count of) SAINT-SAIRE (b. Oct. 21, 1658, Saint-Saire, Fr.—d. Jan. 23, 1722, Paris), French historian and political writer who set forth a broad cultural conception of philosophical history that influenced intellectual developments in the 18th century. He was among the first modern historians to claim that historical studies can supply the tools for analyzing the state of present society.

Boulainvilliers was trained in classical studies, French history, and the sciences. He read widely and was familiar with the works of Descartes, Spinoza, Newton, and Locke. He was in military service for nine years after 1679 and subsequently set out to win back his family's fortune and to cultivate his own literary talents.

Boulainvilliers's ideas of history were developed in a number of treatises (all published posthumously), among which *État de la France,* 3 vol. (1727–28; "The State of France") traced the history of the French monarchy to the end of Louis XIV's reign. In this work, considered to be his finest, he emphasized a socio-psychological explanation of events and a broad conception of institutional development. He defended the French nobility in the *Essai sur la noblesse de France* (ed. 1732; "Treatise on the French Nobility"), in which he analyzed the decline of the French nobility, attacked the absolutism of Louis XIV, and examined the legitimacy of French political institutions.

In his writings, Boulainvilliers worked out a theory of comparative historical study, based on a critique of natural law and the demand

for a "science" of politics and reform, which approached the later writings of Montesquieu.

In addition to writing on history, Boulainvilliers also wrote on philosophy in *L'Idée d'un système général de la nature* (1683); on comparative religions in *Histoire de la religion et de la philosophie ancienne* (1700?); and on occultism and astrology, contained in several miscellaneous works.

Boulanger, Georges (-Ernest-Jean-Marie) (b. April 29, 1837, Rennes, Fr.—d. Sept. 30, 1891, Brussels), French general, minister of war, and political figure who led a brief but influential authoritarian movement that threatened to topple the Third Republic in the 1880s.

Georges Boulanger
H. Roger-Viollet

A graduate of the Saint-Cyr Military Academy, he entered the army in 1856 and saw service in Italy, Algeria, Indochina, and the Franco-German War (1870–71). Wounded in suppressing the 1871 Paris Commune, he was appointed brigadier general in May 1880 and director of infantry in 1882. Two years later he was appointed to command the army in Tunisia but was recalled because of differences of opinion with Pierre-Paul Cambon, the political resident. Returning to Paris, he began to take part in politics under the aegis of Georges Clemenceau and the Radical Party. In January 1886 he entered the government of Charles-Louis de Saulces de Freycinet as minister of war.

By introducing reforms for the benefit of all ranks and by courting popularity openly, Boulanger came to be accepted by the people as the man destined to avenge France's defeat in the Franco-German War. He thus became a tool in the hands of groups hostile to the existing republican dispensation. On Freycinet's defeat in December 1886, Boulanger was retained at the ministry of war by the new prime minister, René Goblet, though Clemenceau by this time had withdrawn his patronage from the obviously too compromising general. On Goblet's retirement from office in May 1887, the Paris populace clamoured for their "*brav' général,*" but Maurice Rouvier, who had long been hostile to Boulanger, refused to include him in his government, and the General was sent to Clermont-Ferrand to command the XIII Corps. A Boulangist "movement," however, was now in full swing. Many Bonapartists had attached themselves to the General, and the royalists were led to support him by the Duchesse d'Uzès (Marie Anne Clémentine de Rochechouart-Mortemart), who contributed large sums to the General's political fund.

Boulanger was deprived of his command in 1888 for coming three times to Paris without leave and in disguise and for visiting Prince Napoleon at Prangins in Switzerland. His name was removed from the army list, but almost immediately he was elected deputy for the Nord. In June 1888 his proposals for revising the constitution were rejected by the Chamber, whereupon he resigned. An altercation with Charles Floquet led to a duel (July 13) in which the elderly prime minister inflicted a severe wound on the General. Neither this humiliation nor Boulanger's failure as an orator checked his followers' enthusiasm, and throughout 1888 his personality dominated French politics.

In January 1889 Boulanger was returned as deputy for Paris by an overwhelming majority. When the election results were announced, wildly shouting masses of his supporters urged him to take over the government immediately. Boulanger declined and spent the evening with his mistress instead. His failure to seize control at the crucial moment was a severe blow to his following. A new government under Pierre Tirard, with Ernest Constans as minister of the interior, decided to prosecute Boulanger, and within two months the Chamber was requested to waive the General's parliamentary immunity. To his friends' astonishment, Boulanger fled from Paris on April 1, going first to Brussels and then to London. He was tried in absentia for treason by the Senate as high court and condemned on Aug. 14, 1889, to deportation. In the elections of 1889 and 1890 his supporters received setbacks, and public enthusiasm for his cause dwindled away. In 1891 Boulanger committed suicide in Brussels at the cemetery of Ixelles, over the grave of his mistress, Marguerite de Bonnemains, who had died two months earlier.

Boulanger, Nadia (b. Sept. 16, 1887, Paris—d. Oct. 22, 1979, Paris), French conductor and one of the most influential teachers of musical composition of the 20th century.

Boulanger's family had been associated for two generations with the Paris Conservatoire, where her father and first instructor, Ernest Boulanger, was a teacher of voice. She received her formal training there in 1897–1904, studying composition with Gabriel Fauré and organ with Charles-Marie Widor. She later taught composition at the conservatory and privately.

Nadia Boulanger

She also published a few short works and in 1908 won second place in the Prix de Rome competition with her cantata *La Sirène.* She ceased composing, rating her works "useless," after the death in 1918 of her talented sister Lili, also a composer.

In 1921 Boulanger began her long association with the Conservatoire Américain, founded after World War I at Fontainebleau by the conductor Walter Damrosch for U.S. musicians. She was organist for the premiere (1925) of the *Symphony for Organ and Orchestra* by Aaron Copland, her first U.S. pupil, and appeared as the first woman conductor of the Boston, New York Philharmonic, and Philadelphia orchestras in 1938. She had already become (1937) the first woman to conduct an entire program of the Royal Philharmonic in London.

In the late 1930s Boulanger recorded little-known works of Claudio Monteverdi, championed rarely performed works by Heinrich Schütz and Fauré, and promoted early French music. She spent the period of World War II in the United States, mainly as a teacher at the Washington (D.C.) College of Music and the Peabody Conservatory in Baltimore, Md. Returning to France, she taught again at the Paris and American conservatories, becoming director of the latter in 1949.

Boulanger's pupils included the composers Arthur Berger, Lennox Berkeley, Easley Blackwood, Marc Blitzstein, Elliott Carter, Aaron Copland, David Diamond, Jean Françaix, Roy Harris, Darius Milhaud, Walter Piston, and Virgil Thomson. Her influence as a teacher was always personal rather than pedantic: she refused to write a textbook of theory. Her aim was to enlarge the student's aesthetic comprehensions while developing his individual gifts.

Boulder, city, seat (1861) of Boulder County, north central Colorado, U.S., on Boulder Creek, at the base of the Flatiron Range of the Rocky Mountains, at an elevation of 5,354 ft (1,632 m), 30 mi (48 km) northwest of Denver. Settled by miners in 1858, it was organized in 1859 and named for the large stones in the area. It was incorporated as a town in 1871 and grew with the arrival of two railroads in 1873 as the gateway to the mines in the mountains to the west and also as a farming centre; the establishment there of the University of Colorado (1876) sustained its growth. An extensive government–industrial–educational complex has developed since the early 1950s. Boulder has become a leading centre for scientific and environmental research. A key section of the National Bureau of Standards, the U.S. branch of the World Data Center of Solar Activity, and the National Center for Atmospheric Research are located there, as are a growing number of industrial firms. The water supply is unique, coming partly from the city-owned Arapahoe Glacier high on the Continental Divide.

Boulder Canyon and others in the vicinity have great scenic beauty. Boulder owns 6,000 ac (2,400 ha) of mountain park lands. It is a main gateway to the Rocky Mountain National Park (northwest) and the Roosevelt National Forest (west). Inc. city, 1918. Pop. (1980) city, 76,685; metropolitan area (SMSA), 1,620,902.

Boulder City, city, Clark County, southeastern Nevada, U.S., overlooking Lake Mead, which is impounded by the Hoover Dam. Named for the Boulder Canyon Project, it was established in 1931 by the federal government as a residential community for personnel employed at Hoover (Boulder) Dam and other local construction projects, including Lake Mohave and Davis Dam. It was incorporated as a city in 1960, after the former U.S. Bureau of Reclamation deeded the area to self-government. It is headquarters for the U.S. Water and Power Resources Service and for the Lake Mead National Recreational Area. Pop. (1980) 9,590.

Boulder Dam: *see* Hoover Dam.

boule, Greek BOULĒ, deliberative council in ancient Greece. It probably derived from an advisory body of nobles, as reflected in the Homeric poems. A boule existed in virtually every constitutional city-state and is recorded from the end of the 6th century BC at Corinth, Argos, Athens, Chios, and Cyrene. It appeared during a transition to democracy when the aristocratic *gerousia* (*q.v.*) was either modified, replaced, or opposed by a new council (the boule). Thus in Athens in 594 BC Solon did not abolish the Areopagite Council but is said to have created a boule of 400 to guide the work of the assembly, or Ecclesia (*q.v.*; Greek *ekklēsia*). Cleisthenes increased the membership of the Athenian Boule to 500 in 508 BC (*see* Five Hundred, Council of).

After the reforms of Cleisthenes, the Athenian Boule was elected by lot every year, except during the brief periods of oligarchic reaction in 411 and 404 BC. Each of Cleisthenes's 10 tribes was provided 50 councillors who were at least 30 years old; a certain number of councillors was allotted to each deme (rural district or village) of the tribe in rough

proportion to its size. The functions of the Athenian Boule were defined by the oath for the members, introduced in 501 BC. A man chosen by lot was not obliged to serve. Since poorer citizens might be unwilling to serve, the Boule was dominated by men of property. Property qualifications did not operate, however, before 322 BC.

The most important task of the Athenian Boule was to draft the deliberations (*probouleumata*) for discussion and approval in the Ecclesia. The Boule also directed finances, controlled the maintenance of the fleet and of the cavalry, judged the fitness of the magistrates-elect, received foreign ambassadors, advised the *stratēgoi* (*see* strategus) in military matters, and could be given special powers by the Ecclesia in an emergency. The Boule, even after the reforms of Ephialtes (462), never totally replaced the Areopagus (*q.v.*) in political importance, however.

The Athenian system largely influenced the organization of the councils of other cities in the Hellenistic period, though other types survived or were introduced. The Boeotian League cities operated with four councils: each in turn acted as a boule, preparing the agenda for the other three, which then functioned as a primary assembly. The Delphi Boule split its 30 councillors into two groups, each directing the general conduct of affairs for six months. By the end of the 3rd century AD, with hereditary membership gradually replacing the recruitment of councillors by lot, election, or selection by magistrates, the boule had everywhere become a permanent body and gradually came to resemble the curiae of the Western Roman Empire.

Boule, André-Charles: *see* Boulle, André-Charles.

Boule, (Pierre-) Marcellin (b. Jan. 1, 1861, Montsalvy, Fr.—d. July 4, 1942, Montsalvy), geologist, paleontologist, and physical anthropologist who made extensive studies of human fossils from Europe, North Africa, and the Middle East and reconstructed the first complete Neanderthal skeleton (1908) from La Chapelle-aux-Saints, Fr. The work on which his fame rests is *Les Hommes fossiles* (1921; *Fossil Men,* 1957).

Boule made extensive studies of the mountains of central France and published, among other geological works, a study of the volcanic cones of the region (1900). A professor at the Muséum National d'Histoire Naturelle, Paris (1902–36), he was editor (1893–1940) of the journal *L'Anthropologie* ("Anthropology"), founder of two other scientific journals, and for many years director of the Institut de Paléontologie Humaine, Paris. His broad background enabled him to correlate geological and archaeological evidence to establish a chronological sequence for remote eras.

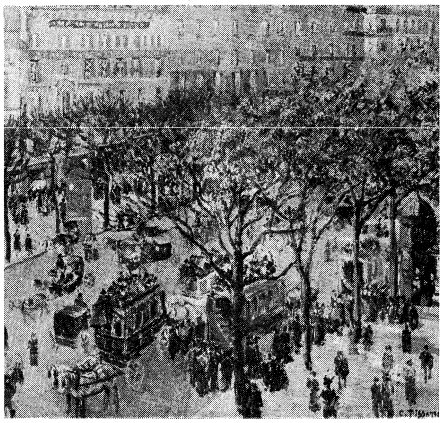
Marcellin Boule
Boyer—H. Roger-Viollet

Boulemane, also spelled BOULMAN, town, provincial capital, and province (established in 1975), Centre Nord region, north central Morocco. The town, located at an elevation of about 5,500 ft (1,700 m) above sea level in the Moyen (Middle) Atlas mountains, is a market centre serving Berber seminomads and is connected by road with Fès city (northwest) and er-Rachidia town (southeast).

Boulemane province, with an area of 5,558 sq mi (14,395 sq km), is bounded by the provinces of Fès and Taza (north), Oujda (northeast), Figuig (east), er-Rachidia (south), Khenifra (southwest), and Ifrane (west). The western half of the province includes high peaks and plateaus of the Moyen Atlas mountains that are mostly covered by cedar, oak, and pine forests. Eastern Boulemane province includes lower outlying ranges of the Moyen Atlas and the upper Oued (river) Moulouya valley. The Tamazigt-speaking Berbers in the west practice transhumance, grazing their sheep in the high mountain pastures in the summer; they also make wood carvings, weave blankets, and cut timber. The many Berber and Arab *ksar*s (fortified villages) in the Oued Moulaya valley are sustained by olive, fig, pomegranate, and apple orchards irrigated by canals; sheep and goats are raised in the semiarid lands surrounding the villages. Pop. (1971) town, 1,964; (1981 est.) province, 133,600.

Consult the INDEX *first*

boulevard, broad landscaped avenue typically permitting several lanes of vehicular traffic as well as pedestrian walkways. The earliest boulevards were built in the ancient Middle East, especially at Antioch.



Detail of "Boulevard des Italiens, Morning, Sunlight," oil painting by Camille Pissarro, 1897; in the National Gallery of Art, Washington, D.C.
National Gallery of Art, Washington, D.C., Chester Dale Collection

Commonly a major axis in a city, the boulevard permits long picturesque views, the foliage along the boulevard minimizing peripheral visual distraction. Straight and geometrically precise boulevards were a hallmark of the design principles taught at the École des Beaux-Arts in Paris, while winding avenues are more common to the naturalistic schools of city planning that have come into being since the latter part of the 19th century.

Formal, geometric, curving boulevards are found at the site of many former fortifications such as Vienna and Prague. In other cases, they have been deliberately included in a plan that has been imposed on an area, for example, the streets leading into the Place Charles de Gaulle (formerly Place d'Étoile) in Paris, and the broad avenues of Washington, D.C.

In Italy, a wide avenue with landscaped edges is called a *corso* or *largo.*

Boulez, Pierre (b. March 26, 1925, Montbrison, Fr.), most significant French composer of his generation, as well as a noted conductor and pianist.

Boulez, the son of a steel manufacturer, majored in mathematics at the Collège de Saint-Étienne, where he also studied music; he later studied mathematics, engineering, and music in Lyon. In 1944–45 he studied with the composer and organist Olivier Messiaen at the Paris Conservatoire. Subsequently (1945–46), he studied the 12-tone technique with René

Boulez
By courtesy of the Festspielleitung Bayreuth

Leibowitz, a pupil of its originator, Arnold Schoenberg. At 22 Boulez became music director of the Marigny, a theatrical company newly formed by Jean-Louis Barrault and Madeleine Renaud, where he remained for 10 years. In 1954 he founded a series of avant-garde concerts, the Concerts Marigny, later called Domaine Musicale.

By the 1960s Boulez had gained an international reputation not only as a composer but also as a conductor of both the 20th-century and the traditional repertories. He was named musical director of the New York Philharmonic (1971), replacing the retiring Leonard Bernstein. He resigned after the 1976–77 season and returned to Paris to direct the Institut de Recherche et de Coordination Acoustique/Musique, the experimental music centre in the Centre National d'Art et de Culture Georges Pompidou.

Boulez' music is marked by a sensitivity to the nuances of instrumental texture and colour, a concern also apparent in his conducting. His earlier compositions combine the influence of the 12-tone composers with that of Messiaen and, through him, of certain Oriental music. Boulez was also influenced by the work of the poets Stéphane Mallarmé and René Char. In his *Sonatine* (1946), for flute and piano, the 12-tone imitations and canons fly so fast as to leave an impression merely of movement and texture. In *Structures,* Book I (1952), for two pianos, the actual 12-tone series is simply taken from a work of Messiaen's; but Boulez elaborates it to a remarkable degree in strict permutations of pitch, duration, and dynamics. *Le Marteau sans maître (The Hammer Without a Master,* 1954) for voice and six instruments has florid decorative textures that flow into one another, with voice and instruments rising and falling with the utmost apparent spontaneity.

Boulez' innovativeness was demonstrated in *Pli selon pli* (*Fold According to Fold;* first performed 1960), in which performers must orient themselves by maintaining a constant awareness of the structure of the work. In his *Piano Sonata No. 3,* as in *Pli selon pli,* he introduced elements of aleatory (chance) music.

Boulez' other works include *Le Visage nuptial* (composed 1946–50) for two voices, women's chorus, and orchestra; *Poésie pour pouvoir* (first performed 1958) for two orchestras; *Structures,* Book II (completed 1961), for two pianos; *Éclat* (published 1965) for chamber orchestra of 15 instruments; and *Domaines* (1968) for solo clarinet and 21 instruments.

He has written three books, *Penser la musique aujourd'hui* (1964; "Thinking of Mu-

sic Today"), *Relevés d'apprenti* (1966; "Raised from Apprenticeship"), and *Par volonté et par hasard* (1975; "By Choice and by Chance").

Boulhaut (Morocco): *see* Ben Slimane.

Boulle, André-Charles, Boulle also spelled BOULE, or BUHL (b. Nov. 11, 1642, Paris—d. Feb. 29, 1732, Paris), one of France's leading cabinetmakers, whose fashion of inlaying, called boulle, or buhl, work, swept Europe and was heavily imitated during the 18th and 19th centuries. An architect as well, he also worked in bronze and mosaic and designed elaborate monograms.

As a young man Boulle studied drawing, painting, and sculpture; his fame as the most skillful furniture designer in Paris led to his being chosen, in 1672, by Louis XIV to succeed Jean Macé as royal cabinetmaker at Versailles. Boulle created much of Versailles's furniture. His masterpiece, however, was his decoration of the dauphin's private study with flooring in wood mosaic and extraordinarily detailed panelling and marquetry (1681–83; now destroyed). Allowed also to execute private commissions, he included among his patrons such eminent royalty as King Philip V of Spain, the Duke of Bourbon, and the electors of Bavaria and Cologne.

Boulle's style is characterized by elaborate adornment with brass (occasionally engraved) and tortoise-shell marquetry. Although the technique of marquetry was originally used by 16th-century Italian craftsmen, Boulle developed it to its ultimate. He incorporated exotic woods from India and South America. His personal collection of master drawings, from which he extracted much of his inspiration, included works by the 15th–16th-century Italian artist Raphael, the 17th-century Flemish artist Rubens, and the 17th-century Italian engraver Stefano della Bella.

On retirement Boulle left his studio to his four sons, among whom were the notable cabinetmakers André-Charles Boulle II (d. 1745) and Charles-Joseph Boulle (d. 1754). His collection was destroyed by fire in 1720; his account of the precious loss reveals an enormous production in addition to what had already gone to other collections. He returned to his studio, directing it until his death. In 1754 Charles-Joseph had hired the brilliant German furniture designer Jean-François Oeben, from whom the Boulle tradition was inherited by Jean-Henri Riesener. His style continued with tremendous success in France during the 18th century and under Napoleon III. Such was its popularity that any piece with some copper inlay on a black or red ground came to be described as buhl.

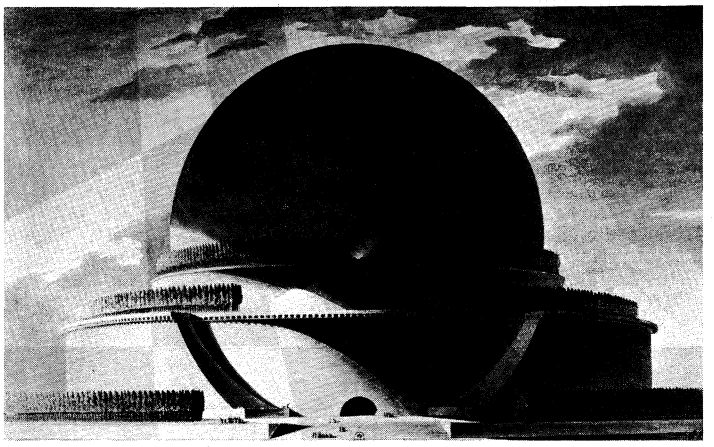
Boulle, Pierre (-François-Marie-Louis) (b. Feb. 20, 1912, Avignon, Fr.), French novelist who successfully combined adventure and psychology in works dealing largely with his experiences in Southeast Asia, especially in Malaya.

Boulle studied to become an electrical engineer but instead went to Asia, where he spent eight years as a planter and soldier. He is best known for his novel *Le Pont de la rivière Kwaï* (1952; *The Bridge on the River Kwai,* 1954), dealing with a company of British soldiers taken prisoner by the Japanese in World War II. An ambiguous moral fable, it presents virtue gradually shading into vice—or, at least, absurdity—in its portrayal of a British officer whose self-discipline and work ethic compel him to complete a bridge for the enemy. A popular film based on the novel appeared in 1957 and won six Academy Awards, including that for best motion picture.

From the legends of the Orient, Boulle created philosophical tales in the manner of Voltaire (*Le Bourreau,* 1954; "The Executioner"). Departing from the Asian background, he turned to a literature of the fantastic, *Contes de l'absurde* (1953; "Stories of the Absurd"), and to science fiction, *La Planète des singes* (1963; *Planet of the Apes,* 1963; film adaptation, 1968) and $E = mc^2$ (1957), which contains ironic but humane considerations of the fate of modern man caught in a political, social, and intellectual upheaval. Later works include *Les Oreilles de jungle* (1972; *Ears of the Jungle,* 1972) and *Les Vertus de l'enfer* (1974; *The Virtues of Hell,* 1974). *Le Bon Leviathan* (1978; *The Good Leviathan,* 1979) is a satiric attack on environmentalists and an apologia for the pollution caused by giant tankers.

Boullée, Étienne-Louis (b. Feb. 12, 1728, Paris—d. Feb. 6, 1799, Paris), visionary architect and teacher, the principal figure, with C.-N. Ledoux, in the development of "Revolutionary Neoclassicism" in France.

Boullée wanted originally to be a painter, but, following the wishes of his father, he turned to architecture. He studied with J.-F. Blondel and Germain Boffrand and with J.-L. Legeay, whose dramatic engravings of classical architectural scenes must have deeply impressed Boullée. Despite the relatively small number of his executed works, he is an important representative of Neoclassicism in France; it is as a teacher that he exerted profound influence. Through his atelier passed such masters as A.-T. Brongniart, J.-F.-T. Chalgrin, J.-N.-L. Durand, A.-F. Peyre, and L.-M. Thibault. In all, he taught for more than 50 years.



"Newton's Cenotaph," ink and wash drawing by Étienne-Louis Boullée, 1784
By courtesy of the Institute for the Arts, Rice University, Houston

The so-called Revolutionary Neoclassicism now identified with Boullée arose under Louis XVI and was not influenced by the actual historical Revolution. It sought to express a yearning for a new society and the liberation of individual potential. At the same time, this visionary mode was strongly conditioned by the indiscriminate enthusiasm for antiquity, and especially Egyptian monuments, felt by Boullée and his contemporaries.

The distinguishing aspect of Boullée's mature work is his abstraction of the geometric forms suggested by ancient works into a new concept of building. In his famous essay *La Théorie des corps* Boullée investigated the properties of solids and their effect on the senses, attributing "innate" symbolic qualities to the cube, pyramid, cylinder, and sphere, the last regarded as an ideal form. In a series of projects for public monuments, culminating in the design (1784) for a spherical cenotaph to honour the British physicist Isaac Newton, Boullée gave imaginary form to his theories. The interior of the cenotaph was to be a hollow globe representing the universe.

To bring geometric forms to life, Boullée depended on light and shadow, claiming that he invented "shadow architecture." He also emphasized the potential for mystery in building, often burying part of a structure. This "poetic" approach to architecture, in some ways prefiguring the 19th-century Romantic movement, may also be seen in Boullée's extensive use of symbolism. For example, his Palais Municipal rests on four pedestal-like guardhouses, demonstrating that society is supported by law.

Boullée's emphasis on the psychology of the viewer is a principal theme of his *Architecture, essai sur l'art,* not published until the 20th century. He has been criticized as a megalomaniac, because of his tendency toward grandiose proposals, but these may also be regarded simply as proposals—visionary schemes—rather than as practical projects. In his desire to create a unique, original architecture appropriate to an ideal new social order, Boullée anticipated similar concerns in 20th-century architecture.

Boulogne, in full BOULOGNE-SUR-MER, city and port, Pas-de-Calais *département,* Nord-Pas-de-Calais region, on the coast of northern France, southwest of Calais at the mouth of the Liane River and 28 mi (45 km) across the English Channel from Folkestone, Eng.

Boulogne was the Roman harbour of Gesoriacum, later called Bononia. Destroyed by the Normans in 882, it was rebuilt about 912. It was the prize in disputes between Flanders and Ponthieu; it was a Burgundian possession when Louis XI united it to the French crown in 1477. England held it from 1544 to 1550. When it served as Napoleon's port of embarkation for his projected invasion of England, its harbour was subjected to naval bombardment. The British Expeditionary Force administered Boulogne during World War I. The Germans made it a submarine base and part of their anti-invasion "West Wall" during World War II; damage to the harbour (now rebuilt) was severe.

Atop a hill, behind 13th-century ramparts on the east bank of the Liane, stands Haute Ville, the older part of town. The law courts, château, town hall, and bell tower (13th and 17th centuries) are behind the old walls. Basse Ville, the modern town at the foot of the hill, was rebuilt after World War II. The industrial zone, Capécure, is on the west bank. The port has an outer, deepwater harbour and an inner harbour for small vessels.

Boulogne is an important port for cross-channel passenger and car-ferry traffic and has a considerable import–export trade. It is also the chief fishing port of France, handling mostly herring and mackerel. There are canneries, fish-curing factories, foundries, cement works, and factories making pens, pencils, ropes, canvas, and fishnets. Pop. (1982) 47,482.

Boulogne, Jean: *see* Giambologna.

Boulsover, Thomas, Boulsover also spelled BOLSOVER (b. 1706, Elkington, Derbyshire, Eng.—d. September 1788, Sheffield), English inventor of fused plating, or "old Sheffield plate."

After an apprenticeship in Sheffield, Boulsover became a member of the Cutlers Company, *i.e.,* a full-fledged craftsman, in 1727. In 1743, while repairing a copper and silver knife handle, he discovered that the two metals could be fused and, equally important, the fact that when the fused metals were rolled in a rolling mill, they expanded in unison, behaving as if they were a single metal. Previously, coating or plating one metal with another had involved fabricating the article into a finished shape and then soldering a thin sheet of the plating to it. Boulsover's invention opened the way to economical production of a great variety of plated objects, from buttons and snuffboxes, which Boulsover himself made, to hollow ware and utensils, which were soon manufactured in large quantity by other Sheffield workers. Boulsover later invented a method of rolling saw-blade steel, previously made only by hand hammering.

Boult, Sir Adrian Cedric (b. April 8, 1889, Chester, Cheshire, Eng.—d. Feb. 23, 1983, Kent), English conductor who led the BBC Symphony and other major orchestras during a career that spanned six decades.

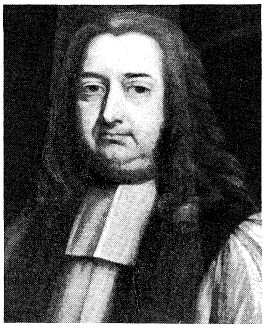
He received his first musical training at Christ Church, Oxford, and continued his studies at the Leipzig Conservatory, where he was influenced by the fluid technique and minimal rehearsal habits of the Hungarian conductor Arthur Nikisch. Boult returned home in 1913 to join the staff of the Covent Garden Opera. In 1919 he was given a season at the Royal Philharmonic. A year later, he began a decade of service on the faculty of the Royal College of Music. In 1919 he conducted with Diaghilev's Ballets Russes during its London sojourn. In 1923 he was engaged by the City of Birmingham Orchestra. He conducted there until 1930, at which time he was hired to train and conduct the BBC Orchestra and act as the corporation's musical director. During his 20 years with the BBC Symphony Orchestra he developed it into a major international orchestra. From 1950 to 1957 he was principal conductor of the London Philharmonic. A nominal retirement followed, marked by another season (1959–60) at Birmingham and numerous guest appearances until he retired in 1981.

Boult's conducting style was economic, with little use of the left hand. Throughout his career he promoted works by modern English composers, including William Walton, Malcolm Arnold, and Vaughan Williams. Boult was knighted in 1937. He was featured in a film about his conducting style, *Point of the Stick* (1971).

Boulter, Hugh (b. Jan. 4, 1672, London—d. Sept. 27, 1742, London), English archbishop of Armagh and virtual ruler of Ireland at the height of the 18th-century Protestant Ascendancy, when Ireland was dominated by members of the established Anglican Church of Ireland.

Boulter was ordained priest in the Anglican Church and in 1719 became chaplain to King George I. In 1724 he reluctantly accepted appointment as archbishop of Armagh and primate of the Church of Ireland. Appointed lord justice, he became the English government's chief adviser in Ireland.

Boulter based his policies on the conviction that England's interests in Ireland were threatened by the large Roman Catholic majority. Hence, he made the penal laws against Catholics more stringent (1728); Catholics were deprived of the vote and excluded from



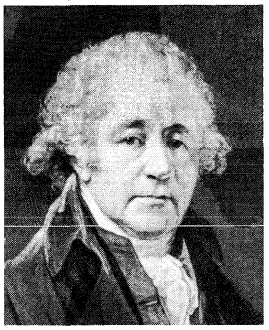
Boulter, detail of a portrait attributed to Francis Bindon; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

the legal profession. He also opposed constitutional independence for Irish Protestants but encouraged the establishment of Protestant schools as vehicles to convert the Irish Catholics. At the same time, he sought wherever possible to replace Irishmen with Englishmen in ecclesiastical and political offices. Nevertheless, he made improvements in agriculture and gained some popularity through his generosity to the poor of Dublin.

Boulton, Edmund: *see* Bolton, Edmund.

Boulton, Matthew (b. Sept. 3, 1728, Birmingham, Warwickshire, Eng.—d. Aug. 17, 1809, Birmingham), English manufacturer and engineer who financed and introduced James Watt's steam engine.



Matthew Boulton, detail of an engraving by William Sharp after a portrait by William Beachey, 18th century

By courtesy of the Science Museum, London

After managing his father's hardware business, in 1762 Boulton built the Soho manufactory near Birmingham. The factory produced small metal articles such as gilt and silver buttons and buckles, Sheffield plate, and a variety of other items. In 1768 Boulton made the acquaintance of James Watt. The need for a power source for his factory stirred Boulton's interest in Watt's invention. When the industrialist John Roebuck went bankrupt, Boulton accepted Roebuck's share in Watt's first steam-engine patent (1769) as repayment of a debt. In 1775 he and Watt became partners in the steam-engine business, obtaining a 25-year extension of the patent. Assisted by the engineer and inventor William Murdock, they established the steam-engine industry by initially erecting pumping engines to drain the Cornish tin mines. Boulton foresaw great industrial demand for steam power and urged Watt to design the double-acting rotative engine, patented in 1782, and the Watt engine (1788) for driving the lapping machines at his factory.

In 1786 Boulton applied steam power to coining machinery, obtaining a patent in 1790. He made large quantities of coins for the East India Company and also supplied machinery to the Royal Mint. He became a fellow of the Royal Society in 1785 and established a theatre in Birmingham in 1807. By 1800, when Boulton's son Matthew Robinson Boulton took over his father's share of the business, almost 500 steam engines had been installed in the British Isles and abroad.

Boumedienne, Houari, original name MOHAMMED BEN BRAHIM BOUKHAROUBA (b. Aug. 23, 1927, Clauzel, near Guelma, Alg.—d. Dec. 27, 1978, Algiers), army officer who became president of Algeria in July 1965 following a coup d'etat.

Boukharouba's service to Algeria began in the 1950s, during his country's struggle for independence from France, when, after studying at al-Azhar University in Cairo, he joined the rebel forces and adopted the name Houari Boumedienne. The rebels divided the country into military districts, and Boumedienne commanded the one around Oran. In 1960 he became chief of staff of the National Liberation Front, and he centred his efforts on raising an Algerian army in Morocco and Tunisia, out of reach of the French.

After a peace treaty was signed with France in March 1962, tension among the Algerian leaders increased, and that September Boumedienne occupied Algiers in support of Ahmed Ben Bella. Ben Bella became president later in the year, and Boumedienne was named minister of defense and vice president. Conflicts developed between the two leaders, and in June 1965 Boumedienne effected a coup against Ben Bella and installed himself as president. Boumedienne lacked widespread popular support, and he governed at first through a 26-member revolutionary council. As a result his leadership was weak and indecisive, but after an attempt by military officers to overthrow his regime failed in December 1967, he asserted his direct and undisputed leadership of Algeria.

In 1971 he imposed state control on the oil industry, at the cost of ending Algeria's special relationship with France. He risked war with Morocco in 1975 by trying to gain territorial access to the Atlantic across the Spanish Sahara (later Western Sahara). In 1976 his government issued a National Charter and then a new constitution, both adopted by referendum. Negotiating important industrial contracts with Western countries and at the same time maintaining close but independent relations with the Soviet bloc, Boumedienne became a leading figure in the nonaligned movement.

Bound Brook, borough, Somerset County, New Jersey, U.S., on the Raritan River, 31 mi (50 km) southwest of New York City. The area was settled in 1681 soon after it was deeded by two Indian chiefs to Philip Carteret (colonial governor) and other men. The Staats Homestead in South Bound Brook was the headquarters of Baron Frederick William von Steuben, inspector general during the American Revolution. Col. Philip Van Horne's house, known as Convivial Hall, was occupied for a time by Henry ("Light-Horse Harry") Lee, cavalry commander in the Revolutionary War. George Washington's army twice camped on the hills behind the village known as the heights of Middlebrook, where Washington allegedly unfurled the Stars and Stripes (sewn by Betsy Ross) as the national flag in 1777; the site is now a state historical monument. Bound Brook, though primarily residential, has some industries, including the manufacture of chemicals, drugs, textiles, and clothing. Inc. 1891. Pop. (1982 est.) 9,551.

boundary layer, in fluid mechanics, thin layer of a flowing gas or liquid in contact with a surface such as that of an airplane wing or of the inside of a pipe. The fluid in the boundary layer is subjected to shearing forces. A range of velocities exists across the boundary layer from maximum to zero, provided the fluid is in contact with the surface. The peculiar flow in boundary layers can be treated in a simpler

way than the flow in the free stream farther from the surface. Boundary layers are thinner at the leading edge of an aircraft wing and thicker toward the trailing edge. The flow in such boundary layers is generally laminar at the leading or upstream portion and turbulent in the trailing or downstream portion. *See also* laminar flow; turbulent flow.

Boundary Peak, highest point (13,143 ft [4,056 m]) in Nevada, U.S. The northernmost peak of the White Mountains, it lies in Esmeralda County within Inyo National Forest, 65 mi (105 km) west-southwest of Tonopah, Nev. Its name derives from its location less than ½ mile from the California–Nevada border. It is a one-day climb to the summit.

boundary value, condition accompanying a differential equation in the solution of physical problems. In mathematical problems arising from physical situations, there are two considerations involved when finding a solution: (1) the solution and its derivatives must satisfy a differential equation, which describes how the quantity behaves within the region; and (2) the solution and its derivatives must satisfy other auxiliary conditions either describing the influence from outside the region (boundary values) or giving information about the solution at a specified time (initial values), representing a compressed history of the system as it affects its future behaviour. A simple example of a boundary-value problem may be demonstrated by the assumption that a function satisfies the equation $f'(x) = 2x$ for any x between 0 and 1 and that it is known that the function has the boundary value of 2 when $x = 1$. The function $f(x) = x^2$ satisfies the differential equation but not the boundary condition. The function $f(x) = x^2 + 1$, on the other hand, satisfies both the differential equation and the boundary condition. The solutions of differential equations involve unspecified constants, or functions in the case of several variables, which are determined by the auxiliary conditions.

The relationship between physics and mathematics is important here, because it is not always possible for a solution of a differential equation to satisfy arbitrarily chosen conditions; but if the problem represents an actual physical situation, it is usually possible to prove that a solution is possible, even if it cannot be explicitly found. For partial differential equations, there are three general classes of auxiliary conditions: (1) initial-value problems, as when the initial position and velocity of a travelling wave are known; (2) boundary-value problems, representing conditions on the boundary that do not change from moment to moment; and (3) initial- and boundary-value problems, in which the initial conditions and the successive values on the boundary of the region must be known to find a solution. *See also* Sturm–Liouville problem.

Boundiali, town, administrative headquarters (since 1969) of Boundiali *département*, northwestern Ivory Coast, at the intersection of roads from Abidjan (the national capital), Mali, and Guinea. An agricultural trade centre (livestock, maize [corn], manioc, and yams) among the Senufo (Senoufo) people, it is also the site of a cotton-ginning factory. Boundiali's Senufo wood-carvers, practitioners of a traditional art utilized by the Poro secret society, also create artifacts for the tourist market in Abidjan. Pop. (1975) town, 9,910; (1975) *département*, 114,241.

bounds (property law): *see* metes and bounds.

Bountiful, city, Davis County, northern Utah, U.S., between the Wasatch Mountains and Great Salt Lake, just north of Salt Lake City. Originally called Sessions' Settlement (for Perrigrine Sessions, a Mormon pioneer who arrived in 1847), it was renamed Bountiful in 1855 because of abundant harvests. As a precaution against hostile Indians, an adobe wall 3 mi (5 km) long, 8 ft (2 m) high, and 4 ft thick was built around the settlement. The city is mainly residential, with some nursery and mixed farming activities. Bountiful Peak (9,482 ft) is 5 mi northeast. Inc. town, 1855; city, 1890. Pop. (1980) 32,877.

Bounty, English armed transport ship remembered for the mutiny of her crew on April 28, 1789, while she was under the command of Capt.William Bligh (*q.v.*). *See also* Christian, Fletcher.

Bounty Islands, outlying island group of New Zealand, in the South Pacific Ocean, 415 mi (668 km) east of South Island. Comprising 13 granite islets with a total land area of 320 ac (130 ha), they are inhospitable and without human habitation. Discovered and named by Capt. William Bligh of the British ship "Bounty" in 1788, the group was once the home of large herds of fur seals. Decimated by hunters in the early 19th century, the seal population is now beginning to grow again. There is a large population of seabirds, especially penguins.

Bounty System, in U.S. history, program of cash bonuses paid to entice enlistees into the army; the system was much abused, particularly during the Civil War, and was outlawed in the Selective Service Act of 1917. During the French and Indian Wars, the Revolutionary War, the War of 1812, and the Mexican War, military bounties included land grants as well as cash payments; Civil War bounties were in cash only.

From 1861 to 1865 the federal government, along with states and localities, paid about $750,000,000 in recruitment bounties. Congress authorized a $100 bounty in July 1861 to men enlisting for three years. With the passage of the Enrollment Act (March 3, 1863), three-year enlistees received $300 and five-year recruits got $400, but these sums were divided up and paid in monthly installments with the soldiers' regular compensation.

The states and localities offered higher bonuses. Since the federal draft applied only to congressional districts unable to meet their manpower quotas, wealthy districts would often pay in excess of $1,000 to volunteers from poorer districts in order to entice these men to enlist. The poorer districts were thus inequitably affected by the draft because their volunteers were not counted toward their quotas.

Bounty-jumping—the widespread practice of enlisting, collecting the bonus, deserting, reenlisting, collecting another bonus, etc.—was an inherent defect in the system. Many bounty brokers recruited men and pocketed a sizable portion of the bonus, or they passed off derelicts as able-bodied men to the recruiting sergeants, receiving their money before the derelicts were discovered and discharged.

bouquet garni, bundle or faggot of herbs that is added to a soup, stew, sauce, or poaching liquid to give flavour. It is removed before the dish is served. The classic bouquet garni consists of sprigs of parsley and thyme and a bay leaf, tied together if fresh or wrapped in cheesecloth if dried. Celery, garlic, fennel, orange peel, and marjoram are common additions.

Bouraoui, Hédi (André) (b. July 16, 1932, Sfax, Tunisia), Tunisian poet and scholar whose creative and critical works seek to illuminate the human condition and transcend cultural boundaries.

Bouraoui specialized in English literature at the University of Toulouse in France and then, in the United States, received degrees in English and American literature at Indiana University and in romance studies at Cornell University. He later taught at York University, Toronto.

His scholarly publications include *Créaculture I* and *II* (1971), essays on comparative culture; *Parole et Action* (1971; "Word and Action"), a language text; and *Structure intentionnelle du 'Grand Meaulnes': vers le poème romancé* (1976; "Intentional Structure of 'Grand Meaulnes': Toward the Poetic Novel"), a book of literary criticism on Alain-Fournier. Bouraoui published several volumes of French poetry: *Musocktail* (1966), *Tremblé* (1969; "Wavy"), *Éclate module* (1972; "Modulated Explosion"), *Vésuviade* (1976), *Haïtuvois* (1980), and *Vers et l'envers* (1981; "Verse and the Reverse"). The usual focus of his poems is on the affinities of the peoples of his native North Africa with North Americans, Caribbeans, and Europeans. Bouraoui's vision is informed by wit, intellectual complexity, and, above all, compassion for mankind.

Bourassa, (Joseph-Napoléon) Henri (b. Sept. 1, 1868, Montreal—d. Aug. 31, 1952, Outremont, Île de Montréal, Que., Can.), politician and journalist, spokesman for Canadian nationalism, and founder of the Montreal newspaper *Le Devoir* (1910).

Bourassa, portrait by an unknown artist, *c.* 1910
By courtesy of the Public Archives of Canada

Bourassa studied law but built a reputation as a writer on political affairs. He became mayor of Montebello, Labelle County, Que., in 1890 and represented Labelle in the federal House of Commons as a Liberal (1896–1907). In 1899 he resigned in protest against Canadian support of the imperialist cause in South Africa, but, as the accredited leader of the Nationalist Party, he was reelected in 1900 and 1904.

Bourassa proposed that Canada should become a completely separate nation under the crown, and he cooperated with the Conservatives in opposing U.S. capital investment in his country. From 1908 to 1912 he was a member of the Quebec Legislature, where he opposed the Liberals. He also campaigned against conscription, introduced by the Conservatives in 1917.

In 1925 Bourassa was reelected by Labelle to the federal Parliament as an independent, and the following year he allied with Prime Minister W.L. Mackenzie King in demanding a modification of the role of the governor general, although he declined office in King's new government. He left Parliament in 1935, when his disregard for local political patronage brought him defeat in the general election.

Bourbaki, Nicolas, pseudonym chosen by a dozen or so mathematicians in France in the mid-1930s to represent the essence of a "contemporary mathematician." The name selected, in jest, was that of a French general whose efforts to bridge the Prussian line during the Franco-German War (1870–71) ended in a humiliating disaster. The mathematicians who collectively wrote under the Bourbaki pseudonym at one time studied at the École

Normale Supérieure in Paris. They included the Frenchmen Claude Chevalley, Andre Weil, Henri Cartan, Jean Dieudonné, and C. Ehresmann and the American Samuel Eilenberg.

The group's purpose was to present mathematics in a contemporary and original fashion as well as to illustrate the axiomatic structure of modern mathematics. Thus, the Bourbaki authors used special notations to illustrate key points and concluded chapters with historical notes and exercises. The Bourbaki writings commenced in 1939 with the first of what was to become a comprehensive treatise, *Éléments de mathématique.* The series soon became a standard reference on the fundamental aspects of modern mathematics. The various historical notes included at the ends of chapters were published as a collection in 1960 in *Eléments d'histoire des mathématiques.*

Bourbon, DUKES OF, titled French nobility of the House of Bourbon (*q.v.*), grouped below chronologically and indicated by the symbol •.

• **Bourbon, Louis I, 1er duc de** (1st duke of) (b. *c.* 1270—d. *c.* 1342), son of Robert, count of Clermont, and Beatrix of Bourbon, who was made duke of Bourbon by Charles IV of France in 1327. He took part in several military campaigns, including those at Courtrai (1302) and Mons-en-Pévèle (1304), and twice was put at the head of proposed crusades that never took place. He was made the king's grand chamberlain in 1310.

• **Bourbon, Pierre I, 2e duc de** (2nd duke of) (b. *c.* 1311—d. 1356, Poitiers, Fr.), duke of Bourbon (from 1342), diplomat and governor during the reigns of Philip VI and John II of France. After campaigns in Brittany (1341–43), he was made governor of the Languedoc. He subsequently negotiated numerous treaties and was made lieutenant general of Bourbonnais, Auvergne, Berry, and Marche. He fought at the Battle of Poitiers (1356).

• **Bourbon, Louis II, 3e duc de** (3rd duke of), byname LOUIS THE GOOD, French LOUIS LE BON (b. 1337—d. Aug. 19, 1410), duke of Bourbon (from 1356), count of Clermont and of Forez. He was an ally of Bertrand du Guesclin, the Breton-French hero, and a staunch supporter of John II of France; when John was taken prisoner by the English at Poitiers, Bourbon became one of the hostages delivered to the English as a guarantee of the payment of the ransom. He returned to France in 1367 and again fought the English in Poitou and Guyenne (1368–70).

• **Bourbon, Jean I, 4e duc de** (4th duke of) (b. 1380/81—d. 1434, London), count of Clermont (from 1404) and duke of Bourbon (from 1410), who was a champion of the House of Orléans in the Hundred Years' War. He helped lead the Armagnacs in their resistance to the English king Henry V's invasion of France but was captured at Agincourt (1415) and brought to England. Despite payment of his ransom, Henry never freed him.

• **Bourbon, Charles I, 5e duc de** (5th duke of) (b. 1401—d. Dec. 4, 1456), duke of Bourbon (from 1434) and count of Clermont. After having rendered notable services to Charles VII of France, he turned about and became—with Jean II, duke of Alençon—the leader of the short-lived Praguerie (1440), a revolt of nobles nominally led by the Dauphin (the future Louis XI). The nobles were cornered in the territory of Bourbon and made peace, given generous terms.

• **Bourbon, Jean II, 6e duc de** (6th duke of) (b. 1427—d. 1488), duke of Bourbon (from 1456) whose military successes, as at Formigny (1450) and Châtillon (1453), contributed greatly to the conquest of Normandy and Guyenne and the rout of the English. From Louis XI of France he received the governance of Orléanais, Berry, Limousin, Périgord, and Languedoc (1466) and became an ardent supporter of the crown. His brother, Charles II of Bourbon (1433–88), became archbishop of Lyon (1444) and then cardinal (1476).

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

• **Bourbon, Pierre II, 7e duc de** (7th duke of), also called SEIGNEUR (lord) DE BEAUJEU (b. 1438—d. October 1503, Moulins, Fr.), duke of Bourbon (from 1488) and seigneur de Beaujeu (from 1474).

Louis XI of France espoused his eldest daughter, Anne of France (*q.v.*), to Pierre de Beaujeu in 1474 and, on his deathbed, entrusted to Pierre the charge of his 13-year-old son, Charles VIII. Thus, from 1483 to the end of 1491, Beaujeu and Anne were to exercise a virtual regency in France. Faced with the reaction of all who had suffered from Louis XI's callous oppressions, the Beaujeus managed to promote the King's authority by adroit concessions or, when these failed, by military action—for example, at the meeting of the States General at Tours (1484) and in the "Mad War" and subsequent Breton campaigns. Moreover, in 1491, despite Austrian and English opposition, they concluded the marriage of Charles VIII with Anne of Brittany. But when Charles freed himself from tutelage, his former guardians were exposed to the resentment of the new queen, whose duchy's independence had been compromised.

• **Bourbon, Charles III, 8e duc de** (8th duke of) (b. Feb. 17, 1490, Montpensier, Fr.—d. May 6, 1527, Rome), constable of France (from 1515) under King Francis I and later a leading general under Francis' chief adversary, the Holy Roman emperor Charles V.

The second son of Gilbert, comte de Montpensier, head of a junior branch of the House of Bourbon, Charles benefitted by a rapid succession of deaths: his father's (1496) was followed by his eldest brother's (1501); and finally, in 1503, his father's cousin Pierre II, duc de Bourbon, died leaving no male heir. Charles, who then proceeded to marry Pierre's daughter Suzanne, thus inherited the domains of the ducal line of Bourbon as well as those of Montpensier. At the age of 15, in 1505, he was one of the most powerful men in France.

Charles now started a brilliant military career. He was at the siege of Genoa in 1507 and took part in the Battle of Agnadello in 1509. Appointed constable of France on the accession of Francis I, he contributed greatly to the victory at Marignano, which made his young king master of the Milanese. At 25, laden with honours by the King, Charles was governor of the Milanese in the King's name. He took effective measures to defend the province against the Holy Roman emperor Maximilian.

Then the Constable began to lose the King's favour. Various explanations have been advanced for this change, but above all it seems to have been the King's mother, Louise of Savoy, who worked against Charles. It is certain in any case that Francis, who had neglected to pay his salary to the Constable since his investiture, instituted proceedings in the Parlement of Paris to recover the inheritance of the senior branch of the Bourbon family from him (1522–23). As the King's case was bad in law, the Parlement suspended judgment but ordered the property to be sequestered, thus constituting the crown a trustee.

Thereupon, Charles turned to negotiate with the emperor Charles V and with Henry VIII of England. At one time they even considered a partition of France, whereby the Emperor would take Languedoc, Burgundy, Champagne, and Picardy; the Constable would add Provence and Dauphiné to his own domains of Bourbonnais and Auvergne; and the King of England would have the rest of France, from Normandy to Guienne. Francis got wind of this simple project but failed to stop Charles from escaping to the Franche-Comté. Passing into the Emperor's service at the head of an army of German mercenaries, Charles then repelled a French attack on Italy (April 1524), invaded Provence and captured Toulon, but was halted before Marseille (August–September 1524). Falling back on Lombardy, he fought in the Battle of Pavia (Feb. 24, 1525), in which Francis was taken prisoner by Charles's soldiers. The Treaty of Madrid (1526), whereby Francis recovered his liberty, guaranteed Charles's free return to France and the restitution of his possessions, but Francis did not keep his word.

To offset this disappointment, Charles V made the Constable governor of the Milanese, the post that he had held 10 years earlier as the representative of the king of France. Left by the Emperor without resources for the upkeep of his army, the Constable, in the spring of 1527, led his pillaging troops across central Italy to Rome. He was killed in the first assault on Rome, just before the capture and sack of the city.

• **Bourbon, Louis III, duc de** (duke of): *see* Condé, Louis III, 6e prince de.

• **Bourbon, Louis-Henri, duc de** (duke of): *see* Condé, Louis-Henri, 7e prince de.

• **Bourbon, Louis-Joseph, duc de** (duke of): *see* Condé, Louis-Joseph, 8e prince de.

Bourbon, Louis-Henri-Joseph, duc de (duke of): *see* Condé, Louis-Henri-Joseph, 9e prince de.

Bourbon, HOUSE OF, Spanish BORBÓN, Italian BORBONE, one of the most important ruling houses of Europe. Its members were descended from Louis I, duc de Bourbon from 1327 to 1342, the grandson of the French king Louis IX (ruled 1226–70). Bourbons ruled in France from 1589 to 1792 and from 1814 to 1848; in Spain from 1700 to 1868, from 1870 to 1873, from 1874 to 1931, and from 1975; and in Naples and Sicily from 1735 to 1861.

A brief account of the Bourbons follows; for a full history and complete genealogical tables, *see* MACROPAEDIA: Bourbon, House of.

The House of Bourbon, with its many branches, is itself a branch of the House of Capet, since Louis IX of France, a Capetian of the direct line, is the ancestor of all the Bourbon princes through his son Robert, comte de Clermont, who married the heiress of the ancient lords of Bourbon and whose son Louis, likewise the ancestor of the whole house, was created duc de Bourbon in 1327. The senior male lines of the first duke's descendants, who had moreover acquired by marriage the countship of Montpensier, became extinct in 1527, so that the succession is through a junior line, that of La Marche-Vendôme, from which all the sovereign branches of the house, as well as the princes de Condé and the princes de Conti descend. After two Bourbons of this line had been kings consort (Jacques II, comte de La Marche, in Naples—a title not uncontested—and Antoine, duc de Vendôme, in Navarre), Henry de Bourbon, the head of the house, became not only king of Navarre in 1572 in succession to his mother but also king of France as Henry IV in 1589 as head of the whole House of Capet on the extinction of the male line of the Valois dynasty. From Henry descend not only the two French branches but also the Spanish, Parmesan, Neapolitan-Sicilian, and Brazilian.

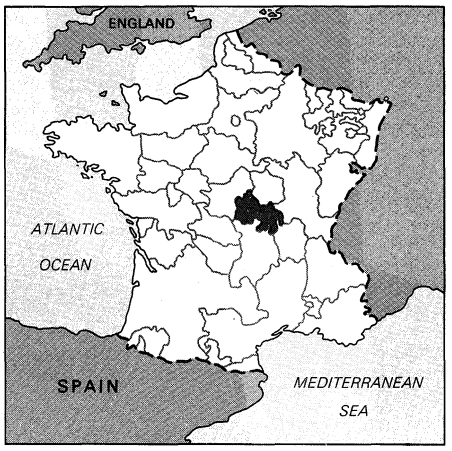
Bourbon, Louis Auguste de: *see* Maine, Louis-Auguste de Bourbon, duc du.

Bourbon-Condé, Anne-Geneviève de: *see* Longueville, Anne-Geneviève de Bourbon-Condé, duchesse de.

bourbon whiskey, whiskey distilled from corn mash; specifically, a whiskey distilled from a mash containing at least 51 percent corn, the rest being malt and rye, and aged in new charred oak containers. *See* whiskey.

Bourbonnais, historic and cultural region encompassing the central French *département* of Allier and coextensive with the former province of Bourbonnais.

The following article summarizes the political history, geography, and modern culture of Bourbonnais; for further treatment *see* MACROPAEDIA: France.



The *gouvernement* of Bourbonnais in 1789

In Roman times the area was divided between Aquitania and Lugdunensis. Bourbonnais itself originated in the feudal period; it was gradually carved out of neighbouring provinces by the sires, or lords, of Bourbon (the modern Bourbon-l'Archamboult), who were descended from Aimon I (10th century). One of their descendants, Louis, created 1st duc de Bourbon in 1327, was the ancestor of the great Bourbon dynasty.

The French crown confiscated Bourbonnais in 1527 and attached it to the crown in 1531. By the 18th century, different parts of Bourbonnais formed parts of the five dioceses of Bourges, Clermont, Autun, Nevers, and Limoges. Moulins (the capital), for judicial purposes under the Parlement of Paris, was the headquarters of a military *gouvernement.*

Physically, the region consists of a highland bordering France's Massif Central on the north. The higher reaches are arid, but the lower Limagne region, watered by the Allier River, flowing northward out of the Massif, grows grains, fruits, vegetables, and wine grapes and supports cattle. Montluçon is the only industrial centre.

Sharecropping (*métayage*) predominated until the early 20th century; subsequent land reform and a relatively small rural population have favoured the development of large family farms. The traditional farmstead is built of limestone and roofed with thatch or tiles. Houses in wine-growing districts have cellars. Barns are ordinarily detached from the farmhouse. Villages tend to be clustered along old Roman roads.

Roman Catholicism predominates, and Protestantism has made few inroads outside the larger towns. There are small Protestant enclaves in Moulins, Montluçon, and Vichy. A cult of the dead persists in some rural districts. A coin is commonly placed in the hand of a corpse before a funeral, and the folklore abounds in ghosts. Priests are occasionally asked to bless barns over which a spell has allegedly been cast. The scarcity of candidates for the priesthood has contributed to the consolidation of numerous parishes. *Veillées,* soirees held in homes during the winter, feature recitations of popular stories, legends, and songs. There are numerous local cultural societies; Montluçon alone has more than 300 such groups. The Communist Party has a large following throughout Bourbonnais.

Bourboune, Mourad (b. 1938, Djidjelli, Alg.), Algerian novelist who, like many young Algerian writers in the decades following their country's independence, criticized the oppressiveness of the new state as well as its religious traditionalism.

Bourboune's first novel, *Le Mont des genets* (1962; "The Mountain of Jennets"), describes the collapse of the old order and the coming of a new age that began with the insurrection of Nov. 1, 1954, the event that precipitated the Algerian war for independence. *Le Muezzin* (1968) presents the principal character in enigmatic terms and uses him to show the rupture of modern-day North Africans with their past. The protagonist is an atheistic muezzin whose sacrilegious violence acts to exorcise and delineate the sham and hypocrisy of the Algerian government since independence.

Bourchier, John: *see* Berners, John Bourchier, 2nd Baron.

Bourchier, Thomas (b. *c.* 1412—d. March 30, 1486, Knole, Kent, Eng.), English cardinal and archbishop of Canterbury who maintained the stability of the English Church during the Wars of the Roses (1455–85) between the houses of York and Lancaster.

Bourchier was the son of William Bourchier, made count of Eu in 1419, and Anne, a granddaughter of King Edward III. Bourchier was bishop of Worcester (1435–43) and of Ely (1443–54). Because he won acceptance from both the feuding Yorkist and Lancastrian parties, he was elected archbishop of Canterbury in 1454. He served as chancellor (1455–56) during the opening months of the Wars of the Roses and arranged a temporary reconciliation between the two sides in 1458. Nevertheless, after the defeat of the Lancastrians in 1461, Bourchier became a loyal supporter of the newly crowned Yorkist monarch Edward IV, who made him a cardinal in 1467. In 1483 he persuaded Edward's widow to hand over her youngest son, Richard, duke of York—a potential claimant to the throne—to Richard, duke of Gloucester, who shortly thereafter usurped the throne as King Richard III. Bourchier was not implicated, however, in the mysterious disappearance of the Duke of York and his elder brother, Edward V, from the Tower of London in August 1483.

Bourdeille, Pierre de: *see* Brantôme, Pierre de.

Bourdelle, (Émile-) Antoine (b. Oct. 30, 1861, Montauban, Fr.—d. Oct. 1, 1929, Paris), French sculptor in whose works heroic energy and exaggerated, rippling surfaces mingled with the flat, decorative simplifications of Archaic Greek and Romanesque art, introducing a new vigour and strength into the sculpture of the early 20th century.

He studied at the École des Beaux-Arts in Toulouse and then went to Paris in 1885. After studying with Jean-Baptiste Carpeaux and Jules Dalou, he entered the studio of Auguste Rodin, who was to remain one of the chief influences of his artistic life. In 1900 he created a crucial work, the "Head of Apollo," the majestic dignity and broad planes of which recalled early Classical Greek works. In 1910 he achieved his first triumph in the Salon with "Héraklès archer," which again owed much to Archaic art, although the pose is far more sinuous and the musculature more exaggerated; he made more than one sculpture of this subject. In that year he also created the full-length portrait "Rodin at Work" (Musée Antoine Bourdelle, Paris), the head of which is a pastiche of Michelangelo's "Moses" in S. Pietro in Vincoli, Rome. In 1912 he executed

"Héraklès archer," bronze sculpture by Antoine Bourdelle, 1909; in the Art Institute of Chicago
By courtesy of the Art Institute of Chicago, A.A. Munger Collection

reliefs for the Théâtre des Champs-Élysées, remarkable for their unusually compact, planar style. The subject was "Apollo and His Thought," accompanied by dancing Muses. The year 1914 marked the creation of another masterpiece, the "Dying Centaur," which represented for him the defeat of paganism. Never able as a sculptor completely to escape the shadow of Rodin, Bourdelle became a famous teacher, turning his studio into the Académie de la Grande-Chaumière.

Bourdet, Édouard (b. 1887, Saint-Germain-en-Laye, Fr.—d. Jan. 17, 1945, Paris), French dramatist noted for his satirical and psychological analyses of contemporary social problems.

Bourdet's first plays, *Le Rubicon* (1910) and *L'Homme enchaîné* (1923), were not successful. His reputation was secured, however, by *La Prisonnière* (1926; *The Captive,* 1926), a psychological study of the sufferings of a sexually maladjusted woman. With *Vient de paraître* (1928), a satire on the literary world, Bourdet established a formula for the series of satirical comedies that he produced between the world wars. Notable plays in the series are *Le Sexe faible* (1931; *The Sex Fable,* 1931) and *Les Temps difficiles* (1934).

Bourdet served as director of the Comédie-Française from 1936 to 1940. His later plays include *Hyménée* (1941) and *Père* (1943).

Bourdin, Maurice (antipope): *see* Gregory (VIII) *under* Gregory (Papacy).

bourdon (music): *see* drone.

Bourdon, Sébastien (b. Feb. 2, 1616, Montpellier, Fr.—d. May 8, 1671, Paris), French painter with a considerable reputation for landscapes who used nature, however, largely as a backdrop for historical and religious works; he also was known for his colourful caricatures and strikingly lifelike portraits. Bourdon excelled at imitating the styles of other painters and adding a personal touch, but he never developed a distinctive style of his own.

At the age of seven he was sent by his father to Paris as an apprentice to a painter, but he left his apprenticeship when he was 14 and travelled to Bordeaux and then to Toulouse. Having no financial support, he enlisted in the army, but an officer recognized his artistic talent, discharged the young man, and in 1634 financed a visit to Rome. There Bourdon became acquainted with the painters Claude Lorrain and Nicolas Poussin and worked for

an art seller by providing imitations of their works.

Bourdon returned in 1637 to Paris, where he soon obtained commissions. In 1643 he was

"Landscape with a Mill," oil on canvas by Sébastien Bourdon; in the Museum of Art, Rhode Island School of Design, Providence

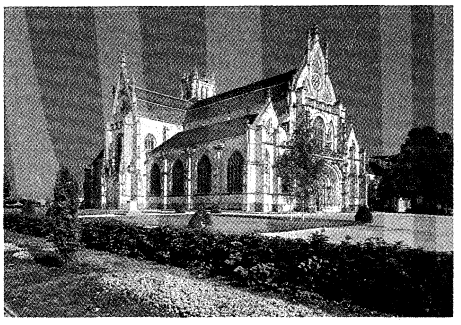
By courtesy of the Museum of Art, Rhode Island School of Design, Providence

commissioned to paint St. Peter's martyrdom for Notre-Dame, and he completed several other works during this time, including the decoration of the Hôtel de Grammont and the "Martyrdom of St. Andrew" for the chapter of the Church of Saint-André in Chartres. In 1648 Bourdon was one of the founders of the French Royal Academy, in which he became professor and rector and led an impressive series of public lectures on current issues in art.

In 1652 Bourdon went to Sweden, where he rapidly became the chief painter of Queen Christina, who posed for him several times. In 1653 he returned to Paris, where he carried out commissions for the government in addition to painting "Dead Christ" for the church of Saint-Benoît. In 1657 he went to Montpellier to paint a large work for the cathedral, "The Fall of Simon Magnus."

In the final years of his life Bourdon executed commissions for the city of Cologne and the Abbey of St. George. His masterpiece, the decoration of the gallery of the Hôtel de Bretonvilliers, belongs to this period. His final work, "The Deification of Hercules," in the Tuileries Palace, was interrupted by his death.

Bourg, in full BOURG-EN-BRESSE, town, capital of Ain *département,* Rhône-Alpes region, eastern France, on the Reyssouze River, west of Geneva. It is the main centre for the Bresse–Dombes lowlands, west of the Jura, at the crossing of the Alpine Route Napoléon. Its market dates from the 11th century. A franchise charter was granted in 1250, and in the early 15th century it was made the chief city of Bresse (*q.v.*) by the dukes of Savoy. The Brou Church, used for *son et lumière* ("sound and light") performances, is a Late Gothic masterpiece raised by Margaret of Austria in memory of her husband, Philip IV the Fair



The Brou Church, Bourg, Fr.

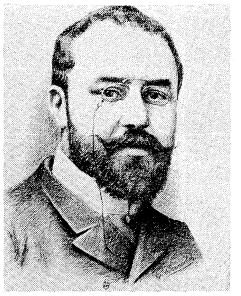
Editions "La Cigogne"—Hachette

of Savoy, and his mother, Margaret of Bourbon. Notre-Dame church is mainly 16th century (nave, choir, stalls). The Ain Museum is housed in the former Brou Priory. The economy depends on light manufacturing, farm trade, and tourism. Pop. (1982) 37,582.

Bourgeois, Jeanne-Marie (comedienne): *see* Mistinguett.

Bourgeois, Léon(-Victor-Auguste) (b. May 21, 1851, Paris—d. Sept. 29, 1925, Château d'Oger, near Épernay, Fr.), French politician and statesman, an ardent promoter of the League of Nations, who was awarded the Nobel Prize for Peace in 1920.

Trained in law, Bourgeois entered the civil service in 1876 and by 1887 had advanced to the position of prefect of police for the Seine *département.* In 1888 he was elected to the National Assembly as a deputy from the Marne district. After serving in a number of ministerial posts, he became premier (Nov. 1, 1895–April 21, 1896). Later, he was the head of the Radical-Socialist Party. He represented the Marne (1905–23) in the Senate and was its president from 1920 to 1923.



Léon Bourgeois, lithograph by Brunscher, *c.* 1900

By courtesy of the Bibliotheque Nationale, Paris

Bourgeois was a French delegate to the Hague Conference of 1899, where he espoused international cooperation among nations. In 1903 he was appointed to the International Court of Justice (at The Hague). He was instrumental in formulating the 1906 agreements on Moroccan independence during the Algeciras Conference. In 1919 he was France's representative to the League of Nations, emerging as its champion. He was known as a leading spokesman for the social theory of solidarism, which stressed the quasi-contractual nature of society and the essential obligations of all men to it. His publications include *Solidarité* (1896), *La Politique de la prévoyance sociale,* 2 vol. (1914–19), *Le Pacte de 1919 et la Société des Nations* (1919), and *L'Oeuvre de la Société des Nations, 1920–1923* (1923).

Bourgeois, Louis, Louis also spelled LOYS (b. *c.* 1510, Paris—d. after 1561), Huguenot composer who wrote, compiled, and edited many melodic settings of Psalms in the Genevan Psalter.

Little is known of Bourgeois's early life. He moved to Geneva in 1541 and lived there until 1557, when he returned to Paris. He was a friend of John Calvin and lived with him (1545–57). Bourgeois was made a citizen of Geneva in 1547 but in 1551 was imprisoned for a day for tampering with the accepted Psalm tunes without authorization. Calvin secured his release, and eventually Bourgeois's alterations were approved.

Bourgeois based his Psalm settings on French texts by the celebrated poet Clément Marot and the leading theologian Théodore de Bèze (Beza). Though his harmonizations were not widely popular, the melodies he created were used by many later composers. Bourgeois used fragments of popular tunes and possibly also of liturgical chant in his melodies, the most familiar of which is Ps. 134, known as "Old Hundredth." He was himself responsible for about 85 melodies in the Psalter, which was completed by his successors in 1562.

Besides contributing to the Psalter, Bourgeois was one of the first to propose (in *Le Droict Chemin de musique,* 1550) learning to sing by means of solfeggio (note syllables, as do, re, mi, . . .) in place of the then-standard Guidonian hand, a method of learning notes by associating them with parts of the hand.

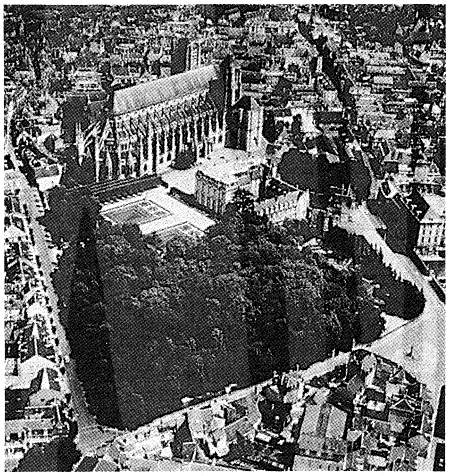
bourgeoisie, in economic theory, the social and economic class embracing merchants, entrepreneurs, and other townsmen who derive income from commercial and industrial enterprises. In France the term referred originally to the inhabitants of walled towns in the Middle Ages. Such townspeople made their living by practicing the medieval arts and crafts and occupied an intermediate position in the economic and social scale between the landlords and the peasantry in the open country. With the introduction of mechanical power into urban industry and the growth of the factory system, the medieval handicraftsmen began to divide into two classes—employers and employees—and the growth of a new kind of class consciousness tended to restrict the idea of bourgeois to the employers. Thus arose a system of economic and social classification that emphasized the distinction between bourgeois (or capitalist) and proletarian (*see* proletariat).

Later, Marxists built a pretentious system of social and political philosophy on this distinction between bourgeoisie and proletariat. That the attempt to create a comprehensive philosophy of history and politics on this narrow basis was unrealistic is demonstrated by the subsequent struggles between different schools of Socialism and Communism. The successors of Marx and Engels, from Karl Kautsky and Lenin to Joseph Stalin and Nikita Khrushchev, were forced to make increasing concessions to the facts of modern industrial and political life. The original simplicity of the Marxist scheme of social classification yielded to a growing recognition of the baffling complexity of modern society and politics.

In the most advanced capitalistic countries there is a strong tendency to revert to one of the oldest schemes of social and political classification. Aristotle's system of politics emphasized the distinctions among three classes—upper, middle, and lower—and stressed the importance of the middle class in a well-ordered state. But in contemporary politics these major classes are highly complex, and there is no part of them which can be identified as the bourgeoisie.

The word bourgeois retains its practical utility chiefly in discussions of art and manners, where it usually is used disparagingly to characterize a concern for material interests and respectability, with a tendency toward mediocrity. In much of Western discourse, bourgeoisie had nearly disappeared from the vocabulary of political writers and politicians by mid-20th century.

Bourges, city, capital of Cher *département,* Centre region, almost exactly in the centre of France, on the Canal du Berry, at the confluence of the Yèvre and Auron rivers, in marshy country watered by the Cher, southeast of Orléans. As ancient Avaricum, capital of the Bituriges, it was defended valiantly in 52 BC by Vercingetorix against Julius Caesar, who in his commentaries deemed it one of the most beautiful cities in Gaul. St. Ursin brought Christianity there in the 3rd century. Charlemagne unified Berry and made Bourges capital of Aquitaine. During the Hundred Years' War, Charles VII resided there (1422–37), and Joan of Arc wintered there (1429–30). In 1438 the Pragmatic Sanction was signed at Bourges. Louis XI, who was born there, endowed the city in 1463 with a university (abolished during the Revolution) at which Jacques Cujas (1522–90) was once a renowned teacher of



The cathedral of Saint-Étienne, Bourges, Fr.
Editions Modernes "Theojac"

Roman law. John Calvin was converted to Luther's ideas in Bourges.

The summit of the hill on which the city is built is crowned by the Gothic cathedral of Saint-Étienne, which dominates the city. Begun at the end of the 12th century on the site of earlier sanctuaries, it was completed in 50 years, receiving later additions. The cathedral has five magnificently sculptured doorways and two asymmetrical towers. Its inner aisles are remarkably high, and there are no transepts. The interior contains stained-glass windows of the 12th and 13th centuries that are of exceptional beauty. Beneath the choir is a splendid 12th-century crypt.

The archbishop of Bourges bears the title of Primat des Aquitaines, Métropolite et Patriarche. The palace of Jacques Coeur, chief financier to Charles VII, is a fine example of French 15th-century civil architecture. The hôtel de ville and the Berry Museum were built in the 15th and 16th centuries, using Gallo-Roman fortifications. The city has many other fine old buildings.

Capital of the historic province of Berry, Bourges still serves as the centre for marketing sheep, cattle, wine, and cereals. It also has diversified manufacturing, including foundries, armament works, food processing, and plants manufacturing tires and machinery. Pop. (1982) 74,622.

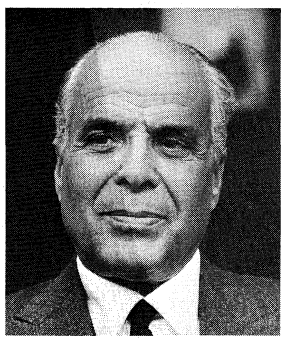
Bourget, Paul (-Charles-Joseph) (b. Sept. 2, 1852, Amiens, Fr.—d. Dec. 25, 1935, Paris), novelist and critic, a molder of opinion among French conservative intellectuals in the pre-World War I period.

Bourget began his career as a poet, and several of his poems were set to music by Claude Debussy. Encouraged and deeply influenced by the critic Hippolyte Taine, he published a series of brilliant essays tracing the sources of contemporary Pessimism to the works of Stendhal, Gustave Flaubert, Charles Baudelaire, Hippolyte Taine, and Ernest Renan. Fashionable in their day because of their high-society setting, his early novels, such as *Cruelle Énigme* (1885), *Un Crime d'amour* (1886), and *André Cornélis* (1887), were psychological studies in the naturalistic tradition.

Bourget, oil painting by Paul Chabas; in a private collection
J.E. Bulloz

Bourget's most important novel, *Le Disciple* (1889), heralded a marked change in his intellectual position. Prefaced by an appeal to youth to abide by traditional morality rather than modern scientific theory, the novel portrays the pernicious influence of a highly respected Positivist philosopher and teacher (who strongly resembles Taine) on a young man. Applying the philosopher's teachings to life, the young man plays dangerous games with human emotions that end in a tragic crime. Bourget was converted to Roman Catholicism in 1901. His later novels, such as *L'Étape* (1902) and *Un Divorce* (1904), are increasingly didactic theses in support of the church, traditionalism, nationalism, and monarchy.

Bourguiba, Habib (ibn Ali) (b. Aug. 3, 1903, al-Munastīr, Tunisia), architect of Tunisia's independence and first president of Tunisia (1957–87), one of the major voices of moderation and gradualism in the Arab world.



Bourguiba
Stuart

He was born—the seventh child of Ali Bourguiba, a former lieutenant in the army of the bey (ruler) of Tunisia—in a small fishing village. At an early age, he was sent to Tunis, where he received a good education in Arabic and in the foundations of Islām, as well as in French and in Western thought.

Between 1924 and 1927 Bourguiba studied law and political science at the Sorbonne, in Paris, where he established contacts with a number of French liberals and with Algerians and Moroccans who were working for the independence of their countries.

For seven years after his return to Tunis in 1927, Bourguiba practiced law and in 1932 founded a nationalist newspaper in French. In 1934, when it became apparent that the leading nationalist political group, the Destour (Constitution) Party, was unable to make headway in the struggle for Tunisian independence from France, Bourguiba and his younger colleagues seceded and established the Neo-Destour Party, with Bourguiba as its secretary-general. He would become its president 14 years later.

From 1934 onward, Bourguiba was the central figure in the Tunisian national struggle. A practical man, he believed in doing things in stages, and his gradualist policy came to be known as "Bourguibism." It was he who in one word formulated the demands of the Tunisians: independence. Under him the people came to identify with the national movement that had been almost a monopoly of the urban elite. An exceptionally able organizer, Bourguiba not only established branches of the party in out-of-the-way villages but, realizing that the French government would resort to repressive measures, also saw to it that a new set of party executives would always fill the vacuum created by arrest or exile. Between 1934 and 1952 nine such groups succeeded one another, thus keeping the struggle alive; Bourguiba himself spent about 10 years in detention during this period (1934–36, 1938–42, 1952–55).

Imprisoned in Vichy, Fr., at the outbreak of World War II, Bourguiba refused to throw in his lot with the Axis powers unless they declared Tunisian independence first. He was convinced that the Allies would win the war and strove to keep Tunisia neutral. In 1945–46 and 1951 Bourguiba traveled extensively in the Middle East, the United States, the Far East, and Europe, publicizing the cause of Tunisian independence.

When, in 1952–54, the Tunisian nationalists increasingly took to terrorism, the French government became seriously concerned. Repression ceased to be effective, and in 1954 the government of Pierre Mendès-France began negotiations with Bourguiba; in April 1955 he secured autonomy for his country from Edgar Faure, Mendès-France's successor. Foreign affairs and defense were reserved for France.

On March 20, 1956, Bourguiba, following his policy of gradualism, concluded—with Guy Mollet, the French premier—a treaty giving Tunisia its independence. In 1957 agreement in principle for the evacuation of the French forces from Tunisia, except Bizerte, was reached. After the abolition of the monarchy in 1957, Bourguiba was elected president of Tunisia. Two years later he gave Tunisia a constitution that, while retaining Islām as the state religion, abolished polygamy, controlled divorce, and attempted to make certain that the month-long fast of Ramaḍān did not curtail workers' productivity.

Bearing in mind the need to economize, as well as the danger from military coups, Bourguiba kept the Tunisian army small. Tunisia's defense expenditures never exceeded 10 percent of the budget, while education and agriculture usually received 25 percent each and health even a little more. One of the most successful of his projects was the settlement of about 50,000 nomads in southern Tunisia, which under French rule was under military administration. He divided the country into 14 provinces under civilian administration with modern administrative laws.

Since Tunisia depended for its development on foreign aid from various sources, Bourguiba observed a policy of neutrality. Intellectually, culturally, and educationally, however, Tunisia leaned toward France. Yet after independence two incidents imperiled Tunisia's close ties with that country.

In 1961, probably in response to pressures by other Arab leaders, Bourguiba asked France to evacuate Bizerte, which, according to the agreement on independence (1956), was to remain a French military and naval base. When the French did not immediately respond, he ordered an attack on their forces, who returned the fire. Bizerte was finally evacuated more than two years later but at the cost of more than 1,000 Tunisian lives. The nationalization of all land still owned by French settlers in 1964 further strained relations with France. The evacuation of Bizerte caused economic loss to Tunisia by cutting off a source of revenue from France, but Bourguiba gained in prestige.

For many years Bourguiba was a controversial figure in Arab politics, primarily because he took a courageous and independent stand against "unanimous" decisions or dictates by the Arab League but also possibly because he cut a figure on the international scene far bigger than in his own country. Bourguiba believed in a moderate form of socialism. In the mid-1960s Tunisia tried a strict form of agricultural cooperatives and state control of trade and industry, but the result was disas-

trous, and Bourguiba returned to his more deliberate methods. There was, however, far from unanimous agreement that Bourguiba owed his overall success, both domestically and in foreign affairs, to his gradualist approach. Some felt that his method would not have worked for a leader who did not possess both Bourguiba's fighting spirit and his great gifts as a negotiator, as well as an integrity that made some of his former opponents his friends and admirers. In 1975 the Tunisian National Assembly appointed him president for life.

Bourguiba's health began failing in the 1970s, and with it the question of his succession emerged. In 1986 the elderly leader began acting erratically, dismissing close advisers and his handpicked successor, Prime Minister Mohammed Mzali. In early 1987 he appointed Zine el-Abidine Ben Ali, the minister of the interior, to the prime ministry after the latter had firmly suppressed Islāmic fundamentalists who had planned to overthrow the government. In November 1987 Ben Ali removed Bourguiba from the presidency on the grounds that the aged leader had become too ill and senile to effectively govern the country any longer. (N.A.Z./Ed.)

BIBLIOGRAPHY. A biography of Bourguiba is Norma Salem, *Habib Bourguiba, Islam, and the Creation of Tunisia* (1984). Aspects of his life and career are studied in Fēlix Garas, *Bourguiba et la naissance d'une nation* (1956), an attempt to explain Bourguiba's struggle and his leadership of the national movement in Tunisia to the beginning of the serious negotiations with France; Jean Lacouture, *Cinq hommes et la France* (1961), a work that includes an explanation of Bourguiba's role in Tunisian national life; Samuel Merlin, *The Search for Peace in the Middle East: The Story of President Bourguiba's Campaign for a Negotiated Peace Between Israel and the Arab States* (1968), a penetrating study of Bourguiba's Arab policy; and Dirk Vandewalle, "Bourguiba, Charismatic Leadership and the Tunisian One Party System," *The Middle East Journal,* 34(2): 149–159 (Spring 1980).

Bourignon, Antoinette (b. Jan. 13, 1616, Lille, Fr.—d. Oct. 30, 1680, Friesland, Neth.), mystic and religious enthusiast who believed herself to be the "woman clothed with the sun" (Rev. 7).

Bourignon was a Roman Catholic but took to self-imposed retirement, penance, and mortification. Later she tried convent life and the management of an orphanage; both were failures because of her distrust of human nature and her harsh, autocratic disposition. She became convinced that she was illuminated by God to reform both temporal and spiritual life. Accordingly, she attacked every form of religious organization and was praised by some and condemned by others. She attracted many followers in the Netherlands, France, and England, but especially in Scotland, where her doctrines were posthumously denounced by the Presbyterian general assemblies of 1701, 1709, and 1710. Her works, which exhibit a curious medley of opinions, were collected (1679) by her disciple Pierre Poiret, who in the same year also wrote her biography.

Bourke, town, north-central New South Wales, Australia, on the Darling River. It originated from a stockade built in 1835 by Sir Thomas Mitchell as a defense against Aborigines and was named after Governor Sir Richard Bourke. The town, surveyed in 1862 and made a municipality in 1878, was a busy port in the 1880s and 1890s, was incorporated into Darling Shire in 1955, and is now part of Bourke Shire. Located along the Mitchell Highway, with air and rail links to Sydney (410 miles [660 km] southeast), Bourke serves a large section of outback (inland rural areas) that supports sheep raising and irrigated citrus fruit and fodder farming. An important wool-shipping point, the town has meatworks and a wool-scouring plant. The stockade, Fort Bourke, is preserved by the Royal Australian Historical Society. Pop. (1981) 3,326.

Bourke FAMILY: *see* Burgh Family.

Bourke, Richard Southwell: *see* Mayo, Richard Southwell Bourke, 6th earl of.

Bourke, Ulick de: *see* Clanricarde, Ulick de Burgh, marquess and 5th earl of.

Bourke-White, Margaret (b. June 14, 1906, New York City—d. Aug. 27, 1971, Stamford, Conn., U.S.), American photographer, important as one of the innovators of the photo-essay in the field of photojournalism.

"South African Miners," by Margaret Bourke-White
Margaret Bourke-White, *Life* © Time Inc.

During her youth she had intended to become a biologist, but a brief study of photographic composition in college persuaded her to become a photographer. She began her professional career as an industrial and architectural photographer in 1927. She soon gained a reputation for originality. In 1929, the publisher Henry Luce hired her for his new *Fortune* magazine.

While photographing the Krupp Iron Works in Germany and the First Five-Year Plan in the Soviet Union, she developed her personal photojournalistic style. She became one of the first four staff photographers for *Life* magazine when it began publication in 1936, and her photograph of Fort Peck Dam appeared on the cover of the first issue of that periodical.

With the outbreak of World War II, Bourke-White covered the war for *Life* and was the first woman photographer attached to the U.S. armed forces. Crossing the Atlantic to North Africa, her transport ship was torpedoed and sunk, but she survived to cover the bitter daily struggle of the Allied infantrymen in the Italian campaign. She then covered the siege of Moscow. Toward the end of the war, she crossed the Rhine River into Germany with the American troops. Her photographs of the emaciated inmates of concentration camps and of the corpses in gas chambers stunned the world.

After World War II, Bourke-White traveled to India to photograph Mahatma Gandhi. She also recorded the migration of millions of persons caused by the division of the Indian subcontinent into Hindu India and Muslim Pakistan. During the Korean War, as a war correspondent with South Korean troops, she penetrated deeply into Communist territory and covered the fierce fighting there.

In 1952 Bourke-White was stricken with Parkinson's disease. Subsequently, much of her time was devoted to writing, but she also continued to photograph. Two of her last photo-essays were on the Jesuits in America and on the United States as viewed from the air.

Bourke-White's photographs were published in numerous books, the best-known of which are *You Have Seen Their Faces,* a study of rural poverty in the American South (co-authored with her second husband, Erskine Caldwell; 1937); *Shooting the Russian War* (1942); *Halfway to Freedom: A Study of the New India* (1949); and *Purple Heart Valley* (1944). She retired from *Life* magazine in 1969. Vicki Goldberg's biography *Margaret Bourke-White* was published in 1986.

Bourmont, Louis-Auguste-Victor, comte de Ghaisnes de (count of Ghaisnes of) (b. Sept. 2, 1773, château de Bourmont, Fr.—d. Oct. 27, 1846, château de Bourmont), French soldier and politician, conqueror of Algiers (1830), for which he received the title of marshal of France.

Bourmont entered the French Guard (1788) but fled the French Revolution to join the royalist forces in 1792. Three years later he was a leading figure in the royalist revolt in the Vendée in western France. By 1800 Bourmont had made his peace with Napoleon Bonaparte, only to be arrested for his alleged participation in a royalist plot (1800). He escaped to Portugal (1804), where three years later he joined French invading forces and returned to France. He served Napoleon with distinction in the Italian and Russian campaigns (1810–12) and at the battles of Lützen (1813) and Nogent (1814). He was promoted to brigade general and awarded the Legion of Honour. On the eve of the Battle of Waterloo (June 1815), however, he deserted to the Prussians, rejoining the royalist cause.

Bourmont, lithograph by Fonrouge, 19th century
By courtesy of the Bibliotheque Nationale, Paris

He served the restored Louis XVIII (reigned 1814–24) in the French expedition to suppress an uprising in Spain (1823). Six years later he was appointed minister of war in the tottering government of the ultra-rightist prince of Polignac. In Algeria in 1830, Bourmont's speedy conquest earned him a marshal's baton. Refusing to support the "Citizen King" Louis-Philippe, he became implicated in the plots of the Duchesse de Berry (1832) and went into exile in Portugal. There—as always on the side of absolutism—he aided Dom Miguel in the civil war of 1833–34. After the victory of the constitutional forces, he retired to Rome. He later returned under the amnesty of 1840 to France, where he remained a staunch supporter of the Bourbon pretender Henri, comte de Chambord.

Bourne, resort town (township), Barnstable County, southeastern Massachusetts, U.S., between Cape Cod and Buzzards Bay, at the base of the Cape Cod Peninsula. It comprises several villages, including Buzzards Bay, Cataumet,

Monument Beach, Pocasset, Sagamore, and Bournedale. Settled about 1640 as a part of Sandwich and named Monument, it was separately incorporated in 1884 and renamed for Jonathan Bourne, a local whale-oil tycoon. The town is crossed by the Cape Cod Canal (17 miles [28 km] long and bridged), which was built in 1909–14 and improved (1927) as part of the Atlantic Intracoastal Waterway. Freight-car manufacturing thrived until 1935. Tourism, dairying, and cranberry farming are now the main sources of income. The Massachusetts Maritime Academy (founded 1891 at Buzzards Bay) and the nearby Otis Air Force Base are economic assets.

Points of interest include a replica of the Aptucxet Indian Trading Post (established 1627 by members of the Plymouth Colony), Indian Burial Hill (site of the colony's first Indian meetinghouse), and Gray Gables Inn (the summer retreat of President Grover Cleveland). Pop. (1986 est.) 15,084.

Bourne, Francis (b. March 23, 1861, Clapham, London—d. Jan. 1, 1935, Westminster), cardinal, archbishop of Westminster who was a strong leader of Roman Catholics, pursuing, despite adverse criticism, policies he considered right for church and state.

Francis Bourne
The Mansell Collection

Educated at St. Sulpice, Paris, and Louvain University, Bourne was ordained in 1884 and was appointed (1889) rector of St. John's Seminary, Wonersh, Surrey. In 1895 he became a monsignor and in 1896 coadjutor bishop of Southwark. He was made archbishop of Westminster in 1903 and became prominent when, in 1908, the Blessed Sacrament procession he had planned through the streets during the Eucharistic Congress was banned for fear of disturbances; he opposed the ban by having the benediction given from the loggia of the cathedral.

After becoming cardinal in 1911, his influence grew. He championed the rights of the Arabs in Palestine, upheld Roman Catholic claims in education, condemned violence in Ireland, denounced the general strike, reproved the modernists, and was lukewarm toward the Malines conversations on interfaith problems inaugurated by Cardinal Mercier, Lord Halifax, and other Anglicans. He took a strong interest in university education, preferring that Roman Catholics attend the national universities rather than attempt to set up schools of their own and that they join existing political parties rather than form a Roman Catholic party. E.J. Oldmeadow's two-volume *Francis, Cardinal Bourne* appeared in 1940 and 1944.

Bourne, Geoffrey (Howard) (b. Nov. 17, 1909, Perth, Western Australia—d. July 19, 1988, New York City), Australian-born American anatomist whose studies of the mammalian adrenal gland made him a pioneer in the chemistry of cells and tissues (histochemistry).

Bourne was educated at the University of Oxford (D.Sc., 1935; Ph.D., 1943), where he was a demonstrator in physiology from 1941 to 1947. From 1947 to 1957 he served as reader in histology at the University of London. He was chairman of the anatomy department at Emory University, Atlanta, Ga. (1957–62). He became a naturalized U.S. citizen in 1962. From 1962 to 1978 he served as director of the Yerkes Regional Primate Research Center, Atlanta. In 1978 he became the vice chancellor and professor of nutrition at St. George's University School of Medicine, Grenada, West Indies.

Using the mammalian adrenal gland, Bourne developed (1933) the first histochemical technique for demonstrating the presence of vitamin C (ascorbic acid) in animal tissue. Later, he studied wound healing and the localization of enzymes in hard and soft tissues. Among his more important books are *Structure and Function of Muscle* (1962) and *Biochemistry and Physiology of Bone* (1956). His works on primatology include *Ape People* (1970), *Primate Odyssey* (1974), and *The Gentle Giants: The Gorilla Story* (1975).

Bourne, Randolph Silliman (b. May 30, 1886, Bloomfield, N.J., U.S.—d. Dec. 22, 1918, New York City), American literary critic and essayist whose polemical articles made him a spokesman for the young radicals who came of age on the eve of World War I.

Bourne was disfigured at birth by the attending physician's forceps, and an attack of spinal tuberculosis at age four left him stunted and hunchbacked. He held a variety of odd jobs before winning a scholarship (at age 23) to Columbia University, from which he was graduated with an M.A. in 1913. That same year his *Youth and Life* appeared—essays affirming his belief that the youth of his day would sweep away much that was antiquated and unworthy in American life.

After a year in Europe, resulting in 1914 in "Impressions of Europe: 1913–14," he turned his attention to the progressive education theories of the pragmatist philosopher John Dewey, who had been his teacher at Columbia. The outcome was two books: *The Gary Schools* (1916) and *Education and Living* (1917).

Bourne had been a steady contributor to the liberal weekly *The New Republic* since its inception in 1914, but after the American government entered the war the magazine found his pacifist views unpalatable. He signaled his attack on the liberal support for the war in "The War and the Intellectuals" in the June 1917 issue of *Seven Arts,* a magazine whose antiwar articles—often by Bourne—led to its suppression in September of that year.

Bourne's early death was brought on by influenza during the influenza epidemic of 1918–19. At his death he left incomplete a lengthy analysis of the modern state, built around his theory that war was the health of the state. Two posthumous volumes of essays appeared: *Untimely Papers* (1919), made up largely of his antiwar articles, and *The History of a Literary Radical and Other Essays* (1920), which contains a fragment of an unfinished autobiographical novel.

Bournemouth, district and seaside resort, county of Dorset, England, on the English Channel. It has an area of 17 square miles (46 square km).

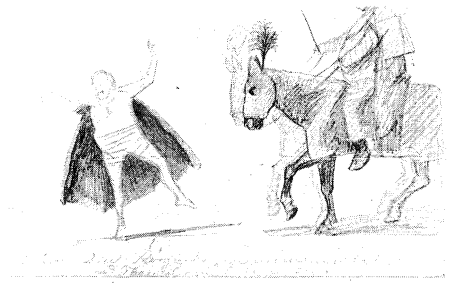
The borough dates from the erection of a summer residence there by a Dorset squire, Lewis Tregonwell, after 1810. In 1841 there were still only 26 buildings, but thereafter Bournemouth grew rapidly, especially after the coming of the railway (1870). Piped water supply made possible large-scale residential development of the well-drained but agriculturally inferior pinewoods and sandy heaths that front the cliff coast east of Poole Harbour. The heaths are dissected by small, steep-sided river valleys, or chines. One of these small streams, the Bourne, now enters the sea through ornamental gardens on the site of the first pier (1860). The main shopping and entertainment centre, with assembly halls and theatres, has grown near the river mouth.

The pleasant climate of southern England, with notably mild winters, not only lengthens the summer tourist season and attracts winter visitors but also favours Bournemouth as a town of retired people. The beaches extend from Alum Chine to Hengistbury Head, and extensive residential areas, with distinct local shopping centres, lie behind the seafront. Inland sites of light industries have added to the economy of what is still predominantly a resort and residential town. It has also become one of England's main conference and convention centres. Pop. (1986 est.) 152,200.

bournonite, sulfosalt mineral, a lead, copper, and antimony sulfide ($PbCuSbS_3$), that occurs as heavy, dark crystal aggregates and masses with a metallic lustre in association with other sulfur-containing minerals in many locations, including the Harz Mountains, East and West Germany; a number of localities in Italy; Bolivia; Peru; Ontario, Canada; and the western United States. Its crystals have orthorhombic symmetry. For detailed physical properties, *see* sulfosalt (table).

Bournonville, August (b. Aug. 21, 1805, Copenhagen—d. Nov. 30, 1879, Copenhagen), dancer and choreographer who directed the Royal Danish Ballet for nearly 50 years and established the Danish style based on bravura dancing and expressive mime.

He studied under his father, Antoine Bournonville, one of the major dancers of his day, before going to Paris for further training under Auguste Vestris and Pierre Gardel. After



Caricature on Bournonville's intention to dance in front of Bertel Thorvaldsen's funeral procession, March 1844, drawing by Conrad Weidemann
Courtesy of the Theatre Museum, Christiansborg Castle, Copenhagen

appearances at the Paris Opéra and in London, Bournonville returned to Copenhagen as soloist and choreographer for the Royal Danish Ballet. In 1836 he staged his own version of *La Sylphide,* a ballet by Filippo Taglioni, with his pupil and protégée, Lucile Grahn, in the title role. Many of Bournonville's more important ballets were based on observations he made while on tour. *Napoli* (1842), for example, was inspired by a trip to Italy; *Bruges* (1851) revealed his interest in Flemish art of the 17th century; *Wedding in Hardanger* (1853) was inspired by visits to Norway; and *From Siberia to Moscow* (1876), his last ballet, was the result of a trip to Russia. Ballets set in Spain (*The Toreador, La Ventana*), Austria (*In the Carpathians*), and the Orient (*Abdallah*) and imagined dances from around the world (*Far From Denmark*) were matched by those that celebrated Denmark (*Valdemar,* sometimes referred to as the Danish national ballet, and *A Folk Tale* among them). His *Konservatoriet* (1849) is the only surviving ballet to show classical dance exercises as practiced in the classroom in the early 19th century.

A strong dancer with excellent elevation and an accomplished mime, he emphasized these qualities in his ballets. His choreographic style also reflected the pre-Romantic approach of his teacher Vestris. Many of his ballets have remained in the repertoire of the Royal Danish Ballet for more than a century. Bournonville also directed the Swedish Royal Opera at Stockholm (1861–64) and staged several of his works in Vienna (1855–56). In 1877, after his return to Denmark, he retired and was knighted.

In 1979, on the occasion of the 100th anniversary of Bournonville's death, the Royal Danish Ballet presented a week-long Bournonville Festival in Copenhagen that included performances of all of his existing ballets, lecture-demonstration programs, art exhibits, special publications, and open classes and rehearsals of Bournonville ballets and techniques. This was attended by dance writers, Bournonville scholars, and ballet followers from many parts of the world.

bourrée, French folk dance with many varieties, characteristically danced with quick, skipping steps. The dancers occasionally wear wooden clogs to emphasize the sounds made by their feet. Notably associated with Auvergne, bourrées are also danced elsewhere in

Bourrée, engraving by Johann Georg Puschner, from G. Lambranzi's *Theatralisches Tanzschule,* 1716

By courtesy of the Victoria and Albert Museum, London

France and in Vizcaya, Spain. Michael Praetorius mentions the bourrée in his musical compendium *Syntagma musicum* in 1615.

Stylized bourrées in $\frac{2}{4}$ or $\frac{4}{4}$ time (folk bourrées also occur in $\frac{3}{8}$ time) have been composed as abstract musical pieces since the mid-16th century. In such 17th-century suites as those of Bach and Handel the bourrée often appears as one of the *galanteries,* or optional movements.

The bourrée was among the dances from which ballet derived its early steps. The *pas de bourrée* ("bourrée step") has been variously elaborated; it is usually a small, quick step executed in preparation for a larger step. *Pas de bourrée couru* ("running bourrée") is a smooth run on the toes, with the feet close together (first or fifth positions).

Bourrienne, Louis-Antoine Fauvelet de (b. July 9, 1769, Sens, Fr.—d. Feb. 7, 1834, Caen), French diplomat and one-time secretary to Napoleon Bonaparte. His *Mémoires* provide a colourful but not very reliable commentary on the First Empire.

Bourrienne claimed to have been a friend of the future emperor at the military school of Brienne. In the early 1790s he served the Revolutionary government as a diplomat in Germany. He was called to Italy by Napoleon in the negotiations with Austria (May–October 1797) and helped with the drafting of the Treaty of Campo Formio. In 1804 he was sent to Hamburg to conduct French commercial war measures against Britain. He amassed a large fortune in his questionable trade dealings in that post and was recalled in disgrace (1813). During Napoleon's return from exile (March 1815), he supported the Bourbon cause and the restoration of Louis XVIII (July 1815). Subsequently, he served as councillor and minister of state and in the Chamber of Deputies. He wrote a prose drama, *L'Inconnu* (1792; "The Unknown"), and in 1829–31 his more famous *Mémoires,* of which an English translation by Col. R.W. Phipps appeared in 1892.

Boursault, Edme (b. October 1638, Mussy l'Évêque, Fr.—d. Sept. 15, 1701, Paris), French man of letters, active in the literary world of mid-17th-century Paris.

Boursault first went to Paris at the age of 13 and was brought up by the poet Des Barreaux. He composed light verse that appeared in the collection *Délices de la poésie galante* (1663) and plays, many of which became highly successful. The first was *Le Portrait du peintre ou la contre-critique de l'école des femmes* (1663), an attack on Molière, who was provoked to reply in his play *L'Impromptu de Versailles.*

In 1667 he published a reply to Boileau's celebrated *Satires* with a *Satire des satires;* this was later recast as a play, the public performance of which seems to have been prevented by Boileau.

Boursault also wrote novels, including some pseudo-historical works, and his *Lettres* went into several editions; he also kept a diary in verse in which he recorded the daily and often trivial events of the Parisian literary and social scene.

Bourse: *see* stock exchange.

Boursiquot, Dionysius Lardner (dramatist): *see* Boucicault, Dion.

Bousoño, Carlos (b. May 9, 1923, Boal, Spain), Spanish poet and critic, a leading theorist of Hispanic literature.

He studied literature and philosophy in Madrid and in 1945 published his first volume of poetry, *Subida al amor* ("Ascent to Love"), which deals with struggles for religious faith. His second book, *Primavera de la muerte* (1946; "Springtime of Death"), takes up themes of death and love and the value of life. In 1946 Bousoño went to Mexico and then to the United States to teach literature at Wellesley College (Massachusetts). In 1948 he returned to Spain and took a doctorate at the University of Madrid, where he taught courses on poetry. Thereafter he combined writing and teaching.

His later works include *Noche del sentido* (1956; "Night of Feeling"), which brings together romantic views and religious ideas, *Invasión de la realidad* (1962; "Invasion of Reality"), and *Oda en la ceniza* (1967; "Ode to the Ashes"). In an introduction to an anthology of his poems (*Antologia Poetica*) published in 1976, he discussed his poetic concern with the splendour and the emptiness that the world offers.

From an early age he found a mentor in the poet Vicente Aleixandre, who won the Nobel Prize for Literature in 1977. In 1950 Bousoño published *La poesía de Vicente Aleixandre.* Bousoño's *Teoría de la expresión poética* (1952, rev. ed. 1966; "Theory of Poetic Expression") analyzes poetic devices and seeks general rules and a scientific basis for the study of poetry. It is his major critical work and received the Spanish Academy's Fastenrath Prize. He wrote books on irrationalism (*El irracionalismo poético,* 1977), Surrealism (*Superrealismo poético y simbolización,* 1979), and Romanticism (*Epocas literarias y evolución,* 1981) as part of his comprehensive study of poetry.

Boussac, Marcel (b. April 17, 1889, Châteauroux, Fr.—d. March 21, 1980, Paris), French industrialist and textile manufacturer whose introduction of colour into clothing ended the "black look" in France.

The second son of a dry-goods dealer and clothing manufacturer, at 18 he took over the family business. In 1910 he set up his cotton works in the textile quarter of Paris. This became the nerve centre of an immense business called Les Établissements Boussac, which served as its own banker and insurance broker.

In 1915 he created the airplane cloth (*toile d'avion*) industry and rebought all the government stocks of this cloth in 1918. Between World Wars I and II he established his Toile d'Avion chain of retail shops. In 1947 he also opened the fashionable couturier House of Dior. Boussac also manufactured electrical home appliances and acquired the Paris daily paper *L'Aurore.*

In 1978, however, the Boussac economic empire collapsed as creditors closed in and the French government refused to subsidize his operations further, to cancel a $20 million debt, or to allow him to transform his horse-grazing lands near Notre Dame into a housing development. He then sold out to the French conglomerate of Agache-Willot for $175,000,000. He died at his château near Paris.

Bousset, Wilhelm (b. Sept. 3, 1865, Lübeck—d. March 8, 1920, Giessen, Ger.), New Testament scholar and theologian, professor successively at the universities of Göttingen and Giessen, and co-founder of the so-called Religiousgeschichtliche Schule (history of religions school) of biblical study. His many publications include works on New Testament textual criticism, Gnosticism, and the early church. His principal works were *Die Religion des Judentums im neutestamentlichen (späthellenistischen) Zeitalter* (1903; "The Religion of the Jews in the New Testament [late Hellenistic] Era") and *Kyrios Christos* (1913; "Lord Christ").

Boussingault, Jean-Baptiste (b. Feb. 2, 1802, Paris—d. May 12, 1887, Paris), French agricultural chemist who helped identify the basic scheme of the biological nitrogen cycle when he demonstrated that plants do not absorb the element from air but from the soil in the form of nitrates.

A director of French mining explorations in South America, Boussingault became professor of chemistry at the University of Lyon, Fr., and professor of agricultural chemistry at the Conservatory of Arts and Crafts, Paris (1839–87). After finding that nitrogen is essential to plants and animals, he disproved the belief that plants absorb the element from the atmosphere and proved that plants derive carbon from atmospheric carbon dioxide. He also conducted valuable studies of the nitrogen content of different foods, the amount of gluten in different wheats, the functions of plant leaves, the action and value of manures, and the properties of steel alloys. Boussingault's major work was *Agronomie, chimie agricole, et physiologie* (1860–74; "Agronomy, Agricultural Chemistry, and Physiology").

Boutens, Pieter Cornelis (b. Feb. 20, 1870, Middelburg, Neth.—d. March 14, 1943, The Hague), Dutch poet, mystic, and classical scholar who evolved a very personal and sometimes esoteric style and influenced a number of other poets.

Boutens studied classical languages at Utrecht and established himself at The Hague as a private tutor and man of letters. His mysticism, or divine revelation, was achieved by linking the soul with the spirit of immortal beauty through complete introspection, or contemplation of the exclusively inner life. The immense spiritual solitude he came to ex-

Boutens, engraving after a photograph, 1914
By courtesy of the Gemeente Archief, The Hague

perience is exquisitely expressed in the poem "Ik sloot de blinkevenstren van mijn ziel" ("I Closed the Shining Windows of My Soul"), from *Verzen* (1898).

Boutens' later volumes, from *Stemmen* (1907; "Voices") to *Lentemaan* (1916; "Spring Moon"), symbolically treated the themes of solitude, pain, and death with a mastery of form and rhythm. His popular *Beatrijs* (1908), a narrative poem of childlike simplicity, tells of a nun who went to her lover "from May to May" but always returned to continue the life of the spirit. Boutens also was noted for his translations from Homer, Sophocles, Goethe, and others.

Bouterwek, Friedrich (b. April 15, 1766, Oker, near Hanover, Hannover—d. Aug. 9, 1828, Göttingen), German philosopher and

Bouterwek
By courtesy of the University Library, Gottingen, W.Ger.

critic of aesthetics and literature who, after embracing the philosophical school of Immanuel Kant, later criticized it while using its analytic method; he also deeply influenced German and Italian Idealism (the view that reality is essentially the embodiment of ideas).

After studying law at the University of Göttingen, Bouterwek became an exponent of Kantian philosophy, expressing it in *Aphorismen, den Freunden der Vernunftkritik nach kantischer Lehre vorgelegt* (1793; "Aphorisms, to Friends of the Critique of Reason According to Kantian Doctrine"). Appointed professor of philosophy at the University of Göttingen in 1797, he composed *Ideen zu einer allegemeinen Apodiktik* (1799; "Ideas for a General Apodictic"), a more important Kantian mode delineating ideas of philosophical certainty.

Dissatisfied, however, with the formalism of Kant's doctrine, he attacked Kantian logic for producing only hypothetical conclusions. Inclining to the views of Friedrich Heinrich Jacobi (1743–1819), Bouterwek argued that philosophical certainty is based exclusively on the unique reality of man's insight into ultimate being.

Bouterwek's aesthetic philosophy was also affected by his revision of Kantianism. For him beauty was a pre-analytic intuition that based standards for aesthetic judgment on a single, transcendent Beauty resembling a "mystical Idea." Influenced further by the aesthetics of Jean Paul, he viewed poetry as the theoretical basis for all the arts.

Bouterwek's principal writings, embodying his philosophical development, include *Geschichte der neueren Poesie und Beredsamkeit,* 12 vol. (1801–19; "The History of Modern Poetry and Rhetoric"); *Religion und Vernunft* (1824; "Religion and Reason"), which explains his moderate rationalism as distinct from Kant's; *Lehrbuch der philosophischen Wissenschaften* (1813; "Principles of Philosophical Research"); and *Kleine Schriften* (1818; "Brief Writings"), of value for its biographical data.

Bouteville, François-Henri de Montmorency-: *see* Luxembourg, François-Henri de Montmorency-Bouteville, duc de.

Bouthillier, Léon: *see* Chavigny et de Buzançais, Léon Bouthillier, comte de.

boutonneuse fever, French FIÈVRE BOUTONNEUSE, or FIÈVRE EXANTHÉMATIQUE, a mild, typhus-like fever caused by *Rickettsia conorii* and transmitted by ticks, occurring in most of the Mediterranean countries and the Crimea. Available evidence suggests that the diseases described as Kenya typhus and South African tick-bite fever are probably identical with boutonneuse fever although conveyed by a different species of tick.

Primarily, the carrier was found to be a brown dog tick, *Rhipicephalus sanguineus;* subsequently, other ticks were incriminated. The reservoir probably exists in nature in the lower animals, but the dog is apparently an important source of infection. The course of the disease is somewhat similar to Rocky Mountain spotted fever, but it is milder. The case fatality rate is less than 3 percent. A primary lesion, called a *tâche noire* ("black spot"), is frequently found at the site of the infecting tick bite and, therefore, may be found on any part of the body, but it is usually on a part covered by clothing. Experimental evidence has suggested that both chloramphenicol (chloromycetin) and tetracyclines would be effective in the treatment of boutonneuse fever. *See also* Rocky Mountain spotted fever.

Bouts, Dirck, Dirck also spelled DIERICK, DIRK, DIERIC, or THIERRY (b. *c.* 1400, Haarlem, Holland—d. May 6, 1475, Louvain, Brabant), 15th-century painter of the northern Netherlands who, while falling short of the grace of expression and intellectual depth of his two great Flemish contemporaries, Rogier van der Weyden and Jan van Eyck, was an accomplished and sincere master.

"The Lamentation over Christ," panel painting by Dirck Bouts; in the Louvre, Paris
Cliche Musees Nationaux, Paris

Little is known of Bouts's early years in Haarlem, although it is possible that he studied in Brussels with van der Weyden, whose influence is obvious in his early works. In 1448 he visited Louvain in the southern Netherlands, where he married the daughter of a local merchant. After 1457 his name appeared almost every year in the archives of Louvain. Bouts's earlier works, dated on stylistic evidence before 1457, are strongly Rogierian in their expression of strong emotion through symbolic gestures. Passionate subjects such as "The Entombment" (National Gallery, London), "Pietà" (Louvre, Paris), and scenes of the Crucifixion, descent from the Cross, and the Resurrection depicted in an impressive triptych in the Capilla Real in Granada, Spain, were appropriate vehicles for this expression. They lack Rogier's anatomical correctness, however, and his compositions appear stiff and angular; these differences are perhaps as much due to the sober religious intensity of the northern Netherlands in comparison with the more relaxed spirit of Flanders as to a deficiency in skill or feeling. The overall design of Bouts's early works shows the influence of the elegant and intellectual van Eyck.

In the paintings ascribed to Bouts's mature period after he settled in Louvain, van der Weyden's influence gives way to a greater severity and dignity in the treatment of figures; there is a shift toward grander, more allegorical subjects as well. The facial expressions of the figures in these paintings show an extraordinary restraint that appears as a deliberately controlled intensity with great spiritual effect. Bouts's two best known works, which exemplify all of these characteristics of his mature style, belong to the last 20 years of his life. One, ordered by the Confraternity of the Holy Sacrament for the church of St. Peter in Louvain in 1464, is a triptych, the wings of which are divided into two smaller panels, one above the other. The central panel represents the Last Supper, and on the wings are shown four scenes from the Old Testament foreshadowing the institution of the Eucharist: the "Feast of the Passover," "Elijah in the Desert," the "Gathering of Manna," and "Abraham and Melchisedek." The second painting, commissioned by the city of Louvain in 1468, the year in which Bouts became official painter to the city, was to be an ambitious project on the theme of the Last Judgment, but the work remained uncompleted at Bouts's death. Panels representing heaven and hell survive (Musée des Beaux-Arts, Lille, Fr.), as well as two thematically related panels illustrating an episode from the legend of the Holy Roman emperor Otto III (Musées Royaux des Beaux-Arts, Brussels).

bouts-rimés (French: "rhymed line endings"), the literary game of making verses from a list of rhyming words supplied by another person. The game, which requires that the rhymes follow a given order and that the result make a modicum of sense, is said to have been invented by the minor French poet Dulot in the early 17th century. Its wide popularity inspired at least one notable tour de force, an extended satirical poem by the French poet Sarasin, entitled "Dulot Vanquished, or the Defeat of bouts-rimés" (1654). The fad was revived in the 19th century when Alexandre Dumas (*père*) invited French poets and versifiers to try their skill with given sets of rhymes and published the results in 1865.

In 19th-century England, John Keats is said to have produced his charming poem "On the Grasshopper and Cricket" (1816) in a bouts-rimés competition with his friend Leigh Hunt. Dante Gabriel Rossetti (1828–82) and

his brother William tested their ingenuity and improved their rhyming facility by filling in verses from bouts-rimés. Most of William's poems in the Pre-Raphaelite magazine *The Germ* were bouts-rimés experiments.

Boutwell, George Sewall (b. Jan. 28, 1818, Brookline, Mass., U.S.—d. Feb. 27, 1905, Groton, Mass.), leading Radical Republican during the U.S. Civil War and Reconstruction era.

As a young man in Massachusetts, Boutwell worked as a clerk while teaching himself law. He wrote and lectured on political issues and from 1842 to 1850 represented Groton in the state legislature as a Democrat.

In 1851 a coalition of antislavery Democrats (of which Boutwell was a leader) and Free Soilers elected Boutwell governor of Massachusetts. The same political combination reelected him the following year. But Boutwell found it impossible to remain a Democrat as the antislavery controversy intensified during the 1850s. In 1855 he helped organize the Republican Party in Massachusetts, and in 1860 he supported Abraham Lincoln's bid for the presidency.

In 1862 Boutwell became the first federal commissioner of internal revenue. After a year of capable administration of the new branch of government, he won a seat in the U.S. House of Representatives. From 1863 to 1869 he occupied a leadership position among the Radical Republicans in the House. He served on the Joint Committee on Reconstruction, and he helped frame and pass the Fourteenth and Fifteenth Amendments.

Among the most vehement critics of Pres. Andrew Johnson's Reconstruction policies, Boutwell led in the movement for Johnson's impeachment in 1867. Two years later, Pres. Ulysses S. Grant named him secretary of the treasury, a position he held until 1873.

From 1873 to 1877, Boutwell was a U.S. senator. Then, during Rutherford B. Hayes's administration, the President appointed him to prepare a new codification of the statutes of the United States; the *Revised Statutes of the United States* (1878) was the result. By 1880 Boutwell was in private law practice in Massachusetts, specializing in questions of international law. During the final decade of his long life, he wrote three of his most notable books: *The Constitution of the United States at the End of the First Century* (1895), *The Crisis of the Republic* (1900), and *Reminiscences of Sixty Years in Public Affairs* (1902).

Bouvard, Alexis (b. June 27, 1767, Contamines, Fr.—d. June 7, 1843, Paris), astronomer and director of the Paris Observatory, who is noted for discovering eight comets and writing *Tables astronomiques* of Jupiter and Saturn (1808) and of Uranus (1821). Bouvard's tables accurately predicted orbital locations of Jupiter and Saturn, but his tables for Uranus failed, leading him to hypothesize that irregularities in Uranus' motion were caused by the influence of an unknown celestial body. In 1846, three years after Bouvard's death, his hypothesis was confirmed by the discovery of Neptune by John Couch Adams and Urbain-Jean-Joseph Le Verrier. Bouvard was elected to the Académie des Sciences in 1803 and the Royal Society in 1826.

Bouvardia, genus of about 30 species of evergreen shrubs or herbs of the madder family (Rubiaceae, *q.v.*), mostly natives of tropical America. Some species are forced in greenhouses.

The large, showy flowers are usually red, white, or yellow. They are sold by florists in colder climates.

Bouvet Island, Norwegian BOUVETØYA, islet of the South Atlantic Ocean, about 1,500 mi (2,400 km) southwest of the Cape of Good Hope, and about 1,000 mi north of the mainland of Antarctica. It is rocky, with ice cliffs surrounding the coast; landing is extremely difficult. Bouvet Island was discovered in 1739 by the French navigator Jean-Baptiste-Charles Bouvet de Lozier (1705–86), for whom it is named. It was rediscovered by a German expedition in 1898, which determined its geographic coordinates but was not able to land. The island, 22.6 sq mi (58.5 sq km) in area, rises to 3,068 ft (935 m) above sea level and is uninhabited. The Norwegian flag was first hoisted over the island in December 1927; it was annexed to Norway by royal decree of Feb. 27, 1930.

Bouvier des Flandres, cattle-driving dog noted for its working ability. The breed originated in southwestern Flanders and the northern hills of France. It served as an ambulance dog and messenger in World War I. In Belgium it must win a prize in police work or as a guard or army dog before it can gain the title of champion. The Bouvier des Flandres is characterized by a rugged appearance and compact build. It has a thick, wiry, tousled-looking coat and may be brown, black,

Bouvier des Flandres
Walter Chandoha

gray, mixed gray and white (salt-and-pepper), or brindle. It stands 23 to 28 inches (58 to 70 centimetres) and weighs 60 to 70 pounds (27 to 32 kilograms).

Bouvines, Battle of (July 27, 1214), decisive victory for the French king Philip II Augustus over an international coalition of the Holy Roman emperor Otto IV, King John of England, and the French vassals—Ferdinand (Ferrand) of Portugal, count of Flanders, and Renaud (Raynald) of Dammartin, count of Boulogne. The victory enhanced the power and the prestige of the French monarchy in France and in the rest of Europe.

The leaders of the coalition had planned for King John to land with his forces in western France, to stir up revolts in Aquitaine and Anjou, and then to march on Paris, while the imperial forces and those of the counts of Flanders and Boulogne advanced on Paris from the north. The plan failed when John was defeated at La Roche-aux-Moines, near Angers, on July 2, 1214; Philip was then able to take the offensive in the north. A decisive battle was fought in the marshy plain between Bouvines (Bouvignies) and Tournai in Flanders. The furious contest ended in a clear French victory: Renaud and Ferdinand were taken prisoner, though Otto managed to escape.

As a result of the two battles, Philip Augustus was confirmed in possession of most of the former English lands in France; King John, by losing them, faced the growing opposition of his barons; and, in Germany, Otto IV's power weakened considerably.

bouzouki, also spelled BUZUKI, long-necked string instrument of Greece, introduced by the Turks and closely related to the *tanbūr,* a lute of Afghanistan. Resembling a mandolin, the bouzouki is fretted, with metal strings arranged in three or four double courses. The bouzouki is traditionally used for dancing and entertainment at social gatherings, although the music is usually nostalgic or melancholy.

Bovenwindse Eilanden (Dutch: Windward Islands), three Dutch islands of Saba, Sint Eustatius, and the southern half of Sint Maarten, among the windward group of the Lesser Antilles, situated in the northeastern rim of the Caribbean among what the British and French call the Leeward Islands. The islands, however, are hundreds of miles to windward of the Dutch Leeward (Benedenwindse) Islands, and some hundred miles north of the British Windwards. The combined area of the Bovenwindse is 26 sq mi (68 sq km). Together with the three Benedenwindse Eilanden, they constitute the Netherlands Antilles (*q.v.*), an integral part of The Netherlands. Pop. (1981 est.) 17,114.

Boveri, Theodor Heinrich (b. Oct. 12, 1862, Bamberg, Bavaria—d. Oct. 15, 1915, Würzburg, Ger.), German cytologist whose work with roundworm eggs proved that chromosomes are separate, continuous entities within the nucleus of a cell.

Boveri received an M.D. degree (1885) from the University of Munich and from 1885 until 1893 was engaged in cytological research at the Zoological Institute in Munich. In 1885 he began a series of studies on chromosomes. His first major report (1887) described the development of an unfertilized egg, including the formation of polar bodies (small cells that result from the division of an unfertilized egg). Later he described finger-shaped lobes that appeared in the nuclei of eggs of the roundworm *Ascaris* during early cleavage stages. These structures, he decided, were chromosomes, previously believed to be part of the nucleus and present only during nuclear division. Boveri's third report proved the theory—introduced by Belgian cytologist Edouard van Beneden—that the ovum (egg cell) and sperm cell contribute equal numbers of chromosomes to the new cell created during fertilization.

Later, Boveri introduced the term centrosome and demonstrated that this structure is the division centre for a dividing egg cell. He also proved that a single chromosome is responsible for particular hereditary traits and demonstrated the importance of cytoplasm by showing that chromosomes are influenced by the cytoplasm surrounding the nucleus. In 1893 he was appointed professor at the University of Würzburg.

Bovet, Daniel (b. March 23, 1907, Neuchâtel, Switz.), pharmacologist who received the 1957 Nobel Prize for Physiology or Medicine for his discoveries of certain chemotherapeutic agents.

In 1944 Bovet discovered pyrilamine (me-

Bovet
By courtesy of the World Health Organization

pyramine), the first antihistamine, which, in counteracting the effect of histamine, is effective against allergic reactions. In 1947 a search for a synthetic substitute for curare (a muscle relaxant, used as a poison by South American Indians) led to his discovery of gallamine and other muscle relaxants. Among these are derivatives of succinylcholine, whose curare-like action he was the first to recognize. Curare and its synthetic substitutes are used in conjunction with light anesthesia during surgery to induce muscle relaxation.

Bovet studied in Geneva, graduating with a doctorate in science in 1929. He went to the Pasteur Institute in Paris and became head of the therapeutic chemistry laboratory in 1937. Ten years later he was invited to establish a laboratory of chemotherapeutics at the Istituto Superiore di Sanità in Rome. In 1964 he became professor of pharmacology at the University of Sassari, Italy. He served as the head of the psychobiology and psychopharmacology laboratory of the National Research Council (Rome) from 1969 until 1971, when he became professor of psychobiology at the University of Rome.

bovid, any member of the family Bovidae, hoofed mammals of the order Artiodactyla, including cattle, antelope, sheep, and goats. Bovids are cud-chewing, grazing, or browsing animals found in a variety of habitats, such as mountains, forests, swamps, plains, and deserts, in both the Old and New Worlds. Some live alone or in small bands, but many associate in large herds. Bovids may be graceful (antelope), stocky (cattle), or lightly built (goats). They range from a shoulder height of about 25 centimetres (10 inches) in the royal antelope (*Neotragus pygmaeus*) to about 2 metres (6½ feet) in the bison (*Bison bison*). Horns are present—sometimes in males only but often in both sexes. Depending on the species, the female bears one to five young; gestation ranges from 4 to 11 months.

The family Bovidae includes about 45 genera and 110 species. Some, such as the domestic cattle, sheep, and goats, are of considerable economic value to man. Others, such as the bighorn and some antelope, are hunted for food, sport, horns, or hides.

For further information on bovid species and groups, *see* antelope; banteng; bison; bongo; buffalo; bushbuck; cattle; eland; gaur; goat; kudu; nilgai; nyala; sitatunga; yak; Damaliscus; gnu; hartebeest; Kobus; oryx; reedbuck; roan antelope; sable antelope; bighorn; chamois; ibex; markhor; mouflon; mountain goat; musk ox; ox; saiga; tahr; takin.

bovine infectious keratoconjunctivitis, also called PINKEYE, or INFECTIOUS KERATITIS, an inflammation of the conjunctiva or the cornea of the eye in cattle as the result of an infection; early viral involvement is suspected. *Moraxella bovis* is usually found in discharge from the affected eye; other bacteria, such as *Staphylococcus* and *Corynebacterium,* are also often present. Ultraviolet rays from the sun may play a role in the inflammation; face flies may transmit the disease. Diseased beef cattle lose weight, and dairy cattle may produce as much as 25 percent less milk.

bovine typhus, contagious: *see* rinderpest.

bow, in music, curved stick with rosined horsehair stretched between the ends, used to produce sound by friction in stringed instruments of the rebec, viol, and violin groups. Since the 16th century the tension of the hair has been controlled by means of a "frog" (nut) at the end of the bow held by the player.

In non-European and folk bows and in European bows before the late 18th century, the stick curves away from the hair. In the modern bow, established by François Tourte of France (1747–1835), the curve is toward the hair.

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Bow, Clara (b. July 29, 1905, Brooklyn, N.Y., U.S.—d. Sept. 27, 1965, Los Angeles), U.S. motion-picture actress called the "It girl" after she played in *It* (1927), the enormously popular film version of Elinor Glyn's novel of that name. She personified the vivacious, emancipated flapper of the 1920s. From 1927 to 1930 she was one of the top five Hollywood box-office attractions.

Clara Bow
Brown Brothers

Born into a poor family, Bow entered a beauty contest at 17 and won. Among the prizes were a screen test and a brief appearance in the film *Beyond the Rainbow* (1922). Within three years she was a successful actress, usually playing manicurists, waitresses, usherettes, or salesgirls in such films as *Mantrap* (1926), *Down to the Sea in Ships* (1922), *Kid Boots* (1926), and *Dancing Mothers* (1926).

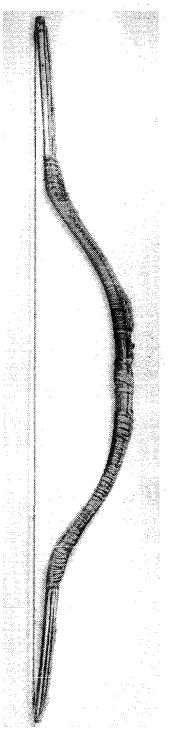
She was chosen by Elinor Glyn to star in *It.* A tremendous box-office success, the film was followed by others such as *Rough House Rosie* (1927), *Red Hair* (1928), *Three Weekends* (1928), *The Saturday Night Kid* (1929), *Call Her Savage* (1932), and *Hoopla* (1933).

Clara Bow's poor transition to sound (she had a marked Brooklyn accent), combined with a series of highly publicized personal scandals, contributed to her declining popularity. She retired completely from films after 1933.

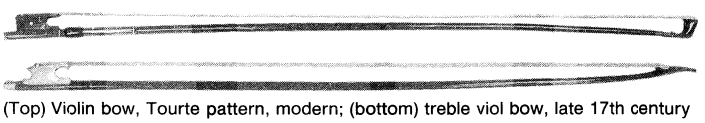
bow and arrow, prehistoric missile system, one of the oldest weapons on Earth, whose origins are lost in Paleolithic times. The bow consists of a stave, usually of wood, bent and held in tension by a string. The arrow is usually a wooden shaft tipped by a stone or metal head and has a feathered tail. The arrow is fitted to the string by a notch in the end of the shaft and is drawn back until sufficient tension is produced in the bow so that when released it will propel the arrow. The earliest arrowheads were of flint.

The bow served as a primary military weapon from Egyptian times through the Middle Ages in the Mediterranean world and Europe and for an even longer period in China and Japan. In the climax of the *Odyssey,* Odysseus' prowess with the bow is decisive in his combat with Penelope's suitors. In the Old Testament, Ahab's death is the result of an enemy arrow that "struck the king of Israel between the joints of harness." The armoured infantry of Greece and Rome generally disdained the bow but were nevertheless often beset by skillful enemy archers, especially those mounted on horseback. But it was principally the development of the crossbow (*q.v.*), which had been known in ancient times but was perfected in the Middle Ages, and the English longbow, introduced to European battlefields in the 14th century, that made the arrow a formidable battlefield missile. The equally powerful composite Turkish bow, used by the Janissaries, also had a significant impact on warfare in the late Middle Ages. All three of these weapons were far more effective in their day than existing handwielded weapons.

For many cultures, the bow's importance in warfare has been secondary to its value as a hunting weapon. The North American Indians, the Eskimo, many African peoples, and others used either the regular bow or the crossbow in both hunting and war. Some ancient Japanese wooden bows are 8 feet (2.44 metres) in length; the Japanese also made smaller bows of horn or whalebone. Japanese bows and quivers (for holding the arrows) were often elaborately decorated and signed by the craftsman. The natives of the Andaman Islands, between the Andaman Sea and the Bay of Bengal, produced very large and broad bows. African bow makers generally produced small bows, partly because ranges in the African jungle were usually short. The Eskimo used composite bows of wood and bone backed by sinew, similar to most bows made in Asia. The American Indians' bows were made either of wood or of wood backed by sinew. Bows have also been made of compositions of several materials, such as wood and horn or wood and metal. Cable and pulleys on the modern compound bow increase accuracy and power. Many sport hunters prefer the bow to firearms; others hunt with both weapons.



Eskimo bow made of wood reinforced with plaited sinew; in the Tower of London
By courtesy of the Ministry of Works (Tower of London, Armouries), Crown copyright reserved



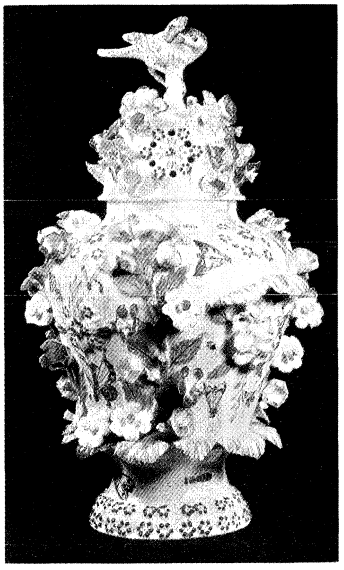
(Top) Violin bow, Tourte pattern, modern; (bottom) treble viol bow, late 17th century
Eric Halfpenny

The string, too, may be made of a variety of materials, the requisite being toughness. Bowstrings have exhibited an enormous range of variation in materials. The English longbow of the Middle Ages usually had a string of linen or hemp, but Turkish and Arab bows were strung with silk and mohair. Rattan, bamboo, vegetable fibre, and animal sinew or hide have served in many parts of the world.

Arrows have exhibited even greater variations. Usually the shaft is a single piece, but often two different materials, such as wood and metal, are combined; the arrowhead—of metal, stone, bone, or shell—may be affixed by socketing, cementing, or both. Fletches of feathers or of substitutes (leaf, pieces of leather or fur) are nearly always used to stabilize the arrow in flight; arrows with heavy foreshafts, however, may be unfeathered. *See also* archery.

bow lute (musical instrument): *see* pluriarc.

Bow porcelain, English soft-paste porcelain made at a factory in Stratford-le-Bow, Essex, from about 1744 to 1776. From 1750 bone ash, or calcined bones, in considerable proportions was used in Bow porcelain, an invention of Thomas Frye, a gifted Irish engraver who, with his partner, Edward Heylyn, had founded the factory.

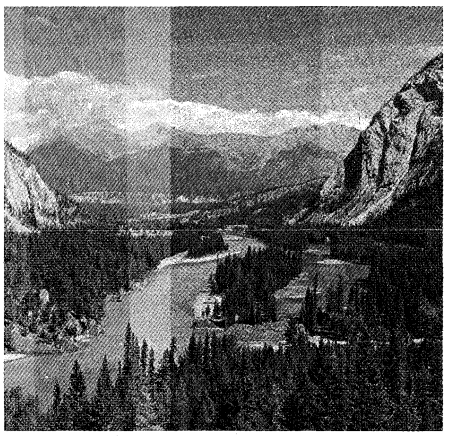


Bow soft-paste porcelain vase with applied and enamelled ornament designed by the French modeller Tebo (also Thibout or Thibaud) after Meissen ware, *c.* 1760; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

The Bow factory expanded rapidly, and over some 30 years the total output was enormous. Bow porcelain varies considerably in appearance and quality; a soft, creamy-white tone with a smooth glaze is perhaps its best achievement. Bow at first imitated Chinese blue-and-white and Japanese polychrome porcelain, in rivalry with East India Company imports, some of the designs being free adaptations that continued to be used for most of the factory's tableware. Underglaze blue and overglaze colours, brilliant at first and softening by the mid-1750s, were used, followed by a general trend to heavily gilded, elaborate, richly coloured patterns. Unpainted tableware also was made, in imitation of Chinese blanc de chine, which is ornamented with prunus blossoms in relief. About 1755, Bow tablewares were among the first English porcelain to be ornamented with transfer-printed decorations, many from the copperplates of Simon-François Ravenet and Robert Hancock. Bow produced figures in great quantity, some of considerable originality—for example, those representing statesmen, generals, and, in particular, actors and actresses in favourite roles. Bird and animal models, some copied from Chelsea or Meissen, were produced—all in the old Rococo idiom. The fact that the old Rococo style was superseded elsewhere by the Louis XVI style probably helped to bring about the end of Bow in 1776.

Bow River, river in southern Alberta, Canada, the main headstream of the South



The Bow River, near its source in the Canadian Rockies, Alberta

Malak, Ottawa

Saskatchewan River. It rises in the Canadian Rockies of Banff National Park at the foot of Mt. Gordon and flows from the glacial Bow Lake southeastward for 328 mi (528 km). It joins the Oldman River 37 mi west of Medicine Hat and thus forms the South Saskatchewan River. The river was so named because the Cree Indians made bows from Douglas firs that grew along its banks. It was explored by the North West Company early in the 19th century. The Bow is important for hydroelectric power and irrigation, with the Bassano and Ghosts dams serving Calgary, the largest settlement in its valley. Bow Valley Provincial Park (2,309 ac [934 ha]) lies at the junction of the Bow and Kananaskis rivers, 50 mi west of Calgary.

bow wave, progressive disturbance propagated through a fluid such as water or air as the result of displacement by the foremost point of an object moving through it. Viewed from above, the crest of the bow wave of a moving ship is V-shaped; the sharpness of the V is determined by the relative speeds of the ship and of the propagation of waves in the water. *See also* wave motion.

Bowdich, Thomas Edward (b. June 20, 1791, Bristol, Gloucestershire, Eng.—d. Jan. 10, 1824, Bathurst, Gambia), British traveller and scientific writer who in 1817 completed peace negotiations with the kingdom of Ashanti (now in Ghana) on behalf of the African Company of Merchants. This achievement aided in the extension of British influence as well as in the annexation of the Gold Coast Colony. Returning to England (1818), Bowdich published *The Mission from Cape Coast Castle to Ashantee* (1819), the earliest European account of Ashanti at the height of its splendour; the work is still considered a classic in the field. On his return his criticism of the practices of the African Company led the British government to abolish the company and to take over administration of the Gold Coast (1821). He then studied at Paris (1820–22), where he was associated with Georges Cuvier, Alexander von Humboldt, and other scholars, and published geographic and other scientific works, some illustrated by his wife. He died of malaria soon after arriving at Bathurst to undertake a trigonometric survey of the Gambia region. Bowdich's books include *An Essay on the Geography of North-Western Africa* (1821) and *An Essay on the Superstitions, Customs and Arts, Common to the Ancient Egyptians, Abyssinians, and Ashantees* (1821).

Bowdich, engraving by Thomson after a painting by William Derby

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Bowditch, Nathaniel (b. March 26, 1773, Salem, Mass., U.S.—d. March 16, 1838, Boston), self-educated American mathematician and astronomer, author of the best book on navigation of his time, and discoverer of the Bowditch curves, which have important applications in astronomy and physics.

Between 1795 and 1799 Bowditch made four lengthy sea voyages, and in 1802 he was put in command of a merchant vessel. Throughout that period he pursued his interest in mathematics. After investigating the accuracy of *The Practical Navigator*, a work by the Englishman J.H. Moore, he produced a revised edition in 1799. His additions became so numerous that in 1802 he published *The New American Practical Navigator*, based on Moore's book, which was adopted by the U.S. Department of the Navy and went through some 60 editions.

Bowditch also wrote many scientific papers, one of which, on the motion of a pendulum swinging simultaneously about two axes at right angles, described the so-called Bowditch curves (better known as the Lissajous figures, after the man who later studied them in detail). By 1818 he had translated from the French and updated the first four volumes of Pierre-Simon Laplace's monumental work on the gravitation of heavenly bodies, *Traité de mécanique céleste* (published 1829–39), more than doubling its size with his own commentaries.

Bowditch refused professorships at several universities. He was president (1804–23) of the Essex Fire and Marine Insurance Company of Salem and worked as an actuary (1823–38) for the Massachusetts Hospital Life Insurance Company of Boston. From 1829 until his death he was president of the American Academy of Arts and Sciences.

Bowditch curve (geometry): *see* Lissajous figure.

Bowdler, Thomas (b. July 11, 1754, Ashley, near Bath, Somerset, Eng.—d. Feb. 24, 1825, Rhydding, near Swansea, Glamorganshire, Wales), English doctor of medicine, philanthropist, and man of letters, known for his *Family Shakspeare* (1818), in which, by expurgation and paraphrase, he aimed to provide an edition of the plays suitable for a father to read aloud to his family without fear of offending their susceptibilities or corrupting their minds. Bowdler sought to preserve all Shakespeare's "beauties" without the "blemishes" introduced (he supposed) to please a licentious age. The first edition, the title of which was spelled *The Family Shakespeare* (1807), contained a selection of 20 plays that

probably were expurgated by Bowdler's sister, Harriet.

Although criticized for tampering with Shakespeare's text, Bowdler deserves a certain amount of credit for making the plays well known to a wide audience. The word bowdlerize, current by 1838 as a synonym for expurgate and now used in a pejorative sense, remains his most lasting memorial.

Bowdoin, James (b. Aug. 7, 1726, Boston—d. Nov. 6, 1790, Boston), political leader in Massachusetts during the era of the American Revolution (1775–83) and founder and first president of the American Academy of Arts and Sciences (1780).

Bowdoin, detail of a portrait by Robert Feke, 1748; in the Bowdoin College Museum of Art, Brunswick, Maine

By courtesy of the Bowdoin College Museum of Art, Brunswick, Maine

Bowdoin graduated from Harvard in 1745. A merchant by profession, he was president of the constitutional convention of Massachusetts (1779–80) and a member of the state convention to ratify the federal Constitution (1788). As governor of Massachusetts (1785–87), he took prompt action to suppress Shays's Rebellion (an uprising among poor and heavily taxed farmers) and was, in general, a stabilizing force in the critical postwar period.

Bowdoin was also a scientist prominent in physics and astronomy. He wrote several papers, including one on electricity with Benjamin Franklin. Bowdoin College, Brunswick, Maine, was named in his honour.

bowel movement (physiology): *see* defecation.

Bowell, Sir Mackenzie (b. Dec. 27, 1823, Rickinghall, Suffolk, Eng.—d. Dec. 10, 1917, Belleville, Ont., Can.), publisher, political leader, and prime minister of the Dominion of Canada (1894–96).

At age 10 Bowell moved with his parents to Belleville, Ont., where he became a printer's apprentice at a local newspaper—the *Intelligencer*—which he came, eventually, to own. He joined the Orange Association of British America and was its grand master for many years. In 1867 he was elected to the Canadian House of Commons from North Hastings as a Conservative and served until 1892. Bowell was a cabinet minister in three governments (for customs, militia, and trade and commerce, successively) before he was chosen prime minister and formed his own government in 1894. He was knighted in 1895.

Serious questions arose within his own administration before long, and in early 1896 half of his ministers resigned en masse. Thereupon he resigned; after the Conservatives were defeated he remained in the Senate as opposition leader until his retirement in 1906.

Bowen, town and port, northeastern Queensland, Australia, on Port Denison, an inlet of the Coral Sea on the Edgecumbe Bay. In 1859, Capt. H.D. Sinclair was commissioned by the government of New South Wales to locate a new harbour in the area. Before a settlement could be established there, an independent Queensland was created, and the town was named after the first governor, Sir George Ferguson Bowen. Proclaimed a shire in 1863, it remained the region's principal port until overshadowed by Townsville, 100 mi (160 km) northwest. On the Bruce Highway and a rail line to Brisbane (600 mi southeast), Bowen serves a hinterland growing tomatoes and tropical fruits and possessing deposits of copper, silver, and graphite. Its industries include coke and salt manufacture. Meat from works at Merinda (west) and coal from Collinsville (60 mi south) are shipped from the port. Pop. (1981) 7,663.

Bowen, Catherine (Shober), *née* DRINKER (b. Jan. 1, 1897, Haverford, Pa., U.S.—d. Nov. 1, 1973, Haverford), American historical biographer known for her partly fictionalized biographies. After attending the Peabody Institute and the Juilliard School of Music, she became interested in writing. Not surprisingly, her earliest works were inspired by the lives of musicians.

Her biography of the Elizabethan jurist Sir Edward Coke, *The Lion and The Throne* (1957), won her the National Book Award in 1958. Her many other books include *Beloved Friend* (1937), about the relationship of Tchaikovsky and Nadezhda von Meck; *Yankee from Olympus; Justice Holmes and His Family* (1944); *John Adams and the American Revolution* (1950); and *Miracle at Philadelphia: The Story of the Constitutional Convention, May to September 1787* (1966).

Bowen, Elizabeth (Dorothea Cole) (b. June 7, 1899, Dublin—d. Feb. 22, 1973, London), British novelist and short-story writer who employed a finely wrought prose style in fictions frequently detailing uneasy and unfulfilling relationships among the upper middle class. *The Death of the Heart* (1938), the title of one of her most highly praised novels, might have served for most of them.

Bowen was born of the Anglo-Irish gentry and spent her early childhood in Dublin, as related in her autobiographical fragment *Seven Winters* (1942), and at the family house she later inherited at Kildorrery, County Cork. The history of the house is recounted in *Bowen's Court* (1942), and it is the scene of her

Elizabeth Bowen

By courtesy of Elizabeth Bowen; photograph, Jonathan Cape Ltd.

novel *The Last September* (1929), which takes place during the troubles that preceded Irish independence. When she was 7, her father suffered a mental illness, and she departed for England with her mother, who died when Elizabeth was 12. An only child, she lived with relatives on the Kentish coast.

With a little money that enabled her to live independently in London and to winter in Italy, Bowen began writing short stories at 20. Her first collection, *Encounters,* appeared in 1923. It was followed in 1927 by *The Hotel,* which contains a typical Bowen heroine—a girl attempting to cope with a life for which she is unprepared. *The Last September* (1929) is an autumnal picture of the Anglo-Irish gentry. *The House in Paris,* another of Bowen's highly praised novels, was published in 1935.

During World War II, Bowen worked for the Ministry of Information in London and served as an air raid warden. Her novel set in wartime London, *The Heat of the Day* (1949), is among her most significant works. The war also forms the basis for one of her collections of short stories, *The Demon Lover* (1945; U.S. title, *Ivy Gripped the Steps,* 1946). Her essays appear in *Collected Impressions* (1950) and *Afterthought* (1962). Bowen's last book, *Pictures and Conversations* (1975), is an introspective, partly autobiographical collection of essays and articles.

Bowen, I(ra) S(prague) (b. Dec. 21, 1898, Seneca Falls, N.Y., U.S.—d. Feb. 6, 1973, Los Angeles), American astrophysicist whose explanation of the strong green emission from nebulae (clouds of rarefied gas) led to major advances in the study of celestial composition. Such emission, unlike that characteristic of any known element, had previously been attributed to a hypothetical element, "nebulium." Bowen showed, however, that the emission was identical with that calculated to be produced by ionized oxygen and nitrogen under extremely low pressure.

I.S. Bowen, 1948

By courtesy of the California Institute of Technology, Pasadena

He joined the faculty of the California Institute of Technology, Pasadena, in 1926, where he became a full professor in 1931. In 1946 he became director of the Mt. Wilson Observatory and served as director of the Hale Observatories, which comprise Mt. Wilson and Palomar Mountain observatories, from 1948 until 1964. In 1938 Bowen invented the image slicer, a device that improves the efficiency of the slit spectrograph, which is used to break up light into its component colours for study.

Bowen retired as observatory director in 1964, becoming a distinguished-service staff member. His awards include the Bruce Medal of the Astronomical Society of the Pacific (1957) and the Gold Medal of the Royal Astronomical Society (1966).

Bowen, Norman L(evi) (b. June 21, 1887, Kingston, Ont., Can.—d. Sept. 11, 1956, Washington, D.C.), Canadian petrologist and mineral chemist, widely recognized for his syntheses of silicate systems as they relate to the origin of igneous rocks.

Bowen was the son of W.A. Bowen, who had emigrated to Canada from London. Educated at Queen's University, Kingston, he specialized in chemistry, mineralogy, and geology. When he won an 1851 International Exhibition Scholarship, he proceeded to the Massachusetts Institute of Technology, Cambridge. He spent a year (1910–11) at the Geophysical Laboratory of the Carnegie Institution of Washington, D.C., undertaking experimental studies of a mineral group (a silicate system, nepheline–anorthite), which studies formed part of a thesis submitted for his Ph.D. degree at the institute in 1912. In all, Bowen spent six summers in the field during his university career (1907–12), working in Canada for the Ontario Bureau of Mines and for the Geological Survey of Canada in

British Columbia along the Canadian Pacific Railway.

After completing his doctorate, Bowen returned to the Geophysical Laboratory in Washington. The nature of the work at the laboratory enabled him to avoid having to make an outright choice between geology and chemistry. By 1915 he had executed a group of experimental studies that proved to be critically important to petrology and formed the basis of his critical review *The Later Stages of the Evolution of the Igneous Rocks* (1915), a paper of such outstanding merit that it established Bowen's position at the age of 28 as an international figure in petrology.

The United States' entry into World War I in 1917 deflected Bowen's researches into the study of optical glass, which had become a research priority, and he worked for a time in the glass plant of the Bausch and Lomb Optical Company.

After the war ended, Bowen resigned from the Geophysical Laboratory to return briefly to Queen's University, as professor of mineralogy (1919), but after two years he returned again to the laboratory in Washington. There he remained for 16 years, broadening his attack on silicate systems. His researches carried great weight when he applied his experimental physicochemical data to field petrological problems. To this end he diligently visited classical localities relating to problems of igneous rocks: the Bushveld of South Africa, the alkalic lavas of East Africa, and the peridotites of Skye and the Fen area of Norway. Quiet and retiring in disposition, Bowen was perfectly suited to a lifetime of work in a research institution; he enjoyed the sheltered environment such an institution offered.

In the spring of 1927, Bowen delivered a course of lectures to advanced students in geology at Princeton University, the substance of which was published in 1928 as *The Evolution of the Igneous Rocks.* In this vigorous presentation, Bowen provided a survey and a synthesis that have exerted a profound influence on petrologic thought. Later Bowen collaborated extensively with J.F. Schairer, a young and able experimenter who had joined the laboratory from Yale University. Together they worked on silicate systems containing iron oxide, beginning with ferric oxide and later ferrous oxide.

Bowen made a second and more extended break from the Geophysical Laboratory when he was attracted to fill the Charles L. Hutchinson Distinguished Service Professorship of petrology at the University of Chicago, where he remained from 1937 to 1947. He rapidly developed a school of experimental petrology there and produced a succession of papers by his pupils that dealt with equilibrium studies of alkali systems. Bowen himself presented a synthesis of these results in their bearing on the origin and differentiation of alkaline rocks (1945).

After World War II, Bowen was induced to return once more to the Geophysical Laboratory in 1947 to cooperate in research on mineral systems embracing volatiles, particularly water. This work culminated in studies (published in 1958), with O.F. Tuttle as a collaborator, on the granite system.

Bowen's association with the Geophysical Laboratory extended, in all, more than 35 years, and his long and splendid record was recognized by the award of honours from learned societies in the United States and Europe.

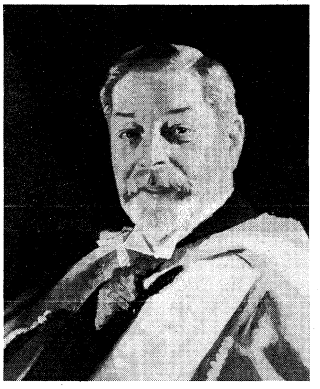
After his retirement in 1952, he moved to Clearwater, Fla., but a year later returned to Washington. Despite poor health, he was still active and had an office in the Geophysical Laboratory as research associate until his death. (C.E.T.)

BIBLIOGRAPHY. C.E. Tilley, "Norman Levi Bowen," *Biogr. Mem. Fellows R. Soc.*, 3:7–22 (1957).

Bowenia, a genus of two species of Australian ornamental cycads, evergreen perennial plants of the family Cycadaceae. Each is tuberous in form, with a subterranean stem resembling a gigantic carrot, 20 to 30 centimetres (8 to 12 inches) long. The leaves are bipinnate (split into feather-like barbs, or segments, that are again divided).

Bower, Frederick Orpen (b. Nov. 4, 1855, Ripon, Yorkshire, Eng.—d. April 11, 1948, Ripon), English botanist whose study of primitive land plants, especially the ferns, contributed greatly to a modern emphasis on the study of the origins and evolutionary development of these plants. He is best known for his interpolation theory of the evolutionary development of the vegetative, or asexual, sporophyte generation at the expense of an alternate reproductive, or sexual, gametophyte generation.

Bower postulated that a regular pattern of alternation of generations was established independently in primitive land plants through the evolutionary development, or interpolation, of the sporophyte from the zygote following fusion of gametes (sex cells). He believed that land plants developed through the progressive sterilization in the sporophyte of all but a few potential spores to form vegetative cells characteristic of an independent plant.



Frederick Orpen Bower, detail of an oil painting by Sir William Orpen; in the University of Glasgow Art Collections

By courtesy of the University of Glasgow, University Art Collections

The precise algal origin of land plants has yet to be ascertained, but questions raised by Bower's work, summarized in his classic *The Origin of a Land Flora* (1908), have done much to coordinate paleobotany and plant morphology in a widespread study of plant evolution.

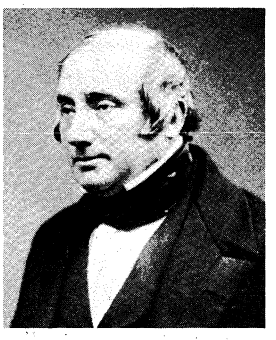
A student of the German botanists Julius von Sachs at the University of Würzburg (1877–78) and Anton de Bary at the University of Strasbourg (now in France; 1879), Bower was associated with the British biologist Thomas Huxley as an assistant and instructor of botany at the University of London (1880–85). He spent most of his career as professor of botany at the University of Glasgow (1885–1925). He also wrote *The Ferns* (3 vol., 1923–28), *Size and Form in Plants* (1930), and *Primitive Land Plants* (1935).

Bower, Walter (b. 1385, Haddington, Lothian, Scot.—d. 1449), author of the *Scotichronicon*, the first connected history of Scotland, which expands and continues the work of John of Fordun. Begun in 1441, it was finished in 1447, the last date it mentions. In addition to Fordun, Bower relied upon the chronicles of Andrew of Wyntoun. First printed in 1722 from late-15th-century manuscripts, the *Scotichronicon* exists in several copies, that at Corpus Christi College, Cambridge, being apparently the author's manuscript. It was edited and translated by W.F. Skene in his *Historians of Scotland*, vol. 1 and 4 (1871–72).

Bower probably entered the church at St. Andrews and became abbot of Inchcolm, an island in the Firth of Forth, in 1417, after which he was named in papal and royal records, notably as an unsuccessful claimant of the abbacy of Holyrood (1420), an opponent of peace with England (1432), and an auditor for Parliament.

Bowerbank, James Scott (b. July 14, 1797, London—d. March 8, 1877, London), British naturalist and paleontologist best known for his studies of British sponges.

Bowerbank devoted much time to the study of natural history while running a family business, Bowerbank and Company, distillers, in which he was an active partner until 1847.



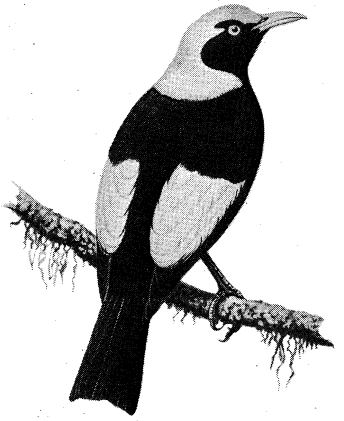
Bowerbank

BBC Hulton Picture Library

He lectured on botany (1822–24) and human osteology (1831) and founded, with six others, the London Clay Club (1836). In 1847 he founded the Paleontographical Society as an instrument for publication of undescribed British fossils. His most important publications are *A History of the Fossil Fruits and Seeds of the London Clay* (1840), a standard work, and *Monograph of the British Spongiadae* (4 vol., 1864–82).

bowerbird, family name PTILONORHYNCHIDAE, any of 17 bird species (order Passeriformes) of Australia, New Guinea, and nearby islands that build more or less elaborate structures on the ground. Some are called catbirds, gardeners, and stagemakers. The male builds the bower, and he displays and sings loudly in or above it; females visit him there and lay their eggs in simple nests some distance away. The bowers, beset with all kinds of shiny and coloured objects, are of three kinds:

The "mat," or "platform," type consists of a thick pad of plant material, ringed or hung about with objects, made by Archbold's bowerbird (*Archboldia papuensis*). The stagemaker, or tooth-billed catbird (*Scenopoeetes*



Regent bowerbird (*Sericulus chrysocephalus*)

Painting by Albert E. Gilbert

dentirostris), of forests of northeastern Australia, arranges leaves silvery-side up (withered ones are carried aside) to form a "circus ring."

The "maypole" type consists of a tower of twigs erected around one or more saplings in a cleared court. The golden bowerbird (*Prionodura newtoniana*) makes a rooflike bridge from tower to tower. Male gardeners, any of the four species of the genus *Amblyornis,* plant a lawn of tree moss around the maypole and embellish it with flowers, berries, and other objects. The brown, or crestless, gardener (*A. inornatus*), lacking the orangish crown of the other species, makes the fanciest garden and a hut big enough to resemble a child's playhouse.

The "avenue" type consists of two close-set parallel walls of sticks, interwoven and sometimes overarching, on a circular mat of twigs. Avenues are made by the satin bowerbird (*Ptilonorhynchus violaceus*); the regent bowerbird (*Sericulus chrysocephalus*) and its relatives; and the spotted bowerbird (*Chlamydera maculata*) and its relatives. Satin and regent bowerbirds make a paint of vegetable pulp, charcoal, and saliva and apply it to the interior walls; a daub of green leaves may be used—a rare instance of a bird using a tool.

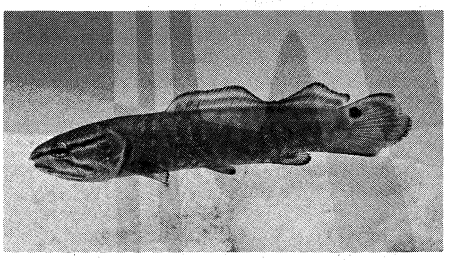
Bowery, the, street and section of Lower Manhattan, New York City, U.S., extending diagonally from Chatham Square to the intersection of Fourth Avenue and Eighth Street. It follows a trail used by the Indians in their skirmishes with the Dutch, which later became the road leading to Gov. Peter Stuyvesant's *bouwerie* ("farm"). The street was named the Bowery in 1807. The city's theatre life once centred there (1860–75), but by the 1880s the Bowery had degenerated into a skid-row area of cheap cafés, flophouses, saloons, dance halls, and pawnshops, patronized by ne'er-do-wells and derelicts. The district's sordid reputation was widely publicized after 1892 by the popular Percy Gaunt-Charles Hoyt song "The Bowery, the Bowery!" with its final refrain "I'll never go there anymore."

Bowes, Edward, byname MAJOR BOWES (b. June 14, 1874, San Francisco—d. June 14, 1946, Rumson, N.J., U.S.), pioneer American radio personality who was instrumental in launching many prominent entertainment careers on his variety radio program, the "Original Amateur Hour." The show was presented from 1935 until the Major's death in 1946 by the National Broadcasting Company (NBC). It gave aspiring performers—singers, comedians, impersonators, and others—a chance to perform for a nationwide radio audience. Contestants were chosen in advance of their appearances by traveling amateur shows that crisscrossed America looking for outstanding talent.

Bowes's father died when the boy was six years old, and young Bowes worked as he could to augment the family income. After leaving grammar school he worked as an office boy and then went into the real estate business. Major Bowes (the title traces to an obscurely documented army reserve commission) entered one partnership owning theatres in New York and Boston, and then entered another to construct the Capitol Theatre in New York City. There in 1926, as a promotional device for the theatre, he launched the "Major Bowes Capitol Family," a forerunner of the famous and long-running "Amateur Hour." Artists introduced on the Major's radio show included the comedian Bob Hope and the singer Frank Sinatra, who was appearing with a group called the Hoboken Four. After Bowes died, the program was revived for television with the title "The Ted Mack Original Amateur Hour."

Bowes-Lyon, Elizabeth Angela Marguerite (queen consort of George VI of Great Britain): *see* Elizabeth.

bowfin, also called GRINDLE, MUDFISH, or DOGFISH (*Amia calva*), freshwater fish of the order Amiiformes (superorder Holostei); it is the only living representative of its family (Amiidae), which dates back to the Jurassic Period (beginning about 180,000,000 years ago). The bowfin is a voracious fish found in sluggish North American waters from the Great Lakes southward to the Gulf of Mexico.



Young bowfin (*Amia calva*)
Miami Seaquarium

The bowfin is mottled green and brown and has a long dorsal fin and strong conical teeth. The female reaches a length of 75 centimetres (30 inches); the smaller male is distinguished by a black tail spot circled with orange. The bowfin spawns in spring. The male constructs a crude nest among vegetation and guards both the fertilized eggs and the newly hatched young.

Bowie, James, byname JIM BOWIE (b. 1796?, Logan County, Ky., U.S.—d. March 6, 1836, San Antonio, Texas), popular hero of the Texas Revolution (1835–36) who is mainly remembered for his part in the Battle of the Alamo (February–March 1836).

Jim Bowie, portrait by an unknown artist; in the Capitol Building, Austin, Texas
By courtesy of the Library of Congress, Washington, D.C.

Bowie migrated with his parents to Missouri (1800) and then to Louisiana (1802). At 18 he left home, clearing land and sawing timber for a living. Later he reportedly engaged in the slave trade with his brothers John and Rezin. With the latter he also bought and improved a sugar plantation in Louisiana, where he served for a time in the state legislature and spent much time in New Orleans society.

After he reportedly killed a man in a duel, Bowie went to Texas about 1828, where at Bexar (now San Antonio) he became friendly with the Mexican vice governor, Juan Martín de Veramendi. He assumed Mexican citizenship, acquired land grants, and married Veramendi's daughter, Ursula (1831). He was one of thousands of U.S. settlers and adventurers who swelled the non-Mexican population in Texas, and restrictive Mexican legislation to curb the newcomers soon interested him in the Texas revolutionary movement. As a colonel in the Texas army, he fought with distinction in several battles and finally joined Col. William B. Travis in the gallant defense of the Alamo, an abandoned mission house in San Antonio. Already confined to his cot by illness, Bowie was killed with the other defenders against overwhelming Mexican forces.

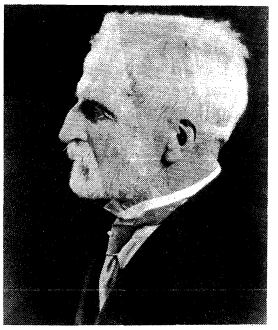
Bowie's daring and courage have become legendary through Western song and ballad. His name is also associated with the Bowie knife, a weapon (sometimes called the "Arkansas toothpick") invented by either him or his brother Rezin.

Bowie, William (b. May 6, 1872, Annapolis Junction, Md., U.S.—d. Aug. 28, 1940, Washington, D.C.), American geodesist who investigated isostasy, a principle that rationalizes the tendency of dense crustal rocks to cause topographic depressions and of light crustal rocks to cause topographic elevations.

Bowie was educated at Trinity College, Hartford, Conn. (B.S., 1893), and at Lehigh University, Bethlehem, Pa. In 1895 he joined the U.S. Coast and Geodetic Survey; he served as chief of the Division of Geodesy from 1915 to 1937. Bowie instituted systematic observations of gravity anomalies on land and encouraged gravity surveys in the oceans. These observations showed that the anomalies correlated with topographic features and validated isostasy as a geologic phenomenon. With John F. Hayford, his predecessor at the Coast and Geodetic Survey, he computed tables of the depth of isostatic compensation (the surface above which the weight of the crust per unit area is equalized). Bowie felt that this zone would occur at a uniform depth as predicted by John Henry Pratt, rather than at the varying depth predicted by Sir George Airy. His book *Isostasy* was published in 1927.

Bowker, Richard Rogers (b. Sept. 4, 1848, Salem, Mass., U.S.—d. Nov. 12, 1933, Stockbridge, Mass.), editor and publisher who was important in the development of U.S. professional library standards.

Bowker graduated from the City College of the City of New York and became literary editor of the *New York Evening Mail* and later of the *New York Tribune.* He founded the R.R. Bowker Company, which specialized in the publication of bibliographical materials. He was instrumental in organizing the American Library Association in 1876 and in founding the *Library Journal,* which he edited for more than 50 years; he also edited or published the *Annual Library Index,* the *American Catalog,* and *Publishers Weekly.* As a champion of au-



Bowker
By courtesy of the American Library Association

thors' rights Bowker became a noted authority on copyright and wrote two books on copyright history, literature, and law. He organized the earliest list of state documents and other important bibliographies and also wrote books on business, politics, education, religion, and economics.

A proponent of civil service reform, Bowker drafted the first national civil service reform plank. He also helped form the Independent Republican, or "Mugwump," movement in 1879.

Bowles, Chester (Bliss) (b. April 5, 1901, Springfield, Mass., U.S.—d. May 25, 1986, Sussex, Conn.), American advertising entrepreneur, public official, and noted liberal politician.

After graduating from Yale University in 1924, Bowles worked for a year as a reporter and then took a job in 1925 as an advertising copywriter. With William Benton he established the successful advertising company of Benton and Bowles in 1929, selling his multimillion-dollar interest in it in 1941, when he took a position in the state wartime rationing administration under the governor of Connecticut. He became that state's director of price administration and in the autumn of 1943 was appointed general manager of the Federal Price Administration by President Franklin D. Roosevelt. He then served under President Harry S. Truman as director of the Office of Economic Stabilization from February to July 1946. In 1946 he failed to win the Democratic nomination for governor of Connecticut. He was an American delegate to the first conference of the United Nations Educational, Scientific, and Cultural Organization and later served as a special assistant to the UN secretary-general in 1947–48.

Bowles was elected governor of Connecticut in 1948, but his liberal stands on civil rights and other issues caused him to be defeated for reelection in 1950. In 1951 he was appointed ambassador to India and Nepal by President Truman and served until 1953, when he was elected to the House of Representatives from Connecticut. He served three terms, and in 1961 President John F. Kennedy appointed him undersecretary of state. In 1963 he was reappointed ambassador to India, holding the post until 1969. His publications include *The New Dimensions of Peace* (1955), *Africa's Challenge to America* (1956), *The Coming Political Breakthrough* (1959), *The Conscience of a Liberal* (1962), and *Promises to Keep: My Years in Public Life* (1971).

Bowles, William Lisle (b. Sept. 24, 1762, Kings Sutton, Northamptonshire, Eng.—d. April 7, 1850, Salisbury, Wiltshire), English poet, critic, and clergyman, noted for his *Fourteen Sonnets* (1789), which expresses with simple sincerity the thoughts and feelings inspired in a mind of delicate sensibility by the contemplation of natural scenes.

Bowles was educated at Trinity College, Oxford, and became an Anglican priest in 1792. His *Fourteen Sonnets* was enthusiastically received by the early Romantic poets, whose theory and practice it foreshadowed, and the work particularly influenced Samuel Taylor Coleridge. Once its impact had been made, however, it took its place as a minor work of some talent but lacking the sustained inspiration and strength of great poetry.

As a critic, Bowles is remembered for his assertion that natural objects and basic passions are intrinsically more poetic than are artificial products or mannered feelings. This attitude may have influenced Bowles's annotated 1806 edition of the works of Alexander Pope, in which, under a mask of judicial impartiality, Bowles attacked the great poet's moral character and poetic principles. So began the pamphlet war known as the "Pope–Bowles controversy," in which Pope's chief defenders were Thomas Campbell and Lord Byron; Byron's characterization of Bowles as "the maudlin prince of mournful sonneteers" is perhaps the only memorable remnant of this seven-year-long (1819–26) public argument.

William Bowles, engraving by Thomson, first quarter of the 19th century, after a painting by Mullar

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

bowling, also called TENPINS, game in which a heavy ball is rolled down a long, narrow lane to knock down a group of wooden objects known as pins. The player or team that knocks down the most pins wins the game.

A brief treatment of bowling follows. For full treatment, *see* MACROPAEDIA: Sports, Major Team and Individual.

The earliest evidence of bowling was found in an Egyptian tomb dating from about 5200 BC, when stone pins and balls were used. The game was played in ancient Germany, and there are numerous references to various types of bowling games in Germany and central Europe after AD 1300. Over the 15th, 16th, and 17th centuries, bowling became common in Britain and in other parts of Europe. Ninepin bowling was brought to the United States in the 17th century by Dutch settlers, and the game became so popular and so rife with gambling that it was outlawed in several states. According to legend, a 10th pin was added in the early 18th century to circumvent such laws, which applied only to the ninepin game. In 1895 the American Bowling Congress, the men's governing body in the United States, was organized to standardize rules and equipment and sponsored its first national championship in 1901. Its counterpart is the Women's International Bowling Congress (WIBC), founded in 1916.

Bowling pins had long been set by hand, but the automatic pinsetter, introduced in the early 1950s, revolutionized the game, and the number of bowling establishments increased greatly. The Professional Bowlers Association of America (PBA) was organized in 1958 and now sponsors several lucrative championship tournaments. The Fédération Internationale des Quilleurs (founded 1951) is the world governing body of all types of bowling games.

Bowling is played on a lane of lacquered wood about 62 feet (19 m) in length. The pins are placed a foot apart in a triangular arrangement. The ball must be made of a nonmetallic substance and cannot weigh more than 16 pounds (7.3 kg). A game is divided into 10 frames, and each player is allowed to deliver two balls per frame. If all the pins are knocked down on the first ball, a strike is recorded. If pins remain standing, the felled pins are cleared, and another ball is delivered. A second ball that knocks down the remaining pins is called a spare. In scoring, strikes and spares are worth 10 pins, or points. If two strikes are made consecutively, the score for the first frame is 20 plus the number of pins knocked down by the first ball of the next frame; a perfect score is 300, or 12 strikes in a row. Bowling competitions can be held between two players or between teams of up to five players. *See* Sporting Record: *Bowling.*

Bowling Green, city, seat (1796) of Warren county, west-central Kentucky, U.S. It lies along the Barren River, 65 miles (105 km) northeast of Nashville, Tenn. It was settled in 1780 by Robert and George Moore, and tradition suggests that their sport of bowling wooden balls across the green gave the city its name. Designated the Confederate capital of Kentucky (1861), it was occupied by Confederate general Simon B. Buckner's troops until Union forces under Ulysses S. Grant and Don Carlos Buell forced a retreat in 1862. The construction of railroads in the state in the mid-19th century led to the city's development as a river and rail transportation centre. An important tobacco and agricultural market (corn [maize], livestock), it also has diversified manufactures and is the site of Western Kentucky University (1906) and Bowling Green State Vocational Technical School (1939). Inc. 1810. Pop. (1986 est.) 43,958.

Bowling Green, city, seat (1868) of Wood county, northwestern Ohio, U.S., 22 miles (35 km) south of Toledo. The site, originally a swamp wilderness, was first settled by Elisha Martindale in 1832. The town was laid out in 1835 and named for Bowling Green, Ky. The swampland, drained by German immigrants and transformed into productive farmland, now supports livestock, grain, and tomatoes. Oil was discovered in the area (1886), and a short-lived industrial boom (mainly glass manufacture) followed until the wells ran dry. In 1914 the construction of a large tomato-canning plant and the founding of a state normal school (which became Bowling Green State University in 1935) boosted the city's development. Light manufactures now include mobile homes, adjustable seating, plastics, stamping dies, fuse holders, floor-maintenance equipment, and chemicals. Inc. town, 1855; city, 1904. Pop. (1986 est.) 24,508.

bowls, also called LAWN BOWLS, outdoor game in which a ball (known as a bowl) is rolled toward a smaller stationary ball, called a jack. The object is to roll one's bowls so that they come to rest nearer to the jack than those of an opponent; this is sometimes achieved by knocking aside an opponent's bowl or the jack. A form of bowls was played in ancient Egypt, and by the Middle Ages the game was well-known in continental Europe. The International Bowling Board, the ruling body of lawn bowls, was founded in 1905.

Bowls is generally played on a flat lawn, about 40–42 yards (37–38 m) square and surrounded by a shallow ditch and grass banks beyond. The green is divided into six rectangular sections, or rinks, each of which is about 18–21 feet (5.5–6.4 m) wide. The bowls are also called woods, though they may be made of rubber, wood, or some other composition. Bowls measure from 4¾ to 5¾ inches (12 to 14.5 cm) in diameter and have a maximum weight of 3½ pounds (1.5 kg). They are black or brown in colour. They are also biased, or flattened on one side, so that they follow a curved course when rolled. The jack is white in colour, weighs 8 to 10 ounces (0.2 to 0.3 kg), and has a diameter of 2½ inches (6.3 cm). Players deliver their bowls from a rubber mat of 24 by 14 inches (61 by 36 cm).

To begin play, a jack is rolled to the opposite side of the rink, and it becomes the target so long as it stops at least 25 yards (23 m) from the delivery mat. Players then bowl in turn. In singles and pairs (doubles) games, each player uses four bowls; in triples, every player has three bowls; and in fours, or rink games, two bowls per player are used. When all of the bowls have been delivered, an end is said to be complete. In scoring, all the bowls of one team nearer the jack at the finish of an end than the nearest bowl of the opposing team count for one point each. A game consists of 21 points in pairs or fours, and 18 points in triples. There is no prescribed number of points in singles matches, but the usual number played is 21.

In crown green bowls, a variation that is popular in the northern and Midland counties of England, the green is a square area with a gradually raised crown, or hump, in the centre of the green. Unlike the surface for flat green bowls, the surface for crown green bowls tends to be uneven. The game is usually played between two competitors, each having two bowls. Both the bowls and the jack are biased, and play may be in any direction over the green. Another variation on lawn bowls, indoor bowls, is popular chiefly in the United Kingdom, where it is played on carpet-covered

indoor rinks. The English Indoor Bowling Association (EIBA) was founded in 1971. *See* Sporting Record: *Bowls.*

Bowman, Isaiah (b. Dec. 26, 1878, Waterloo, Ont., Can.—d. Jan. 6, 1950, Baltimore), geographer and educator who helped establish the American Geographical Society's international standing during his 20 years as its director.

A graduate of Harvard University (1905), Bowman received his Ph.D. from Yale University (1909), where he taught from 1905 to 1915. His *Forest Physiography* (1911), the first comprehensive work published on American physiographic divisions, and extensive field studies in the Andes mountains (1907, 1911, 1913) established him professionally.

As director of the American Geographical Society (1915–35), he enlarged both the membership and the staff and launched a 25-year project to map the American continents south of the United States. Studies of pioneer settlements and polar geography were but two of the many other programs he fostered. Bowman served as president of Johns Hopkins University from 1935 to 1948; under his administration, departments of geography, oceanography, and aeronautics were established at Johns Hopkins.

A territorial adviser to President Woodrow Wilson at the Paris Peace Conference (1918–19), Bowman also was frequently consulted by President Franklin Roosevelt on matters of scientific and national policy. The best-known of Bowman's many writings is *The New World: Problems in Political Geography* (4th ed., 1928).

Bowman, Sir William, 1ST BARONET (b. July 20, 1816, Nantwich, Cheshire, Eng.—d. March 29, 1892, near Dorking, Surrey), English surgeon and histologist who discovered that urine is a by-product of the blood filtration that is carried on in the kidney. He also made important discoveries concerning the structure and function of the eye and of striated muscle.

Upon his appointment to King's College Hospital, London (1840), he began a microscopic investigation of the fine structure and function of various organ tissues with his teacher Robert Todd. During the next two years Bowman published three major papers on the structure and function of voluntary muscle, the minute anatomy of the liver, and the structure and function of the kidneys.

William Bowman
The Mansell Collection

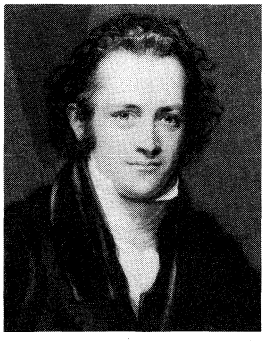
Most significant were his discoveries concerning the kidneys. He found that the capsule surrounding each ball of capillaries (the glomerulus) in the nephrons (the blood filtration units of the kidney) is a continuous part of the renal duct, which eventually drains urine into the bladder. This structure, now called Bowman's capsule, was of prime importance to his filtration theory of urine formation, which is the most important element in the present understanding of kidney function. Bowman and Todd's investigations resulted in their *The Physiological Anatomy and Physiology of Man,* 5 vol. (1845–56), a pioneering work in both physiology and histology.

Turning to the study of the eye, Bowman worked at the Royal London Ophthalmic Hospital (1846–76, later Moorfields Eye Hospital) and at King's College Hospital (1856) and taught at King's College, London (1848–55). He was a highly successful private practitioner and was soon recognized as London's outstanding eye surgeon and one of the world's foremost ophthalmic research scientists. He was the first to describe several eye structures and their functions. He was created a baronet in 1884.

Bowning orogeny, mountain-building event in eastern Australia in Late Silurian time (the Silurian Period began 430,000,000 years ago and ended 395,000,000 years ago). Of the several orogenic episodes to affect the Tasman Geosyncline, the Bowning orogeny was one of the severest. Plutonic intrusions occurred widely, and most of the eastern continental margin became emergent—*i.e.,* was uplifted above sea level.

Bowral, town, east New South Wales, Australia, at the edge of the Southern Highlands. Settled in 1825, it bears an Aboriginal name meaning "large," or "high." Proclaimed a town in 1863, it had become a fashionable resort for wealthy families of Sydney (60 miles [100 km] northeast) by the time it was gazetted a municipality in 1886. Bowral lies close to the Hume Highway and continues to serve as a resort and as a trade centre for a district producing vegetables, dairy products, fruits, trachyte, and coal. It has sawmills and brickworks. Fitzroy Falls and the Wombeyan limestone caves are nearby. Pop. (1981) 6,862.

Bowring, Sir John (b. Oct. 17, 1792, Exeter, Devonshire, Eng.—d. Nov. 23, 1872, Claremont, near Exeter), English author and diplomat who was prominent in many spheres of mid-Victorian public life.



Bowring, detail of an engraving by William Ward (1766–1826), after a painting by H.W. Pickersgill
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Bowring early became accomplished in many different languages while traveling abroad for commercial purposes. When the philosopher and economist Jeremy Bentham started the *Westminster Review* in 1824 as a vehicle for the views of English radicals, Bowring became coeditor of the publication and subsequently took over its entire management. From the 1820s on he published studies in and translations of the literatures of eastern Europe and also of The Netherlands and Spain. In 1835–37 and 1841–49 he was a member of Parliament, where he supported free trade, the repeal of the Corn Laws, penal reform, and the abolition of flogging in the army. He advocated Britain's adoption of the decimal system of currency, securing the issue of the florin (two shillings, or one-tenth of a pound) as a step in this direction. Economic circumstances compelled him to take up a diplomatic career, and in 1849 he became British consul at Canton and superintendent of trade in China. In 1854 he was sent to Hong Kong as governor, and in 1855 he visited Siam (now Thailand), where he negotiated a treaty of commerce with the king. In 1861 he was sent as a commissioner to the newly created kingdom of Italy.

Particularly remembered as the friend and literary executor of Jeremy Bentham, he subsequently published Bentham's *Life and Works,* 11 vol. (1838–43). Of special interest among Bowring's own writings are *The Kingdom and People of Siam,* 2 vol. (1857), and his *Autobiographical Recollections,* posthumously published in 1877 by his son.

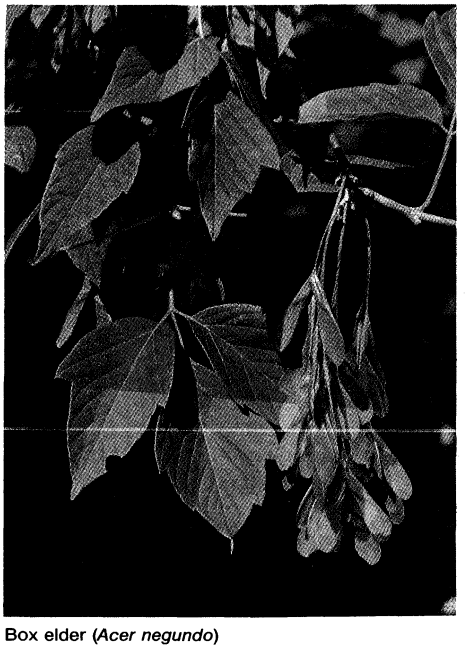
Bowring Treaty (1855), agreement between Siam (Thailand) and Britain that achieved commercial and political aims that earlier British missions had failed to gain and opened up Siam to Western influence and trade.

The treaty lifted many restrictions imposed by Thai kings on foreign trade. It set a 3 percent duty on all imports and permitted British subjects to trade in all Thai ports, to own land near Bangkok, and to move freely about the country. In addition, it granted extraterritoriality (exemption from the jurisdiction of Thai authorities) to British subjects—a privilege which, in time, proved so irritating that its removal became a chief goal of Thai policy.

Sir John Bowring's success in establishing the treaty resulted in part from his being an envoy of the British government, rather than a representative of commercial interests. Unlike previous missions, sent under the auspices of the British East India Company, Bowring represented the government of Britain as a whole, not merely its local Indian and Malayan trade concerns.

The Bowring Treaty ushered in a new era in Siam's foreign relations. The progressive king Mongkut (Rama IV) recognized that the expansion of British power and the decline of traditional Asian powers required new policies. The treaty was followed by a succession of similar agreements between Siam and many European powers, the United States, and Japan. Mongkut's policies, though costing Siam a degree of legal and fiscal independence, spared the country the military incursions and colonial subjugation other Southeast Asian states experienced.

box elder, also called ASH-LEAVED MAPLE (*Acer negundo*), hardy and fast-growing tree,



Box elder (*Acer negundo*)
Kitty Kohout from Root Resources—EB Inc.

of the maple family (Aceraceae), native to the central and eastern United States. Introduced to Europe, it is widely cultivated there as an ornamental. The tree grows to 9–15 m (30–50 feet) tall. The compound leaves (rare among maples) consist of three, five, or seven coarsely toothed leaflets. The single seed is borne in a samara, or key—*i.e.*, a broad, flat winglike structure. Owing to its quick growth and its drought resistance, the box elder was widely planted for shade by early settlers in the prairie areas of the United States. Maple syrup and sugar are sometimes obtained from the box elder. Its wood is used for crates, furniture, paper pulp, and charcoal.

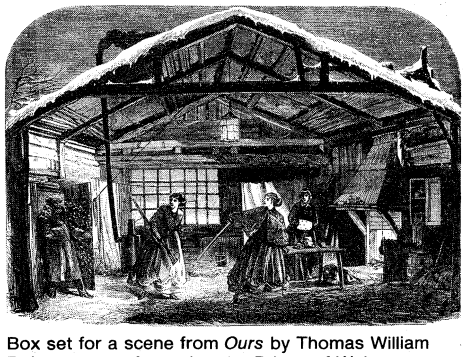
box frame construction, also called CELLULAR FRAMING, or CROSS-WALL CONSTRUCTION, method of building with concrete in which individual cells, or rooms, are set horizontally and vertically together to create an overall structural frame. Because the main weight of the building is carried through the cross walls, they must be sufficiently thick to carry their own weight as well as loads from above, and so the potential height of a structure built in this manner is limited. The most common application is in low apartment flats and similar buildings having walls and floors formed by reinforced concrete slabs.

Beginning in the late 1880s a number of large structures were built with concrete walls and floors made of precast slabs or poured as monolithic sections. The best-known example is the Hotel Ponce de Leon, St. Augustine, Fla. (1886–88). Construction with plain concrete, as used there, was soon replaced by building with reinforced concrete, and box frame construction was superseded by an open frame system in which the walls have no load-bearing function.

box lacrosse, also called BOXLA, game, a variant of lacrosse played principally in Canada during the spring and autumn and occasionally during the summer. There are 6 players on a side instead of the usual 10 (men) or 12 (women). Maximum field dimensions are 200 by 90 feet (about 60 by 27 m), with a goal 4½ feet (about 140 cm) square. The game was devised in Canada to facilitate indoor play in areas such as hockey arenas, and it was recognized by the Canadian Lacrosse Association in 1932. A game with 7 players on a side, mainly for indoor play, was introduced in the 1960s.

box set, in Western theatre, realistically detailed, three-walled, roofed setting that simulates a room with the fourth wall (the one closest to the audience) removed. Authentic details include doors with three-dimensional moldings, windows backed with outdoor scenery, stairways, and, at times, painted highlights and shadows.

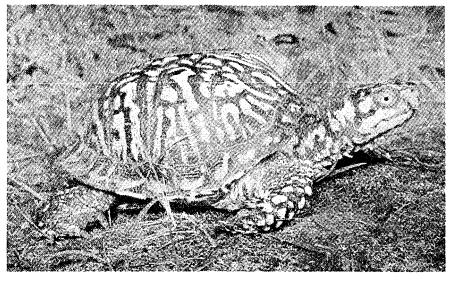
The box set was introduced in 1832 in Madame Vestris' London production of *The Conquering Game* by William Bayle Bernard. It gained wide usage by the end of the 19th century and is a common feature of the modern theatre.



Box set for a scene from *Ours* by Thomas William Robertson, performed at the Prince of Wales Theatre, 1866

By courtesy of the *Illustrated London News;* photograph, John Freeman & Co.

box turtle (*Terrapene*), any of several terrestrial turtles, family Emydidae, found in the United States and Mexico. Box turtles have a high, rounded upper shell (carapace) that grows to a maximum length of about 18 cm (7 inches). The lower shell (plastron) is hinged across the centre and can be drawn very tightly against the carapace to form a protective "box" that completely encloses the soft parts of the turtles. Box turtles are often kept as pets. They are omnivorous and feed on such items as earthworms, insects, mushrooms, and berries. They are often pointed by bird dogs, and hunting dogs in the southern United States pick up the turtles and carry them about.

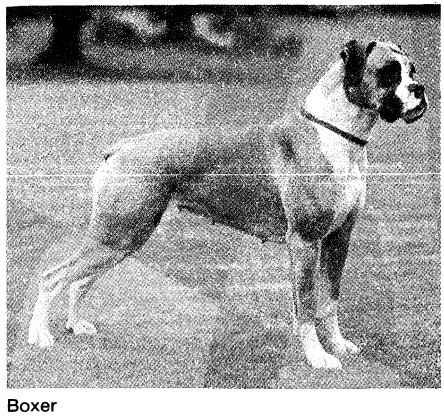


Box turtle (*Terrapene carolina*)

John H. Gerard—EB Inc.

The common box turtle (*T. carolina*) is found in wooded areas from the Eastern United States to about the Mississippi Valley; its shell is usually brown or blackish with yellow or orange markings. The western box turtle (*T. ornata*) is essentially an inhabitant of open plains and sandy regions of the central United States. It has a flat-topped carapace ornamented with radiating yellow lines on a brown background.

boxer, smooth-haired working dog breed named for its manner of "boxing" with its sturdy front paws when beginning to fight. The boxer, developed in Germany, includes



Boxer

Sally Anne Thompson—EB Inc.

strains of bulldog and terrier in its heritage. Because of its reputation for courage, aggressiveness, and intelligence, it has been used in police work but is also valued as a watchdog and companion. It is a trim, squarely built dog with a short, square-shaped muzzle, a black mask on its face, and a shiny short-haired coat of reddish brown or brindle. It stands 21 to 24 inches (53 to 61 cm) and weighs 60 to 70 pounds (27 to 32 kg).

Boxer Rebellion (1900), officially supported peasant uprising that attempted to drive all foreigners from China. "Boxers" was a name that foreigners gave to a Chinese secret society known as the I-ho ch'üan ("Righteous and Harmonious Fists"). The group practiced certain boxing and calisthenic rituals in the belief that this gave them supernatural powers and made them impervious to bullets. It was an offshoot of the Eight Trigrams Society (Pa-kua chiao), which had fomented rebellions against the Ch'ing dynasty in the late 18th and early 19th centuries. Their original aim was the destruction of the dynasty and also of the Westerners who had a privileged position in China.

In the late 19th century, because of growing economic impoverishment, a series of unfortunate natural calamities, and unbridled foreign aggression in the area, the Boxers began to increase their strength in the provinces of North China. In 1898 conservative, antiforeign forces won control of the government and persuaded the Boxers to drop their opposition to the Ch'ing dynasty and unite with it in destroying the foreigners. The governor of the northern province of Shensi began to enroll Boxer bands as local militia groups, changing their name from I-ho ch'üan to I-ho t'uan ("Righteous and Harmonious Militia"), which sounded semiofficial. Many of the Ch'ing officials at this time apparently began to believe that Boxer rituals actually did make them impervious to bullets, and, in spite of protests by the Western powers, they and the ruling empress dowager continued to encourage the group.

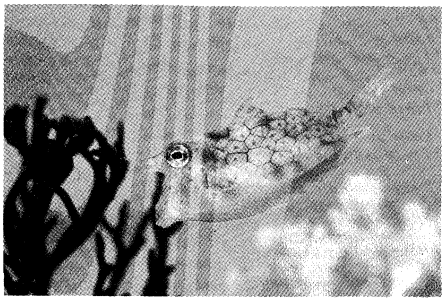
Christian missionary activities helped provoke the Boxers; Christian converts flouted traditional Chinese ceremonies and family relations; and missionaries pressured local officials to side with Christian converts—often from the lower classes of Chinese society—in local lawsuits and property disputes. By late 1899 the Boxers were openly attacking Chinese Christians and Western missionaries. By May 1900, Boxer bands were roaming the countryside around the capital at Peking. Finally, in early June an international relief force of 2,100 men was dispatched from the northern port of Tientsin to Peking. On June 13 the empress dowager ordered Imperial forces to block the advance of the foreign troops, and the small relief column was turned back. Meanwhile, in Peking the Boxers burned churches and foreign residences and killed suspected Chinese Christians on sight. On June 17 the foreign powers seized the Taku forts on the coast in order to restore access from Peking to Tientsin. The next day the empress dowager ordered that all foreigners be killed. The German minister was murdered, and the other foreign ministers and their families and staff, together with hundreds of Chinese Christians, were besieged in their legation quarters and in the Roman Catholic cathedral in Peking.

Imperial viceroys in the central Yangtze Valley and in South China ignored government orders and suppressed antiforeign outbreaks in their jurisdiction. They thus helped establish the myth that the war was not the policy of the Chinese government but was a result of a native uprising in the northeast, the area to which the disorders were mainly confined.

On Aug. 14, 1900, an international force finally captured Peking, relieving the foreigners and Christians besieged there since June 20. While foreign troops looted the capital, the empress dowager and her court fled to Sian, leaving behind a few Imperial princes to conduct the negotiations. After extensive discussions, a protocol was finally signed in September 1901, ending the hostilities and providing for reparations to be made to the foreign powers.

boxfish, also called TRUNKFISH, or COWFISH, any of a small group of shallow-water marine fishes of the family Ostraciontidae (or Ostraciidae), distinguished by a hard, boxlike, protective carapace covering most of the body. The alternative name cowfish refers to the horn-

like projections on the heads of some species. The members of the family, found along the bottom in warm and tropical seas throughout the world, are considered good to eat and are often dried as curios.



Cowfish (*Ostracion*)
Gene Wolfsheimer

Except for the eyes, the low-set mouth, and the fins and tail, boxfishes are encased in the rigid carapace. This covering consists of fused plates, and in cross section, depending on the species of fish, it takes the shape of a rough triangle, square, or pentagon. Boxfishes are often very attractively coloured. They are small, the largest growing to about 50 cm (20 inches) long. When captured and handled, boxfishes exude a toxic substance that can kill other fishes kept with them.

Related to the boxfishes are the keeled boxfishes of the family Aracanidae. These fishes also have a carapace, but there is a keel along the underside and openings behind the dorsal and anal fins. The members of this group are found from Japan to Australia.

Boxhole Meteorite Crater, meteorite crater formed in alluvium near Boxhole Homestead, Northern Territory, central Australia. It is situated 155 miles (250 km) northeast of the Henbury meteorite craters. The bowl-shaped crater, discovered in 1937, is 583 feet (178 m) in diameter and 53 feet (16 m) deep. Numerous nickel–iron fragments have been found in the area. Because of its size, the crater is thought to have resulted from the explosion of a meteorite on impact, although no fused silica glass has been found at the site.

To make the best use of the Britannica, consult the INDEX *first*

boxing, sport for both professionals and amateurs involving attack and defense with the fists. In the modern sport, boxers wear padded gloves and fight bouts of 3 to 15 three-minute rounds, one minute intervening between rounds, in a three-roped square ring.

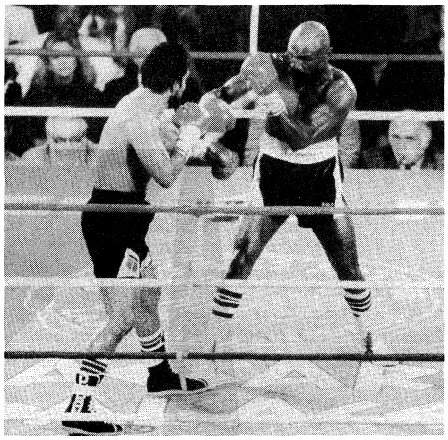
A brief treatment of boxing follows. For full treatment, *see* MACROPAEDIA: Sports, Major Team and Individual.

Early history. The earliest evidence of boxing as a sport is found in the Mediterranean area from about 1500 BC. The sport was introduced by the Greeks into the Olympic Games in the late 7th century BC. Greek boxers used thongs of soft leather to bind their hands and forearms for protection. Later in Rome, the leather glove was exchanged for the cestus, which was studded with metal, and gladiatorial boxing matches usually ended with the death of one contestant. The sport declined with the late Roman Empire, and no further reference to boxing exists until modern times.

Boxing as a sport had reappeared in England by the early 18th century. The first champion by acclamation, in 1719, was James Figg (*q.v.*), who held the title for some 15 years. Until nearly the end of the 19th century, gloves were not used, and at first there were no rules; wrestling was permitted, as was hitting an opponent who was down. Jack Broughton, who was the heavyweight champion of England from 1734 to 1750, first introduced rules in which a round lasted until a man went down; if after 30 seconds he could not continue, the fight was over. Under his rules it was forbidden to hit an opponent who was down or to grasp him below the waist.

The first prizefighter to be considered scientific in his approach was Daniel Mendoza (*q.v.*), who in the late 1780s introduced an emphasis on footwork and the left jab. John ("Gentleman") Jackson, who succeeded Mendoza, did much to attract distinguished people to boxing. London prizefighters remained dominant in the sport throughout the 18th century and until near the end of the 19th, with only occasional Irish, American, and Australian challengers.

In 1839 the London Prize Ring rules, the first since Broughton's, were introduced. These rules (revised in 1853) provided that bouts be fought in a 24-foot-square ring with ropes surrounding it. The rules for rounds and for ending a fight remained the same as Broughton's except that a fighter knocked down had to come to his feet under his own power, not be carried there by his seconds. Kicking, gouging, butting, biting, and blows below the belt were explicitly made fouls. In 1867 the Marquess of Queensberry rules (*q.v.*) were introduced; originally for amateur use, they later superseded the London rules. The American champion John L. Sullivan was the last of the great fighters to box under the London Prize Ring rules. The first world champion under the Marquess of Queensberry rules was James J. ("Gentleman Jim") Corbett, who defeated Sullivan in 1892.



Marvin Hagler (right) retaining his middleweight title in a bout with Roberto Duran, 1983
Dan Helms—Duomo

From Sullivan on, the United States became the premier boxing scene, partly because immigrants supplied a constantly renewed pool of boxers. As a result, different ethnic and racial groups dominated boxing in the United States in successive periods well into the 20th century. By 1915 the Irish, early dominant as heavyweights, dominated every weight division in boxing. Jewish fighters were especially prominent in the period 1915–30. Italians were prominent from the 1920s. There were a few talented black fighters from the 19th century on, but they often encountered racial prejudice. Jack Johnson sought a heavyweight championship fight for which he seemed to be qualified from 1902 until he won the championship in 1908. The heavyweight championship of Joe Louis (1937–49), an extremely popular champion, removed the stigma from black boxers, and after him more black fighters than white have held the heavyweight title. American boxing influence spread to the Philippines after the Spanish-American War, and to the Latin-American countries as the 20th century progressed. After World War II the sport spread to East Asia and in the 1950s to Africa's newly emergent nations. In the second half of the 20th century, American domination remained only in the heavyweight division.

In the 18th century and the first half of the 19th, professional boxers fought with no weight requirements. Most of the boxers, however, were in what is now the heavyweight division, *i.e.,* more than 175 pounds (79 kg). Other weight divisions appeared in the second half of the 19th century, and there is now near-unanimous agreement on the following weight classes; flyweight, not more than 112 pounds (51 kg); bantamweight, not more than 118 pounds (53 kg); featherweight, not more than 126 pounds (57 kg); lightweight, not more than 135 pounds (61 kg); welterweight, not more than 147 pounds (67 kg); middleweight, not more than 160 pounds (72 kg); light heavyweight, not more than 175 pounds (79 kg); and heavyweight, more than 175 pounds. There are also several intermediate divisions, but these categories are considered less important than the primary weight divisions.

Professional boxing was regulated only by the boxers in the early days. Organization began among the amateurs; in 1866 John Graham Chambers founded the Amateur Athletic Club for (among other sports) boxing, and the Marquess of Queensberry rules resulted. The Amateur Boxing Association (ABA) was established in 1880 as the British governing body. Annual U.S. competition began in 1888, when the Amateur Athletic Union (AAU) was formed. Boxing events were held in the Olympic Games from 1904. The Amateur International Boxing Association, formed in 1946, now conducts Olympic boxing. A tournament, inaugurated in 1926 by the *Chicago Tribune* and from 1927 called the Golden Gloves (*q.v.*), augmented the AAU championships and, with the ABA championships, produced many later professional boxers.

In England, modern professional organization began with the Pelican Club (founded 1887), superseded by the National Sporting Club (1891). The British Boxing Board of Control (1919) effectively replaced the National Sporting Club after 1929. In the United States, the National Boxing Association was founded in 1920 and was renamed the World Boxing Association (WBA) in 1962. U.S. dominance of the WBA led to the formation of the rival World Boxing Council (WBC) in 1963. Both of these organizations were concerned with the sponsoring of championship fights and the recognition of champions. When both the WBA and the WBC began naming rival champions from 1965 (with occasional agreements), there was an inevitable dilution of standards. Another professional organization, the International Boxing Federation, was founded in 1983.

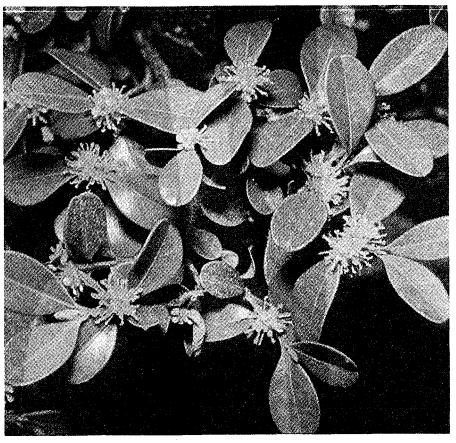
The first great period of boxing popularity began in the 1920s as a result of the American promoter Tex Rickard (*q.v.*), with his million-dollar gates. While boxing at all weights was popular, the heavyweight division predominated. Jack Dempsey was the first popular idol. Joe Louis' long reign was also popular, and, during it, radio broadcasts of championship fights enlarged the audience. By the time of Louis' deposition in 1949, a second period of popularity began. The televising of fights became popular and remained so through the 1950s, after which it produced a decline in local boxing, because the local clubs and fighters could no longer attract audiences, who preferred to watch nationally recognized boxers fight on television. The televising of championship fights did increase revenues. By the 1980s, a championship fight in one of the heavier divisions could produce revenues of more than $15,000,000.

When amateur boxing became popular in the late 19th century, it allowed knockouts (a

count of 10 over downed opponents) but primarily emphasized points (solid blows struck) and decisions rendered by judges. In time, professional boxing adopted the decision system, so that a fighter can now win by amassing a larger number of points than his opponent, as well as by knockout. Thus a bout can end in a decision, when a bout goes the scheduled number of rounds and is won on points; in a knockout; in a technical knockout, when a boxer is judged by the referee incapable of defending himself even though he has not been counted out; and in a draw. A single referee has remained constant, but the number of judges for a boxing match varies from two to five, and in some cases a referee has no vote in the decision. Amateur bouts are 3 rounds; professional ones range from 4 to 12, and championship fights are 12 or 15. All fighters wear protective mouthpieces over the upper teeth. Referees in amateur bouts are instructed to stop a fight in which a boxer could suffer serious injury; in professional fights, the referee stops the bout if a fighter cannot defend himself. In both kinds of boxing, a contestant who floors an opponent must move to a neutral corner before the count begins. *See* Sporting Record: *Boxing.*

boxwood, hard, heavy, fine-grained wood, usually white or light yellow, that is obtained from the box (*Buxus sempervirens*) and other small trees of the genus *Buxus;* about 30 species of shrubby evergreen plants are in the family Buxaceae. Boxwood also refers to many other woods with a similar density and grain, such as Venezuelan boxwood, or zapatero (*Gossypiospermum praecox*), a South American tree of the family Flacourtiaceae; West Indian boxwood, a North American lumber trade name for wood from two tropical American trees, *Phyllostylon brasiliensis* of the family Ulmaceae and *Tabebuia pentaphylla* of the family Bignoniaceae; and a number of woods from Australian trees in the genera *Eucalyptus* and *Tristania* (family Myrtaceae), *Alyxia* (family Apocynaceae), and *Murraya* (family Rutaceae).

Plants of the genus *Buxus* have small, smooth-edged, evergreen leaves and small, petalless flowers. Both male and female flowers are borne on the same plant. The female flowers usually are located above the male flowers and produce three-horned, capsulelike fruits. The common box (*B. sempervirens*), native to the Mediterranean area, has been used for centuries as a source of wood for



Box (*Buxus sempervirens*)
Walter Dawn

engravings, inlays, musical instruments, and other articles that require a smooth-textured wood that can be highly polished. The tree is grown in many parts of the world as a border, hedge, or topiary (ornamentally shaped) plant because of its compact form and slow growth; it seldom exceeds 6 m (20 feet) in height. A dwarf form, *B. sempervirens* variety *suffruticosa,* often is used to edge walks in formal gardens. The Japanese boxwood (*B. microphylla*) and its varieties provide a wide range of ornamental shrubs.

boxwork, in geology, honeycomb pattern of limonite (a mixture of hydrous iron oxide minerals) that remains in the cavity left when a sulfide mineral grain has dissolved. The boxwork may be spongelike, triangular, pyramidal, diamondlike, or irregular in shape and may be coloured various shades of ochre and orange through dark brown. The colour and shape of the boxwork are often used to identify the dissolved sulfide minerals. *See* gossan.

boy bishop, widespread custom in the Middle Ages in which a boy was chosen to act as bishop in connection with the Feast of the Holy Innocents on December 28. In England a boy bishop was elected on December 6, the feast of St. Nicholas, the patron of children. On the eve of Holy Innocents the boy and his colleagues took possession of the cathedral and performed all the ceremonies and offices except mass. Several ecclesiastical councils attempted to abolish or restrain the abuses of the custom, and the Council of Basel prohibited it in 1431. It was, however, too popular to be easily suppressed. In England it was finally abolished by Elizabeth I. An analogous custom survived until late in the 18th century in Germany, where on March 12 a schoolboy was elected bishop in honour of St. Gregory the Great, the patron of schools.

Boy Scouts, organization of boys from 11 to 14 or 15 years of age that aims to develop in them good citizenship, chivalrous behaviour, and skill in various outdoor activities. The Boy Scout movement was founded in Great Britain in 1908 by a then cavalry officer, Lieutenant General Robert S.S. (later Lord) Baden-Powell, who had written a book called *Scouting for Boys* (1908) but who was perhaps better-known as the defender of Mafeking in the South African War. Baden-Powell's book described many games and contests that he had used to train cavalry troops in scouting, and this book became popular reading among the boys of Great Britain. Prior to the book's publication, Baden-Powell held an experimental camp on Brownsea Island off the coast of southern England in which he put into practice his ideas on the training of boys.

Baden-Powell's idea was that boys should organize themselves into small natural subgroups of six or seven under a boy leader—the patrol and patrol leader. Their training would consist of such things as tracking and reconnaissance, mapping, signaling, knotting, first aid, and all the skills that arise from camping and similar outdoor activities. To become a scout a boy would promise to be loyal to his country, help other people, and in general obey the scout law, itself a simple code of chivalrous behaviour easily understood by the boy. This basic pattern of scouting aims and emphases has continued. In every country where scouting exists it involves a scout oath or promise; a scout law, with such small variations as national traditions and culture demand; an emphasis on the delights of the outdoor life and the pursuit of such outdoor activities as camping, swimming, sailing, climbing, canoeing, and exploring caves; a progressive training rewarded by the granting of certain badges; and the encouragement of a daily good deed. In every country, too, the highest proficiency is marked by the award of a special badge (*e.g.,* the Eagle Scout Badge in the United States and the Queen's Scout Badge in Canada and Great Britain). The symbols of the scouts include the handshake with the left hand, the fleur-de-lis badge, and the motto "Be Prepared."

Baden-Powell had intended his ideas to be used by existing youth organizations in Britain, but it was soon obvious that a new movement had come into being, and the Boy Scouts quickly spread to other countries. By 1910 there were Boy Scout troops in Sweden, Mexico, Argentina, and the United States, as well as such Commonwealth countries as Canada, Australia, and South Africa. By the late 20th century there were Boy Scout organizations in 110 nations.

Boy Scout units, or troops, are divided into individual subgroups, or patrols, and hold regular meetings. Scout troops are sponsored on the local level by churches, schools, fraternal organizations, and other community groups. An adult "scoutmaster" heads each troop. Since 1920 international scout meetings, or "world jamborees," have been held every four years. These are gatherings of thousands of scouts representing their countries and camping together in friendship. There have also been innumerable national camps which parties of scouts from neighbouring countries attend.

The Boy Scout movement was intended for boys aged 11 to 14 or 15, but it soon became apparent that programs for younger and older boys were needed. Accordingly, in 1916 Baden-Powell founded a parallel organization for younger boys, the Wolf Cubs (known in some countries as Cub Scouts). For boys older than 14 or 15 years, there are special groups known variously as Sea Explorers, Explorers, and other similar names. *See also* Girl Scouts.

Boyacá, *departamento,* east-central Colombia. The *departamento* occupies 8,953 square miles (23,189 square km) of cool Andean

Lake Tota, Boyacá *departamento,* Colombia
Carl Frank

uplands in the west, densely forested lower mountain slopes, and a great expanse of llanos (plains) in the east. It was established in 1886. Lake Tota in the uplands is a noted beauty spot. Boyacá has traditionally had an agrarian economy based on grains, coffee, tobacco, and bananas and other fruits. It is also known for its emerald mines, the most famous of which are located at Muzo. Colombia's first fully integrated iron and steel plant was built at Paz de Río in 1955. The plant uses iron ore and coal from major deposits nearby and produces most of the nation's steel. Although the *departamento*'s transportation network is poorly developed, a major railroad and highway pass through Tunja (*q.v.*), the *departamento*'s capital, and other major centres. The Chivor dam, one of the highest rock-fill dams in the world, on the Batá River, is a source of hydroelectric power. Pop. (1985) 1,097,618.

Boyacá, Battle of (Aug. 7, 1819), in the wars for Latin-American independence, encounter near Bogotá that resulted in a victory by South American insurgents over Spanish forces. It freed New Granada (Colombia and Venezuela) from Spanish control.

A rebel army of about 3,000 men under generals Simón Bolívar and Francisco de Paula Santander first surprised and defeated

the Spaniards in preliminary engagements at Gámeza (July 12) and the Vargas River (July 25) and captured Tunja on August 5. In the final encounter at Boyacá, Santander cut off the Spanish advance force near a bridge over the Boyacá River, while Bolívar's troops attacked the main force a half mile away, capturing about 1,800 prisoners and the Spanish commander. Bolívar then captured Bogotá on August 10 and was hailed as the liberator of New Granada. He set up a provisional government with Santander as vice president and acting head. Bolívar then went to La Angostura in Venezuela, where he announced his scheme to establish the Republic of Gran Colombia.

boyar, Russian BOYARIN, plural BOYARE, member of the upper stratum of medieval Russian society and state administration. In Kievan Rus during the 10th–12th century, the boyars constituted the senior group in the prince's retinue (*druzhina*) and occupied the higher posts in the armed forces and in the civil administration. They also formed a boyar council, or duma, which advised the prince in important matters of state. In the 13th and 14th centuries, in the northeastern Russian principalities, the boyars were a privileged class of rich landowners; they served the prince as his aides and councillors but retained the right to leave his service and enter that of another prince without losing their estates.

From the 15th to the 17th century, the boyars of Muscovy formed a closed aristocratic class that surrounded the throne of the grand prince (later the tsar) and ruled the country together with him. They were drawn from about 200 families, descended from former princes, old Moscow boyar families, and foreign aristocrats. The rank of boyar did not belong to all members of these families but only to those senior members to whom the tsar granted this title. Below the boyars stood the group of *okolnichy*. Together these two strata formed the boyar council, which helped the tsar direct the internal and foreign affairs of the state. The decisions of the boyar council, as confirmed by the tsar, were recognized as the normal form of legislation. The boyars and *okolnichy* generally served as heads of government offices, provincial governors, and military commanders.

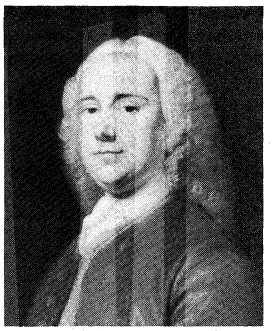
The tsar did not have complete freedom in the choice of his chief aides and subordinates. He was bound by the peculiar aristocratic custom of *mestnichestvo*. This was a complicated hierarchy of precedence among aristocratic Muscovite families. They were ranked in a definite genealogical order according to their relative seniority, and, in the course of filling the highest posts in his army and administration, the tsar had to consider not so much the candidate's personal merits as his genealogical seniority as defined by earlier precedents. *Mestnichestvo,* which hampered the selection of appropriate candidates for high offices, caused endless quarrels among the boyar families and was finally abolished in 1682.

Throughout the 17th century, the social and political importance of the boyars declined. Early in the 18th century, Tsar Peter I the Great abolished the rank and title of boyar and made state service the exclusive means of attaining a high position in the bureaucratic hierarchy.

Consult the INDEX *first*

Boyce, William (b. 1710, London?—d. Feb. 7, 1779, London), one of the foremost English composers of church music, known also for his symphonies and as an organist and musical editor.

Boyce was a chorister and later a student of



Boyce, detail of a portrait by Thomas Hudson; in the Bodleian Library, Oxford University

By courtesy of the curators of the Bodleian Library, Oxford University

the organ at St. Paul's Cathedral. His career as a composer was closely related to his many official positions. He became composer to the Chapel Royal in 1736, and many of his anthems and church services were written for use there and at other London churches of which he was organist. He also composed secular music for the stage. An early example of such works is the music for the masque *Peleus and Thetis,* first produced sometime before 1740. The serenata *Solomon* (1743) is among the best of his compositions for the theatre; it contains the once-popular tenor scena "Softly rise, o southern breeze." His next published work was *Twelve Sonatas for Two Violins, with a Bass for the Violoncello or Harpsichord* (1745), which achieved an instant and lasting popularity. In 1749 he received his doctorate of music from the University of Cambridge for his setting of an ode by William Mason and for the anthem "O be joyful." In the same year, he wrote the music for *The Chaplet,* a musical entertainment that long remained popular. The next year saw a revival of Dryden's *Secular Masque,* with music by Boyce, including the "Song of Momus to Mars."

In 1755 Boyce became master of the King's Band of Music. In 1758 he became one of the organists at the Chapel Royal, and in 1759 he composed the music for the pantomime *Harlequin's Invasion,* by David Garrick, which includes his best-known song, "Heart of Oak." In 1760 appeared his *Eight Symphonys,* orchestral pieces selected from his odes, operas, and other works. Ten years later, when he published a second set, the *Twelve Overtures,* the more exciting symphonies of the Mannheim school were in vogue, and Boyce's shapely and tuneful "ancient style" symphonies were regarded as out of date. Boyce's symphonies usually follow the Italian overture form: fast-slow-fast. Associated with the orchestral suite and the concerto grosso, they have little relation to the developing Classical symphony. Meanwhile, he had begun to publish *Cathedral Music,* 3 vol. (1760–73), the first collection of church music in England after the Restoration and the first to be printed in score. This collection, which covered three centuries, was not superseded until the mid-19th century.

boycott, collective and organized ostracism applied in labour, economic, political, or social relations to protest practices that are regarded as unfair. The boycott was popularized by Charles Stewart Parnell during the Irish land agitation of 1880 to protest high rents and land evictions. The term boycott was coined after Irish tenants followed Parnell's suggested code of conduct and effectively ostracized a British estate manager, Charles Cunningham Boycott.

The boycott is used most frequently by labour organizations as a tactic to win improved wages and working conditions from management. U.S. law distinguishes between primary and secondary labour boycotts: a primary boycott is the refusal of employees to purchase the goods or services of their employers, and a secondary boycott involves an attempt to induce third parties to refuse to patronize the employer. In most U.S. states, primary boycotts are legal if they involve no physical violence, coercion, or intimidation. Secondary boycotts, however, are illegal in most states.

Boycotts were also used during the U.S. Civil Rights Movement of the 1950s and '60s as a social and political tool. Stores and businesses that discriminated against blacks were boycotted, in the expectation that falling revenues would influence a company to change its policy.

The term boycott may also signify a refusal to participate in given proceedings. Representatives of a nation may boycott international conferences or convocations, for example, as a means of indicating disapproval of another nation's political policy or conduct.

Boycotts have also been employed by a nation or a group of nations, or by an international organization to influence or protest the policies or actions of another country. The United States, for example, called for a boycott of the summer Olympics of 1980 in Moscow in protest over the Soviet invasion of Afghanistan the previous year. In an instance of a boycott called by an international organization, the United Nations in 1965 asked all member states to break off economic relations with Rhodesia, which had illegally declared its independence from Great Britain earlier that year; the boycott remained in effect until 1979.

Boycott, Charles Cunningham (b. March 12, 1832, Burgh St. Peter, Norfolk, Eng.—d. June 19, 1897, Flixton, Suffolk), retired British army captain who was an estate manager in Ireland during the agitation over the Irish land question. He is the eponym for the verb and common noun boycott (*q.v.*).

After retiring from the army, Boycott in 1873 became agent for the 3rd Earl of Erne's

Captain Boycott, crayon sketch by Sydney Prior Hall, 1889; in the National Gallery of Ireland, Dublin

By courtesy of the National Gallery of Ireland, Dublin

estates in County Mayo. The Land League, formed in Ireland in 1879 when bad harvests made a famine likely, told Boycott in 1880 that he must reduce rents by 25 percent. In September 1880, after Boycott had attempted to serve writs of eviction, the president of the Land League, Irish nationalist statesman Charles Stewart Parnell, urged that, without resort to violence, the tenants should avoid any communication with those who refused their demand for lower rents. Parnell's policy was first used against Boycott, who, consequently, was forced to employ workers from Ulster, guarded by soldiers, to harvest his crops. He left Ireland the same year and eventually became an agent for estates in Suffolk. Conditions in Ireland quickly eased after William Ewart Gladstone's Land Act of 1881 instituted fair-rent tribunals.

Boyd, Belle (b. May 9, 1844, Martinsburg, Va., U.S.—d. June 11, 1900, Kilbourne, Wis.), spy for the Confederacy during the American Civil War and later an actress and lecturer.

Boyd was born and brought up in Virginia. At the outbreak of the Civil War, she and her mother denied entry to Union soldiers who wanted to raise a flag over their house in Martinsburg. When one of the soldiers tried to force his way in, Belle Boyd shot and killed him. She was tried and was acquitted on a defense of justifiable homicide. Union officers under the command of Gen. James Shields were quartered in the same residence as Boyd in Front Royal, Va., and Boyd overheard their plans for a withdrawal from that town. She undertook a hazardous journey through the lines to inform Gen. T. J. "Stonewall" Jackson of the Union plans to destroy the town's bridges as part of their retreat. This was the only major success in intelligence work she is known to have had. After her return to Martinsburg, Boyd continued to spy openly for the Confederates and served also as a courier and scout with J. S. Mosby's guerrillas.

In 1862 Boyd was arrested on a warrant signed by U.S. Secretary of War Edwin Stanton; she was eventually released as part of an exchange of prisoners. Arrested again after her return to Union-held Martinsburg, Boyd was again released, in 1863, after a bout with typhoid fever in prison. Her usefulness in the North at an end, she was thenceforth employed as a courier. In 1864 she sailed on a blockade runner to England bearing letters from Confederate president Jefferson Davis. After her ship was intercepted by a Union vessel, she utterly distracted an officer named Hardinge who was placed aboard as prize master. He allowed the Confederate captain of the vessel to escape and for that was court-martialled and discharged from the Navy, after which he went to England, where he married Boyd in August 1864. In England Boyd made her debut on the stage. Her book *Belle Boyd In Camp and Prison* was published in England in 1865, in which year also her husband died. She made her American stage debut in 1868, but retired from the stage shortly thereafter upon her second marriage. From 1886 she worked both as an actress and as a lecturer.

Boyd, Martin (à Beckett) pseudonym MARTIN MILLS (b. June 10, 1893, Luzern, Switz.—d. June 3, 1972, Rome), Anglo-Australian novelist, best known for *The Montforts* (1928), a novel noted for its vigorous and humorous characterizations.

Boyd spent his childhood in Victoria, Australia, was educated in Melbourne, then travelled to England, where he served during World War I. After the war he returned to Australia for a few years but went back to England again. His first three novels were published under the pen name Martin Mills; thereafter he used his real name. *The Montforts,* his only completely Australian novel, is the saga of several generations of an English family that migrated to Victoria during pioneer days. *The Picnic* (1937) and *Lucinda Brayford* (1946) portray Australian characters but are set almost entirely in England. He wrote two volumes of memoirs: *A Single Flame* (1939), largely concerned with his youth and war experiences, and the well-received *Day of My Delight* (1965).

Boyd (of Kilmarnock), Robert Boyd, 1st Lord (d. *c.* 1471, Northumberland, Eng.), Scottish statesman during the reign of James III.

He was a son of Sir Thomas Boyd (d. 1439) and belonged to an old and distinguished family, one member of which, Sir Robert Boyd, had fought with William Wallace and Robert de Bruce. Boyd, who was created a peer, Lord Boyd, about 1454, was one of the regents of Scotland during the minority of James III; but, in 1466, with some associates he secured the person of the young king and was appointed his sole governor. As ruler of Scotland he was instrumental in reforming some religious foundations; he arranged the marriage between James III and Margaret, daughter of Christian I, king of Denmark and Norway, and secured the cession of the Orkney Islands by Norway. However, when in 1467 he obtained for himself the offices of chamberlain and justiciary and the hand of the king's sister Mary, with the title of earl of Arran for his eldest son, Thomas, his enemies became too strong for him, and he was found guilty of treason and sentenced to death. He escaped to England and died soon after. His brother and assistant, Sir Alexander Boyd, was detained by illness and was beheaded on Nov. 22, 1469.

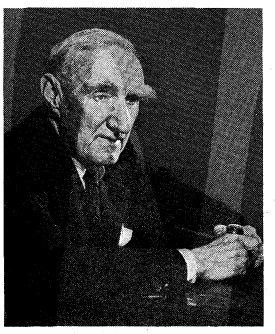
Boyd's son Thomas Boyd, earl of Arran (d. *c.* 1473), was in Denmark when his father was overthrown. However, he fulfilled his mission, that of bringing the king's bride, Margaret, to Scotland, and then, warned by his wife, escaped to the continent of Europe. He is mentioned very eulogistically in one of the Paston Letters, but practically nothing is known of his subsequent history. He was dead by 1474, the year of his widow's marriage to Lord Hamilton, from whom the Hamilton earls of Arran are descended.

Boyd, William (b. June 5, 1898, Hendrysburg, Ohio, U.S.—d. Sept. 12, 1972, Hollywood), American motion-picture and television actor who was best known for his portrayal of Hopalong Cassidy in a series of western films.

Although born in Ohio, he grew up (from the age of 7) in Oklahoma and attended school only until he was 13. Thereafter, he held many odd jobs until, at the age of 20, he set out for California. Boyd began his film career in 1918 with a role in Cecil B. deMille's *Old Wives for New,* and he appeared throughout the 1920s in films made by deMille. He first played the role of the cowboy hero in 1935 in the film *Hopalong Cassidy.* With his tall stature and white hair, Boyd was a distinctive figure; wearing a black hat and costume and riding a white horse, he quickly became identified by the public with the screen hero. He played the role in subsequent films until the late 1940s and then reenacted it for a television series, also called *Hopalong Cassidy* (1952–54).

Boyd-Orr of Brechin Mearns, John Boyd Orr, Baron, also called (1935–49) SIR JOHN BOYD ORR (b. Sept. 23, 1880, Kilmaurs, Ayrshire, Scot.—d. June 25, 1971, Edzell, Angus), Scottish scientist and authority on nutrition, winner of the Nobel Prize for Peace in 1949.

Boyd-Orr was educated at the University of Glasgow, where he enrolled as a theological student before turning to the study of nutrition. In 1914 he became director of the Institute of Animal Nutrition at the University of Aberdeen and in 1929 founded the Imperial Bureau of Animal Nutrition there. He first gained fame with the publication of *Food, Health and Income* (1936), a report of a dietary survey by income groups made during 1935 that showed that the cost of a diet fulfilling basic nutritional requirements was beyond the means of half the British population and that 10 percent of the population was undernourished. This and other reports conducted by the Rowett Research Institute (formerly Institute of Animal Nutrition) formed the basis of the British food-rationing system during World War II.



Boyd-Orr
Camera Press

During the war, Boyd-Orr was a member of the Cabinet's scientific committee on food policy and held the chair of agriculture at Aberdeen University. In 1945 he became rector of the University of Glasgow, a member of Parliament for the Scottish universities, and director general of the United Nations Food and Agriculture Organization, serving in the latter until 1948. Knighted in 1935, he received a barony in 1949. His writings include *The National Food Supply and Its Influence on Public Health* (1934), *Food and the People* (1943), *Food—the Foundation of World Unity* (1948), *The White Man's Dilemma* (1953), and *As I Recall* (1966).

Boye, Karin (Maria) (b. Oct. 26, 1900, Göteborg, Swed.—d. April 24, 1941, Alingsås), poet, novelist, and short-story writer who is considered to be one of the leading poets of Swedish modernism.

She studied at the universities of Uppsala and Stockholm, became a leading figure in the Clarté Socialist movement inspired by the French novelist Henri Barbusse, and worked on *Spektrum,* a review propagating psychoanalytical theory and modernistic literary views. Her five collections of poems—beginning with *Moln* (1922; "Clouds") and ending with the posthumously published *De sju dödssynderna* (1941; "The Seven Deadly Sins")—show the evolution of her outlook and style from the simple expression of a middle-class girl's dreams and a young radical's eager acceptance of life to bolder images, wider perspectives, and feeling for the problems of mankind. Among her novels are *Kris* (1934; "Crisis"), based on her discovery of her own deviant sexual inclinations, and *Kallocain* (1940; Eng. trans.,1940), which describes the insupportable oppression of a totalitarian society of the future. During World War II Karin Boye committed suicide.

Boyer, Charles (b. Aug. 28, 1897, Figeac, Lot, Fr.—d. Aug. 26, 1978, Phoenix, Ariz., U.S.), stage and motion-picture actor known as the prototypical suave Gallic lover.

Though committed to an acting career in his teens, Boyer nevertheless acceded to his mother's request that he graduate from the Sorbonne (with a degree in philosophy) before studying acting at the Conservatoire de Paris. At the age of 21 Boyer stepped into his first leading role on 12 hours notice when the star of the play fell ill. In the 1920s he was not only the most popular romantic leading man on the Paris stage but was steadily employed in silent films.

Boyer went to Hollywood at the beginning of the sound era, and *Private Worlds* (1935), his third film there, made an international star of the handsome actor with the rich, accented voice. His long, distinguished career included the motion pictures *Algiers* (1938), *All This and Heaven Too* (1940), *Gaslight* (1944), *Around the World in 80 Days* (1956), *How to Steal a Million* (1966), and *Stavisky* (1974).

Boyer, Jean-Baptiste de: *see* Argens, Jean-Baptiste de Boyer, marquis d'.

Boyer, Jean-Pierre (b. 1776, Port-au-Prince, Haiti—d. July 9, 1850, Paris), politician who served as president of Haiti in 1818–43 and tried unsuccessfully to stop a severe decline in the Haitian economy.

Boyer, a mulatto, was educated in France.

He served with the mulatto leader Alexandre Sabès Pétion and the black leader Henry Christophe after they had killed the Haitian dictator Jean-Jacques Dessalines in 1806. He then served with Pétion against Christophe, and, after these two leaders had died, he succeeded in unifying the country in 1821. During his presidency, Boyer tried to halt the downward trend of the economy—which had begun with the successful revolt of black slaves against their French masters in the 1790s—by passing the Code Rural. Its provisions sought to tie the peasant labourers to plantation land by denying them the right to leave the land, enter the towns, or start farms or shops of their own and by creating a rural constabulary to enforce the code and labour discipline. These efforts, however, failed to stop the decline in production.

Boyer also negotiated an agreement with France in 1825 by which the French consented to recognize Haitian independence in return for the payment of an indemnity of 150,000,000 francs as compensation for the massacre of French plantation owners by black slaves during the Haitian wars of independence. These payments soon placed an impossible financial burden on the already impoverished Haitian people. Boyer also maintained a huge corrupt army and a civil service that constantly preyed on the rural population. The gap between the black peasants in the countryside and the mulattoes of the towns grew during Boyer's presidency. The corruption of Boyer's rule and the stagnation of the economy finally led to a rebellion in 1843 that forced Boyer to flee to Jamaica and then to Paris.

Boyer Aḥmadī-ye Kohkīlūyeh, *ostān* (province), western Iran, bounded by the *ostāns* of Khūzestān on the west-northwest, Chahār Māḥāl-e Bakhtīārī on the northeast, Eṣfahān on the east, Būshehr on the southwest, and Fārs on the southeast. It covers an area of 5,506 sq mi (14,261 sq km). The region, part of the main Zagros Mountains, consists of ridges that are extremely regular and straight in form. Rainfall is sporadic; there are few perennial streams. Settlement is sparse, and pastoralism remains the principal way of life. Crops grown include barley, wheat, sugar beets, potatoes, nuts, and apples. Industries are mostly household and produce mats, baskets, coarse carpets, and rugs. Pop. (1984 est.) 390,000.

Boyle, Kay (b. Feb. 19, 1902, St. Paul, Minn., U.S.), American novelist, poet, and short-story writer.

Boyle spent much of her childhood abroad in Europe and began writing stories at her mother's encouragement while still in her teens. She moved to France with her first husband in 1923 and lived there and in England and Austria until returning to the United States in 1941. After World War II she was stationed in France and West Germany while serving as foreign correspondent for *The New Yorker* (1946–53). She later taught at several colleges and universities in the United States.

Boyle twice won the O. Henry Award for outstanding short stories—"The White Horses of Vienna" (1935) and "Defeat" (1941). Among her more notable novels are *Plagued by the Nightingale* (1931), *Monday Night* (1938), and *Generation Without Farewell* (1960). Her short-story collections include *The White Horses of Vienna and Other Stories* (1936) and *The Smoking Mountain: Stories of Postwar Germany* (1951). Boyle's early works centre on the conflicts and disappointments individuals encounter in their search for romantic love. Her later fiction usually dealt with the need for an individual's commitment to wider political or social causes as a prerequisite to attaining self-knowledge and fulfillment.

Boyle, Richard: *see* Cork, Richard Boyle, 1st earl of.

Boyle, Robert (b. Jan. 25, 1627, Lismore, County Waterford, Ire.—d. Dec. 30, 1691, London), Anglo-Irish chemist and natural philosopher noted for his pioneer experiments on the properties of gases and his espousal of a corpuscular view of matter that was a forerunner of the modern theory of chemical elements. He was a founding member of the Royal Society of London.

Robert Boyle, oil painting by an unknown artist after F. Kerseboom; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Boyle was the 14th child of a family of wealth and influence. In 1635 he was sent to Eton College, after which he spent the years from 1639 to 1644 with a tutor on the Continent, for the most part in Switzerland.

From 1645 to 1655 Boyle lived partly in Dorset, where he began his experimental work and wrote moral essays, some of which appeared in 1655 in *Occasional Reflections upon Several Subjects.* One of his essays is reputed to have inspired the writing of *Gulliver's Travels* by Jonathan Swift. He spent some time in Ireland in connection with his estates; because laboratory apparatus was unobtainable there, he engaged in anatomical dissection.

From 1656 to 1668 he resided at Oxford, where he had the good fortune to secure the assistance of Robert Hooke, the able inventor and subsequent curator of experiments to the Royal Society, who helped him to construct an air pump. Recognizing at once its scientific possibilities, Boyle conducted pioneering experiments in which he demonstrated the physical characteristics of air and that air is necessary for combustion, respiration, and the transmission of sound. Boyle described this work in 1660 in *New Experiments Physio-Mechanicall, Touching the Spring of the Air and its Effects.* To the second edition of this work, in 1662, he appended his report of 1661 to the Royal Society on the relationship, now known as Boyle's law, that at a constant temperature the volume of a gas is inversely proportional to the pressure. In *The Sceptical Chymist,* Boyle in 1661 attacked the Aristotelian theory of the four elements (earth, air, fire, and water) and also the three principles (salt, sulfur, mercury) proposed by Paracelsus. Instead, he developed the concept of primary particles which by coalition produce corpuscles. According to this concept, different substances result from the number, position, and motion of the primary matter. All natural phenomena were therefore explained not by Aristotelian elements and qualities but by the motion and organization of primary particles. Thus, Boyle did not postulate different kinds of primary elements—the 19th-century view—but his ideas are valid within certain limits. In his experimental work he studied also the calcination of metals and proposed a means of distinguishing between acid and alkaline substances, which was the origin of the use of chemical indicators. He was also interested in trades and manufacturing processes.

Beginning in 1668, he resided with his sister Katherine, Lady Ranelagh, in London. In this final period of his life he continued his experimental work with the help of laboratory assistants, one of whom founded a chemical manufacturing firm that had an independent existence until the early part of the 20th century. Boyle also continued to take interest in the Royal Society and in his charitable activities. By his will he endowed a series of Boyle lectures, or sermons, which still continue, "for proving the Christian Religion against notorious Infidels."

Boyle acquired great renown in his lifetime, and foreigners of distinction invariably tried to visit him. He was elected president of the Royal Society in 1680 but declined the honour. As a devout Protestant, Boyle took a special interest in promoting the Christian religion abroad, giving money to translate and publish the New Testament into Irish and Turkish. In 1690 he developed his theological views in *The Christian Virtuoso,* which he wrote to show that the study of nature was a central religious duty. In his view of divine providence, nature was a clocklike mechanism that had been made and set in motion by the Creator at the beginning and now functioned according to secondary laws, which could be studied by science. But the soul of man was incorporeal and nobler than the moving corpuscles of which his body was composed.

BIBLIOGRAPHY. T. Birch (ed.), *The Works of the Honourable Robert Boyle, to Which Is Prefixed the Life of the Author,* 5 vol. (1744, reprinted 1965–66), a collection of Boyle's publications, and *The Life of the Honourable Robert Boyle* (1744), still an indispensable biographical study; J.F. Fulton, *A Bibliography of the Honourable Robert Boyle, Fellow of the Royal Society,* 2nd ed. (1961), an indispensable guide to serious study; M.B. Hall, *Robert Boyle and Seventeenth-Century Chemistry* (1968), an excellent account of the subject; R.E.W. Maddison, *The Life of the Honourable Robert Boyle* (1969), an exhaustive biographical study, which supplements Birch's *Life;* R. Pilkington, *Robert Boyle: Father of Chemistry* (1959), a useful general introduction to Boyle and his scientific work.

Boyle's law, also called MARIOTTE'S LAW, a relation concerning the compression and expansion of a gas at constant temperature. This empirical relation, formulated by the British physicist Robert Boyle in 1662, states that the pressure (p) of a given quantity of gas varies inversely as its volume (v) at constant temperature; *i.e.,* in equation form, $pv = k$, a constant. The relationship was also discovered by the French physicist Edme Mariotte (1676).

The law can be derived from the kinetic theory of gases assuming a perfect (ideal) gas (*see* perfect gas). Real gases obey Boyle's law at sufficiently low pressures, although the product pv generally decreases slightly at higher pressures.

Boylesve, René, pseudonym of RENÉ-MARIE-AUGUSTE TARDIVEAU (b. April 14, 1867, La Haye-Descartes, Fr.—d. Jan. 14, 1926, Paris), novelist whose novels set in the Touraine region mark him as an able historian of rural and urban society in the west of France from 1870 to 1900. The series includes *Mademoiselle Cloque* (1899), *La Becquée* (1901; *Daily Bread*), *L'Enfant à la balustrade* (1903; *The Child at the Balustrade*), *La Jeune Fille bien élevée* (1909; "The Well Brought-Up Girl"), and others. In these works, notable for their studies of provincial personality and for their richly detailed style, Boylesve utilizes a characteristic irony to chronicle the triumph of

conventional values over artistic and spiritual aspirations.

Boylesve's other works include short stories and lighter novels such as *La Leçon d'amour dans un parc* (1902; "Lesson in Love in a Park"), *Le Bel Avenir* (1905; "The Beautiful Future"), and *Mon Amour* (1908; "My Love"). Boylesve early recognized the importance of Marcel Proust and is sometimes hailed as one of Proust's precursors. He was elected to the French Academy in 1918.

Boylesve, engraving

By courtesy of the Bibliotheque Nationale, Paris; photograph, J.P. Ziolo

Boylston, Zabdiel (b. March 9, 1676, Muddy River, Mass.—d. March 1, 1766, Muddy River), physician who introduced smallpox vaccination into the American colonies.

During the Boston smallpox epidemic of 1721, Boylston was urged to begin inoculations by the minister Cotton Mather, who had heard reports from Europe of their use in Turkey. Boylston responded enthusiastically, beginning with his own family and eventually inoculating more than 200 people. Vaccination was so bitterly opposed by other physicians, the clergy, and much of the populace that Boylston's life was threatened and he was forced to perform his work in great secrecy.

Boymans-van Beuningen Museum, art gallery in Rotterdam, noted for its collection of Flemish, Dutch, French, and Italian painting, drawings and prints, modern sculpture, and European decorative arts. Since 1935 the museum has been housed in a building designed by A. van der Steur in collaboration with D. Hannema. The original collection was bequeathed in 1847 by F.J.O. Boymans, a Rotterdam councilman. In 1958 the important Beuningen Collection of paintings and sculpture was acquired.

Boyne, Battle of the (July 11 [July 1, old style], 1690), a victory for the forces of King William III of England over the former king James II, fought on the banks of the River Boyne in Ireland. James, a Roman Catholic, had been forced to abdicate in 1688 and, with the help of the French and the Irish, was attempting to win back his throne.

James, failing to take Londonderry and Enniskillen, had left Ulster as a bridgehead to William and had wasted his best Irish regiments in England and France. In the Oldbridge area, south of the Boyne, he assembled about 7,000 French infantry, some regular Irish cavalry, and untrained Irish infantry and dragoons—all together, about 21,000 men. William led the Dutch Blue Guards, two regiments of French Huguenots, some English, and contingents of Danish, Prussian, Finnish, and Swiss mercenaries—all together, about 35,000 men. Fearing encirclement by William's cavalry, which crossed the Boyne at Rosnaree on the left and at Oldbridge on the right, James fled hastily from the battle and from the country. The battle was William's, but the Jacobite army successfully withdrew to carry on the war for another year in Ireland. The Battle of the Boyne is celebrated in Northern Ireland as a victory for the Protestant cause on July 12, which is actually the old style date of the more decisive Battle of Aughrim in the following year.

Boyne, River, Irish AN BHÓINN, river rising in the Bog of Allen, County Kildare, Ireland, and flowing 70 mi (110 km) northeast to enter the Irish Sea just below Drogheda. Neolithic passage graves at Knowth, Newgrange, and Dowth are of archaeological significance, and nearby in the Boyne Valley is Tara, seat of the high kings of Ireland. The river was the scene of a famous battle (1690). *See* Boyne, Battle of the.

Boyneburg, Johann Christian, Freiherr von (baron of), Boyneburg also spelled BOINEBURG (b. April 12, 1622, Eisenach, Thuringia—d. Dec. 8, 1672, Mainz, Ger.), German statesman and man of learning, who worked for a balance of power between the Habsburg emperor and the other German princes and for a solution of the Catholic-Lutheran-Calvinist conflict.

Brought up as a Lutheran, Boyneburg studied at Jena (1638–43) and then at Helmstedt University (1643–44). After serving the landgraves of Hesse-Darmstadt and Hesse-Braubach, he accepted the offer of Johann Philipp von Schönborn, archbishop-elector of Mainz, to become marshal of the court of Mainz and prime minister if he would become a Catholic (1653). Boyneburg encouraged the Elector to seek an entente with France and was a principal negotiator of the League of the Rhine (1658), whereby a number of German states, both Catholic and Protestant, secured a French guarantee against any attempt by the new emperor, Leopold I, to restore Habsburg domination. In 1664, however, while he was concerned with asserting the Elector's temporal rights over the Protestant city of Erfurt, his enemies in Mainz procured his arrest on suspicion of duplicity. Though Boyneburg was exculpated, he never recovered control of Mainz's affairs and devoted himself thereafter mainly to research and to a voluminous correspondence (still extant) with literary men and scientists. His protégé, the philosopher G.W. Leibniz, whom he had brought to Mainz in 1667, wrote a pamphlet for him on the Polish question and later devised with him a plan for diverting French aggression to Egypt.

Boyoma Falls, formerly STANLEY FALLS, seven cataracts in the Lualaba River, northeast central Zaire, central Africa. The falls extend for 60 mi (100 km) along a curve of the river between Kisangani and Ubundu. The total fall in the river's elevation is about 200 ft (60 m), and the seventh and largest cataract is 800 yd (730 m) wide. Beyond the cataract the Lualaba becomes the Congo (Zaïre) River. A rail line goes around the falls, connecting river ports at Kisangani and Ubundu.

Boys, Sir Charles Vernon (b. March 15, 1855, Wing, Rutland, Eng.—d. March 30, 1944, St. Mary Bourne, Andover, Hampshire), English physicist and inventor of sensitive instruments, known particularly for his utilization of the torsion of quartz fibres in the measurement of minute forces. This technique was applied in connection with his radiomicrometer (1888) for measuring radiant heat and also in connection with his elaboration (1895) of Henry Cavendish's experiment relating to the Newtonian constant of gravitation.

Boys had earlier constructed an integraph (1881) for mechanically drawing the graph of an antiderivative of a given mathematical function. Among his inventions were an improved automatic recording calorimeter for testing manufactured gas (1905) and high-speed cameras for photographing rapidly moving objects, such as bullets and lightning discharges. He was knighted in 1935.

Boys Town, village, Douglas County, eastern Nebraska, U.S. Dedicated to homeless boys, it was established (1917) in Omaha by Father Edward J. Flanagan and was later moved 10 mi (16 km) west to its present location. The community, which now covers 1,500 ac (600 ha), with facilities for 1,000 children, became a village in 1936. It is governed by the children and is maintained by voluntary contributions. Girls began to be admitted in small numbers as members of Boys Town beginning in 1979. Both boys and girls attend regular classes and are taught a variety of vocational skills. Boys Town's combination of discipline, instruction, and affectionate supervision by staff members has proven effective in raising and rehabilitating homeless or troubled children. Boys Town's continuous growth led in the 1980s to the creation of a second, satellite Boys Town in Orlando, Fla., with more extensions planned elsewhere. The original institution first received widespread attention after a motion picture, *Boys Town,* starring Spencer Tracy and Mickey Rooney, was made in 1938. Inc. 1936. Pop. (1982 est.) 637.

boysenberry, a very large bramble fruit, usually considered, along with the loganberry and the youngberry, a variety of blackberry (*Rubus ursinus*). The dark, reddish-black fruit is especially valued for canning and preserving. It is grown chiefly in the United States, in the South and Southwest and on the Pacific Coast from southern California into Oregon.

The boysenberry was developed in the early 1920s by Rudolph Boysen (1895–1950) of Napa, Calif., who later turned it over to William Knott for commercial development.

Bozeman, city, seat (1867) of Gallatin County, southern Montana, U.S., at the southern end of Gallatin Valley. First settled in 1864 and known locally as Missouri, it was renamed for John M. Bozeman, who guided the first settlers into the Gallatin Valley. The basic farm economy (wheat and livestock) is supplemented by lumbering. A U.S. fish hatchery is nearby at the mouth of Bridger Canyon. Bozeman is the seat of Montana State University (1893) and headquarters of Gallatin National Forest. Bozeman Hot Springs, en route to Yellowstone National Park, is a few miles south. Inc. village, 1864; town, 1874; city, 1883. Pop. (1982 est.) 22,532.

Bozeman, John M. (b. 1835, Georgia—d. April 20, 1867, near Yellowstone River, Montana Territory, U.S.), creator of the Bozeman Trail to the gold-rush towns of western Montana in the 1860s.

Little is known of Bozeman's life in Georgia, other than that he left his wife and two children there in 1861 to try his luck at mining in Colorado. The following year, he moved to Montana, along with thousands of others lured by tales of vast gold deposits there.

Recognizing that gold-seekers entering the region from the east had to follow either of two circuitous routes, Bozeman, in late 1862, decided to seek a more direct one. He traveled east from Bannack, crossed the Continental Divide (at what became known as Bozeman Pass), and then turned south through the eastern foothills of the Bighorn Mountains.

Bozeman seemed unaware or unconcerned that his trail cut through territory reserved by treaty to Indians. He and his partner were set on by Sioux and experienced severe hardship before finally reaching Ft. Laramie. Ignoring the obvious danger, however, Bozeman led a party of would-be settlers over his road in spring 1863. Again, hostile Indians attacked, and all but Bozeman turned back and took a traditional circuitous route. He made his way

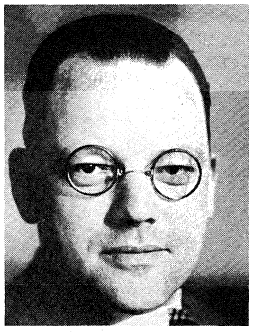
across Indian territory, traveling by night, and reached Virginia City.

In 1864 Bozeman took another caravan over his route, and the following year, federal troops began to guard the Bozeman Trail. In December 1866, however, the Sioux succeeded in closing the road by a massacre near Ft. Kearny. Undaunted, Bozeman in the spring of 1867 set out once more from Virginia City to follow his trail. At the Yellowstone, a band of five Blackfeet attacked, killing the erstwhile explorer and wounding his companion.

Bozrah, Latin BOSTRA, Greek BOSORRA, or BOSORA, modern BUṢRĀ ASH-SHĀM, ruined Syrian city, 67 miles south of Damascus. First a Nabataean city, it was conquered by the Roman emperor Trajan, made the capital of the Roman province of Arabia, and served as a key Roman fortress east of the Jordan River. The city eventually achieved the title metropolis under the Roman emperor Philip, a native of the city. It became the see of a bishop early in the 4th century but fell to the Muslims in 634/635. The crusaders captured it in the 12th century but failed to hold it, and in the same century earthquakes, together with Turkish misrule, hastened its decline. The monumental remains of temples, theatres, triumphal arches, aqueducts, reservoirs, churches, mosques, and a 13th-century citadel stretch over the modern site.

BP: *see* British Petroleum Company Limited.

Braak, Menno ter (b. Jan. 26, 1902, Eibergen, Neth.—d. May 14, 1940, The Hague), Dutch critic whose cutting intellect and challenging of preciousness in art earned him the title of the "conscience of Dutch literature."



Menno ter Braak

By courtesy of the Gemeente Archief, The Hague

In 1932 Braak founded, with Edgar du Perron, the magazine *Forum,* which called for a rejection of contemporary mannered aestheticism and a return to integrity and sincerity. His main literary essay, with its mastery of irony and distinctively creative style, is *Het carnaval der burgers* (1930; "The Carnival of Citizens"). His characteristic Nietzschean mistrust of political and religious dogma is especially evident in *Politicus zonder partij* (1934; "Politician Without a Party") and in *Van oude en nieuwe Christenen* (1937; "Concerning Old and New Christians"), which propounds the theory that all mass movements are basically inspired by resentment.

Ter Braak's respect for personal freedom and dislike of militarism made him on opponent of Nazism, and when the Germans invaded The Netherlands he committed suicide.

Braaten, Oskar (b. Nov. 25, 1881, Kristiania [now Oslo]—d. July 17, 1939, Oslo), Norwegian novelist and dramatist who first brought the life of the factory worker to readers and theatregoers.

Braaten was closely affiliated with the Norwegian labour movement, but his works are more concerned with depicting childhood and youth in the tenement houses of the east side of Oslo, where he grew up, than with an analysis of labour organizations or movements. He had a great popular success with the play *Den store barnedåpen* (1925; "The Big Baptism"). His two most widely read novels are *Ulvehiet* (1919; "The Wolf's Lair") and *Matilde* (1920). Besides his activity as an author, he worked until 1910 in a bookstore, then became a journalist, editor, and assistant director of the Norwegian theatre.

Brabant, province, central Belgium, subdivided into four *arrondissements:* Hal-Vilvorde and Louvain (both Flemish-speaking), Nivelles (French-speaking), and bilingual Brussels. It was formerly the southern part of the old Duchy of Brabant, the central and northern parts of which became Antwerp province and the Dutch province of North Brabant after Belgian independence in 1830. A revolutionary era (1830) song, "La Brabançonne," became the Belgian national anthem.

Brabant has an area of 1,300 sq mi (3,367 sq km). It is one of the most densely populated of Belgium's nine provinces. Outside of the towns, its rural population lives in prosperous-looking nucleated villages, with occasional large individual farms. Brabant occupies the central part of the low plateau of Belgium, rising southward from about 60 ft (18 m) above sea level in the north to 545 ft in the south. In the broad river valleys much alluvium has been deposited, and in addition a widespread cover of *limon* (wind-carried loam) lies on the interfluves. The main rivers of the eastern Scheldt basin, the Zenne, Dijle, and Gete, flow in a north-northeast direction until each is picked up by the east–west line of the Demer–Dijle Rupel river system, flowing hence to the lower Scheldt.

Brabant's fertile, well-cultivated loams are of great agricultural importance. Large fields grow wheat and sugar beets, producing high yields through intensive use of fertilizers. Near Brussels, the provincial capital, concentration is on market gardening, pig and poultry farming, and the production of flowers and nursery cultivation. To the northwest of the city, vast areas of greenhouses produce early vegetables and flowers, while others in the southeast specialize in grapes. Northeast of Brussels, in the Demer Valley, the heavily fertilized soils grow early vegetables such as peas, asparagus, potatoes, carrots, and chicory. Greenhouse produce, bush and orchard fruits, and flowers are also grown. Cattle raising for both meat and dairy purposes is widespread because of the province's dense urban population. Nearly 10 percent of the province is wooded, the largest area being the Forêt de Soignes to the southeast of Brussels.

The industrialization of Brabant is considerable, particularly in the Brussels area and the Zenne Valley. The Flanders textile industry has spread eastward into Brabant, particularly into Brussels and Anderlecht. In the Zenne Valley there are miscellaneous metallurgical, textile, and food-processing industries. Farther east is a host of smaller towns, many within the Brussels orbit, sharing the well-developed industrial life of Belgium. The principal cities aside from Brussels, are Louvain, Nivelles, Tienen (French Tirlemont), Tubize, Halle (Hal), and Vilvoorde (Vilvorde). Brabant is served by the Charleroi-Brussels and Willebroek canals and several rail lines fanning out from Brussels and Louvain. Notable among many historic châteaus are Beersel, Gaasbeek, and Elewijt. The Waterloo battlefield is south of Brussels. Pop. (1983 est.) 2,221,383.

Brabant, feudal duchy that emerged after the decline and collapse of the Frankish Carolingian Empire in the mid-9th century. Centred in Louvain and Brussels, it was a division of the former duchy of Lower Lorraine, possession of which had been contested for three generations.

A brief treatment of the duchy of Brabant follows. For full treatment, *see* MACROPAEDIA: Low Countries.

In 1190 the title of duke of Brabant was assumed for the first time by Henry I, the Warrior. Three generations of his heirs ruled relatively peacefully. In 1283 John I of Brabant bought the duchy of Limburg from Adolph V of Berg, who was at that time disputing the title; John won the territory and united the two areas under his rule.

When Johanna, daughter of John III and wife of Duke Wenceslas of Luxembourg, acceded to the duchy, the charter of rights known as the Joyeuse Entrée was issued. When Johanna succeeded to the title of Brabant, however, she was challenged by her sister's husband, Louis II, count of Flanders. During the ensuing strife, Johanna continued to rule Brabant and, after Wenceslas' death, Luxembourg, but she had to rely for aid on the House of Burgundy. In 1390 she ceded her rights to Philip II the Bold of Burgundy, who was married to her niece Margaret of Flanders. When the family line died out in 1430, inheritance passed to the House of Burgundy and hence, by marriage two generations later, to the House of Habsburg.

Under the rule of the Spanish Habsburg Philip II, there began the Eighty Years' War. During that period, Brabant was divided into northern and southern portions. The south remained under Spanish rule, and the north went to the Dutch. With a few additional tracts, the northern portion formed the current Netherlandic province of Noord-Brabant.

The southern part of Brabant was ceded by the Treaties of Utrecht (1713) to the Austrian Habsburgs. After an armed resistance to emperor Joseph II in 1789–90 and the French conquest of 1795, southern Brabant came to be part of Belgium. Symbols of the duchy are still visible in the flag of Belgium, which uses Brabançon colours. The title of duke of Brabant has been revived as the style of the eldest son of the king of Belgium.

Brač, Italian BRAZZA, rugged, mountainous island, one of the larger islands in the Adriatic Sea, part of Croatia, Yugoslavia, with an area of 149 sq mi (395 sq km). Its maximum altitude, 2,552 ft (778 m), is reached at Vidova Gora, the highest point in the Adriatic islands. The main occupations of the inhabitants are fishing and agriculture; crops include figs, olives, almonds, and wine grapes. With insufficient fresh water, the island must be supplied from the mainland in summer. Mechanized quarrying of marble provides a further export, and a small tourist industry has developed.

The principal village is Supetar, and there is an ancient wall at the hamlet of Škrip, where stone was quarried to build (AD 295–305) Diocletian's palace in Split. The island was occupied by the ancient Greeks and Romans and then—following the power struggles in the Adriatic—in turn by pirates and the powers of Dubrovnik (the Ragusan republic), Venice, Bosnia, France, and the Austro-Hungarian Empire, with a brief period of autonomy. In 1918 it was incorporated into Yugoslavia. During World War II, Yugoslav partisans and Allied special forces retook Brač from the Germans in 1944. Pop. (1981 prelim.) 12,715.

Bracciano, Lake, Italian LAGO DI BRACCIANO, Latin LACUS SABATINUS, circular lake in Lazio (Latium) region, central Italy, in the Monti (mountains) Sabatini, just northwest of Rome. Mineral hot springs along its shores recall its earlier geological formation from a group of volcanic craters. The surface lies 538 ft (164 m) above sea level, with an area of 22 sq mi (57 sq km). The maximum depth is 525 ft and the diameter about 5½ mi (9 km). The lake, drained by the Arrone River on its southeast side, is known for its eels and other fish. The lakeside towns of Bracciano and

Anguillara Sabazia preserve their magnificent late medieval castles. There is a seaplane base at Vigna di Valle on the south shore.

Bracciolini, Gian Francesco Poggio: *see* Poggio Bracciolini, Gian Francesco.

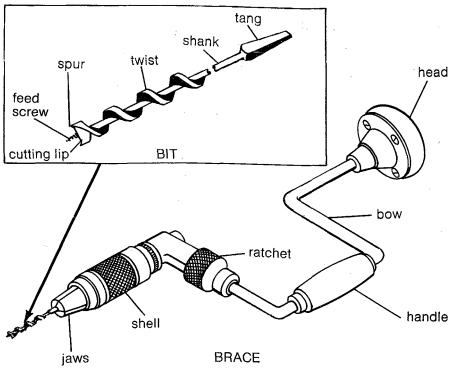
Brace, Charles Loring (b. June 19, 1826, Litchfield, Conn., U.S.—d. Aug. 11, 1890, Campfer, Switz.), U.S. reformer and pioneer social welfare worker, a founder and for 37 years executive secretary of the Children's Aid Society of New York City.

The descendant of a Hartford family long prominent in religious and political life, Brace was educated at Yale University and at Union Theological Seminary in New York City. Asked to become the head of "a mission to children" in 1853, he spent the remainder of his life in the Children's Aid Society. In 1872 he wrote an unconsciously autobiographical account of it as *The Dangerous Classes of New York, and Twenty Years' Work Among Them,* which established him as a world authority. At his death a leading sociologist estimated that Brace's influence had aided over 300,000 children.

In 1882 Brace published *Gesta Christi: A History of Humane Progress Under Christianity,* a review of "certain practices, principles and ideals—now the richest inheritance of the race—that have been either implanted or stimulated or supported by Christianity." This study became a significant contribution to the literature supporting the growing Social Gospel movement. He also wrote on comparative religion and on European and American travel, knew and corresponded with many of the great figures of his time, and contributed extensively to the *New York Times* and several journals of opinion and current affairs.

His daughter Emma Brace edited *The Life and Letters of Charles Loring Brace* (1894). Upon his death, his son, Charles Loring Brace (1855–1938), became executive secretary of the Children's Aid Society, holding the position until his retirement in 1928.

brace and bit, hand-operated tool for boring holes in wood, consisting of a crank-shaped turning device, the brace, that grips and rotates the hole-cutting tool, the bit. The auger bit shown in the Figure is of the style traditionally used by carpenters; its six parts are shown in the Figure. At the end of the twist are two sharp points, called the spurs, that mark



Brace and bit

the circle, and two cutting edges, or lips, that cut shavings within the marked circle. The feed screw centres the bit and draws it into the wood. When in use, the tang is gripped in adjustable jaws in the shell or chuck of the brace. When drilling, one hand of the operator is placed on the head to push the bit into the wood while the other grips the handle and rotates the brace with a cranking action. A ratchet mechanism allows the brace to be rotated in one direction only by an oscillation of the bow; this mechanism is particularly useful when tightening or loosening screws using a screwdriver bit in place of an auger.

Bracegirdle, Anne (b. *c.* 1663 or *c.* 1673—d. 1748, London), actress, one of the earliest on the English stage. She studied with Thomas Betterton and was much encouraged by him.

Bracegirdle's talents were first noted in 1688 when she appeared in a play by Thomas Shad-

Anne Bracegirdle as Semerina in *The Widow Ranter,* mezzotint by W. Vincent, 1689

By courtesy of the Mander and Mitchenson Theatre Collection

well at Drury Lane Theatre, London. Subsequently such different playwrights as William Congreve and Nicholas Rowe wrote leading parts for her. For the heroines of Congreve's artificial comedies she could turn on "the Charms and Attractions of a conscious Beauty," as Colley Cibber noted; but she had also a feeling for Rowe's pathetic sentiments when she acted Selina in *Tamerlane* or Lavinia in *The Fair Penitent.* One of her most famous roles, however, was that of Statira in Nathaniel Lee's *Rival Queens.* She left the stage in the prime of life, about 1707, when she began to be eclipsed by the rising star of Anne Oldfield. Anne Bracegirdle enjoyed a reputation for virtuous character extraordinary in an actress of the period. It was believed during her life that she was married to Congreve, who left her a legacy. She was buried in Westminster Abbey.

Brach (Libya): *see* Birāk.

Bracheux Sands, lowermost and oldest division of lower Paleocene rocks in France (the Paleocene Epoch began about 65,000,000 years ago and lasted about 11,000,000 years). The Bracheux Sands, which overlie Cretaceous chalk deposits, underlie the Soissons Lignites, and represent deposits of the Thanetian Stage, were named for Bracheux, near Beauvais. The Bracheux Sands were laid down by a transgressing sea that inundated much of France and other areas early in the Paleocene.

The fossil faunal assemblage found in the Bracheux Sands provides a contradictory picture of environmental conditions that prevailed during early Paleocene time in the region. The molluscan fauna indicates temperate or cool climates and water temperatures; such clam genera as *Ostrea* and *Venericardia,* as well as distinctive echinoids (sea urchins), are common cool-weather indicators. On the other hand, distinctive fish, calcareous algae, and coral forms clearly indicate mild, perhaps subtropical climatic conditions. In the vicinity of Rheims, a continental facies occurs that is characterized by the excellently preserved remains of insects, flowers, and leaves; the plants, among which are sassafras and magnolia, indicate that mild climatic conditions prevailed on the land as well as in the sea. Near Cernay, Fr., the Cernay Conglomerate, which is of approximately the same age as the Bracheux Sands, contains the oldest mammalian faunal assemblage known in Europe.

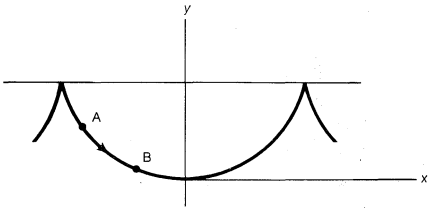
brachial plexus, network of nerves arising from the ventral branches of the fifth through the eighth cervical spinal nerves and from most of the ventral branch of the first thoracic spinal nerves. The plexus, located partly in the area known as the posterior triangle of the neck and partly in the axilla, consists of two principal sets of branches and trunks: the supraclavicular nerves, which innervate the upper back and part of the chest; and the infraclavicular, which innervate the arms and the rest of the chest.

brachiation, in animal behaviour, specialized form of arboreal locomotion in which movement is accomplished by swinging from one hold to another by the arms. The process is highly developed in the gibbon and siamang, which are anatomically adapted for it in the length of their forelimbs, their long hooklike fingers, and the mobility of their shoulder joints. The South American spider monkey is considered a semibrachiator, as it uses its prehensile tail as a third arm. Spider monkeys also run along branches as well as swing from them.

Because bipedal locomotion is the terrestrial form of movement in the true brachiators, some researchers believe that the human species may have evolved from a proto-brachiator. Other researchers have tried to demonstrate that the so-called knuckle-walking apes (*e.g.*, the gorilla) are descended from brachiating ancestors. They base this theory on the characteristically long arms and curved fingers of knuckle-walkers.

brachiopod (marine invertebrate): *see* lamp shell.

brachistochrone, the idealized path on which a body subjected only to the force of gravity will slide (without friction) between two points in the least possible time (*see* Figure). Finding the path was a problem posed (with a reward



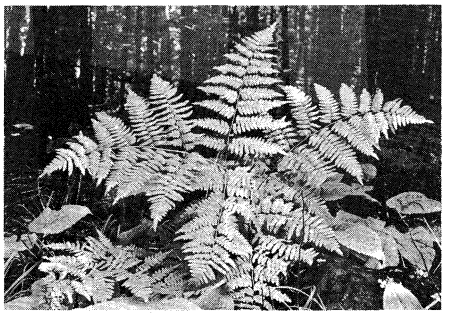
Brachistochrone (curve of fastest descent)

offered) by the Swiss mathematician Jakob Bernoulli in the late 17th century. He and his younger brother Johann, along with Gottfried Wilhelm Leibniz, Isaac Newton, and others found the curve to be a cycloid (*q.v.*). *See also* isoperimetric problem.

brachygraphy (rapid writing method): *see* shorthand.

Brachypteraciidae (bird family): *see* ground roller.

bracken, also called BRAKE, genus of ferns (*Pteridium*), the sole species (*P. aquilinum*) of which is widely distributed throughout the


Bracken (*Pteridium*)

Gretchen Garner—EB Inc.

world in temperate and tropical regions. The species is represented by 12 varieties, 4 of which occur in North America and Great Britain. Variety *pubescens* grows from Alaska to Mexico, east to Wyoming, Colorado, and Texas. Variety *latiusculum,* growing also in northern Europe and eastern Asia, occurs from Newfoundland to Minnesota, south to Oklahoma and Tennessee. Variety *pseudocaudatum* grows from Massachusetts to Florida, west to Missouri and Texas. Variety *caudatum,* a West Indian plant, grows in southern Florida. Variety *typica* is common in Great Britain. This species has a perennial black rootstock, which creeps extensively underground and at intervals sends up fronds. The fronds may reach a height of 5 metres (15 feet) or more, and, although dying in autumn, often remain standing throughout the winter, affording in some regions cover for game. The fronds are used by man for thatching and as fodder.

Brackenridge, Hugh Henry (b. 1748, Kintyre, near Campbeltown, Argyll, Scot.—d. June 25, 1816, Carlisle, Pa., U.S.), author of the first novel portraying frontier life in the United States after the Revolutionary War, *Modern Chivalry* (1792–1815).

At five Brackenridge was taken by his impoverished family from Scotland to a farm in York County, Pa. After a local minister taught him Latin and Greek, he became a teacher and worked his way through the College of New Jersey (now Princeton), receiving his B.A. in 1771. For the commencement exercises he recited "The Rising Glory of America," a patriotic poem he had written with a classmate, Philip Freneau, who also was to make his name in American letters. Brackenridge went on to get his M.A. in theology at Princeton in 1774. An enthusiast for the Revolution, he joined George Washington's army as chaplain. He published two verse dramas on Revolutionary themes: *The Battle of Bunkers-Hill* (1776) and *The Death of General Montgomery at the Siege of Quebec* (1777); and *Six Political Discourses founded on the Scripture* (1778). In an attempt to promote native American literature, he established and edited *The United States Magazine* in 1779, but it failed within the year.

He became a lawyer and settled in the frontier village of Pittsburgh in 1781, where he helped start *The Pittsburgh Gazette,* the first newspaper in what was then the Far West. After he was elected to the Pennsylvania Assembly in 1786, he obtained funds to found the academy that became the University of Pittsburgh. As mediator in 1794 during the Whiskey Rebellion (*q.v.*) he lost favour with both sides but wrote *Incidents of the Insurrection in the Western Parts of Pennsylvania in the Year 1794* (1795).

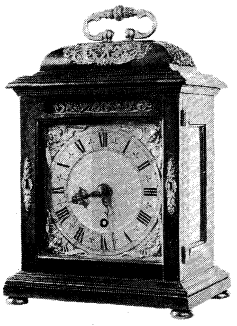
His leadership of Thomas Jefferson's Republican Party won him, in 1799, appointment as a judge of the Supreme Court of Pennsylvania, a post he held until his death. He settled permanently in Carlisle in 1801.

bracket, in architecture, device of wood, stone, or metal that projects from or overhangs a wall to carry a weight. It may also serve as a ledge to support a statue, the spring of an arch, a beam, or a shelf. Brackets are often in the form of volutes, or scrolls, and can be carved, cast, or molded. They are sometimes entirely ornamental. Among the types of bracket are the corbel (*q.v.*) and the console (*q.v.*), but there are many types that have no special name.

A bracket acts simultaneously outward, along the horizontal or top edge, and downward along the wall that supports the vertical. Too great a load on the bracket may pull dangerously against the wall, and so the horizontal edge is often an extension of an interior floor, to counteract the outward tendency. Such a design may be seen in the Old Cloisters, Windsor Castle, New Windsor, Berkshire, Eng.

bracket clock, English spring-driven pendulum clock, first commonly kept on a small wall bracket and later on a shelf. Many bracket clocks contained a drawer to hold the winding key.

The earliest bracket clocks, made for a period after 1660, were of architectural design,



Bracket clock with dome top and carrying handle by Thomas Tompion, *c.* 1690; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

with pillars at the sides and a pediment on top; in later versions the pillars were omitted, the pediment was replaced with a domed top, and a carrying handle was added. An ebonized finish was popular.

Brackley, Thomas Egerton, Viscount, also called (1603–16) BARON ELLESMERE (b. *c.* 1540—d. March 15, 1617, London), English lawyer and diplomat, who secured the independence of the Court of Chancery from the common-law courts, thereby formulating nascent principles of equitable relief.

Called to the bar by Lincoln's Inn in 1572, he was promoted rapidly under Queen Elizabeth I, becoming lord keeper of the great seal in 1596, an office he held for the unprecedented term of nearly 21 years, until March 3, 1617, and serving on many diplomatic missions.

Brackley, detail of an oil painting by an unknown artist; in the Bodleian Library, Oxford

By courtesy of the Bodleian Library, Oxford

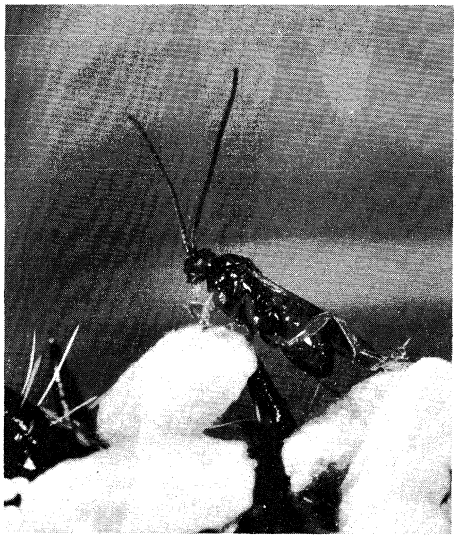
After the accession of James I (1603), whose view of the royal prerogative and whose ecclesiastical policy he was to support, Egerton was created Baron Ellesmere and became lord chancellor.

The chancellor's Court of Chancery was originally set up as a tribunal to decide civil cases not served by the common law—to correct its rigidity and insufficiency—and it came into rivalry with the common-law courts. When it granted relief against judgments of common law in 1616, a conflict with Ellesmere's antagonist, Sir Edward Coke, chief justice of the King's Bench, ensued and was resolved only by the King's decision in favour of equity (Earl of Oxford's case). Thereafter the equitable jurisdiction of the Court of Chancery was unquestioned.

In 1616 he was created Viscount Brackley; he declined an earldom on his deathbed the following year.

Bracknell, new town, Bracknell district, county of Berkshire, England. The district occupies an area of 42 sq mi (109 sq km). Old Bracknell town was unimportant until the 19th century, when its cattle market replaced one at Wokingham that dated from the early 13th century. The population was about 5,000 when the new town was designated in 1949; an influx of industry followed, including engineering, furniture, and clothing, drawing workers to the entire area including neighbouring towns. The Royal Military Academy at Sandhurst, established in 1799 for the training of military officers, is located in the extreme south. Pop. (1981 prelim.) new town, 48,752; (1981) district, 82,512.

braconid, any member of the family Braconidae (order Hymenoptera), a group of several hundred parasitic insects. Most species are dark or dull in colour and relatively small,



Braconid wasp (*Apanteles*)

Anthony Bannister from the Natural History Photographic Agency—EB Inc.

seldom exceeding 1.5 centimetres (0.6 inch) in length. The wings are sometimes banded or spotted. The ovipositor, or egg-laying organ, of the female is long and conspicuous.

Many species are valuable in the control of insect pests. *Apanteles glomeratus,* for example, parasitizes the larvae of the destructive white cabbage butterfly (*Pieris rapae*) and those of the cabbage looper (*Trichoplusia ni*). *Apanteles congregatus* parasitizes the tobacco hornworm (*Protoparce sexta*) and the tomato hornworm (*P. quinquemaculata*). Some braconids attack wood-boring pests such as beetles of the families Buprestidae and Cerambycidae. The braconid *Chremilus rubiginosus* attacks the granary weevil (*Sitophilus granarius*). In the Mediterranean region *Opius concolor* is a parasite of the olive fly (*Dacus oleae*), a destructive pest of commercial olives.

The female braconid lays its egg or eggs in the larvae or eggs of the host. The braconid larva remains within the host's body at least until it enters a resting stage (pupa). The pupa may be formed in the body of the host or attached to the outside or it may be separate—*i.e.,* on a leaf or stem. As many as 150 larvae may develop in a single host.

bracteate, thin, gold, disk-shaped pendant peculiar to early Scandinavian civilizations. Bracteates were produced by first carving the design in relief on some resistant material,

such as bronze or wood, and then pressing a thin sheet of gold over the carving.

These circular bracteates were derived from late Roman and Byzantine coins. Goldsmiths later abandoned the Roman originals for a local style of animal ornament or for designs representing their native deities, such as Thor riding a goat.

Bracton, Henry de, Bracton also spelled BRATTON, or BRETTON (b. Devon?—d. 1268, Exeter, Devon?), leading medieval English jurist, author of *De legibus et consuetudinibus Angliae* ("On the Laws and Customs of England"), one of the oldest systematic treatises on the common law. While depending chiefly on English judicial decisions and the methods of pleading required by English judges, Bracton enlarged the common law with principles derived from civil (Roman) and canon law. *De legibus* shows the influence of several continental jurists, notably Azzone (Azo), a Bolognese glossator of Roman law.

By 1245 Bracton was an itinerant justice for King Henry III, and from about 1247 to 1257 he was a judge of the Coram Rege (Before the Monarch), which afterward became the King's (or Queen's) Bench. Like most other English lawyers of his time, he was a priest; from 1264 he was chancellor of Exeter cathedral. In 1884 a manuscript collection, evidently by Bracton, of about 2,000 English law cases was discovered. Called the *Note-Book,* it was edited by the British legal scholar Frederic Maitland and published in 1887.

Bradbury, Ray (Douglas) (b. Aug. 22, 1920, Waukegan, Ill., U.S.), U.S. author of science fiction, nostalgic tales, poetry, radio drama, and television and motion-picture screenplays. His work showed special adeptness at capturing the bizarre, the grotesque, and the sentimental.

Bradbury published his first story in 1940 and was soon contributing widely to magazines; many of his stories have won prizes and have been published in more than 700 anthologies. His first book of stories, *Dark Carnival* (1947), was followed by, among others, *The Martian Chronicles* (1950; motion picture 1966; television miniseries 1980), generally accounted a science fiction classic; *The Illustrated Man* and *Fahrenheit 451* (1951), both later adapted for motion pictures; *The Golden Apples of the Sun* (1953); *The October Country* (1955); *Dandelion Wine* (1957); *A Medicine for Melancholy* (1959); *R Is for Rocket* (1962); *Something Wicked This Way Comes* (1962); and *I Sing the Body Electric!* (1969). He wrote children's stories, plays, and several screenplays, including *Moby Dick* (1956; in collaboration with John Huston). Bradbury also wrote several volumes of poetry, including *When Elephants Last in the Dooryard Bloomed* (1973) and *Where Robot Mice and Robot Men Run Round in Robot Towns* (1977).

Braddock, Edward (baptized 1695, London—d. July 13, 1755, Great Meadows, Pa.), unsuccessful British commander in North America in the early stages of the French and Indian War. Appointed major general in 1754, he went to Virginia in February of the following year to take command of all British forces in North America. In an attempt to expel the French from the Ohio Valley, he undertook an expedition against their stronghold at Fort-Duquesne (now Pittsburgh). After an extremely arduous march, the expedition was surprised and defeated by the French and their Indian allies on July 9 only eight miles from its objective. Braddock himself was mortally wounded in the fighting.

Braddock, James J(oseph) (b. Dec. 6, 1905, New York City—d. Nov. 29, 1974, North Bergen, N.J., U.S.), U.S. world heavyweight boxing champion from June 13, 1935, when he outpointed Max Baer in 15 rounds at the Long Island City Bowl, New York, until June 22, 1937, when he was knocked out by Joe Louis in eight rounds in Chicago.

A professional fighter from 1926, Braddock lost to the light-heavyweight champion Tommy Loughran in a 15-round title bout in New York City in 1929. Living on relief and seemingly at the end of his pugilistic career, Braddock returned to the ring in 1934 and earned a chance at the heavyweight championship with several unexpected victories. In defeating Baer he upset a 10-to-1 favourite. From 1926 to 1935, he had 85 bouts, winning 51, 26 by knockouts. Because of his quick second rise from obscurity to fame, he became known as "the Cinderella Man."

Braddon, Mary Elizabeth (b. Oct. 4, 1837, London—d. Feb. 4, 1915, Richmond, Surrey, Eng.), English novelist whose popular *Lady Audley's Secret* (1862) was a sensational and financial success. A three-volume novel written at the request of John Maxwell, a publisher, whom she subsequently married, it told a lurid story of crime in high society that yet managed not to transgress the Victorian bounds of propriety. She published more than 70 novels, in many of which she demonstrated a skill for social satire and the power to create atmosphere.

Bradenton, city, seat (1903) of Manatee County, southwestern Florida, U.S., on the south bank of the Manatee River, near its mouth at Tampa Bay (an inlet of the Gulf of Mexico), adjacent to Sarasota (south). Hernando de Soto landed nearby, probably at Shaw's Point, in 1539 (an event commemorated by a national memorial and an annual pageant). The first permanent settler was Joseph Braden, who planted sugar and built a "castle" (1854), remnants of which survive.

The community developed as a winter resort and market processing centre for farm produce (citrus, winter vegetables, and flowers) and livestock and was incorporated in 1903. In 1947 it merged with Manatee (founded 1842), its neighbour to the east, to form the City of Bradenton. Its economy became more diversified with an influx of light industries. Port Manatee at Piney Point on Tampa Bay is a terminal for shipping phosphate ore. South Florida Museum and Bishop Planetarium, near Green Bridge, display Indian artifacts and marine life. Gamble Mansion (Judah P. Benjamin Memorial, built 1842–45) at nearby Ellington is Florida's chief Confederate shrine. Manatee Junior College (1957) is in Bradenton. Pop. (1980) city, 30,170; metropolitan area (SMSA), 148,442.

Bradford, district (city), metropolitan county of West Yorkshire, England, west of Leeds, in a side valley where a broad ford crosses a small tributary of the River Aire.

A fulling mill recorded in 1311 indicates the early importance of the manufacture of wool products. In the late 17th century the fine worsted trade followed. With the working of local sandstone, ironstone, and coal in the 19th century, Bradford rapidly expanded along the stream toward the canalized Aire. By 1900 it had emerged as the main wool-buying centre for Yorkshire, handling wool from overseas and the home markets. Besides fine worsteds, silk, alpaca, and velvet cloths were manufactured in the late 19th century, when an influx of foreign merchants (mainly German Jews) stimulated the trade and assured the commercial supremacy of Bradford over other cloth markets at Wakefield and Halifax.

Wool sorting employs a large work force in the modern city. Today there is increasing use of synthetic fibres for blending with other yarns, and Bradford controls the dyestuffs industry throughout West Yorkshire. The city has become more cosmopolitan, with a large number of Pakistanis who work in the textile trades.

Important Victorian buildings include the Town Hall (Italian style) and the Wool Exchange (Venetian-Gothic). The parish church (dating from the 15th century but occupying the site of an earlier Norman church) became a cathedral in 1920. Bradford Institute of Technology, founded in 1957, became the University of Bradford in 1966. Pop. (1981 prelim.) city, 280,691; (1981) district, 457,423.

Bradford, city, McKean County, northern Pennsylvania, U.S., on the forks of the Tunungwant River, near the New York border. Established *c.* 1827 and first called Littleton, it was incorporated as a borough in 1873 and took the name Bradford probably for the New Hampshire home of many of its settlers. The discovery of oil (1871) brought sudden wealth, and in 1881 the area was producing 40 percent of the world's output. Production declined at the end of the 19th century, but increased after 1906 when a flooding process was introduced. Oil production has remained significant but has been overshadowed economically by diversified manufactures. Bradford campus of the University of Pittsburgh opened in 1963. The Allegheny National Forest and State Park and the Cornplanter Indian Reservation (the state's last Indian reserve) are nearby. Inc. city, 1879. Pop. (1980) 11,211.

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Bradford, Roark (Whitney Wickliffe) (b. Aug. 21, 1896, Lauderdale County, Tenn., U.S.—d. Nov. 13, 1948, New Orleans), U.S. novelist and short-story writer whose works of fiction and folklore were based on his contacts with U.S. blacks.

Bradford had little formal education; instead, he found the substance for his career in the people around him. When he began work as a reporter in 1920, he met the colourful characters of various Southern cities, including the musicians, preachers, and storytellers on the riverfront of New Orleans. This reacquaintance with the figures he had known while growing up on a plantation spurred Bradford to write a series of stories for the New York *World.* The second story he sold won the O. Henry Memorial Prize in 1927. When collected, the stories became his popular first book, *Ol' Man Adam an' His Chillun* (1928), which consisted of Biblical stories as related by uneducated blacks. The stories were adapted by Marc Connelly into the play *Green Pastures,* which won a Pulitzer Prize in 1930. Bradford also wrote novels that show U.S. blacks in historical perspective, such as *This Side of Jordan* (1929), about the arrival of machines on the plantations.

A major weakness of Bradford's work is his reliance on stereotypes of his black subjects. Yet his writing accurately reflects their dialect, and his approach is gentle and humorous.

Bradford, William (b. March 1590, Austerfield, Yorkshire, Eng.—d. May 9, 1657, Plymouth, Mass.), governor of the Plymouth Colony for 30 years, who helped shape and stabilize the political institutions of the first permanent colony in New England. Bradford also left an invaluable journal chronicling the Pilgrim venture, of which he was a part.

As a boy in England, he was caught up in the fervour of the Protestant Reformation and became a dedicated member of the Separatist Church, the "left wing" of Puritanism, when only 12. Seven years later he joined a group of nonconformists who migrated to Holland (1609) in search of religious freedom. Dissatisfied with the lack of economic opportunity

there, he helped organize an expedition of about 100 "Pilgrims" to the New World in 1620. Aboard ship, Bradford was one of the framers of the historic Mayflower Compact, an agreement for voluntary civil cooperation that became the foundation of the Plymouth government. The following year he was unanimously chosen as governor of the New World settlement and was re-elected 30 times, serving all but five years until 1656.

Bradford is remembered mainly for his contribution in nurturing the fledgling colony's democratic institutions, such as the franchise and town meeting, thus establishing those traditions of self-government that would set the pattern for national political development in years to come. Although he called himself a Congregationalist, he discouraged sectarian labels and made a point of welcoming all Separatist groups to New England shores. In addition, he evolved means of assimilating nonbelievers into the life of the colony.

Bradford's *History of Plymouth Plantation, 1620–47* is a unique source of intimate detail and description of both the sea voyage and the hardships and challenges faced by the settlers. A biography, *Bradford of Plymouth,* by William Bradford Smith appeared in 1951.

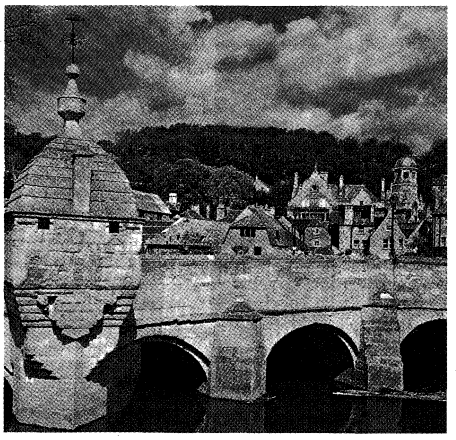
Bradford, William (b. May 20, 1663, Leicestershire, Eng.—d. May 23, 1752, New York City), printer who issued one of the first American almanacs, *Kalendarium Pennsilvaniense or America's Messenger* (1685), the first *American Book of Common Prayer* (1710), and many political writings and pamphlets. He learned the printer's trade in London, emigrated to Pennsylvania (1682), and opened a printing shop (1685) and a bookstore (1688) in Philadelphia. In 1690, with William Rittenhouse and others, he established the first paper mill in America, at Roxborough, Pa., now in Philadelphia. He went to New York (1693), was appointed royal printer for the colony, and, in the next half century, issued about 400 titles. In November 1725 he published the first New York newspaper, the *New York Gazette.* Many of his descendants were also printers.

Bradford, William (b. April 30, 1823, Fairhaven, Mass., U.S.—d. April 25, 1892, New York City), U.S. marine painter whose pictures attracted much attention by reason of their novelty and colour effects.

He was a Quaker and a self-taught artist, painting the ships and the marine views he saw along the coasts of Massachusetts, Labrador, and Nova Scotia; he went on several Arctic expeditions with Isaac Hayes and was the first American painter to portray the frozen regions of the north. His "Steamer 'Panther' in Melville Bay, under the Light of the Midnight Sun" was exhibited at the Royal Academy in London in 1875. Bradford was a member of the National Academy of Design, New York City.

His style was somewhat influenced by Albert van Beest, who worked with him at Fairhaven for a time, but Bradford is observant of minute detail, whereas Beest's aim was general effect. John Greenleaf Whittier's poem "Amy Wentworth" was inspired by a Bradford painting and is addressed to him.

Bradford-on-Avon, parish (town), West Wiltshire district, county of Wiltshire, England, on the Bristol Avon. Its limestone houses rise up the steep side of the valley, and the river is spanned by a medieval bridge complete with chapel. A local monastery existed in the 7th century, and in Abbey Yard, presumably its site, stands the Saxon Church of St. Lawrence, discovered and carefully restored in 1856. The monastery was sacked by the Danes in 1003. Bradford became a busy centre of the medieval wool trade and later was known for its manufacture of fine broadcloth. With the on-

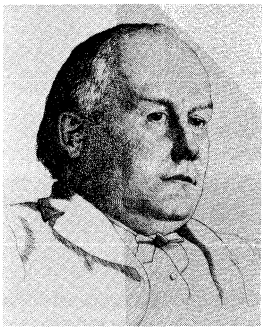


Medieval chapel and Stirling Bridge, Bradford-on-Avon, Wiltshire
G.F. Allen—Bruce Coleman Inc.

set of the Industrial Revolution, this declined, and the last cloth mill closed in 1905. The main industry today is the processing of rubber. Pop. (1981 prelim.) town, 8,752.

Bradlaugh, Charles (b. Sept. 26, 1833, London—d. Jan. 30, 1891, London), British radical and atheist, a freethinker in the tradition of Voltaire and Thomas Paine, prominent throughout most of the second half of the 19th century for his championship of individual liberties.

Son of a poor legal clerk, Bradlaugh served in the British Army (1850–53), followed his father's occupation for a time, and then became an antireligious lecturer under the name of Iconoclast. In 1860 he took over the editorship of the periodical *National Reformer,* which was prosecuted (1868–69) for alleged blasphemy and sedition. From 1874 to about 1885 he was closely associated with Annie Besant, an advocate of numerous unorthodox causes. In 1876 the Bristol publisher of *Fruits of Philosophy,* a birth-control pamphlet by Charles Knowlton, a U.S. physician, was



Bradlaugh, etching by W. Strang
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

given a light sentence for selling an indecent work. To vindicate their ideas of freedom, Bradlaugh and Besant republished the book in London in 1877 and circulated it aggressively, incurring much more severe penalties. Their indictments were nullified on a technical point, however.

In 1880 Bradlaugh, campaigning as a radical, was elected to the House of Commons. For more than five years, however, he was denied his seat because he asked to be allowed to affirm rather than to take the religious oath of Parliament. During that period he was re-elected three times and later offered to take the oath but was forbidden to do so, until finally, in January 1886, permission was granted and he was seated. By that time public opinion had swung in his favour, and Bradlaugh himself, who opposed Socialism, appeared increasingly conservative.

Bradley, A(ndrew) C(ecil) (b. March 26, 1851, Cheltenham, Gloucestershire, Eng.—d. Sept. 2, 1935, London), literary critic and pre-eminent Shakespearean scholar of the late 19th and early 20th centuries.

Bradley attended Oxford and held professorships of modern literature at the University of Liverpool (1882–90), of English language and literature at the University of Glasgow (1890–1900), and of poetry at Oxford University (1901–06). His *Shakespearean Tragedy* (1904), praised not only for penetrating analysis but also for its lucid prose style, is recognized as a classic of modern Shakespeare criticism. His psychological analysis of Shakespeare's characters anticipated post-Freudian criticism; his cataloging of images from the plays foreshadowed the sensitive analysis of Shakespeare's imagery made by Caroline Spurgeon and several later critics. Bradley also published *Oxford Lectures on Poetry* (1909), which includes an essay on Shakespeare's *Antony and Cleopatra,* and *A Miscellany* (1929), in which a well-known commentary on Tennyson's *In Memoriam* appears.

Bradley, Bill, byname of WILLIAM WARREN BRADLEY (b. July 28, 1943, Crystal City, Mo., U.S.), collegiate and professional basketball player, who after retirement from the game became a U.S. senator.

Bradley began to play basketball at the age of nine and became the best player in Missouri high school basketball history. At Princeton University (N.J.), Bradley, a forward, was a playmaker and high scorer, averaging 30.1 points a game during three seasons, in each of which Princeton won the Ivy League championship and Bradley was named an All-American. He was the first basketball player to win the Amateur Athletic Union's Sullivan Award for the amateur athlete of the year (1965). He played on the U.S. Olympic team that won the gold medal in the 1964 games. After graduation he deferred a contract offer from the National Basketball Association (NBA) New York Knickerbockers in order to study at Oxford University (M.A. 1968) as a Rhodes scholar. He joined the Knicks during the 1967–68 season and played with them through 1977 before retiring. During Bradley's career the Knicks won two NBA championships (1970, 1973). Bradley's *Life on the Run* (1977) is about professional basketball players during a few weeks of the 1973–74 season. He was elected to the Basketball Hall of Fame in 1983.

Bradley was elected to the U.S. Senate from New Jersey in 1978.

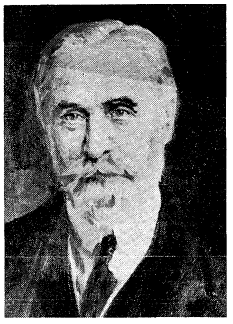
Bradley, Edward Riley (b. 1859, Pennsylvania, U.S.—d. Aug. 15, 1946, Lexington, Ky.), U.S. sportsman, gambler, philanthropist, owner and racer of Thoroughbreds, four of whom won the Kentucky Derby.

As a boy, Bradley worked in steel mills, then went to the Southwest, where he became a cowboy and fought Indians and was briefly a miner before he turned to gambling, which became a lifelong passion. Before the turn of the century, he opened a gambling casino in Palm Beach, Fla., the Oasis Club, which became a favourite haunt of celebrities. His Embassy Club, also in Palm Beach, was patronized and respected by social and industrial leaders who wintered in Florida. Advised by his physician that he needed to spend more time outdoors, Bradley bought the Idle Hour Farm, near Lexington, Ky., and became interested in horse racing, acquiring such outstanding horses as Blue Larkspur—whom Bradley and his trainer Dick Thompson considered his best horse, despite the animal's losing the Derby in 1929 on a muddy track—Bimelech, Bridal Flower, Bazaar, Black Helen, and Bagenbaggage, in addition to the four who won the Kentucky

Derby: Behave Yourself (1921); Bubbling Over (1926); Burgoo King (1932); and Brokers Tip (1933). Known for his blunt and forthright manner and for his superstitions, Bradley gave all his horses names beginning with the letter B. He also forbade his jockeys to carry whips. During the Depression of the 1930s, Bradley bought an interest in Hialeah Park in Miami.

In all, his horses won about 1,000 races and more than $2,500,000 in purses, but his expenses undoubtedly exceeded that amount. Bradley also instituted an annual charity race at the Idle Hour Farm, the proceeds of which went to Kentucky orphans of all races and religions. In 1940 he turned his Oasis Club over to the Catholic Institutum Divi Thomae for the founding of a laboratory of marine biology. Former governor A.O. Stanley of Kentucky gave Bradley the honorary rank of colonel.

Bradley, F(rancis) H(erbert) (b. Jan. 30, 1846, Clapham, Surrey, Eng.—d. Sept. 18, 1924, Oxford), influential English philosopher of the absolute Idealist school, which based its doctrines on the thought of G.W.F. Hegel and considered mind to be a more fundamental feature of the universe than matter.



F.H. Bradley, detail of a portrait by R.G. Eves, 1924; in the collection of Merton College, Oxford

By courtesy of the Warden and Fellows of Merton College, Oxford; photograph, Thomas Photos

Elected to a fellowship at Merton College, Oxford, in 1870, Bradley soon became ill with a kidney disease that made him a semi-invalid for the rest of his life. Because his fellowship involved no teaching duties and because he never married, he was able to devote the major part of his life to writing. He was awarded Britain's Order of Merit, the first English philosopher to receive the distinction.

In his early work Bradley participated in the growing attack upon the Empiricist theories of English thinkers such as John Stuart Mill and drew heavily on Hegel's ideas. In *Ethical Studies* (1876), Bradley's first major work, he sought to expose the confusions apparent in Mill's doctrine of Utilitarianism, which urged maximum human happiness as the goal of ethical behaviour. In *The Principles of Logic* (1883), Bradley denounced the deficient psychology of the Empiricists, whose logic was limited, in his view, to the doctrine of the association of ideas held in the human mind. He gave Hegel due credit for borrowed ideas in both books, but he never embraced Hegelianism thoroughly.

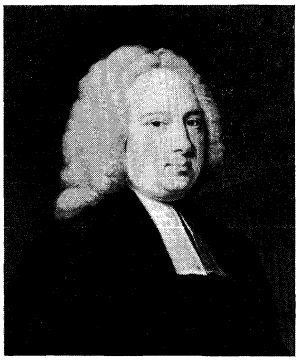
Bradley's most ambitious work, *Appearance and Reality: A Metaphysical Essay* (1893), was, in his own words, a "critical discussion of first principles," meant "to stimulate inquiry and doubt." The book disappointed his followers, who expected a vindication of the truths of religion. While reality is indeed spiritual, he maintained, a detailed demonstration of the notion is beyond human capacity. If for no other reason, the demonstration is impossible because of the fatally abstract nature of human thought. Instead of ideas, which could not properly contain reality, he recommended feeling, the immediacy of which could embrace the harmonious nature of reality. His admirers were disappointed as well by his discussion of worship and the soul. He declared that religion is not a "final and ultimate" matter but, instead, a matter of practice; the philosopher's absolute idea is incompatible with the God of religious men.

The effect of *Appearance and Reality* was to encourage rather than to dispel doubt, and the following that Bradley had gained through his work in ethics and logic became disenchanted. Thus, the most influential aspect of his work has been the negative and critical one because of his skill as a polemical writer. Bertrand Russell and G.E. Moore, who led the attack on Idealism, both benefitted from his sharp dialectic. Modern critics value him less for his conclusions than for the manner in which he reached them, via a ruthless search for truth. In addition to original work in philosophical psychology, Bradley wrote *The Presuppositions of Critical History* (1874) and *Essays on Truth and Reality* (1914). His psychological essays and minor writings were combined in *Collected Essays* (2 vol., 1935).

BIBLIOGRAPHY. R.W. Church, *Bradley's Dialectic* (1942); R. Wollheim, *F.H. Bradley* (1959); T.S. Eliot, *Knowledge and Experience in the Philosophy of F.H. Bradley* (1964).

Bradley, James (b. March 1693, Sherborne, Gloucestershire, Eng.—d. July 13, 1762, Chalford, Gloucestershire), English astronomer who in 1728 announced his discovery of the aberration of starlight, an apparent slight change in the positions of stars caused by the yearly motion of the Earth. That finding provided the first direct evidence for the revolution of the Earth around the Sun.

Bradley was educated at Balliol College, Oxford, where he received the B.A. in 1714 and the M.A. in 1717. He was instructed in observational astronomy at Wanstead, Essex, by his uncle, the Rev. James Pound, clergyman and skilled amateur astronomer, who introduced him to the famous astronomer Edmond Halley.



James Bradley, detail of an oil painting after Thomas Hudson, c. 1742–47; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Bradley's scientific acumen was stimulated by his membership in the Royal Society, to which he was elected a fellow in 1718 on the recommendation of Halley. Bradley took church orders and became vicar of Bridstow in 1719. The income from that position was augmented by a sinecure as an absentee rector in a parish in Pembrokeshire, Wales, which was procured for him by his friend and astronomical collaborator, Samuel Molyneux. Bradley resigned his church offices when he was appointed in 1721 to the Savilian chair of astronomy at Oxford and thenceforth devoted his full time to astronomy.

After the publication of *De revolutionibus orbium coelestium* by Copernicus in 1543, it became increasingly imperative for astronomers to be able to observe and measure the parallactic displacement of a star—the change in a star's position over a six-month period—to confirm the orbital motion of the Earth around the Sun. Such information would provide the empirical evidence needed to augment the mathematical and conceptual arguments thitherto advanced for the idea that the Sun does not revolve around the Earth. In the absence of such evidence for parallax, Tycho Brahe, the 16th-century astronomer, had not been favourably disposed to Copernican theory. Ole Rømer, a Danish astronomer, measured an apparent displacement of the stars Sirius and Vega in the 17th century, but his observations were found to be erroneous. Robert Hooke, one of the founding members of the Royal Society, measured the star Gamma Draconis in a series of observations in 1669 for a similar attempt but was forced to report failure.

In 1725, using Molyneux's house as an observatory, Bradley attempted to repeat Hooke's measurements on Gamma Draconis with a telescope aimed so as to avoid any error resulting from the refraction of light. Although he failed to detect parallax because the star was too far away, Bradley made one of the two discoveries for which he is famous. He observed that Gamma Draconis shifted south in position by an astonishing 1″ of arc in three days—the wrong direction and by too large an amount to be accounted for by parallax. It is said that the explanation for this phenomenon came to Bradley as he sailed on the Thames, observing how the wind vane on the mast shifted position with the varying motion of the boat, even though the wind had not changed direction. He concluded that the apparent stellar shift was brought about by the aberration of light, which was a result of the finite speed of light and the forward motion of the Earth in its orbit. Bradley communicated this discovery to the Royal Society in 1728, shortly after the death of Molyneux. On the basis of his quantitative observations of aberration, Bradley confirmed the velocity of light to be 295,000 kilometres (183,000 miles) per second and gave a proof for the Copernican theory.

Bradley's star measurements in 1727–32 also revealed what he called the "annual change of declination in some of the fixed stars," which could not be accounted for by aberration. He concluded that this was caused by the slight and uneven nodding motion of the Earth's axis (nutation) that resulted from the changing direction of the gravitational pull of the Moon. But he withheld this announcement until he had made careful confirmatory observations during one complete set of revolutions of the Moon in its orbit. For this achievement the Royal Society of London awarded him the Copley Medal in 1748.

Members of the Royal Society in their function as "visitors and directors" of the Royal Greenwich Observatory recommended Bradley in 1742 to succeed Halley in the post of astronomer royal. (Halley, the second astronomer royal, had followed John Flamsteed.) Bradley received £250 a year and the then sizable grant of £1,000 for instruments, notably an 8-foot (2.4-metre) quadrant for more precise measurements. In 1744 he married Susannah Peach, by whom he had one daughter. He held his important scientific, administrative, and consultative position at Greenwich until a few years before his death.

The bulk of Bradley's observations was published after his death in an atmosphere of acrimony. Dispute between his heirs and the British Admiralty over the ownership of his work delayed publication until 1798–1805. The German mathematician Friedrich Bessel analyzed and organized his data, correcting for the small errors in Bradley's instruments, and then computing star positions.

Bradley was one of the first post-Newtonian observational astronomers who led the quest for precision. (G.S.H.)

BIBLIOGRAPHY. No complete biography exists. Additional information may be found in the preface to Bradley's *Miscellaneous Works and Correspondence,* ed. by S.P. Rigaud (1832); and in the article, "James Bradley, 1693–1762: Bicentary Contributions," *Q. Jl. R. Astr. Soc.,* 4:38–61 (1963).

Bradley, Joseph P. (b. March 14, 1813, Berne, N.Y., U.S.—d. Jan. 22, 1892, Washington, D.C.), associate justice of the Supreme Court from 1870. Bradley was appointed to fill a vacancy on the Electoral Commission of 1877, and his vote elected Rutherford B. Hayes president of the U.S. As a justice he emphasized the power of the federal government to regulate commerce. His decisions reflecting this view, rendered during the period of rapid industrialization that followed the Civil War, were significant in assuring a national market for manufactured goods. His refusal to allow constitutional protection for the civil rights of blacks assisted in the defeat of Reconstruction in the South.

A farm boy with a thirst for learning, he managed to find a way to Rutgers College and thence to the New Jersey bar. He grew to be both a reflective master of the law and an active participant in large undertakings; the Camden & Amboy Railroad was his most important client. In 1870 Bradley was appointed to the Supreme Court by Pres. Ulysses S. Grant and was assigned, as a travelling circuit justice, to the Fifth (Southern) Circuit. His first major civil rights case was *United States* v. *Cruikshank,* which he heard initially in federal circuit court in 1874. It concerned an armed attack by whites who killed 60 blacks at a political rally in Louisiana. Bradley ruled that such rights as the citizen's right to vote, to assemble peaceably, to bear arms, and the rights to due process and equal protection, were not protected by the federal government but by the states. When the case reached the Supreme Court, the majority held the same view.

In 1883 Bradley and the court majority declared unconstitutional two sections of the Civil Rights Act of 1875, which had forbidden discrimination on the ground of colour in inns, public conveyances, and places of amusement. Bradley held that the act was beyond the power of Congress because the Fourteenth Amendment barred discriminatory actions only by states and not by private individuals. The dissent by Justice John M. Harlan, who called attention to the public nature of inns and restaurants, was later to be followed by Congress in the Civil Rights Act of 1964 and sustained by the Supreme Court under the Commerce Clause, *Heart of Atlanta Motel* v. *U.S.* (1964); *Katzenbach* v. *McClurg* (1964).

Bradley, Omar N(elson) (b. Feb. 12, 1893, Clark, Mo., U.S.—d. April 8, 1981, New York City), U.S. Army officer who commanded the highly effective 12th Army Group, which helped ensure the Allied victory over Germany during World War II; later he served as first chairman of the U.S. Joint Chiefs of Staff (1949–53).

Omar Bradley, 1970
By courtesy of the U.S. Army

Bradley graduated from the U.S. Military Academy at West Point, N.Y. in 1915. He served as commandant of the Infantry School, Ft. Benning, Ga., at the opening of World War II and later commanded the 82nd and 28th divisions. After being placed at the head of the II Corps for the North African campaign, he captured Bizerte, Tunisia, in May 1943, contributing directly to the fall of Tunisia and the surrender of more than 250,000 Axis troops. He then led his forces in the Sicilian invasion, which was successfully concluded in August.

Later in 1943 Bradley was transferred to Great Britain and given command of the U.S. 1st Army, taking part in planning the invasion of France. In June 1944 he joined his troops in the assault on the Normandy beaches and in the initial battles on the mainland. One of the most memorable episodes in that summer's fighting was the symbolic liberation of Paris (August 25) by Bradley's forces following the spontaneous uprising of the city's population earlier that month. At the same time, he was elevated to command the U.S. 12th Army Group and, with the largest force ever placed under an American group commander, successfully carried on operations in France, Luxembourg, Belgium, The Netherlands, Germany, and Czechoslovakia until the end of European hostilities.

After the German surrender, Bradley returned to the United States to serve as administrator of veterans' affairs (1945–47) and chief of staff of the army (1948–49). He was well liked by both officers and men and, after the unification of the armed forces, was chosen in 1949 as the first chairman of the Joint Chiefs of Staff. While at that post he was promoted (1950) to General of the Army. After retiring from the Army in 1953, Bradley was active in private enterprise. In 1951 he published his reminiscences, *A Soldier's Story.*

Bradman, Don, byname of SIR DONALD GEORGE BRADMAN (b. Aug. 27, 1908, Cootamundra, N.S.W., Australia), Australian cricketer, considered the greatest natural batsman in the history of the game. He was a share broker from 1934.

In Test (international) matches he scored 6,996 runs for Australia and set a record with his average of 99.94 runs a match. He scored 19 centuries (100 runs in a single innings) in Test matches against England between 1928 and 1948. On his first visit to England, in 1930, he established a Test record (eventually broken) by scoring 334 runs in one innings; in 1934, also in England, he had an innings of 304 runs. In 1948 he was captain of the Australian team that was victorious in England, four matches to none. He retired from first-class cricket in 1949 and was knighted in the same year.

Bradman, as a youth, perfected his timing by hitting a soft ball against a corrugated metal water tank. He developed a quick eye, deft footwork, and an uncanny judgment of bowling and also became a brilliant outfieldsman. He wrote a volume of reminiscences, *Farewell to Cricket* (1950), and a coaching manual, *The Art of Cricket* (1958). A biography by Irving Rosenwater appeared in 1978.

Bradshaw, John (b. 1602, Stockport, Cheshire, Eng.—d. Oct. 31, 1659, London), president of the court that condemned King Charles I of England to death.

Bradshaw, the son of a country gentleman, became a lawyer and in 1643 was appointed judge of the sheriff 's court in London. During the early years of the Civil Wars he used his legal talents to aid the Parliamentarians' cause. He became chief justice of Chester, Cheshire, in 1647, and in January 1649 the Independents (radical Puritans), who controlled the House of Commons, made him president of the court assembled to try Charles for treason. Charles repeatedly refused to plead, though he sought to have his case heard before Parliament—a request denied by Bradshaw. Charles was convicted and executed (Jan. 30, 1649).

John Bradshaw, mezzotint by an unknown artist
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

In March 1649 Bradshaw became president of the Council of State, the executive body of the Commonwealth. After Oliver Cromwell established the Protectorate in 1653, Bradshaw openly expressed his dissatisfaction with the new government and retired from politics (1654). In May 1659, following the death of Cromwell and the abdication of Cromwell's son Richard, Bradshaw was again made a member of the Council of State, and in June he became commissioner of the great seal.

Bradshaw, Terry (Paxton) (b. Sept. 2, 1948, Shreveport, La., U.S.), U.S. professional football quarterback for the National Football League (NFL) Pittsburgh Steelers. He led his team to four American Football Conference (AFC) championships (1974–75, 1978–79) and, all four times, to Super Bowl victories.

Bradshaw practiced passing from early boyhood, but he became starting quarterback at Woodlawn High School only in his senior year. He also played baseball and threw the javelin in high school. In his last two years at Louisiana Technical University (Ruston) he was the star quarterback. He was signed by the Steelers in 1970 as their first draft choice, but did not come into his own until 1974, when the Steelers won their first championship. He led the league in average yardage gained by passing (1977–78).

Bradshaw-Isherwood, Christopher William: *see* Isherwood, Christopher.

Bradstreet, Anne (Dudley) (b. *c.* 1612, Northampton, Northamptonshire?, Eng.—d. Sept. 16, 1672, Andover, Massachusetts Bay Colony), one of the first poets to write English verse in the American colonies. Long considered primarily of historical interest, she won critical acceptance in the 20th century as a writer of enduring verse, particularly for her sequence of religious poems "Contemplations," written for her family and not published until the mid-19th century.

Her father, Thomas Dudley, was chief steward to the Puritan earl of Lincoln, and she grew up in cultured circumstances. She married Simon Bradstreet, another protégé of the Earl's, when she was 16, and two years later she, her husband, and her parents sailed with other Puritans to settle on Massachusetts Bay.

She wrote her poems while rearing eight children, functioning as a hostess, and performing other domestic duties. The Bradstreets moved frequently in the Massachusetts colony, first to Cambridge, then to Ipswich, and then to An-

dover, which became their permanent home. Bradstreet's brother-in-law, without her knowledge, took her poems to England, where they were published as *The Tenth Muse Lately Sprung Up in America* (1650). The first American edition of *The Tenth Muse* was published in revised and expanded form as *Several Poems Compiled with Great Variety of Wit and Learning* (1678).

Most of the poems in the first edition are long and rather dully imitative works based on the standard poetic conventions of the time, but the last two poems—"Of the vanity of all worldly creatures" and "David's Lamentation for Saul and Jonathan"—are individual and genuine in their recapitulation of her own feelings.

Her later poems, written for her family, show her spiritual growth as she came fully to accept the Puritan creed. She also wrote more personal poems of considerable beauty, treating in them such subjects as her thoughts before childbirth and her response to the death of a grandchild. These shorter poems benefit from their lack of imitation and didacticism. Her prose works include "Meditations," a collection of succinct and pithy aphorisms. A scholarly edition of her work was edited by John Harvard Ellis in 1867. In 1956 the poet John Berryman paid tribute to her in *Homage to Mistress Bradstreet,* a long poem which incorporates many phrases from her writings.

Bradwardine, Thomas (b. *c.* 1290—d. Aug. 26, 1349, London), archbishop of Canterbury, theologian, and mathematician.

Bradwardine studied at Merton College, Oxford, and became a proctor there. About 1335 he moved to London, and in 1337 he was made chancellor of St. Paul's Cathedral. He became a royal chaplain and confessor to King Edward III. In 1349 he was made archbishop of Canterbury but died of the plague soon afterward during the Black Death.

Bradwardine's most famous work in his day was a treatise on grace and free will entitled *De causa Dei* (1344), in which he so stressed the divine concurrence with all human volition that his followers concluded from it a universal determinism. Bradwardine also wrote works on mathematics. In the treatise *De proportionibus velocitatum in motibus* (1328), he asserted that an arithmetic increase in velocity corresponds with a geometric increase in the original ratio of force to resistance. This mistaken view held sway in European theories of mechanics for almost a century.

Bradwell, Myra Colby, *née* COLBY (b. Feb. 12, 1831, Manchester, Vt., U.S.—d. Feb. 14, 1894, Chicago), American lawyer and editor who was involved in several landmark cases concerning the legal rights of women.

After studying law with her husband, James Bolesworth Bradwell, a judge in Cook County, Ill., whom she married in 1852, Myra Bradwell founded a weekly legal newspaper, *Chicago Legal News,* in 1868. It soon became the most important legal publication in the western United States. Bradwell's application in 1869 for admission to the Illinois bar was denied because she was a woman; the U.S. Supreme Court upheld the lower court ruling in 1873, setting a precedent for state jurisdiction in matters of the entrance of women into occupations. In 1890, however, Bradwell was admitted to the bar in Illinois, and in March 1892 she was admitted to practice before the U.S. Supreme Court.

Her most important legal contributions were made before she won the right to practice law. An active suffragist, she worked for state laws that gave married women the right to keep their own wages (1869) and protected the rights of widows. Her articles in the *Chicago Legal News* evaluated legal opinions and legislation, and promoted the regulation of big corporations, the passage of zoning ordinances, and the establishment of professional standards for the legal profession.

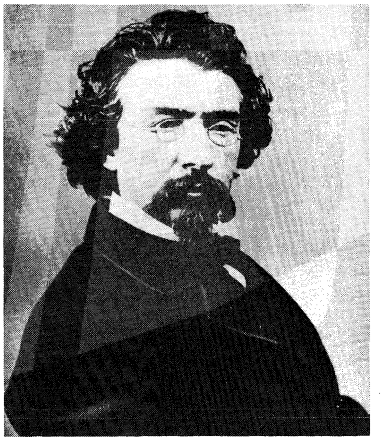
Brady, James Buchanan, byname DIAMOND JIM BRADY (b. Aug. 12, 1856, New York City—d. April 13, 1917, Atlantic City, N.J., U.S.), American financier and philanthropist, noted for his lavish lifestyle, fondness for ostentatious jewelry, and enormous appetite.

Brady worked as a bellhop and in various jobs with the New York Central Railroad before taking a sales position with a railroad supply house. An extremely successful salesman, he drew huge commissions and soon was a multimillionaire. As his wealth increased, so did his generosity and his penchant for the good life. He handed out cash liberally and forgave debts freely. He invested much of his fortune in jewelry, mostly diamonds. Rarely seen in public without one or more of his great gems prominently displayed, he thus acquired the nickname "Diamond Jim" and became a legendary and popular figure in New York City. He was equally famous for his seemingly insatiable capacity for food, an appetite that he freely indulged at grand feasts.

In 1912 he donated funds to Johns Hopkins Hospital in Baltimore for the establishment of a medical institute. He also bequeathed a large sum to New York Hospital.

Brady, Mathew B. (b. *c.* 1823, near Lake George, N.Y., U.S.—d. Jan. 15, 1896, New York City), one of the best-known 19th-century American photographers, celebrated for his portraits of politicians and for his photographs of the American Civil War.

The artist and inventor Samuel F.B. Morse taught him to take daguerreotypes, and Brady opened his first studio in New York City in



Mathew Brady, *c.* 1863

By courtesy of the Gernsheim Collection, Humanities Research Center, The University of Texas at Austin

1844, a second in Washington, D.C., four years later; and a third, also in New York City, in 1854.

In 1845 he began to carry out his plan of photographing as many famous persons of his time as he could—including Daniel Webster, Edgar Allan Poe, and James Fenimore Cooper. His collection of presidential portraits attests to the scope of that project. Except for William Henry Harrison, who died only a month after his inauguration, Brady created, copied, or collected the photographs of every U.S. president from John Quincy Adams to William McKinley. This added to the already great prestige of Brady's fashionable studios, and he won critical fame at home and abroad with the publication of *A Gallery of Illustrious Americans* (1850).

At the outbreak of the American Civil War in 1861, Brady decided to make a complete record of that conflict. He hired a staff of a score or more photographers, the best-known of whom were Alexander Gardner (1821–82) and Timothy H. O'Sullivan (*c.* 1840–82). He dispatched his staff throughout the war zones. Although his main activities were directing his cameramen from his Washington office and supervising the operation of his studios, Brady himself probably photographed such battlefields as Bull Run, Antietam, and Gettysburg. He also took memorable photographs of Abraham Lincoln in the field and Robert E. Lee soon after he had surrendered his army at Appomattox, in April 1865.

The Civil War project ruined Brady financially. He had invested $100,000 in it, confident that the government would buy his photographs after the war ended. The government, however, showed no interest. Moreover, the best photographers had left Brady's organization by then because Brady refused to give them public credit for their work. The financial panic of 1873 forced him to sell his New York City studio and go into bankruptcy. He was unable to pay the storage bill for his negatives; the War Department finally bought them at public auction for $2,840. Through the efforts of his friends in government, however, Brady was finally granted $25,000 by Congress in 1875. Nevertheless, he never regained financial solvency, and he died an alcoholic, alone and forgotten in a hospital charity ward.

Brady, Nicholas (b. Oct. 28, 1659, Bandon, County Cork, Ire.—d. May 20, 1726, Richmond, Surrey, Eng.), Anglican clergyman and poet, author, with Nahum Tate, of a well-known metrical version of the Psalms.

Brady graduated from Trinity College, Dublin, and became prebendary of Cork. In 1690, he was able to prevent the burning of the town of Bandon, after James II had given orders for its destruction in his attempt to regain his crown. Brady soon afterward settled in London, where he held the livings of Clapham and Richmond.

Brady and Tate's *New Version of the Psalms* was licensed in 1696 and largely displaced the old version of T. Sternhold and J. Hopkins. Among Brady's other works was a blank-verse translation of Virgil's *Aeneid* (1726).

Brady, William A(loysius) (b. June 19, 1863, San Francisco—d. Jan. 6, 1950, New York City), American actor, manager, stage and motion-picture producer, and sports promoter.

Brady made his acting debut in San Francisco in 1882 and began touring with his own company by 1888. He became a producer after successfully bringing the melodrama *After Dark* to the New York stage in 1889. In three New York theatres—the Manhattan, 48th Street, and Playhouse—Brady went on to produce more than 250 plays, including *Way Down East;* an all-star revival of *Uncle Tom's Cabin; A Free Soul;* and Elmer Rice's *Street Scene.* His second wife, the stage and film star Grace George, starred in many of these productions. As a manager, Brady numbered among his clients his wife, Helen Hayes, Douglas Fairbanks, Sr., and Tallulah Bankhead, as well as the heavyweight boxers James J. Corbett and James J. Jeffries.

In 1917 he was appointed chairman of a committee to organize the American motion-picture industry for World War I by President Woodrow Wilson. Brady was a pioneer producer of motion pictures and served as president of the National Assembly of the Motion Picture Industry between 1915 and 1920. He was the father of the stage and film actress Alice Brady (1892–1939).

bradycardia, unusual slowing of the heart rate to 60 beats per minute or less. A slow heart rate in itself may have little medical significance; physiological bradycardia is frequent among young adults, especially in highly trained athletes or during sleep. Bradycardia may indi-

cate significant heart disease if accompanied by other symptoms. Bradycardia caused by a dysfunction of the sinus node, the heart's natural pacemaker, often produces weakness, confusion, palpitations, and fainting. When slowing alternates with rapid acceleration of the heart rate (tachycardia) in the "sick sinus" syndrome or when sinus bradycardia is accompanied by congestive heart failure or other serious complications, an artificial pacemaker may be necessary to regulate the heart rate. Another common cause of bradycardia, the blockage of electrical conduction through the atrioventricular node, is similar in its symptoms to sinus bradycardia. Bradycardia can also be produced by drugs such as digitalis or morphine and is a common abnormality in those undergoing an acute myocardial infarction (heart attack), for whom it often indicates a favourable prognosis.

Bradysaurus, genus of a group of extinct early reptiles found as fossils in Middle Permian deposits of South Africa (the Permian Period began 280,000,000 years ago and lasted 55,000,000 years). *Bradysaurus* is included in a group of early reptiles known as the pareiasaurs, which were characterized by massive bodies, strong limbs and limb supports, and grotesque skulls that carried many bony protuberances. *Bradysaurus,* like the other pareiasaurs, had serrated teeth along the jaw margins, palatal teeth, and a thick skull; it was adapted to a plant diet. The skull of *Bradysaurus* was about 0.5 m (about 1.5 feet) long.

Braemar, in full CASTLETON OF BRAEMAR, small village on the Clunie Water (stream) at its confluence with the River Dee, and the centre of a picturesque mountainous area in Grampian region, Scotland. Famous as the site of the raising of the standard of national revolt in the (Jacobite) Fifteen Rebellion of 1715, Braemar is now a popular tourist resort and the focus of the Deeside Highlands, an area of royal deer forests, castles, and mansions, including the British royal residence of Balmoral Castle. The Royal Braemar Gathering (Highland Games), a national folk athletic contest, is held annually in September. Pop. (1981) 966.

Braga, city, capital, and *concelho* (municipality), Braga district, northern Portugal. It lies at the head of the railway from Porto. Probably founded in 296 BC by Carthaginians, Braga was called Bracara Augusta by the Romans. It served as capital of the Callaici Bracarii, a Celtic tribe, and was a meeting place for five strategic military roads. The city was taken successively by the Suebi (5th century) and the Visigoths (585). Braga is known as the place where the Visigoths renounced the Arian and Priscillianist heresies against Christ's divinity and against sensual pleasures. Taken by the Moors (716), it was recaptured in 1040 by Ferdinand I, king of Castile and Leon, and from 1093 to 1147 it was the seat of the Portuguese court. Braga is an archiepiscopal see, and its archbishop is the primate of Portugal.

Staircase leading to the church of Bom Jesus do Monte, Braga, Port.

Porterfield-Chickering—Photo Researchers/EB Inc.

The city's principal landmarks include a 12th-century cathedral, rebuilt during the 16th century in the blend of Moorish and florid Gothic styles known as Manueline; the 17th-century church of Santa Cruz; and a library that contains many rare books and manuscripts. On a hill about 3 miles (5 km) southeast stands the sanctuary of Bom Jesus do Monte, which is visited on Whitsunday by thousands of pilgrims and is famous for its 18th-century architectural staircase. About a mile beyond it is Mount Sameiro, atop which is situated a colossal statue of the Virgin Mary. The University of Minho was founded in Braga in 1973. The industries in Braga include the manufacturing of firearms, jewelry, cutlery, furniture, electronics, textiles, and hats. Large cattle fairs are held annually in June and September. Braga can be reached from Porto and Viana do Castelo by highway and railroad.

Braga district has an area of 1,032 square miles (2,673 square km). Pop. (1981) city, 63,033; *concelho,* 157,349; (1986 est.) district, 756,300.

Braga, Rubem (b. Jan. 12, 1913, Cachoeiro de Itapemirim, Braz.), Brazilian journalist and author, best-known for his numerous volumes of *crônicas,* short prose sketches integrating elements of essay and fiction.

As a journalist, Braga worked on almost all the periodicals of Rio de Janeiro and São Paulo. He was a foreign correspondent in Italy during World War II and later in Argentina, Peru, Paraguay, and the United States. For a three-year period (1961–63) he served as Brazilian ambassador in Morocco.

As a *cronista,* Braga reflects the joy of living, a keen sense of benevolent humour, a compassionate tolerance toward the human types treated in his sketches (principally the urban population of Rio de Janeiro and its environs), and an affirmation of optimism and solidarity among peoples. His best-known collections include *O Conde e o Passarinho* (1936; "The Count and the Little Bird"), *O Homem Rouco* (1949; "The Hoarse Man"), *A Borboleta Amarela* (1956; "The Yellow Butterfly"), and *Ai de Ti, Copacabana!* (1960; "Woe to You, Copacabana!").

Braga, (Joaquim) Teófilo (Fernandes) (b. Feb. 24, 1843, Ponta Delgada, Azores—d. Jan. 28, 1924, Lisbon), poet, critic, and statesman who was the first to attempt a complete history of Portuguese literature.

Braga's family was Roman Catholic and monarchist by tradition, but he himself soon became noted for his intransigent republicanism and anticlericalism at Coimbra University, from which he graduated in 1868. He became a professor of modern literature at Lisbon in 1872. Of a buoyant, pugnacious temperament, he wrote profusely on literary, social, historical, and political subjects and produced some verse. His long poem *Visão dos Tempos* (1864; "Vision of the Ages") was inspired by Victor Hugo's *Légende des siècles* ("Tale of the Centuries"). He published several books on Portuguese folklore and collections of early songs and ballads. Braga was the leading follower of Auguste Comte's Positivism in Portugal.

Braga's investigations ranged widely over the whole history of Portuguese literature, but, owing to his lack of a sense of proportion and his determination to fit the facts to his own sociological and philosophical theories, the valuable material he accumulated is often swamped by digressions and theorizings that have lost much of their validity. Among his historical works are *História do Romantismo em Portugal* (1880; "History of Romanticism in Portugal"), *História da Literatura Portuguesa,* 10 vol. (1870–81; "History of Portuguese Literature"), and studies of the Romantic poet Almeida Garrett and of the 18th-century Portuguese poets.

An unswerving republican, Braga became president of the provisional government that set up the Portuguese republic in 1910, and he held the presidential office again in 1915.

Bragança, city, northeastern Pará state, northern Brazil. Situated near the Atlantic coast, it is a regional commercial centre. Cotton, tobacco, cassava, corn (maize), rice, and sugarcane are the principal crops traded and processed in the city, which also contains lime kilns. Goods are sent to Belém, 125 miles (200 km) southwest, by railroad and highway. Bragança can also be reached by air. Pop. (1980 prelim.) 31,452.

Bragança, English BRAGANZA, city, capital, and *concelho* (municipality), Bragança district, northeastern Portugal. It lies on a branch of the Sabor River in the Culebra Mountains, 105 miles (170 km) northeast of Porto on the Spanish frontier.

Originally Bragança was a Celtic city known as Brigantia; it later became the Juliobriga of the Romans. Historically the city is important as the seat of the House of Bragança, which provided the kings of Portugal from 1640 to 1910 and the emperors of Brazil from 1822 to 1889; their feudal castle (built 1187) still remains. Catherine of Bragança became the queen consort (1662) of Charles II of England. An episcopal see, Bragança was the capital of the historical Trás-os-Montes province. Notable landmarks in the city include the 12th-century Domus Municipalis (Portugal's oldest and largest town hall), the Renaissance cathedral, and the town walls, with 18 watch towers. The possessions of the House of Bragança belong to the Portuguese state and support the Fundaçao da Casa de Bragança, a foundation with a library, museum, and lecture centre in the 16th-century residence of the Bragança family in Vila Viçosa.

Bragança is an agricultural trade centre (wine, olive oil, grains, livestock), and some manufacturing (textiles) is carried on there. The centuries-old Ash Wednesday celebration attracts many tourists each year. Bragança is connected to Porto by rail and paved road.

Bragança district is largely mountainous and has an area of 2,551 square miles (6,608 square km). High-grade iron ore is mined there. Pop. (1981) city, 14,662; *concelho,* 35,553; (1986 est.) district, 186,400.

Bragança, HOUSE OF, English BRAGANZA, ruling dynasty of Portugal from 1640 to 1910 and of the empire of Brazil from 1822 to 1889.

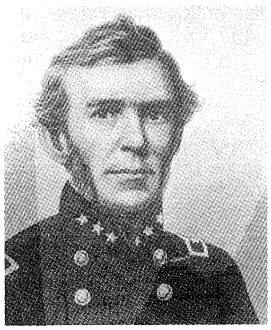
The first duke of Bragança was Afonso (d. 1461), an illegitimate son of the Portuguese king John I. When Portugal gained its independence from Spain in 1640, João II, 8th duke of Bragança, ascended the Portuguese throne as John IV. Thereafter the title duke of Bragança was borne by the heir presumptive to the throne. The new dynasty lasted until the death of Maria II in 1853. Her two sons (Peter V and Louis), grandson (Charles), and great grandson (Manuel II), all of the House of Saxe-Coburg-Gotha-Kohâry (their father's dynastic house), ruled until the end of the monarchy in 1910.

Meanwhile, after Brazil declared its independence from Portugal in 1822, two successive members of the House of Bragança ruled Brazil as emperors until the formation of the Brazilian republic in 1889.

Bragg, Braxton (b. March 22, 1817, Warrenton, N.C., U.S.—d. Sept. 27, 1876, Galve-

ston, Texas), Confederate officer in the U.S. Civil War (1861–65) whose successes in the West were dissipated when he failed to follow up on them.

After graduating in 1837 from the U.S. Military Academy at West Point, N.Y., Bragg served in the Seminole Wars and the Mexican War (1846–48). As a major general in the Confederate Army, he commanded a corps at Shiloh (April 1862) and, upon the death of Gen. Albert Sidney Johnston in that battle, was promoted to full general's rank. In the autumn of that year, having succeeded Gen. P.G.T. Beauregard in the command of the Army of Tennessee, Bragg led a bold advance from eastern Tennessee across Kentucky to Louisville. Tactically, the ensuing Battle of Perryville (October) was a draw; unwilling to fight to a decision, Bragg withdrew into Tennessee. Though he was bitterly censured, the personal favour of Confederate Pres. Jefferson Davis kept him at the head of the Army of

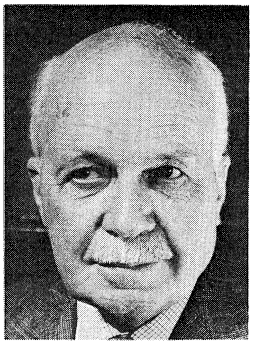


Braxton Bragg, engraving by George E. Perine
By courtesy of the Library of Congress, Washington, D.C.

Tennessee, and in December–January 1862–63 he fought the indecisive Battle of Stones River (Murfreesboro) against Gen. William Starke Rosecrans. The following September he inflicted a crushing defeat on Rosecrans at Chickamauga and for a time besieged the Union forces at Chattanooga. But large Federal reinforcements were concentrated upon the threatened spot under Gen. Ulysses S. Grant, and the great Battle of Chattanooga (November) ended in the rout of Bragg's army. Bragg was then relieved of his command, but President Davis made him his military adviser. After the war he was a civil engineer in Alabama and Texas.

Bragg, Don, byname of DONALD BRAGG (b. May 15, 1935, Penns Grove, N.J., U.S.), U.S. athlete, outstanding pole-vaulter during the predominance of the aluminum pole, which supplanted the bamboo pole and was itself superseded by the fibre-glass pole. On Feb. 13, 1959, he set a world indoor record by vaulting 15 ft 9⅛ in. (4.8 m), and on July 2, 1960, he established a world outdoor mark of 15 ft 9½ in. In the 1960 Olympic Games in Rome he won a gold medal with a vault of 15 ft 5⅛ in. Nicknamed "Tarzan," he was unusually heavy (190 pounds [86.36 kg]) for a pole-vaulter. After retirement as a vaulter, he became athletic director at Stockton State College, Pomona, N.J.

Bragg, Sir (William) Lawrence (b. March 31, 1890, Adelaide, S.Aus., Australia—d. July 1, 1971, Ipswich, Suffolk, Eng.), Australian-born British physicist and X-ray crystallographer, discoverer (1912) of the Bragg law of X-ray diffraction, which is basic for determination of crystal structure. He was joint winner (with his father, Sir William Bragg) of the Nobel Prize for Physics in 1915. He was knighted in 1941.



Sir Lawrence Bragg, 1962
Camera Press

Bragg was the eldest child of Sir William (Henry) Bragg. His maternal grandfather, Sir Charles Todd, was postmaster general and government astronomer of South Australia. Educated at St. Peter's College, Adelaide, and then at Adelaide University, Bragg gained high honours in mathematics at an age when most boys were still in secondary school.

In 1909 he went to England to enter Trinity College, Cambridge. He began the study of physics, which he had not studied earlier, although he had taken some chemistry. During the summer vacation of 1912, his father discussed with him a recent book on the work of the German physicist Max von Laue, who asserted that X-rays could be diffracted by passing them through crystals. Upon his return to Cambridge, young Bragg, believing that Laue's explanation was incorrect in detail, carried out a series of ingenious original experiments, as the result of which he published the Bragg equation, which tells at what angles X-rays will be most efficiently diffracted by a crystal when the X-ray wavelength and distance between the crystal atoms are known (*see* Bragg Law). This equation is basic to X-ray diffraction, a process used to analyze crystal structure by studying the characteristic patterns of X-rays that deviate from their original paths because of the closely spaced atoms in the crystal. He also showed that in rock salt the two kinds of atoms, sodium and chlorine, are arranged alternately, so that atoms of the same element never touch each other. Meanwhile, his father had designed the X-ray spectrometer, a device to make exact measurements of X-ray wavelengths. The two scientists spent vacations using the Bragg spectrometer to determine many other atomic arrangements, including that of diamond.

In 1914 Bragg became a fellow and lecturer in natural sciences at Trinity College. Later that year he and his father were jointly awarded the Barnard Gold Medal of the U.S. Academy of Sciences, the first of many such honours and awards. From 1915 to 1919, in World War I, Bragg served as technical adviser on sound ranging (determining the distance of enemy artillery from the sound of their guns) in the map section of British army headquarters in France, and he was there in 1915 when the Nobel Prize for Physics was awarded jointly to his father and himself for demonstrating the use of X-rays for revealing the structure of crystals.

After the war Bragg succeeded Ernest Rutherford as professor of physics at Victoria University of Manchester, and there he built his first research school, for the study of metals and alloys and silicates. His work on silicates transformed a chemical riddle into a system of simple and elegant architecture. In 1921 he married Alice Hopkinson, a doctor's daughter, by whom he had two sons and two daughters. His wife's charm and character greatly helped him throughout his professional career. In the same year he was elected a Fellow of the Royal Society.

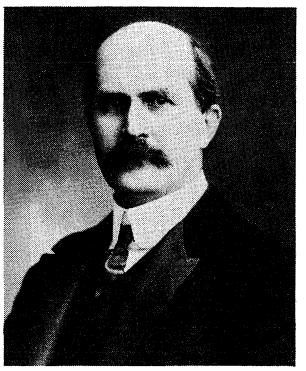
From 1937 to 1938 Bragg was director of the National Physical Laboratory, but he was impatient with committee work. About this period of his life he often used to remark that he found the engagement book, the in-tray, and the list of matters requiring urgent attention to be the deadly enemies of scientific work.

So he gladly left pure administration to succeed Rutherford again, this time as Cavendish Professor of Experimental Physics at Cambridge. Here he founded a second flourishing research school to study metals and alloys, silicates, and proteins, but he was also deeply concerned that science students have time to enjoy a full education and come to understand something of the meaning and purpose of life.

In January 1954 Bragg became director of the Royal Institution, London, as his father had been before 1940. He introduced several successful innovations: year-round lectures for schoolchildren, illustrated by demonstrations requiring apparatus too large or too costly for school resources (some 20,000 children attended each year); courses for science teachers; and lectures for civil servants whose early training had not included science. Popular and successful as a lecturer, Bragg was also in great demand for radio and television appearances. At an age at which many scientists lose interest in research, he built up a third research team, some of whose members successfully tackled the structures of complex organic crystals. Bragg retired from active scientific work in 1965. (K.Lo.)

BIBLIOGRAPHY. W.L. Bragg, "Personal Reminiscences," in P.P. Ewald (ed.), *Fifty Years of X-Ray Diffraction,* pp. 531–539 (1962).

Bragg, Sir William (Henry) (b. July 2, 1862, Wigton, Cumberland, Eng.—d. March 12, 1942, London), pioneer British scientist in solid-state physics who was a joint winner (with his son Sir Lawrence Bragg) of the No-



Sir William Bragg
By courtesy of the Nobelstiftelsen, Stockholm

bel Prize for Physics in 1915 for his research on the determination of crystal structures. He was knighted in 1920.

W.H. Bragg came on his father's side from a family without academic traditions, mainly yeoman farmers and merchant seamen. His mother was the daughter of the local vicar. Upon her death, when he was barely seven, he went to live with two paternal uncles who had set up a pharmacy and grocery shop in Market Harborough, Leicestershire. There he attended an old school reestablished by one of his uncles. He did well, and in 1875 his father sent him to school at King William College, Isle of Man. At first he found it difficult to adjust himself, but he was good at his lessons and at sports and finally became head boy. During his last year, however, the school was swept by a storm of religious emotionalism. The boys were frightened by the stories of hellfire and eternal damnation, and the experience left a strong mark on Bragg. Later he wrote, "It was a terrible year . . . for many years the Bible was a repelling book, which

I shrank from reading." And in a lecture, *Science and Faith*, at Cambridge in 1941, he said, "I am sure that I am not the only one to whom when young the literal interpretation of Biblical texts caused years of acute misery and fear." On the other hand, he attributed his clear, balanced style of writing to his early grounding in the Authorized (King James) Version of the Bible; in *The World of Sound* he wrote, "From religion comes a man's purpose; from science his power to achieve it."

In 1882 he was granted a scholarship at Trinity College, Cambridge; and two years later he obtained third place in the Mathematical Tripos (final examinations), a splendid achievement that led to his appointment, in 1885, as professor of mathematics and physics at the young University of Adelaide, S. Aus. He then not only trained himself to become a good, lucid lecturer but also apprenticed himself to a firm of instrument makers and made all the equipment he needed for practical laboratory teaching. It was this early training that enabled him, later (in 1912), after his return to England, to design the Bragg ionization spectrometer, the prototype of all modern X-ray and neutron diffractometers, with which he made the first exact measurements of X-ray wavelengths and crystal data.

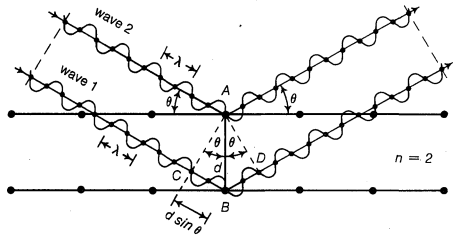
It was not until 1904, when Bragg became president of the physics section of the Australian Association for the Advancement of Science, that he began to think about original research. His subsequent work on alpha, beta, and gamma rays led the renowned British physicist Ernest Rutherford to propose him for fellowship of the Royal Society. He was elected in 1907 and within a year was offered a professorship in Leeds, England, where he developed his view that both gamma rays and X-rays have particle-like properties.

In 1912 the German physicist Max von Laue announced that crystals could diffract X-rays, thus implying that X-rays must be waves like light but of much shorter wavelength. Bragg and his elder son, William Lawrence, who was studying physics at Cambridge, then began to apply X-rays to the study of crystal structure. These researches earned them jointly the award of the Nobel Prize for Physics in 1915.

After World War I, during which he worked on anti-submarine devices, Bragg established a school of crystallographic research at University College, London, and then, upon the death of the chemist and physicist Sir James Dewar, succeeded him as director of the Royal Institution and of the Davy Faraday Research Laboratories, London. To these institutions he attracted many young scientists whose researches he inspired and stimulated and who subsequently achieved fame. Bragg was also a popular scientific lecturer and writer. He gave "Christmas Lectures" for children, which, when published, became best-sellers. With Lady Bragg, he established a salon to which famous scientists came from far and wide. He was president of the Royal Society from 1935 to 1940 and received many other honours, but, to the last, he remained simple, gentle, and humble about his own success and proud of his son's. (K.Lo.)

BIBLIOGRAPHY. Sir Lawrence Bragg and G.M. Caroe (Gwendolen Bragg), "Sir William Bragg, F.R.S. (1862–1942)," *Notes and Records of the Royal Society of London*, 17:169–182 (1962), is a brief, personal biography by his son and daughter. See also the *Obituary Notices of Fellows of the Royal Society*, 4:277–300 (1943), with a complete bibliography.

Bragg law, in physics, the relation between the spacing of atomic planes in crystals and the angles of incidence at which these planes produce the most intense reflections of electromagnetic radiations, such as X-rays and gamma rays, and particle waves, such as those associated with electrons and neutrons. For maximum intensity of reflected wave trains, they must stay in phase to produce constructive interference, in which corresponding points of a wave (*e.g.*, its crests or troughs) arrive at a point simultaneously. The Bragg law was first formulated by William Lawrence Bragg, an English physicist.



Bragg diffraction

The diagram shows waves 1 and 2, in phase with each other, glancing off atoms A and B of a crystal that has a separation distance d between its atomic, or lattice, planes. The reflected (glancing) angle θ, as shown by experiment, is equal to the incident angle θ. The condition for the two waves to stay in phase after both are reflected is that the path length CBD be a whole number (n) of wavelengths (λ), or $n\lambda$. But, from geometry, CB and BD are equal to each other and to the distance d times the sine of the reflected angle θ, or $d \sin \theta$. Thus, $n\lambda = 2d \sin \theta$, which is the Bragg law. As may be seen from the diagram, when $n = 2$ there is only one wavelength along path CB; also, the reflected angle will be smaller than that for, say, $n = 3$. Waves reflected through an angle corresponding to $n = 1$ are said to be in the first order of reflection; the angle corresponding to $n = 2$ is the second order, and so on. For any other angle (corresponding to fractional n) the reflected waves will be out of phase and destructive interference will occur, annihilating them.

The Bragg law is useful for measuring wavelengths and for determining the lattice spacings of crystals. To measure a particular wavelength, the radiation beam and the detector are both set at some arbitrary angle θ. The angle is then modified until a strong signal is received. The Bragg angle, as it is called, then gives the wavelength directly from the Bragg law. This is the principal way to make precise energy measurements of X-rays and low-energy gamma rays. The energies of neutrons, which by quantum theory have wave attributes, are frequently determined by Bragg reflection.

Braggart Warrior (theatre): *see* Miles Gloriosus.

Braginoco (Burmese king): *see* Bayinnaung.

Brahe, Per, Greve (Count), THE YOUNGER, Swedish PER BRAHE DEN YNGRE (b. Feb. 18, 1602, Rydboholm Castle, near Stockholm—d. Sept. 12, 1680, Bogesund Castle, near Stockholm), nobleman, soldier, and statesman who served as a member of the regency councils ruling Sweden during the minorities of the monarchs Christina and Charles XI.

Per Brahe the Younger, detail from an oil painting by an unknown artist; in Gripsholm Castle, Sweden
By courtesy of the Svenska Portrattarkivet, Stockholm

A member of an illustrious Swedish family, Per the Younger was the grandson of Per Brahe the Elder, a nephew of the Swedish king Gustav I Vasa, who wrote historical works and was created the first Swedish count. The younger Brahe fought under the command of Gustav II Adolf in the Thirty Years' War in Prussia (1626–28), becoming a colonel. He was elected marshal of the nobility in 1629 and appointed a privy councillor in 1630. While serving as a member of Queen Christina's regency council (1632–44), he helped negotiate the Truce of Stuhmsdorf (1635) with Poland.

As governor general of Finland (1637–41, 1648–54), Brahe reformed the administration, promoted commerce, communications, and agriculture, and sponsored the building of many new towns. He founded the University of Åbo (Turku) in 1640 and acted as its chancellor from 1646 until his death. While serving as lord high chancellor (1641–80), he also exerted great influence as a member of the regency council (1660–72) for Charles XI. Brahe's brother Count Nils Brahe also served with distinction under the command of Gustav II Adolf before falling in battle at Naumburg in Saxony in 1632.

Brahe, Tycho (b. Dec. 14, 1546, Knudstrup, Scania, Den.—d. Oct. 24, 1601, Prague), Danish astronomer whose work in developing astronomical instruments and in measuring and

Tycho Brahe, engraving by H. Goltzius of a drawing by an unknown artist, *c.* 1586
By courtesy of Det Nationalhistoriske Museum Paa Frederiksborg, Denmark

fixing the positions of stars paved the way for future discoveries. His observations—the most accurate possible before the invention of the telescope—included a comprehensive study of the solar system and accurate positions of more than 777 fixed stars.

Youth and education. Tycho's father was a privy councillor and later governor of the castle of Hälsingborg, which controls the main waterway to the Baltic Sea. His wealthy and childless uncle abducted Tycho at a very early age and, after the initial parental shock was overcome, raised him at his castle in Tostrup, Scania, also financing the youth's education, which began with the study of law at the University of Copenhagen in 1559–62.

Several important natural events turned Tycho from law to astronomy. The first was the total eclipse of the Sun predicted for Aug. 21, 1560. Such a prediction seemed audacious and marvellous to a 14-year-old student, but when Tycho witnessed its realization he saw and believed—the spark was lit—and, as his many later references testify, he never forgot

the event. His subsequent student life was divided between his daytime lectures on jurisprudence, in response to the wishes of his uncle, and his nighttime vigil of the stars. The professor of mathematics helped him with the only printed astronomical book available, the *Almagest* of Ptolemy, the astronomer of antiquity who described the geocentric conception of the cosmos. Other teachers helped him to construct small globes, on which star positions could be plotted, and compasses and cross-staffs, with which he could estimate the angular separation of stars.

In 1562 Brahe's uncle sent him to the University of Leipzig, where he studied until 1565. Another significant event in Brahe's life occurred in August 1563, when he made his first recorded observation, a conjunction, or overlapping, of Jupiter and Saturn. Almost immediately he found that the existing almanacs and ephemerides, which record stellar and planetary positions, were grossly inaccurate. The Copernican tables were several days off in predicting this event. In his youthful enthusiasm Brahe decided to devote his life to the accumulation of accurate observations of the heavens, in order to correct the existing tables.

Between 1565 and 1570 (or 1572?) he travelled widely throughout Europe, studying at Wittenberg, Rostock, Basel, and Augsburg and acquiring mathematical and astronomical instruments, including a huge quadrant. Inheriting the estates of his father and of his uncle Jørgen, Tycho then settled in Scania in 1571(?) and constructed a small observatory on property owned by a relative. Here occurred the third and most important astronomical event in Brahe's life. On Nov. 11, 1572, he suddenly saw a "new star," brighter than Venus and where no star was supposed to be, in the constellation Cassiopeia. He carefully observed the new star and showed that it lay beyond the Moon and therefore was in the realm of the fixed stars. To the world at the time, this was a disquieting discovery, because the intellectual community protected itself against the uncertainties of the future by confidence in the Aristotelian doctrine of inner and continuous harmony of the whole world. This harmony was ruled by the stars, which were regarded as perfect and unchanging. The news that a star could change as dramatically as that described by Tycho, together with the reports of the Copernican theory that the Sun, not the Earth, was the centre of the universe, shook confidence in the immutable laws of antiquity and suggested that the chaos and imperfections of Earth were reflected in the heavens. Tycho's discovery of the new star in Cassiopeia in 1572 and his publication of his observations of it in *De nova stella* in 1573 marked his transformation from a Danish dilettante to an astronomer with a European reputation.

By marrying a peasant's daughter, named Kirstine, in 1573, Tycho—as a nobleman's son—scandalized most of his contemporaries. He seldom mentioned her in his extensive correspondence (which still exists), and it is probable that he was interested mainly in a companion who would superintend his household without being involved in court functions and intrigues. Tycho and Kirstine had eight children, six of whom survived him.

Mature career. The new star in the constellation Cassiopeia had caused Tycho to rededicate himself to astronomy; one immediate decision was to establish a large observatory for regular observations of celestial events. His plan to establish this observatory in Germany prompted King Frederick II to keep him in Denmark by granting him title in 1576 to the island of Ven (formerly Hven), in the middle of The Sound and about halfway between Copenhagen and Helsingør, together with financial support for the observatory and laboratory buildings. Tycho called the observatory Uraniborg, after Urania, the Muse of astronomy. Surrounded by scholars and visited by learned travellers from all over Europe, Tycho and his assistants collected observations and substantially corrected nearly every known astronomical record.

Tycho was an artist as well as a scientist and craftsman, and everything he undertook or surrounded himself with had to be innovative and beautiful. He established a printing shop to produce and bind his manuscripts in his own way; he imported Augsburg craftsmen to construct the finest astronomical instruments; he induced Italian and Dutch artists and architects to design and decorate his observatory; and he invented a pressure system to provide the then uncommon convenience of sanitary lavatory facilities. Uraniborg fulfilled the hopes of Tycho's king and friend, Frederick II, that it would become the centre of astronomical study and discovery in northern Europe.

But Frederick died in 1588, and under his son, Christian IV, Tycho's influence dwindled; most of his income was stopped, partly because of the increasing needs of the state for money. Spoiled by Frederick, however, Tycho had become both unreasonably demanding of more money and less inclined to carry out the civic duties required by his income from state lands.

At odds with the three great powers—king, church, and nobility—Tycho left Ven in 1597, and, after short stays at Rostock and at Wandsbek, near Hamburg, he settled in Prague in 1599, under the patronage of Emperor Rudolf II, who also in later years supported the astronomer Johannes Kepler.

The major portion of Tycho's lifework—making and recording accurate astronomical observations—had already been done at Uraniborg. To his earlier observations, particularly his proof that the nova of 1572 was a star, he added a comprehensive study of the solar system and his proof that the orbit of the comet of 1577 lay beyond the Moon. He proposed a modified Copernican system in which the planets revolved around the Sun, which in turn moved around the stationary Earth. What Tycho accomplished, using only his simple instruments and practical talents, remains an outstanding accomplishment of the Renaissance.

Tycho attempted to continue his observations at Prague with the few instruments he had salvaged from Uraniborg, but the spirit was not there, and he died in 1601, leaving all his observational data to Johannes Kepler, his pupil and assistant in the final years. With these data Kepler laid the groundwork for the work of Sir Isaac Newton. (O.J.E.)

BIBLIOGRAPHY. J.A. Gade, *The Life and Times of Tycho Brahe* (1947, reprinted 1969), is the best account in English of Tycho's life and contains a fairly complete bibliography. J.L.E. Dreyer, *Tycho Brahe* (1890, reprinted 1963), presents an authoritative picture of his work and his astronomical instruments, by the astronomer who also prepared his collected works for publication.

Brahm, Otto (b. Feb. 5, 1856, Hamburg—d. Nov. 28, 1912, Berlin), German literary critic and man of the theatre who became one of the chief Realists in staging, exerting considerable influence on 20th-century theatre.

In 1889 he helped establish and then directed a theatre company, Freie Bühne, and in 1890 he founded the periodical of the same name (later *Neue Deutsche Rundschau*); the Freie Bühne was modelled after André Antoine's celebrated naturalistic Théâtre-Libre in Paris.

The Freie Bühne, where the iconoclastic plays of Ibsen and Tolstoy were introduced to Germany, failed after two seasons, but Brahm later directed the Deutsche Theater, Berlin. His productions were obsessively concerned with the exact reproduction of reality; stimulating existing German Realism to fresh efforts, he encouraged writers to treat such topics as abnormalities of conduct, crime, disease, and the lives of the proletariat, aiming at natural dialogue and the careful integration of character, incident, and environment.

Brahmā, in the late Vedic period of India, one of the major gods of Hinduism; with the rise of sectarian worship, he was gradually eclipsed by Vishnu and Śiva. Brahmā (a masculine form not to be confused with Brahman, the neuter gender, which is the supreme power, or ultimate reality, of the universe) is

Brahmā, carving from Jajnagar, Bogra District, Bangladesh; in the Indian Museum, Calcutta
P. Chandra

associated with the Vedic creator god Prajāpati, whose identity he came to assume. Brahmā is said to have been born from a golden egg and in turn to have created the Earth and all things on it. Later sectarian myths describe him as having come forth from a lotus that issued from Vishnu's navel.

In classical times an attempt to synthesize the diverging sectarian traditions is evident in the doctrine of Trimurtī, which considers Vishnu, Śiva, and Brahmā as three forms of the supreme, unmanifested deity. By the 7th century, when the Smārtas initiated their worship of five deities, omitting Brahmā, he had lost all claims as a supreme deity. Today there is no cult or sect that exclusively worships Brahmā, and few temples are dedicated to him. The only prominent one is at Pushkar, near Ajmer (Rājasthān state). Nevertheless, all temples dedicated to Śiva or to Vishnu must contain an image of Brahmā.

Brahmā is usually depicted in art as having four faces, symbolic of the four Vedas (earliest sacred scriptures of India), the four *yugas* ("ages"), and the four *varṇas* (social classes). He is usually shown with four arms, holding sacrificial instruments, prayer beads, and a book, and either seated or standing on a lotus throne or on his mount, the *haṃsa* ("swan"). His consorts, Sāvitrī and Sarasvatī, frequently accompany him. In painting he is depicted with a yellow complexion, wearing white garments and garlands.

brahma-loka, in Hinduism and Buddhism, that part of the many-layered universe that is the realm of pious celestial spirits. In Theravāda Buddhism, the *brahma-loka* is said to consist of 20 separate heavens: the lower 16 are material worlds (*rūpa-brahma-loka*) inhabited by progressively more radiant and subtle gods, the remaining 4 higher realms are devoid of substance and form and are said to constitute the *arūpa-brahma-loka.* Theravāda Buddhists hold that rebirth in the *brahma-loka* is the reward enjoyed by an individual who has accompanied great virtue with meditation. The actual level an individual attains is determined by his faithfulness to the Buddha, the *dhamma* (Sanskrit *dharma,* "teachings"), and the *saṅgha* (the religious community), as well as the depth of his insight into the true formless nature of the universe. Like all other worlds in Theravāda cosmology, the *brahma-loka* undergoes constant change, destruction, and re-creation.

Brahma Samaj (Hindu theistic movement): *see* Brahmo Samaj.

brahmacarya (Sanskrit: "holy life"), in Buddhism, strictly, the practice of sexual chastity; more generally, the term denotes the endeavour by monks and nuns as well as lay devotees to live a moral life as a way to end suffering and to reach enlightenment. Lay followers are asked not to kill any living being, not to steal, to avoid improper sexual intercourse, not to lie, and to avoid intoxicants. Novices, monks, and nuns must obey these same rules (with complete chastity added to the third) as well as refrain from eating after noon, avoid all musical and theatrical enjoyments, refrain from wearing jewelry or cosmetics, sleep only on a very simple bed, and refuse gifts of gold or silver.

Brahmagupta (b. 598—d. *c.* 665, India), the last and most accomplished of the ancient Indian astronomers, who set forth the Hindu astronomical system in verse form in the *Brahma-sphuṭa-siddhānta* (628; "The Opening of the Universe"). Two chapters are devoted to mathematics, including an arithmetical progression, a quadratic equation, and proofs of various geometrical theorems on the right-angled triangle, on areas of triangles and quadrilaterals, and on surfaces and volumes. The other 23 chapters are concerned with astronomy and deal with lunar eclipses, solar eclipses, planetary conjunctions, the lunar phases, and the determination of the positions of the planets.

Brahman, in the *Upaniṣad*s (Indian sacred writings), the supreme being. The etymology of the Sanskrit is uncertain. Though a variety of views are expressed in the *Upaniṣad*s, they concur in the definition of Brahman as eternal, conscious, irreducible, infinite, omnipresent, the spiritual source of the universe of finiteness and change. Marked differences in interpretation of Brahman characterize the various subschools of Vedānta, the orthodox system of Hindu philosophy based on the writings of the *Upaniṣad*s.

According to the Advaita (Nondualist) school of Vedānta, Brahman is categorically different from anything phenomenal, and human perceptions of differentiation are illusively projected on this reality. The Bhedābheda (Dualist–Nondualist) school maintains that Brahman is nondifferent from the world, which is its product, but different in that phenomenality imposes certain adventitious conditions (*upādhi*s) on Brahman. The Viśiṣṭādvaita (Nonduality of the Qualified) school maintains that a relation between Brahman and the world of soul and matter exists that is comparable to the relation between soul and body and that phenomenality is a glorious manifestation of Brahman; the school identifies Brahman with a personal god, who is both transcendent and immanent. The Dvaita (Dualist) school refuses to accept the identity of Brahman and world, maintaining the ontological separateness of the supreme, which it also identifies with a personal god.

In early Hindu mythology, Brahman (neuter) is personified as the creator god Brahmā (masculine) and placed in a triad of divine functions: Brahmā the creator, Vishnu (Viṣṇu) the preserver, and Śiva (Shiva) the destroyer.

Brahman, also spelled BRAHMIN, Sanskrit BRĀHMAṆA (Possessor of *Brahman* [sacred knowledge]), highest ranking of the four *varṇa*s, or social classes, in Hindu India. The elevated position of the Brahmans goes back to the late Vedic period, when the Indo-European-speaking settlers in northern India were already divided into Brahmans, or priests, warriors (of the Kshatriya class), traders (of the Vaiśya class), and labourers (of the Śūdra class). Since then there has been no fundamental change in their relative position, and the Brahmans still enjoy great prestige and many advantages, though their claim to tangible privileges is no longer officially admitted. The basis of the age-old veneration of Brahmins is the belief that they are inherently of greater ritual purity than members of other castes and that they alone are capable of performing certain vital religious tasks. The study and recitation of the sacred scriptures was traditionally reserved for this spiritual elite, and for centuries all Indian scholarship was in their hands.

Because of their high prestige and tradition of education, Brahmans wielded influence even in secular affairs. Although political power lay normally with members of the warrior caste, they acted frequently as advisers and ministers of ruling chiefs. During the period of British rule, Brahmans largely retained their role as intellectual leaders—at first in the service of government and later in the nationalist movement. After India achieved independence in 1947, Brahmans continued to lead the Congress Party and to dominate the central government, but in many states a reaction developed. In southern India, where Brahmans were particularly firmly entrenched, an anti-Brahman movement gathered considerable strength. This did not, however, affect their traditional position as priests, ministering both in temples and at domestic rites. The Brahman family priest (*purohita*) officiates at weddings, funerals, and other ceremonial occasions.

The ritual purity of the Brahmans is maintained through the observance of numerous taboos, many of which relate to diet and contact with lower castes. Most Brahman castes are strictly vegetarian, and their members must abstain from certain occupations. They may not plow or handle any impure material, such as leather or hides, but they may farm and do such agricultural work as does not violate these specific restrictions. They may also accept employment as domestic servants; many well-to-do Hindus have Brahman cooks, who are valued because members of all castes may eat the food they prepare.

The Brahmans are divided into 10 main territorial divisions, five of which are associated with the north and five with the south. The northern group consists of Saraswati, Gaur, Kanauj, Maithil, and Utkal Brahmans and the southern group comprises Mahārāshtra, Andhra, Drāviḍa, Karṇāṭa, and Gurjara Brahmans. *See also* varṇa.

Brahman, also called ZEBU, any of several varieties of cattle originating in India and crossbred in the United States with improved beef breeds, producing the hardy beef animal known as the American Brahman; similar blending in Latin America resulted in the breed known as Indo-Brazil.

Indian cattle were first imported into the Western Hemisphere in the mid-19th century. The Gir, Guzerat, and Nellore varieties were particularly successful in the southern United States and in Brazil, where heat, humidity, and pests made northern European breeds less profitable. The Hereford and the Shorthorn were among the first breeds used in crossing and have remained popular. Beef of these mixtures, such as the Beefmaster, is markedly low in fat. Other notable crosses include the Charbray, from the Brahman and Charolais, and the Brangus, Brahman and Angus. Pure-bred Brahmans today are used primarily for breeding and seldom slaughtered.

The Brahman is characterized by a pronounced hump over the shoulder and neck, horns which usually curve up and back, and drooping ears. These features may be present to a lesser extent in the mixtures. Gray is the prevalent colour, with deep shading in the fore and rear quarters of the bull; a solid red strain has also been developed.

Brāhmaṇa, any of a number of prose commentaries attached to the Vedas, the most ancient Hindu sacred literature, explaining the significance of the Vedas as used in the ritual sacrifices, and the symbolic import of the priests' actions. The word *brāhmaṇa* may mean either the utterance of a Brahman (priest) or an exposition on the meaning of the sacred word; the latter is more commonly accepted by scholars.

The *Brāhmaṇa*s belong to the period 900–700 BC, when the gathering of the sacred hymns into Saṃhitās ("collections") had acquired a position of sanctity. They present a digest of accumulated teachings, illustrated by myth and legend, on various matters of ritual and on hidden meanings of the sacred texts. Their principal concern is with the sacrifice, and they are the oldest extant sources for the history of Indian ritual. Appended to the *Brāhmaṇa*s are chapters written in similar language and style, but with a more philosophic content, which specifically instruct that the matter of these chapters should be taught only in the forest, away from the village. These later works, called *Araṇyaka*s (*q.v.*), served as a link between the *Brāhmaṇa*s and the *Upaniṣad*s.

Of the *Brāhmaṇa*s handed down by the followers of the Rigveda, two have been preserved, the *Aitareya Brāhmaṇa* and the *Kauṣītaki* (or *Śāṅkhayāna*) *Brāhmaṇa.* Discussed in these two works are "the going of the cows" (*gavāmayana*), the 12 days' rites (*dvādaśāha*), the daily morning and evening sacrifices (*agnihotra*), the setting up of the sacrificial fire (*agnyādhāna*), the new and full moon rites, the four months' rites, and the rites for the installation of kings.

Properly speaking, the *Brāhmaṇa*s of the Sāmaveda are the *Pañcaviṃśa* (25 books), *Ṣaḍviṃśa* (26th), and the *Jaiminīya* (or *Talavakāra*) *Brāhmaṇa.* They show almost complete accordance in their exposition of the "going of the cows" ceremony, the various soma (*q.v.*) ceremonies, and the different rites lasting from one to 12 days. Also described are the atonements required when mistakes or evil portents have occurred during sacrifices.

The *Brāhmaṇa*s of the Yajurveda were at first inserted at various points in the texts alongside the material on which they commented. This was at variance with the practice followed by the teachers of the Rigveda and the Sāmaveda, who probably did not wish to upset the arrangement of such a sacred collection, and who gathered the expository lectures together as the various *Brāhmaṇa*s. The Yajurveda fell into two separate groups, the later White (Śukla) Yajurveda, which separated out the *Brāhmaṇa*s, and the Black (Krishna) Yajurveda, whose Saṃhitās contain much Brahmanic material. *Śatapatha Brāhmaṇa* (or 100 "paths"), consisting of 100 lessons, belongs to the White Yajurveda. Ranking next to the

Rigveda in importance, this *Brāhmaṇa* survives in two slightly differing versions, the *Kāṇva* and the *Mādhyaṃdina*. Elements more closely connected with domestic ritual are introduced here.

Finally, to the Atharvaveda belongs the comparatively late *Gopatha Brāhmaṇa*. Relating only secondarily to the Saṃhitās and *Brāhmaṇas*, it is in part concerned with the role played by the *brahmán* ("pray-er") priest who supervised the sacrifice.

Brāhmani River, river in northeastern Orissa state, eastern India. Formed by the confluence of the Sankh and South Koel rivers in southern Bihār state, the Brāhmani flows for 300 mi (480 km), winding generally south-southeast past Bonaigarh and Tālcher and then turning east to join northern branches of the Mahānadi River and emptying into the Bay of Bengal at Palmyras Point.

Brahmanism, religion of ancient India that evolved out of Vedism. It takes its name both from the predominant position of its priestly class, the Brahmans, and also from the increasing speculation about, and importance given to, Brahman, the supreme power. Brahmanism is distinguished from the classical Hinduism that succeeded it by the enhanced significance given in classical Hinduism to individual deities, such as Śiva and Vishnu, and to devotional worship (bhakti).

Brahmapur, formerly BERHAMPUR, town, Ganjām district, southeastern Orissa state, eastern India, 9 mi (14 km) from the Bay of Bengal. It lies on the Calcutta–Madras national highway and the South-Eastern Railway line; it is a trade centre for rice, sugarcane, and other agricultural products of the district. Industries include rice milling, distilling, and silk weaving. Khallikote College (established 1878), the University of Berhampur (established 1967), a law school, a medical college, a teachers' training school, and a women's college are located there. Pop. (1981) 162,550.

Brahmaputra River, Bengali JAMUNA, Wade–Giles romanization YA-LU-TSANG-PU CHIANG, Pinyin YARLUNG ZANGBO JIANG, Tibetan TSANG-PO, major river of Central and South Asia flowing approximately 1,800 mi (2,900 km) from its source in the Tibetan Himalayas to its confluence with the Ganges River.

The following article summarizes information about the Brahmaputra River; for full details, *see* MACROPAEDIA: Asia.

From its headstreams in Tibet, the Brahmaputra runs eastward nearly 700 mi (1,125 km) across southwestern China between the main Himalayan range to the south and the Nien-ch'ing-t'ang-ku-la Shan (Nyenchen Tangla) range to the north. It then turns south through the eastern Himalayas and enters the Indian union territory of Arunachal Pradesh and Assam state in northeastern India. The Brahmaputra takes a southwesterly course for 450 mi through the Assam Valley, then turns south again, passing through Bangladesh toward the Bay of Bengal, where it forms, with the Ganges and Meghna rivers, a vast delta. The drainage basin of the Brahmaputra covers about 626,000 sq mi (1,621,000 sq km) and includes 24 major tributaries.

The climate of the basin varies from the harsh, cold, and dry conditions found in Tibet to the generally hot, humid, and rainy conditions prevailing in the Assam Valley and Bangladesh. Among the Brahmaputra's important hydrologic features are its constant changes in course, and its tendency to flood yearly along its lower course because of heavy rainfall and the huge discharges of the Tīsta, Torsa, and Jaldhāka tributaries. During the rainy season the Brahmaputra has an estimated discharge of more than 500,000 cu ft/sec (14,000 cu m/sec).

Flood-control projects were initiated after 1954. The Brahmaputra is navigable throughout the Bengal Plain and Assam upstream to Dibrugarh, 800 mi from the sea, and in Tibet for about 400 mi between La-tzu (Lhatse Dzong) and Lhasa. The growth of heavy river transport is important to the continuing development of the economic resources in the Lower Brahmaputra Valley, including tea estates, forests, and oil, coal, and natural gas deposits in Assam and jute in Bangladesh.

Brahmarṣi-deśa, land of the *ṛṣi,* or sages. Historically, the Sanskrit term was used to describe the second region of Indo-European occupation in India—the area eastward from Sirhind, including the tract between the Yamuna (Jumna) and Ganges as far south as Mathurā. It included Indraprastha (Delhi), the capital of the Pāṇḍavas, and Kurukṣetra, the legendary battlefield of the Kurus and the Pāṇḍavas, whose struggle is the main theme of the Hindu epic, the *Mahābhārata.* This region is to be distinguished from the Brahmāvarta, or Holy Land, which covered the seven rivers from the Indus to the Sarasvatī and the town of Sirhind.

Brahmarṣi-deśa was occupied before 1000 BC. It is associated with the Vedic commentaries of the *Brāhmaṇas* and the divinely revealed treatises of the *Upaniṣads.*

brahmavihāra (Sanskrit: "living in the Brahman-heaven"), in Buddhist philosophy, the four noble practices through which men can attain subsequent rebirth in the Brahman heaven. These four practices are: (1) perfect virtue of sympathy, which gives happiness to living beings (Sanskrit *maitri;* Pāli *metta*); (2) perfect virtue of compassion, which removes pain from living beings (*karuṇā*); out of *karuṇā* the *bodhisattva* postpones his own entrance into Nirvāṇa to work for the salvation of others; (3) perfect virtue of joy, the enjoyment of the sight of others who have attained happiness (*muditā*); (4) perfect virtue of equanimity, being free from attachment to everything and being indifferent to living beings (Sanskrit *upekṣa,* Pāli *upekkhā*). These are also called the four *apramāṇas* (infinite feelings), since these four practices give happiness to infinite living beings. This term is also used as one of the stages of meditation in which a person makes his mind pervade one quarter of the world with each of the four thoughts.

Brāhmī, writing system ancestral to all Indian scripts except Kharoṣṭī. Of Aramaic derivation or inspiration, it can be traced to the 8th or 7th century BC, when it may have been introduced to Indian merchants by people of Semitic origin. Brāhmī is semi-alphabetic, each consonant having either an inherent *a* sound pronounced after it or a diacritic mark to show another vowel; initial vowels have separate characters. In most cases Brāhmī and its derivatives are written from left to right, but a coin of the 4th century BC, discovered in Madhya Pradesh, is inscribed with Brāhmī characters running from right to left. Among the many descendants of Brāhmī are Devanāgarī (used for Sanskrit, Hindi, and other Indian languages), the Bengali and Gujarati scripts, and those of the Dravidian languages.

Brahmin (Indian priestly caste): *see* Brahman.

Brahmin, member of any of several old, socially exclusive New England families of aristocratic and cultural pretensions, from which came some of the most distinguished American men of letters of the 19th century. Originally a humorous reference to the Brahmins, the highest caste of Hindu society, the term came to be applied to a number of prominent New England writers, including Oliver Wendell Holmes, Henry Wadsworth Longfellow, and James Russell Lowell. All three were educated in Europe and became associated with Harvard University.

Assuming the role of arbiters of literary taste, they made Boston the literary capital of America in their day. Though they espoused democratic ideals, they remained aesthetically conservative. In an age that brought forth the masterpieces of Emerson, Thoreau, Hawthorne, Melville, Whitman, Poe, and Twain, they advocated a genteel, rational humanism, quite out of step with their brilliant contemporaries. Nevertheless, the Brahmins exerted the dominant influence on American literary taste until the 1890s.

Brahmo Samaj, Brahmo also spelled BRAHMA (Sanskrit: Society of Brahmā), quasi-Protestant, theistic movement within Hinduism, founded in Calcutta in 1828 by Rammohan Ray. The Brahmo Samaj does not accept the authority of the Vedas, has no faith in *avatāras* (incarnations), and does not insist on belief in *karman* (causal effects of past deeds) or rebirth. It discards Hindu rituals and adopts some Christian practices in its worship. Influenced by Islām and Christianity, it denounces polytheism, idol worship, and the caste system. The society has had considerable success with its programs of social reform but has never had a significant popular following.

Whereas Rammohan Ray wanted to reform Hinduism from within, his successor, Debendranath Tagore, broke away in 1850 by repudiating Vedic authority and making reason and intuition the basis of Brahmanism. He tried, however, to retain some of the traditional Hindu customs, and a radical group led by Keshab Chunder Sen (*q.v.*) seceded and organized the Brahmo Samaj of India in 1866 (the older group became known as the Adi—*i.e.,* original—Brahmo Samaj). The new branch became eclectic and cosmopolitan and was also most influential in the struggle for social reform. It sponsored the Band of Hope temperance society, encouraged the education of women, and campaigned for the remarriage of widows and for legislation to prevent child marriages. When Keshab arranged for his daughter to marry the Prince of Cooch Behār, both parties were well under age. He was thus violating his own reformist principles, and many of his followers rebelled, forming a third *samāj,* or "association," the Sadharan (*i.e.,* common) Brahmo Samaj, in 1878. The Sadharan Samaj gradually reverted to the teaching of the *Upaniṣads* and carried on the work of social reform. Although the movement lost force in the 20th century, its fundamental social tenets were accepted, at least in theory, by Hindu society.

Brahms, Johannes (b. May 7, 1833, Hamburg—d. April 3, 1897, Vienna), German composer and pianist of the Romantic period, who wrote symphonies, concerti, chamber music, piano works, choral compositions, and

Brahms, lithograph by Rudolf Fenzl, 1897

By courtesy of the Osterreichische Nationalbibliothek, Vienna

more than 200 songs. In Vienna from 1863, he composed his best known choral work, *A German Requiem* (1868), and completed his four symphonies: *No. 1 in C Minor* (1876), *No. 2 in D Major* (1877), *No. 3 in F Major* (1883), and *No. 4 in E Minor* (1885).

The young pianist and music director. The son of Jakob Brahms, an impecunious horn and double-bass player, Johannes showed early promise as a pianist. He had his first tuition in music from his father and, at the age of seven, was sent for piano lessons to F.W. Cossel, who three years later passed him to his own teacher, Eduard Marxsen. This distinguished teacher wisely recommended against the suggestion of Brahms's father that the boy should undertake a tour of the United States, and Johannes remained with him for several years. Between the ages of 14 and 16 Brahms earned money to help his family by playing in rough inns in the dock area of Hamburg and, in the meantime, composing and sometimes giving recitals. In 1850 he met Eduard Reményi, a Jewish-Hungarian violinist of somewhat irresponsible character, with whom he gave concerts and from whom he learned something of Hungarian national music—an influence that remained with him all his life.

The first turning point came in 1853, when he met Joseph Joachim, who instantly realized the talent of Brahms, whom he recommended to Schumann; and an immediate friendship between the two composers resulted. Schumann wrote enthusiastically about him in the *Neue Zeitschrift für Musik,* praising his compositions. The article created a sensation. From this moment Brahms was a force in the world of music, though there were always factors that made difficulties for him.

The chief of these was the nature of Schumann's panegyric itself. There was already conflict between the "neo-German" school, dominated by Liszt and Wagner, and the more conservative elements, whose main spokesman was Schumann. His praise of Brahms displeased the enemy; Brahms himself, though kindly received (as was almost everyone) by Liszt, did not conceal his lack of sympathy with the self-conscious modernists. He was therefore drawn into controversy, and most of the disturbances in his otherwise uneventful personal life arose from this situation. Gradually Brahms came to be on close terms with the Schumann household, and when Schumann was first taken mentally ill in 1854, Brahms assisted Clara Schumann in managing her family. He appears to have fallen in love with her; but, though they remained deep friends after Schumann's death in 1856, their relationship did not, it seems, go farther.

Between 1857 and 1860 Brahms moved between the court of Detmold—where he taught the piano and conducted a choral society—and Göttingen, while in 1859 he was appointed conductor of a women's choir in Hamburg. Such posts provided valuable practical experience and left him enough time for his own work. Now that the emotional conflict was to some extent resolved, his productivity increased. Apart from the two delightful *Serenades* for orchestra and the colourful first *String Sextet in B Flat Major,* the turbulent *Piano Concerto No. 1 in D Minor* was completed after undergoing various changes and revisions.

By 1861 he was back in Hamburg, and in the following year he made his first visit to Vienna, with some success. Having failed to secure the post of conductor of the Hamburg Philharmonic concerts, he settled in Vienna in 1863, assuming direction of the Singakademie, a fine choral society. His life there was on the whole regular and quiet, disturbed only by the ups and downs of his musical success, by altercations occasioned by his own quick temper and by the often virulent rivalry between his supporters and those of Wagner and Bruckner, and by one or two inconclusive love affairs. His music, despite a few failures and constant attacks by the Wagnerites, was established, and his reputation grew steadily. By 1872 he was principal conductor of the Gesellschaft der Musikfreunde, and for three seasons directed the Vienna Philharmonic Orchestra. His choice of music was not as conservative as might have been expected (Berlioz' *Harold en Italie* was one of the works he conducted), and though the "Brahmins" continued their war against Wagner, Brahms himself always spoke of his rival with respect. Brahms is sometimes portrayed as unsympathetic toward his contemporaries. His kindness to Dvořák is always acknowledged, but his encouragement even of such a composer as the young Mahler is not always realized, while his enthusiasm for Nielsen's First Symphony is not generally known.

In between the two appointments in Vienna, Brahms's work flourished and some of his most significant works were composed. The year 1868 witnessed the completion of his most famous choral work, *Ein deutsches Requiem (A German Requiem),* which had occupied him since Schumann's death. The work, based on biblical texts selected by the composer, made a strong impact at its first performance at Bremen on Good Friday, 1868; after this, it was performed all over Germany. With the *Requiem,* which is still considered one of the most significant works of 19th-century choral music, Brahms moved into the front rank of German composers.

Brahms was also writing successful works in a lighter vein. In 1869 he offered two volumes of *Hungarian Dances* for piano duet, brilliant arrangements of gypsy tunes he had collected in the course of the years. Their success was phenomenal, and they were played all over the world. Similarly, in 1868–69 he paid a gracious compliment to his adopted hometown by presenting his *Liebeslieder (Love Song)* waltzes, Opus 52, for vocal quartet and four-hand piano accompaniment—a work sparkling with humour and incorporating graceful Viennese dance tunes. Some of his greatest songs were also written at this time.

Maturity and fame. By the 1870s Brahms was writing significant chamber works and was moving with great deliberation along the path to purely orchestral composition. In 1873 he offered the masterly orchestral version of his *Variations on a Theme by Haydn.* After this experiment, which even the self-critical Brahms had to consider completely successful, he felt ready to embark on the completion of his *Symphony No. 1 in C Minor,* the opening movement of which he had shown Clara Schumann six years earlier. The magnificent work was completed in 1876 and first heard in the same year. Now that the composer had proved to himself his full command of the symphonic idiom, within the next year he produced his *Symphony No. 2 in D Major.* This is basically a serene and idyllic work, avoiding the heroic pathos of the *C Minor Symphony.* He let six years elapse before his *Symphony No. 3 in F Major.* In its first three movements this work, too, appears to be a comparatively calm and serene composition—until the finale, which presents a gigantic conflict of elemental forces. Again after only one year, Brahm's last symphony, *No. 4 in E Minor,* was begun. This work may well have been inspired by the ancient Greek tragedies of Sophocles that Brahms had been reading at the time. The symphony's most important movement is once more the finale. Brahms took a simple theme he found in Bach's Cantata Number 150 and developed it in a set of 31 highly intricate variations, but the technical skill displayed here is as nothing compared with the clarity of thought and the intensity of feeling.

Materially, too, his music proved most successful. The compositions published since the 1860s by Fritz Simrock in Bonn were widely performed and brought Brahms a sizable income. Strangely enough, the composer who had grown up in poverty treated his fortune rather carelessly. He left its management to the publisher and had no complaint when Simrock lost substantial sums through speculation on the stock market. Although Brahms spent little on himself, feeling most comfortable when leading a simple life, free of luxuries, he derived pleasure from his vast earnings when he had a chance to help others. He was generous to his family, especially to his father and to his stepmother, whom Jakob had married after his wife's death. Even when his father died, Johannes continued providing for the second Mrs. Brahms and her relatives. Moreover, many young musicians secretly received financial assistance.

Gradually, Brahms's renown spread beyond Germany and Austria. Switzerland and The Netherlands showed true appreciation of his art, and Brahms's concert tours—partly in the company of Joachim—to these countries as well as to Hungary and Poland won great acclaim. Urgent invitations reached him from England, too, and in April 1876 the University of Cambridge offered him the honorary degree of doctor of music. At first Brahms was delighted, but when he found out that the degree had to be conferred on him in person, he declined it. Brahms was not, however, to be deprived of a doctor's title, for the University of Breslau (now Wrocław, Pol.) conferred an honorary degree on him in 1879. The composer thanked the university by writing the *Academic Festival Overture* based on various German student songs, the first performance of which he conducted himself in Breslau.

By now the composer's contemporaries were keenly aware of the outstanding significance of Brahms's works. Following the example of the German conductor Hans von Bülow, they spoke of the "three great B's" (Bach, Beethoven, and Brahms), who were given the same rank of eminence. Yet, despite his honours from various quarters, there was a sizable circle of musicians who did not admit Brahms's greatness. Fervent admirers of the avant-garde composers of the day, most notably Liszt and Wagner, looked down on Brahms's contributions as too old-fashioned and inexpressive.

With advancing age he established a certain pattern in his way of life that seemed to be beneficial for his creative work. After 1871 he lived in Vienna close to his beloved Gesellschaft der Musikfreunde in a simple three-room apartment kept up by a friendly and helpful landlady. When he went on concert tours, he conducted or performed only his own works, and so many demands reached him that he often had to decline them. In spring he loved to travel to Italy, to "bathe in beauty," as he wrote. Between 1871 and 1893 he made nine such trips, often in the company of an eminent surgeon, Theodor Billroth, himself a sensitive musician to whom Brahms dedicated his *String Quartet,* Opus 67. Another welcome companion was a Swiss poet, J.V. Widmann, who left an interesting account of these trips. Brahms prepared himself thoroughly for every journey and received lasting inspiration from Italian art. Reverberations of his first experience in Italy are noticeable in his *Piano Concerto No. 2 in B Flat Major,* which is imbued with a beautifully balanced serenity.

The summer was always spent in the country. He responded deeply to nature, which acted as the most powerful stimulant on his creative process; and many of his works bear the imprint of specific summer resorts. The pastoral *Second Symphony,* the romantic *Violin Concerto,* and the sparkling *Rhapsodies* for piano were written near charming Wörther See (Lake

Wörther) in southern Austria, where Brahms stayed during 1877–79. The grandiose Lake Thun in Switzerland was likewise enjoyed for three summers (1886–88), and there Brahms composed the boldly conceived *Double Concerto in A Minor for Violin and Cello,* the *Cello Sonata in F Major,* the powerful *Piano Trio No. 3 in C Minor,* and the *Violin Sonata in D Minor.* The charming Austrian spa Bad Ischl, summer residence of Emperor Francis Joseph I, was another Brahms favourite. He visited it for the first time in 1880 and spent the last eight summers of his life there. It was there that he completed the radiantly joyous first *String Quintet in F Major,* Opus 88, and years later the energetic second *String Quintet in G Major,* Opus 111.

Final years. It was Brahms's intention to conclude his creative work with the second *String Quintet,* which he finished in 1890, but during the following summer he felt inspired to start on a new experiment. He began to include the clarinet in his chamber music because of his acquaintance with an outstanding clarinetist, Richard Mühlfeld, whom Brahms had heard perform some months before. With Mühlfeld in mind, Brahms wrote at Bad Ischl his *Trio for Clarinet, Cello, and Piano,* Opus 114; the great *Quintet for Clarinet and Strings,* Opus 115; and two *Sonatas for Clarinet and Piano,* Opus 120, Nos. 1 and 2. The works are perfect in structure and beautifully adapted to the potentialities of the wind instrument.

On his 63rd birthday, Brahms completed his *Vier ernste Gesänge* (*Four Serious Songs*), for bass voice and piano, on texts from both the Old and the New Testament, a pessimistic work dealing with the vanity of all earthly things and welcoming death as the healer of pain and weariness. In the last song, however, the power of love is rapturously glorified in words from the First Letter of Paul to the Corinthians. The conception of this work arose from Brahms's thoughts of Clara Schumann, whose physical condition had gravely deteriorated. He was aware that he was soon to lose his dearest friend (who, in his own words, was "the most beautiful experience of his life, its greatest wealth, and its noblest content"). On May 20, 1896, Clara died, and Brahms, in a desperate journey to Frankfurt to attend her funeral service, missed a night train, was too late, and had to go on to Bonn, where she had been taken to be buried beside her husband. After this, he was compelled to seek medical treatment, and his liver was discovered to be seriously diseased.

In the summer of 1896 Brahms was still able to write his *Eleven Chorale Preludes* for organ, the last of these a fantasia on "O Welt, ich muss dich lassen" ("Oh World, I Must Depart from Thee"). He appeared for the last time at a concert in March 1897; and in Vienna, in April 1897, he died of cancer.

MAJOR WORKS. *Orchestral music.* Symphonies: *No 1 in C Minor,* op. 68 (1876); *No 2 in D Major,* op. 73 (1877); *No. 3 in F Major,* op. 90 (1883); *No. 4 in E Minor,* op. 98 (1885).

Concerti (piano): *No. 1 in D Minor,* op. 15 (1854-58); *No. 2 in B Flat Major,* op. 83 (1881). (Violin): op. 77 in D major (1878). (Violin and cello): *Double Concerto in A Minor,* op. 102 (1887).

Other orchestral works: Two overtures: *Academic Festival,* op. 80 (1880) and *Tragic,* op. 81 (1880); two serenades: *No. 1 in D Major,* op. 11 and *No. 2 in A Major,* op. 16 (1857–59); *Variations on a Theme by Haydn* (Chorale St. Antoni), op. 56a (1873); *Hungarian Dances* arranged from his own piano duets (published 1873).

Chamber music. Sonatas: Three for violin and piano: *No. 1 in G Major,* op. 78 (1879), *No. 2 in A Major,* op. 100 (1886), and *No. 3 in D Minor,* op. 108 (1886–88); two for cello and piano: *No. 1 in E Minor,* op. 38 (1862–65) and *No. 2 in F Major,* op. 99 (1886); two for clarinet and piano, op. 120 (1894), *No. 1 in F Minor* and *No. 2 in E Flat Major.*

Other chamber works: Two string sextets, two string quintets, and three string quartets, one clarinet quintet, one piano quintet; three piano quartets for violin, viola, cello, and piano; three trios for violin, cello, and piano; one trio for clarinet (or viola), cello, and piano; one trio for violin, horn (or cello or viola), and piano.

Solo piano music. Sonatas: *No. 1 in C Major,* op. 1 (1852–53); *No. 2 in F Sharp Minor,* op. 2 (1852); *No. 3 in F Minor,* op. 5 (1853).

Variations: Five sets, including *Variations on a Theme by Schumann,* op. 9 (1854); *Variations and Fugue on a Theme by Handel,* op. 24 (1861); *Variations on a Theme by Paganini,* op. 35 (1862–63).

Other solo piano works: Numerous ballads, capriccios, fantasies, intermezzos, and rhapsodies, including *Four Ballads,* op. 10 (1854); two *Rhapsodies,* op. 79 (1879); op. 116, 117, 118, 119 (1891–93).

Piano duets: *Variations on a Theme by Schumann,* op. 23 (1861); various waltzes, including *Liebeslieder* waltzes, op. 52a (1874) and *Neue Liebeslieder* waltzes, op. 65a (1877); four sets of *Hungarian Dances.*

Music for two pianos: *Variations on a Theme by Haydn,* op. 56b (1873); *Sonata in F Minor,* op. 34b (1864; an arrangement of his *Piano Quintet,* op. 34).

Organ music. Two preludes and fugues; *Fugue in A Flat Minor; Chorale Prelude and Fugue in A Minor;* and *Eleven Chorale Preludes,* op. 122 (1896).

Vocal music. Accompanied choral music: *Ein deutsches Requiem,* op. 45 (1857–68); various sacred and secular works for female, male, and mixed voices; some arrangements.

Unaccompanied choral music: 117 German folk songs for four-part chorus; various sacred songs, motets, secular part-songs, and canons for female, male, and mixed voices.

Songs: 214 solo songs with piano, composed throughout the course of his life, published in 32 sets, including *Vier ernste Gesänge,* op. 121 (1896).

Duets and quartets: 25 duets, mostly for soprano, contralto, and piano; 16 quartets for soprano, contralto, tenor, and bass; *Liebeslieder* waltzes, op. 52 (1868–69), and *Neue Liebeslieder* waltzes, for piano duet and voices ad lib, op. 65 (1874); and 11 *Zigeunerlieder,* op. 103 (1887).

BIBLIOGRAPHY. Joseph Braunstein (ed.), *Thematic Catalog of the Collected Works of Brahms,* enl. ed. based on the 4th ed. of Simrock's *Thematisches Verzeichnis* (1956), is a complete list of Brahms's works. The Deutsche Brahms-Gesellschaft published Brahms's correspondence (in German) in 16 vol. (1908–22). A small selection of outstanding letters addressed by Brahms to various friends may be found in the appendix to Karl Geiringer, *Johannes Brahms: Leben und Schaffen eines deutschen Meisters* (1935; *Brahms: His Life and Work,* 2nd ed., 1947), which was written by the curator of the Gesellschaft der Musikfreunde, who has drawn extensively on the unpublished material in this collection. Max Kalbeck, *Johannes Brahms,* 4 vol. (1904–14), is the most extensive Brahms biography (in German). Hans Gal, *Johannes Brahms: Werk und Personlichkeit* (1961; *Johannes Brahms: His Work and Personality,* 1963), is a sensitive account by one of the editors of the collected edition of Brahms's compositions. Edwin Evans, *Historical, Descriptive and Analytical Account of the Entire Works of Johannes Brahms,* 4 vol. (1912–36, reprinted 1970), is very thorough, though somewhat pedantic.

Brahui, tribal confederacy of Baluchistan, in Pakistan. Its members are mostly nomadic goat herdsmen, distributed from the Bolān Pass through the Brāhui Hills to Rās (cape) Muarī on the Arabian Sea. The Brahui language is a far northwestern member of the Dravidian family of languages, all of whose other members are spoken in peninsular India; it has borrowed heavily from Sindhi, but remains in unexplained isolation among the surrounding Indo-Iranian dialects, to which it bears no genetic relationship. The Brahui are estimated to number about 700,000.

Physically the Brahui tribesmen resemble their Baluchi and Pashtun neighbours, for the confederacy has been highly absorptive. They are Muslim by creed and Sunnī by sect, though the Muslim rites overlie social customs that are essentially Indian. Women are not strictly secluded.

The 29 tribes owe a loose allegiance to the Brahui khan of Kalāt, which has long been associated with the confederacy's destinies. A group of eight tribes forms what is believed to be the original Brahui nucleus and constitutes about one-eleventh of the Brahui population. To these nuclear tribes have been affiliated many indigenous and captive peoples.

The Brahui rose to power in the 17th century, overthrowing a dynasty of Hindu rajas. Under Naṣīr Khān, the confederacy attained its zenith in the 18th century. Their subsequent history centred on the state of Kalāt, which joined Pakistan in 1948.

Brahui language, also spelled BRĀHUĪ, isolated member of the Dravidian family, spoken in Pakistan. All other Dravidian languages are spoken in peninsular India; Brahui's isolation from the other languages of the family has resulted in heavy borrowing from surrounding non-Dravidian languages (*e.g.,* Baluchi, Sindhi, Persian). Not a written language, Brahui is being displaced by neighbouring languages, and many of its speakers are already bilingual.

Braid, James (b. 1795, Rylawhouse, Fifeshire, Scot.—d. March 25, 1860, Manchester), British surgeon and a pioneer investigator of hypnosis who did much to dispel the superstitious aura surrounding the phenomenon and whose findings provided a major impetus to the development of the French school of neuropsychiatry.

In 1841, when well established in a surgical practice at Manchester, he developed a keen interest in mesmerism, as hypnotism was then called. Proceeding with experiments, he disavowed the popular notion that the ability to induce hypnosis is connected with the magical passage of a fluid or other influence from the operator to the patient. Rather, he adopted a physiological view that hypnosis is a kind of sleep, induced by fatigue resulting from the intense concentration necessary for staring fixedly at a bright, inanimate object. He was mainly interested in the therapeutic possibilities of hypnosis and reported successful treatment of diseased states such as paralysis, rheumatism, and aphasia. He hoped that hypnosis could be used to cure various seemingly incurable "nervous" diseases and also to alleviate the pain and anxiety of patients in surgery.

Braid, James (b. Feb. 6, 1870, Earlsferry, Fife, Scot.—d. Nov. 27, 1950, London), one of the greatest golfers of his time, winner of the British Open championship five times in the first decade of the 20th century. Braid, Harry Vardon, and John Henry Taylor formed what was called the "Great Triumvirate" of British golf prior to World War I.

He won the British Open in 1901, 1905, 1906, 1908, and 1910; the French championship in 1910; and the *News of the World* tournament (retrospectively considered the British professional match-play championship competition) in 1903, 1905, 1907, and 1911. In his later years he designed several golf courses.

Braid movement, first prophet-healing movement in Nigeria and one of the earliest in Africa. The movement began about 1910 in the Niger Delta Pastorate Church, a semi-independent all-African section of the Anglican Church, when Garrick (Sokari) Braid (also spelled Braide) became noted in the Bakana parish church for his gifts of prayer and healing powers. In November 1915, when World War I had disturbed the Delta peoples, a religious revival movement, centred on Braid's activities, suddenly spread around Opobo, Bonny,

and Bakana. It stressed prayer, faith-healing, and mass baptisms and opposed traditional charms and shrines, which were often forcibly destroyed.

The Anglican Church at first welcomed the renewal of religious fervour but began to oppose the movement early in 1916, as Braid's personal following grew. In addition, some aspects of the movement were viewed by the local colonial administration as anti-European, and Braid was twice imprisoned on suspicions of sedition. Some of his followers abandoned the movement; others formed separate churches. Braid, who died in 1918, is still revered as their founder by a variety of Christ Army churches, some more and others less Christian, in southeastern Nigeria.

braiding, in textiles, machine or hand method of interlacing three or more yarns or bias-cut cloth strips in such a way that they cross one another and are laid together in diagonal formation, forming a narrow strip of flat or tubular fabric. The word plaiting is generally applied when such materials as rope or straw are employed.

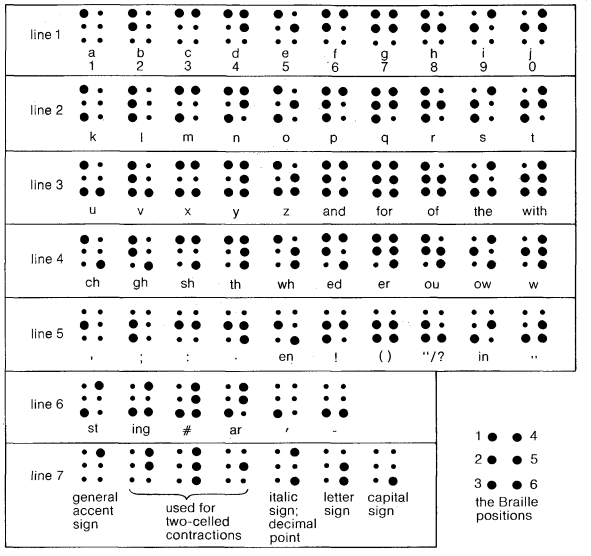
Braids are frequently used as trimming or binding. Flat braid may be used to produce a decorative border effect on garments or home furnishings or may be folded over raw fabric edges as a finishing method. Soutache is a decorative braid with a herringbone pattern, sometimes used to outline designs. Braids may be sewn together to make braided rugs. Hats, handbags, and belts can also be made from various braids, including plastic and straw types.

Brăila, *județ* (district), southeastern Romania, occupying an area of 1,824 sq mi (4,724 sq km). Consisting mostly of lowlands, the district contains the Bărăgan Plain in the west. The Siret River, which flows southwestward; is the northern border of the district. The Danube and its tributary, the Dunărea Veche, drain northward. The area was part of feudal Walachia. It was occupied by Turks from 1554 until 1829. Brăila city, the district capital, is one of the largest Romanian ports on the Danube and can handle ocean-going vessels. Its industries include iron, steel, machinery, textile, and paper production. Factories in Vădeni, Viziru, and Făurei process foodstuffs. Wheat and corn (maize) are cultivated, and livestock are raised in the Bărăgan Plain. Panait Istrati (1884–1935), the writer, lived in the town of Lacul Sarat (Salt Lake). Gropeni, Însurătei, and Chiscani are other towns. Highways and railway connections extend through Brăila city. Pop. (1982 est.) 393,467.

Where the same name may denote a person, place, or thing, the articles will be found in that order

Brăila, city, capital of Brăila *județ* (district), southeastern Romania. On the Danube River, 105 mi (170 km) from its mouth, it is the country's second largest port. First mentioned by the name of Drinago in a Spanish geographical work of 1350, it was referred to as Brayla in 1368 in a transportation and trade license granted to Brașov merchants. It was occupied by the Turks from 1554 until the end of the Russo-Turkish War of 1828–29, when it was returned to Walachia. The scene of much fighting during the war, it was heavily damaged by 1829, and a new street plan was initiated in 1835. Streets radiating from near the port at Brăila's centre are crossed at symmetrical intervals by concentric streets following the geometric design of the old Turkish fortifications. Accessible to small and medium-sized oceangoing ships, it has large grain-handling and warehousing facilities. It is also an important industrial centre, with metalworking, textile, food-processing, and other factories. Historic buildings include the Art Museum in the Palace of Culture, the History Museum, the Greek Church (1863–72), and the Orthodox Church of the Archangels Michael and Gabriel (a mosque until 1831). Pop. (1982 est.) 212,050.

Braille, universally accepted system of writing used by and for blind persons and consisting of a code of 63 characters, each made up of one to six raised dots arranged in a six-position matrix or cell. These Braille characters are embossed in lines on paper and read by passing the fingers lightly over the manuscript. Louis Braille, who was blinded at the age of three, invented the system in 1824 while a student at the Institution Nationale des Jeunes Aveugles (National Institute for Blind Children), Paris.



The Braille characters

The Frenchman Valentin Haüy was the first person to emboss paper as a means of reading for the blind. His printing of normal letters in relief led others to devise simplified versions; but, with one exception, they are no longer in use. The single exception is Moon type, invented in 1845 by William Moon of Brighton, Eng., which partly retains the outlines of the Roman letters and is easily learned by those who have become blind in later life. Books in this type are still in limited use by elderly people, particularly in Great Britain.

When Louis Braille entered the school for the blind in Paris, in 1819, he learned of a system of tangible writing using dots, invented in 1819 by Capt. Charles Barbier, a French army officer. It was called night writing and was intended for night-time battlefield communications. In 1824, when he was only 15 years old, Braille developed a six-dot "cell" system. He used Barbier's system as a starting point and cut its 12-dot configuration in half. The system was first published in 1829; a more complete elaboration appeared in 1837.

To aid in identifying the 63 different dot patterns, or characters, that are possible within the six-dot cell, Braille numbered the dot positions 1–2–3 downward on the left and 4–5–6 downward on the right. The illustration shows the formation of each cell and its simplest designated meaning. The first 10 letters of the alphabet are formed with dots 1, 2, 4, and 5. When preceded by the numeric indicator diagrammed in line 6, these signs have number values. The letters *k* through *t* are formed by adding dot 3 to the signs in line 1. Five of the remaining letters of the alphabet and five very common words are formed by adding dots 3 and 6 to the signs in line 1. When dot 6 is added to the first 10 letters, the letter *w* and 9 common letter combinations are formed (see line 4). Punctuation marks and two additional common letter combinations are made by placing the signs in line 1 in dot positions 2, 3, 5, and 6 (line 5). Three final letter combinations, the numeric indicator, and two more punctuation marks are formed with dots 3, 4, 5, and 6 as shown in line 6. The last seven dot patterns indicated in line 7 are formed by dots 4, 5, and 6 and have no true equivalents in ordinary written language. Like the numeric indicator, these signs serve as modifiers when placed before any of the other signs. Through the application of this principle, the various signs can function in multiple ways. For example, dot 5 added before the sign for the letter *a* forms the Braille contraction for "day."

Braille's system was immediately accepted and used by his fellow students, but wider acceptance was slow in coming. The system was not officially adopted by the school in Paris until 1854, two years after Braille's death. A universal Braille code for the English-speaking world was not adopted until 1932, when representatives from agencies for the blind in Great Britain and the United States met in London and agreed upon a system known as Standard English Braille, grade 2. In 1957 Anglo-American experts again met in London to further improve the system.

In addition to the literary Braille code, there are other codes utilizing the Braille cell but with other meanings assigned to each configuration. The Nemeth Code of Braille Mathematics and Scientific Notation (1965) provides for Braille representation of the many special symbols used in advanced mathematical and technical material. There are also special Braille codes or modifications for musical notation, shorthand, and, of course, many of the more common languages of the world.

Writing Braille by hand is accomplished by means of a device called a slate that consists of two metal plates hinged together to permit a sheet of paper to be inserted between them. Some slates have a wooden base or guide board onto which the paper is clamped. The upper of the two metal plates, the guide plate, has cell-sized windows; under each of these, in the lower plate, are six slight pits in the Braille dot pattern. A stylus is used to press the paper against the pits to form the raised dots. A person using Braille writes from right to left; when the sheet is turned over, the dots face upward and are read from left to right.

Braille is also produced by special machines

with six keys, one for each dot in the Braille cell. The first Braille writing machine, the Hall Braille writer, was invented in 1892 by Frank H. Hall, superintendent of the Illinois School for the Blind. A modified form of this device is still in use today, as are later, similar devices. A recent innovation for producing Braille is electric embossing machines similar to electric typewriters.

Braille, Louis (b. Jan. 4, 1809, Coupvray, near Paris—d. Jan. 6, 1852, Paris), French educator who developed a system of printing and writing that is extensively used by the blind and that was named for him.

Braille was himself blinded at the age of three in an accident that occurred while he was playing with tools in his father's harness shop.

Braille, portrait bust by an unknown artist

Archiv fur Kunst und Geschichte, Berlin

An awl slipped and plunged into his eye. Sympathetic ophthalmia and blindness followed. Nevertheless, he became an excellent organist and cellist. Upon receiving a scholarship, he went in 1819 to Paris to attend the National Institute for Blind Children, and from 1826 he taught there.

Braille became interested in a system of writing, exhibited at the school by Charles Barbier, in which a message coded in dots was embossed on cardboard. When he was 15, he worked out an adaptation, written with a simple instrument, that met the needs of the sightless. He later adapted his system, which consists of a six-dot code in various combinations, to musical notation. He published treatises on his type system in 1829 and 1837.

For the last years of his life Braille was ill with tuberculosis. His remains, returned to his birthplace after his death, were in 1952 sent to Paris, to be buried in the Panthéon.

brain, the concentration of nerve tissue in the anterior end of an animal's body. The brain integrates sensory information and directs motor responses, thus playing a major role in vital instinctive activities; in higher vertebrates it is also the centre of learning.

A brief treatment of the brain follows. For full treatment, *see* MACROPAEDIA: Nerves and Nervous Systems.

Among invertebrates, the brain consists of clusters of nerve-cell bodies at the anterior end of a series of nerve cords. The vertebrate brain is an anterior enlargement of the spinal cord.

In the lower vertebrates the brain is tubular and resembles an early developmental stage of the brain in higher vertebrates. It consists of three distinct regions: the hindbrain, the midbrain, and the forebrain. Although the brain of higher vertebrates undergoes considerable modification during embryonic development, these three regions are still discernible.

The hindbrain is composed of the medulla oblongata and the cerebellum. The medulla oblongata transmits all signals between the spinal cord and the higher parts of the brain; it also governs autonomic functions such as heartbeat and respiration. The cerebellum controls balance and coordination.

The midbrain, the upper portion of which evolved from the optic lobes, serves as the main centre of sensory integration in fish and amphibians. It also plays a major integration role in reptiles and birds. In mammals the midbrain is greatly reduced, serving primarily as a connecting link between the hindbrain and the forebrain.

The forebrain includes the cerebral hemispheres and, under these, the thalamus and hypothalamus. The thalamus is the main relay centre between the medulla and the cerebrum; the hypothalamus is an important control centre for sex drive, pleasure, pain, hunger, thirst, blood pressure, body temperature, and other visceral functions. The hypothalamus produces releasing hormones that govern the secretions of the anterior pituitary, and it also produces oxytocin and the antidiuretic hormone, which are stored in and released by the posterior pituitary.

The cerebrum, originally functioning as part of the olfactory lobes, is involved with the more complex functions of the human brain. In humans and other advanced vertebrates, the cerebrum has grown over the rest of the brain, forming a convoluted (wrinkled) layer of gray matter. The degree of convolution is partly dependent on the size of the body. Small mammals (*e.g.,* lesser anteater, marmoset) generally have smooth brains, and large mammals (*e.g.,* whale, elephant, dolphin) have highly convoluted ones.

The cerebral hemispheres are separated by a deep groove, the longitudinal cerebral fissure. At the base of this fissure lies a thick bundle of nerve fibres, called the corpus callosum, which provides a communication link between the hemispheres. The left hemisphere controls the right half of the body, and vice versa, because of a crossing of the nerve fibres in the medulla or, less commonly, in the spinal cord. Although in many ways the right and left hemispheres are mirror images of one another, there are important functional distinctions. In most people, for example, the areas that control speech are located in the left hemisphere, while areas that govern spatial perceptions reside in the right hemisphere.

Two major furrows—the central sulcus and the lateral sulcus—divide each cerebral hemisphere into four sections: the frontal, parietal, temporal, and occipital lobes. The central sulcus, also known as the fissure of Rolando, also separates the cortical motor area (which is anterior to the fissure) from the cortical sensory area (which is posterior to the fissure). Starting from the top of the hemisphere, the upper regions of the motor and sensory areas control the lower parts of the body, and the lower regions of the motor and sensory areas control the upper parts of the body. Other functional areas of the cerebral hemispheres have been identified, including the visual cortex in the occipital lobe and the auditory cortex in the temporal lobe. A large amount of the primate cortex, however, is devoted to no specific motor or sensory function; this so-called association cortex is apparently involved in higher mental activities. It makes up the largest share of the human cortex.

brain-fever bird, common name for two birds: *Cuculus varius,* a species of cuckoo (*q.v.*), and certain barbets (*see* barbet).

brain scanning, any of a number of diagnostic methods for detecting intracranial abnormalities.

The oldest of the brain-scanning procedures still in use is a simple, relatively noninvasive procedure called isotope scanning. It is based on the tendency of certain radioactive isotopes to concentrate selectively in tumours and blood vessel lesions. The procedure involves the injection of a radioactive isotope (such as technetium-99*m* or iodine-131) into a blood vessel that supplies the cranial region. As the substance becomes localized within the brain, it decays (*i.e.,* breaks down), therewith emitting gamma rays. The concentration of rays at a given site, as measured by a movable radiation detection device, can reveal the presence, shape, and often the size of the intracranial abnormality. In many cases, isotope scanning has been replaced by computerized axial tomography (CAT; also called computed tomography, or CT).

The CAT scan is a procedure in which the brain is X-rayed from many different angles. An X-ray source delivers a series of short pulses of radiation as it and an electronic detector are rotated around the head of the individual being tested. The responses of the detector are fed to a computer that analyzes and integrates the X-ray data from the numerous scans to construct a detailed cross-sectional image of the brain. A series of such images enables physicians to locate brain tumours, cerebral abscesses, blood clots, and other disorders that would be difficult to detect with conventional X-ray techniques.

With the development in the mid-1970s of the CAT scan, computer-based technologies have revolutionized the field of medical diagnosis. One of the more significant new tomographic techniques is nuclear magnetic resonance (NMR) imaging. Like CAT, NMR generates images of thin slices of the brain (or other organ under study), but it does so without the hazard of X rays or other ionizing radiation. In addition NMR can reveal physiological and biochemical, as well as structural, abnormalities. (Although the benefits of NMR are myriad, the technique is not advised for individuals with pacemakers, aneurysm clips, large metallic prostheses, or dependence on iron-containing instruments.) Positron emission tomography (PET) is an experimental computer-based procedure in which a radioactive tracer-labeled compound is introduced into the brain (or other organ under study), and its behaviour is tracked. This information, with computer modeling, eventually yields a cross-sectional image of the physiological process under study.

brain syphilis (disease): *see* paresis.

Brain Trust, also called BRAINS TRUST, group of advisers to Franklin D. Roosevelt during his first campaign for the presidency (1932). The term was coined by journalist John F. Kieran and gained national currency at once. Raymond Moley, Rexford G. Tugwell, and Adolph A. Berle, Jr., all professors at Columbia University, were the three principal members, although others served with them from time to time. Under the chairmanship of Moley, the Brain Trust presented Roosevelt with its thinking on economic and social problems facing the nation and helped him to weigh the alternatives of public policy that would be open to the new president. It contributed suggestions and drafts for campaign speeches, all of which underwent considerable revision by Roosevelt.

Braine, John (Gerard) (b. April 13, 1922, Bradford, Yorkshire, Eng.—d. Oct. 28, 1987, London), British novelist, one of the so-called Angry Young Men (*q.v.*), whose *Room at the Top* (1957; film 1958) typifies the concerns of a generation of post-World War II British writers.

Braine attended St. Bede's Grammar School in Bradford and the Leeds School of Librarianship and was working as a librarian in the West Riding of Yorkshire when *Room at the Top* appeared. Its protagonist, a young working-class man, traps himself into an unhappy marriage with the daughter of a wealthy businessman. None of his later novels approached it in critical or popular success. *Waiting for Sheila* (1976) was adapted for

television (1977), as was *Stay With Me Till Morning* (1970; adapted for television, 1980).

Brainerd, city, seat of Crow Wing County, central Minnesota, U.S., on the Mississippi River, in a forest and lake-resort region south of the Cuyuna Range. Created in 1871 as a logging camp by the Northern Pacific Railway, it was given the maiden name of the wife of the railroad president, John G. Smith. The Paul Bunyan Center has lumbering exhibits including an animated figure (27 ft [8 m] high) of the legendary lumberjack and holds an annual carnival in June. Lumbertown, USA, 12 mi (19 km) northwest, is a replica of a Minnesota camp in the 1870s. Lumbering, however, has declined, and paper and clothing manufactures, railroad shops, tourism, and Brainerd State Hospital are the major sources of income. Brainerd Community College was founded in 1938. Brainerd International Raceway features sports car races. Inc. 1881. Pop. 1980) 11,489.

Brainerd, David (b. April 20, 1718, Haddam, Conn.—d. Oct. 9, 1747, Northampton, Mass.), Presbyterian missionary to the Seneca and Delaware Indians of New York, New Jersey, and Pennsylvania (1744–47). He gained posthumous fame through the publication of his diary by Jonathan Edwards, the Massachusetts religious philosopher.

Brainerd was ordained as a Presbyterian minister on June 12, 1744, at Newark, N.J. As a missionary, he was employed by the Honourable Society in Scotland for Propagating Christian Knowledge. He preached through an interpreter, Moses Tinda Tautamy, working among the Delawares, the Six Nations, the Senakes (probably Senecas), and Tutelas. He rode horseback along the Susquehanna and Delaware rivers, camping at night, his only home a cabin at the forks of the Delaware. He kept a journal for the Scottish society, and a diary. Brainerd spent much time at Crossweeksung (now Crosswicks), N.J., and visited New Haven and Hartford, Conn.; New York; Elizabeth and Princeton, N.J.; and Juniata and Philadelphia, Pa. He contracted tuberculosis and was nursed for 19 weeks at Edwards' home at Northampton, Mass., where he died.

Braintree, district, county of Essex, England. With an area of 236 sq mi (612 sq km), it includes the towns of Braintree and Bocking that lie adjacent on the Roman road known as Stane Street, as well as the other old market towns of Halstead and Witham, set in rich farmlands. The clothing trade that brought prosperity to the towns and villages in the late Middle Ages was superseded in its decline by crepe and silk manufacture introduced by Huguenot refugees in the 17th century. Fine medieval churches and many noteworthy domestic buildings survive. Pop. (1982 est.) 113,300.

Braintree, urban town (township), Norfolk County, eastern Massachusetts, U.S., on Weymouth Fore River (an inlet of Hingham Bay), just southeast of Boston. It was settled in 1634 as Monoticut (an Indian word meaning "abundance") and was part of Boston until it was separately incorporated in 1640 and named for Braintree in Essex. To obtain a clear title, the town purchased its land from the Indians in 1665. Ironworks, using local bog iron, were established as early as 1643 and glassmaking began in 1752. Factories built during the 18th and 19th centuries produced a wide variety of products, including chocolate, textiles, and hardware. Braintree is now an industrial residential suburb of Boston and Quincy.

The village of South Braintree (within the township) was the scene of the payroll robbery murders that led to the Sacco–Vanzetti trial of 1920–27. Braintree is the birthplace of the statesman John Hancock and of Abigail Adams (her house [1740] is preserved). Presidents John Adams and John Quincy Adams (husband and son, respectively, of Abigail) were born in that section of the town that after 1792 became part of Quincy. Pop. (1980) 36,337.

brainwashing, also called COERCIVE PERSUASION, systematic effort to persuade nonbelievers to accept a certain allegiance, command, or doctrine. A colloquial term, it is more generally applied to any technique designed to manipulate human thought or action against the desire, will, or knowledge of the individual. By controlling the physical and social environment, an attempt is made to destroy loyalties to any unfavourable groups or individuals, to demonstrate to the individual that his attitudes and patterns of thinking are incorrect and must be changed, and to develop loyalty and unquestioning obedience to the ruling party.

The term is most appropriately used in reference to a program of political or religious indoctrination or ideological remolding. The techniques of brainwashing typically involve isolation from former associates and sources of information; an exacting regimen requiring absolute obedience and humility; strong social pressures and rewards for cooperation; physical and psychological punishments for noncooperation ranging from social ostracism and criticism, deprivation of food, sleep, and social contacts, to bondage and torture; and continual reinforcement.

The nature of brainwashing as occurring in Communist political prisons received widespread attention after the Chinese Communist victory in 1949 and after the Korean and Vietnamese wars. More recently, its reported use in fringe religious cults and radical political groups has aroused great concern in the United States.

Deprogramming, or reversing the effects of brainwashing through intensive psychotherapy and confrontation, has proven somewhat successful, particularly with religious cult members.

The depth and permanence of changes in attitude and point of view depend on the personality of the individual, degree of motivation to be reformed, and the degree to which the environment supports the new frame of reference.

braising, the cooking of meat or vegetables by heating them slowly with oil and moisture in a tightly sealed vessel. Braising differs from stewing, in which the food is immersed in liquid, and from covered roasting, in which no liquid is added. In relative terms, braising is a combination of covered roasting and steaming.

The food to be braised is first browned in a small amount of fat in an open pan, then is cooked further with the pan covered; meats are frequently braised over a bed of vegetables. A small amount of liquid such as water or wine may be added after the browning is completed.

The term fricasseeing may be applied to the making of a stew by braising small pieces of poultry, rabbit, or veal. The braising of a large piece of meat is sometimes called pot-roasting.

Braithwaite, R(ichard) B(evin) (b. Jan. 15, 1900, Banbury, Oxfordshire, Eng.) British philosopher best known for his theories in the philosophy of science and in moral and religious philosophy.

Braithwaite was educated at the University of Cambridge in physics and mathematics before switching to the study of philosophy. In 1924 he became a fellow of the university, serving there as a lecturer in moral science (1928–53) and as Knightsbridge professor of moral philosophy (1953–67).

Braithwaite's work in the philosophy of the physical sciences was important for his theories on the nature of scientific inductive reasoning and the use of models, as well as on the use of probabilistic laws. He also applied his scientific background to his studies of moral and religious philosophy, particularly in the application of mathematical game theory. In his book *Theory of Games as a Tool for the Moral Philosopher* (1955), he demonstrated the ways in which game theory could be used to arrive at moral choices and ethical decisions.

Braj Bhasa language, also spelled BRAJ BHASHA, or BRAJ BHAKHA, Indo-Aryan language spoken around Mathura, Uttar Pradesh, India, and commonly viewed as a western dialect of Hindi (*q.v.*). It was used as a literary language until the late 19th century, and much of the literature in Braj Bhasa deals with Krishna, a deity closely associated with the Mathura district.

Brak (Libya): *see* Birāk.

Brak, Tell (ancient Syrian site): *see* Birāk, Tall.

brake (plant): *see* bracken.

brake, device for decreasing the speed of a body or for stopping its motion. Most brakes act on rotating mechanical elements and absorb kinetic energy either mechanically, hydrodynamically, or electrically.

Mechanical brakes are the most common; they dissipate kinetic energy in the form of heat generated by mechanical friction between a rotating metallic drum or disk and a stationary friction element brought into contact with it by mechanical, hydraulic, or pneumatic means. The friction elements for drum brakes may be bands or shoes (blocks with one concave surface); for disk brakes they are pads or rings. Friction materials may be organic, metallic, or ceramic; molded asbestos is commonly used.

Mechanical operation by means of rigid links is satisfactory for single brakes, but when several brakes are actuated from a single source, as on an automobile, it is difficult to obtain equal braking effectiveness on all wheels; for this reason, hydraulic actuation, with oil under the same pressure acting on all brakes, is preferable. The braking of railroad cars is effected by cast-iron shoes that bear directly on the circumference of the wheels and are activated by compressed air (*see* air brake).

A hydrodynamic (fluid) brake has a rotor (rotating element) and a stator (stationary element) that resemble the impeller and runner in a hydraulic coupling. Resistance to rotation is created by fluid friction and circulation of the liquid (usually water) from a series of pockets in the rotor to a series of complementary pockets in the stator. Because the resistance to rotation—*i.e.*, braking power—depends on the speed of the rotor, these brakes cannot completely stop a rotating member; however, if means for cooling the liquid are provided, they can dissipate large amounts of kinetic energy in a very effective manner. They are particularly useful on heavy trucks operating in mountainous country.

Brakpan, town, Transvaal, South Africa, east of Johannesburg. It is part of the mining and industrial complex of the East Rand area within the Witwatersrand. The area, first named in 1886, grew rapidly after the discovery of coal (in 1888) and gold (in 1905). Brakpan officially became a town in 1919, and it now has wide, tree-lined streets and residential suburbs separated from the diversified industrial areas. Since 1978, the recycling of the mine tailings at Brakpan (the largest such dump in the Witwatersrand) has resulted in the recovery of significant residual quantities of gold and uranium. Pop. (1978 est.) mun., 89,480.

Bramah, Joseph (b. April 13, 1748, Stainborough, Yorkshire, Eng.—d. Dec. 9, 1814, London), engineer and inventor whose lock-manufacturing shop was the cradle of the British machine-tool industry.

Originally a cabinetmaker, Bramah became interested in the problem of devising a pick-proof lock. In 1784 he exhibited his new lock in his shop window, with a sign offering a reward of 200 guineas to anyone who could pick it. Despite many attempts, the Bramah lock defied all efforts for 67 years, until it was finally opened by a mechanic after 51 hours' work. The success of the lock was won at the price of complexity, and it could be produced in quantity only after the creation of a whole set of well-designed and precisely engineered machine tools. To assist in making them, he hired a young blacksmith, Henry Maudslay, who proved to be an engineering genius. The prototype machines designed and built by Bramah and Maudslay went far toward founding the machine-tool industry, the basis of the vast expansion of British manufacturing in the 19th century.

Of Bramah's other inventions the most notable is his hydraulic press; he also invented an improved water closet, a wood-planing machine, and a machine for numbering bank notes.

Bramante, Donato, Donato also spelled DONINO, or DONNINO (b. 1444, probably at Monte Asdruvaldo, Duchy of Urbino—d. April 11, 1514, Rome), architect who introduced the High Renaissance style in architecture. His early works in Milan included the

Tempietto, S. Pietro in Montorio, Rome, designed by Bramante, 1502

Anderson—Alinari from Art Resource/EB Inc.

rectory of S. Ambrogio and the church of Sta. Maria delle Grazie. In Rome, Bramante served as principal planner of Pope Julius II's comprehensive project for rebuilding the city. St. Peter's Basilica, of which he was the chief architect, was begun in 1506. Other major Roman works were the Tempietto at S. Pietro in Montorio (1502) and the Belvedere court in the Vatican (begun *c.* 1505).

Early years and training. Donato Bramante was born of a family of well-to-do peasants. In his childhood, says the 16th-century biographer and artist Giorgio Vasari, "besides reading and writing, he practiced much at the abacus." His father probably directed him toward painting.

Little is known of Bramante's life and works before 1477. He probably served as an assistant to Piero della Francesca in Urbino, which under the nobleman Federico da Montefeltro (died 1482) had become a Humanist centre of considerable importance. In 1477 Bramante was working in Bergamo as a painter of illusionistic murals of architecture. He probably derived his training not only from the works of artists active in Urbino but also from those of other artists he may have observed in his travels, such as those of Leon Battista Alberti (in Rimini and Mantua), Andrea Mantegna (in Mantua and Padua), Ercole de'Roberti (in Ferrara), and Filippo Brunelleschi (in Florence).

None of Bramante's youthful productions has survived, though some historians attribute various architectural perspectives to him. Almost all of them show some characteristics of Bramante's work, but they appear very different from each other. Before 1477, Bramante may have been primarily a planner, designer, and painter of architectural perspectives that other artists partly modified and inserted into their own paintings or carried out in construction; there are a number of later instances in which he is known to have furnished painters with such architectural perspectives.

Lombard period. By 1477 Bramante had left Urbino for unknown reasons and had settled in the northern Italian province of Lombardy. He worked on frescoes for the facade of the Palazzo del Podestà (later altered) in Bergamo showing classical figures of philosophers in a complex architectural setting. Vasari (though poorly informed on this period) says that Bramante, after working in various cities on "things of no great cost and little value," went to Milan "to see the cathedral." The cathedral workshop, in which Italian, German, and French craftsmen worked by turns, constituted an important centre for the exchange of knowledge, planning methods, and techniques. Moreover, Milan was a large and wealthy metropolis, the capital of a state ruled by Ludovico Sforza, called Il Moro, and Renaissance architecture was a commodity to be imported. Thus the city represented an opportunity for a young and up-to-date architect like Bramante.

The first architectural work that can be definitely attributed to Bramante is a design: a print made in 1481 by a Milanese engraver, Bernardo Prevedari, from a Bramante drawing representing a ruined temple with human figures. About the same time, Bramante was working on the church of Sta. Maria presso S. Satiro, the first structure definitely attributed to him. Along with a certain adherence to local taste, this church shows traces of the influence of Alberti, Mantegna, Brunelleschi, and the Urbino school. This last influence is particularly evident in its choir, which was painted in perspective to give an illusion of a much larger space. Perhaps from the same period (*c.* 1480–85) is Bramante's decoration of a room in Casa Panigarola in Milan (fragments in the Brera, Milan) that consists of architectural settings and the figures of men at arms rendered by means of illusionistic perspective. Similar experiments, perhaps also in the same years, seem to have been carried out by Bramante on the facades of buildings, such as Casa Fontana, later called Silvestri, in Milan.

In 1488 Bramante, along with a number of other architects, was asked by Cardinal Ascanio Sforza, brother of Ludovico Sforza and bishop of Pavia, to draw up a new plan for the cathedral of Pavia. Bramante went many times to that city during this period, and it was probably under his direction that the crypt and the lower portion of the building were executed.

Bramante appears to have had close relations with Leonardo da Vinci. In 1482 Leonardo had visited Milan from Florence, and in 1490 both Bramante and Leonardo were occupied with stylistic and structural problems of the *tiburio,* or crossing tower, of the cathedral of Milan. From 1487 to 1490 a number of mutual exchanges can be documented. The only written evidence of Bramante's ideas on architecture goes back to this time (1490) and consists of a report on the *tiburio* problem. Bramante examined various solutions (among them one of his own, a square plan), demonstrating a conception of architecture remarkably like that of Alberti.

Bramante by now enjoyed the favour of both Ludovico and Ascanio Sforza, as well as that of influential courtiers. His modest salary and the irregularity of payment, however, did not allow him to live luxuriously. He came in contact not only with artists but also with Humanists and poets of the Sforza court, and he himself wrote verses. Like Leonardo, he was involved in the staging of spectacles at the Sforza court, such as one on the occasion of a baptism in 1492.

Architecture increasingly dominated his interests, but he did not give up painting. Of the many works attributed to him by various 16th-century writers, however, none seems to have been preserved. The only extant easel picture that has ever been attributed to him is the "Christ at the Column" ("Cristo alla colonna") of the Abbey of Chiaravalle (*c.* 1490, now in the Brera, Milan). A fresco in a complex architectural setting (*c.* 1490–92) in the Castello Sforzesco in Milan is probably his, with the collaboration of his pupil Il Bramantino.

Starting in 1492, Bramante was entrusted by Ludovico and Ascanio Sforza with the reconstruction of the *canonica* (rectory) of S. Ambrogio in Milan. The work was interrupted by the fall of Ludovico, and, though it was resumed in the 16th century, only one side of the building was executed. Though Bramante's responsibility cannot be proved, the idea for the new *tribuna* (chancel) for Sta. Maria delle Grazie probably originated with him; destined to be the burial mausoleum of the Sforzas, the *tribuna* was in an overall project of reconstruction, begun in 1492, for the entire church. Bramante also may have planned the painted decoration of the interior, but the execution and the clarification of details, particularly on the exterior, were probably done by Lombard masters.

Bramante's activities in the 1490s, before he left Milan finally for Rome, are sporadically documented. It has been conjectured that in the summer of 1492 he was in Florence studying the work of Brunelleschi, in view of the emphatic Brunelleschian character of the S. Ambrogio *canonica.* In 1493 he made a report on certain fortifications on the Swiss border for Ludovico.

His last few years in Lombardy were marked by the restless activity that characterized the remainder of his career. He was probably responsible for the designs of the piazza of Vigevano (carried out between 1492 and 1494, partly transformed in the late 17th century), of the painted architectural decoration on the arcaded facades that marked its limits, and for the designs of other structures of the Vigevano complex, as well as the painted decoration (which has disappeared) for the interior of the castle of the same city. His covered passageway (*ponticella*) for the Castello Sforzesco in Milan must also be from this period, and the facade of the church of Sta. Maria Nascente ad Abbiategrasso (near Milan) dates from 1497. Between 1497 and 1498, in addition to a chapel (later altered) of S. Ambrogio in Milan, he worked on the Cistercian Monastery being erected in Milan under the auspices of Ascanio Sforza; like his work on the *canonica,* it was suspended in 1499 and is unfinished.

Endowed with an extremely receptive character, Bramante was by no means immune to the influence of other artists active in Milan. He was also influenced by his study of Lombard monuments dating from the late ancient and Carolingian periods, the memory of which was to be useful to him in Rome. Conversely,

Bramante's presence (together with Leonardo's) in Milan was of fundamental importance for the later artistic developments in that city.

Roman period. Bramante probably remained in Milan until Ludovico was forced to flee before the city was occupied by the French in September 1499. Bramante appears to have been active from the first in Rome on a variety of projects, such as a painting (now lost) at S. Giovanni in Laterano celebrating the Holy Year 1500. As under-architect of Pope Alexander VI, he probably executed the fountains in Piazza Sta. Maria in Trastevere and in St. Peter's Square (later altered) and served on several architectural councils. It is probable that in these years he had reduced his activity as a designer and was devoting himself to the study of the ancient monuments in and around Rome, even ranging as far south as Naples. In the meantime, he had come in contact with Oliviero Carafa, the wealthy and politically influential cardinal of Naples, who had a deep interest in letters, the arts, and antiquity. Carafa commissioned the first work in Rome known to be by Bramante: the monastery and cloister of Sta. Maria della Pace (finished 1504). Bramante seems to have been engaged in 1502 to begin the small church known as the Tempietto in S. Pietro in Montorio, on the site where St. Peter was said to have been crucified.

The election of Pope Julius II in October 1503 began a new phase in Bramante's work—the grand, or mature, manner. Almost immediately he entered the service of the new pope, one of the greatest patrons in art history. Bramante became the interpreter, in architecture and city planning, of the pontiff's dream of re-creating the ancient empire of the Caesars (*renovatio imperii*). Bramante planned gigantic building complexes that adhered as never before to the idiom of antiquity. At the same time, the buildings often represented an unbiased, personal, and contemporary interpretation of that idiom.

Perhaps as early as 1505, Bramante designed the immense courtyard of the Belvedere, extending the nucleus of the older Vatican palaces to the north and connecting them with the pre-existing villa of Innocent VIII. Though the work was carried forward with great speed, the scale was so large that on the death of Julius II, in 1513, and of Bramante himself, in 1514, it was still far from completion. The project, which continued throughout the 16th century and later, suffered so many changes that today Bramante's concept is almost unrecognizable.

Beginning in 1505, at first in competition with two other architects, Giuliano da Sangallo and Fra Giocondo, Bramante planned the new Basilica of St. Peter in Rome—his greatest work and one of the most ambitious building projects up to that date in the history of mankind. The first stone was placed on April 18, 1506 (after Bramante's first plan had been rejected by the Pope, according to a contemporary). The project's site had to be cleared first of the old, crumbling Basilica of Constantine. Bramante's part in its demolition earned him the nicknames of "Maestro Ruinante" or "Maestro Guastante"—"Master Wrecker" or "Master Breaker." At the time of his death the new construction had scarcely begun to take shape.

Named general superintendent of all papal construction, a well-paid office, Bramante was not only the Pope's principal architect and the engineer at the service of his military entprises but also his personal friend. Concurrent with his work on the Belvedere and St. Peter's, Bramante presented Julius with a highly ambitious plan for the complete remodelling of the Vatican palaces, which was, however, set aside.

Despite the grandiose scale of the St. Peter's undertaking, Bramante continued to work on lesser projects. Between 1505 and 1509 he carried out an enlargement of the choir of the church of Sta. Maria del Popolo, some construction work in Castel Sant'Angelo, and a remodelling of the Rocca di Viterbo. In addition, in 1506, as a military engineer, he accompanied the Pope to Bologna (where the grand staircase of the Palazzo degli Anziani has been attributed to him).

About 1508, when Julius II's new city plan for Rome began to be put into effect, Bramante played an important role as architect and town planner. Within the framework of an organic plan, the Via Giulia (from the Ponte Sisto to the Vatican) was laid out with a large piazza that was to constitute a centre of activity for the city government; the Via della Lungara (from the Vatican across Trastevere to the river port installations of Ripa Grande) was begun; the Via dei Banchi, on which were erected the offices of the most important banks of the time, was widened at the entrance of the Ponte Sant'Angelo; and several streets in the old structure of the medieval city were modified. On the Via Giulia, Bramante designed a huge new Palazzo dei Tribunali (1508), incorporating the church of S. Biagio (1509, also by Bramante). The structure is notable as a model for 16th-century architecture.

Within the framework of Bramante's overall plan, the basin of the port was dug out, and a marine fortress was built at Civitavecchia. The west facade of the Vatican Palace (now the side of the S. Damaso courtyard) was also constructed according to his design, though it was later taken up and completed by Raphael. Around the year 1509, Bramante probably furnished a plan for the church of Roccaverano, whose facade anticipates certain solutions of the late 16th-century architect Andrea Palladio.

Another noteworthy design was that of the Palazzo Caprini (House of Raphael; later destroyed) in the Borgo, which became the model for many 16th-century palaces. This palazzo was later acquired by Raphael. According to Vasari, Bramante, around 1509, had designed the architectural background for the "School of Athens" by Raphael (1508–11; Vatican, Rome), and in return, Raphael represented Bramante in the fresco in the guise of Euclid.

After the death of Julius II, Bramante, though elderly and perhaps in declining health, remained in favour under Pope Leo X. According to a late and uncertain source, in 1513 he presented to Leo X an audacious water-control plan for the city, designed to avoid the periodic floodings of the Tiber. At the end of 1513, however, when consulted about the cathedral of Foligno (S. Feliciano), he was too ill to accept the commission and died the following year. He was buried in St. Peter's, carried there, according to Vasari, "by the papal court and by all the sculptors, architects, and painters."

Personality and interests. Even though he was called unlettered (as were Leonardo, Julius II, and others), probably because he was ignorant of Latin and Greek, Bramante must have acquired considerable learning, however fragmentary. His contemporaries esteemed him not only as an architect and painter and for his knowledge of perspective but also as a poet and an amateur musician. He had an almost fanatical interest in Dante. He also wrote some 20 sonnets on amorous, humorous, and religious themes, and, though somewhat crude in style, they are full of spirit.

His theoretical writings, apart from his report on the *tiburio* of the Milan cathedral, have all been lost, but their subjects are indicative of his interests; *e.g.,* works on perspective, on the "German manner" (*i.e.,* on Gothic architecture), on fortification methods, and others.

Bramante seems to have been an extrovert. He was said to be very friendly to persons with talent, and he did much to help them. Humour, irony, a taste for intelligent jokes, and mockery of himself as well as others often appear in his sonnets. Full of faith in himself, he was an irreverent person who took pleasure in proposing paradoxical ideas. He was critical of priests and courtiers but also capable of deep religious feeling. In the treacherous atmosphere of courts, he was able to manoeuvre skillfully. He must have been highly ambitious and not overscrupulous when it came to securing an important commission. His biographers emphasize his impatience and speed in the conception and conduct of his work (Vasari calls him a "resolute, rapid, and excellent inventor"). This quality was combined with imaginative genius and an artful and lively curiosity. His insatiable thirst for experiment and for new knowledge forced him, as Bramante himself remarks in one of his sonnets, to "change himself" continually ("as time changes in a moment / my thought, its follower, changes too"). This trait of instability and inconstancy seems to have led him away from convention in his works to a multiplicity of attitudes and expressions. Perhaps these characteristics indicate a certain dissatisfaction, an inner melancholy, or a deep sense of solitude. He apparently never married or had children. In unceasing experiments in his work, he may have been seeking a remedy for his incurable restlessness. (Ar.B.)

MAJOR WORKS. Frescoes on the facade of the Palazzo del Podestà, Bergamo (1477); Sta. Maria presso S. Satiro, Milan (*c.* 1480); cathedral at Pavia (plan, crypt, etc., 1488); *tribuna* of the Sta. Maria delle Grazie, Milan (1492); *canonica* and cloisters at S. Ambrogio, Milan (1492–99); cloister, Sta. Maria della Pace, Rome (1500–04); Tempietto, S. Pietro in Montorio, Rome (1502); Belvedere courtyard, Vatican, Rome (begun *c.* 1505); plans for rebuilding St. Peter's, Rome (1505–06); Sta. Maria del Popolo, Rome (new choir, 1505–09); Palazzo dei Tribunali, Rome (never completed, 1508); House of Raphael (formerly Palazzo Caprini), Rome (*c.* 1510? destroyed).

BIBLIOGRAPHY. The most important general biographical and critical publications with extensive bibliographies on the life and work of Bramante are Costantino Baroni, *Bramante* (1944), in Italian; Otto Forster, *Bramante* (1956), in German; F.G. Wolff Metternich, "Der Kupferstich . . . ," in *Römisches Jahrbuch für Kunstgeschichte,* 11:9–108 (1967–68), for the Urbino and Milanese periods; Arnaldo Bruschi, *Bramante architetto* (1969) and *Bramante* (1973); "Bramante" in the *Dizionario biografico degli Italiani,* vol. 13 (1971); F. Sangiorgi, *Bramante "hastrubaldino," documenti per una biografia bramantesca* (1970), for the problem of his birthplace and biographical dates for the Urbino period; and *Bramante tra Umanesimo e Manierismo* (1970), the catalog of the historical and critical exhibition commemorating Bramante, held in Rome, September 1970.

Bramantino, byname of BARTOLOMMEO SUARDI, (b. *c.* 1455, Milan—d. 1536, Milan), Italian painter and architect of the Milanese school and a disciple of Donato Bramante. An independent master, his expressive style was marked by an element of the bizarre.

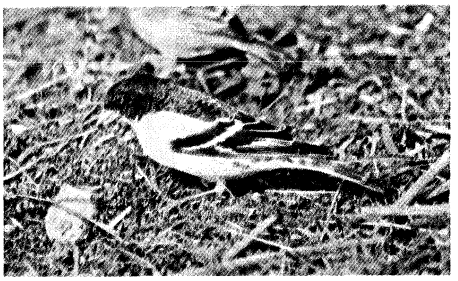
Bramantino's early work dates from about 1490. Representative of this period is the strange but interesting "Adoration of the Shepherds" (Biblioteca Ambrosiana, Milan). After the turn of the century he designed 12 tapestries representing the months of the year (Castello Sforzesco, Milan) and two frescoes—a "Madonna" and "St. Martin" (both in the Pinacoteca di Brera, Milan).

Bramantino left Milan in 1508, probably at the invitation of Bramante, and went to Rome. Bramantino's "Madonna and Two Saints" (Ambrosiana) belongs to this period. Upon returning to Milan, after 1520, he completed the "Madonna with Saints" and "Flight into Egypt" (Church of Madonna del Sasso, Locarno) and designed the Trivulzio burial

chapel in the church of S. Navaro Maggiore. He was appointed court painter and architect in 1525 by Francesco Maria Sforza, in part for his loyalty to the Sforza party during the siege of Milan.

Bramantino's work is noted for its schematic quality, an effect achieved by painting figures stiff in perspective space before diagrammed walls. His abrupt perspective and detailed landscapes are portrayed in a luminous light, and the effect gives a poetic quality to his work.

brambling (*Fringilla montifringilla*), songbird belonging to the family Fringillidae (order Passeriformes) that breeds in coniferous and birch woods from Scandinavia to Japan and winters southward, millions sometimes appearing in Europe. The brambling is a 15-centimetre (6-inch) finch. The male is mostly



Brambling (*Fringilla montifringilla*)
L.R. Dawson—Bruce Coleman Ltd.

black, with white rump and a light red-brown breast and shoulders; the female is brown, with streaked back.

Brampton, city, Regional Municipality of Peel, southeastern Ontario, Canada, on Etobicoke Creek, just west of Toronto. Brampton, originating in about 1830, was named after the English birthplace of John Elliott, one of its founders. Industries include flower growing, tanning, lumbering, and the manufacture of automobiles, shoes, stationery, furniture, and optical goods. Inc. village, 1852; town, 1873; city, 1976. Pop. (1981) 149,030.

Brampton Island, one of the Cumberland Islands off the northeastern coast of Queensland, Australia, 20 mi (32 km) northeast across the Whitsunday Passage (Coral Sea) from Mackay, to which it is connected by launch and air service. An inshore coral-fringed continental island, it has an area of 3 sq mi (8 sq km) and rises to 710 ft (215 m) in forested hills. It is a national park and wildlife sanctuary and a well-developed holiday resort of the Great Barrier Reef.

Brân (Celtic: Raven), gigantic Celtic deity who figured in *The Mabinogion* (a collection of medieval Welsh tales) as "crowned king over this Island" (*i.e.,* Britain). Because of his stature, he and his court had to live in a tent, as no house had ever been built large enough to contain him. The most important aspect of Brân's myth concerned his wondrous severed head. The ancient Celts worshipped the human head and believed it to be the seat of the soul, capable of independent life after the death of the body. They thought that it possessed powers of prophecy and was symbolic of fertility. They also believed that one of its functions was to provide entertainment in the otherworld.

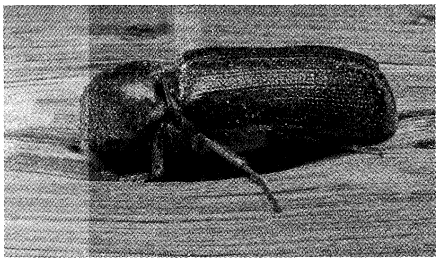
According to the myth, Brân had been mortally wounded and requested his companions to cut off his head. He instructed them to take the head with them on their wanderings, telling them that it would not only provide them with marvellous entertainment and companionship but would also remain uncorrupted as long as they refrained from opening a certain forbidden door. If that door were opened, they would find themselves back in the real world and would remember all their sorrows. Eventually, they were to take the head and bury it on the White Mount in London. All happened as Brân had prophesied, and his companions passed 80 joyous and delightful years. The head was buried in London, where it kept away all invaders from Britain until it was finally unearthed. Brân is also the hero of *The Voyage of Brân.* (*see* imram).

bran, the edible broken seed coat, or protective outer layer, of wheat, rye, or other cereal grain, separated from the kernel. In flour processing, the coarse chaff, or bran, is removed from the ground kernels by sifting or bolting in a rotating, meshed, cylindrical frame.

Wheat bran, the most widely processed, contains 16 percent protein, 11 percent natural fibre, and 50 percent carbohydrate. Most bran is coarsely ground for stock feed. In a more refined form, it is used in breakfast cereal, breads, and muffins for its value to the digestive system as roughage.

The term bran is sometimes used for by-products from the processing (*e.g.*, pineapple bran).

branch and twig borer, any member of two beetle families Bostrichidae and Psoidae (insect order Coleoptera). The approximately 550 species of the family Bostrichidae are also known as false powder post-borers. They live in dry wood or under tree bark and range in size from 3 to 20 millimetres (0.1 to 0.8 inch); the palm borer (*Dinapate wrighti*) of western North America, however, is about 50 mm long. The apple twig, or grape cane, borer (*Amphicerus bicaudatus*) bores into living fruit-tree branches and grape vines but breeds in dead wood. The lead-cable borer or short-circuit beetle (*Scobicia declivis*) bores into the lead covering of telephone cables.



Branch and twig borer (*Apathe*)
E.S. Ross

Moisture entering through the hole can cause short circuits. This beetle lives in oak, maple, or other trees and probably does not feed on the cable sheathing.

The psoid branch and twig beetles (family Psoidae) differ from the bostrichids in having a large head visible from above. The adults are black or brown and range from 14 to 28 mm; the larvae bore through the heartwood. The spotted-limb borer (*Psoa maculata*) breeds only in dead wood, and the genus *Polycaon* is often destructive in orchards.

branchial arch, also called VISCERAL ARCH, or GILL ARCH, one of the bony or cartilaginous curved bars on either side of the pharynx (throat) that support the gills of fishes and amphibians; also a corresponding rudimentary ridge in the embryo of higher vertebrates, which in some species may form real but transitory gill slits. In the human embryo, the branchial arches give rise to such structures as the mandible, hyoid bone, and larynx.

Branchidae (Greek religion): *see* Didyma.

branching, radioactive disintegration of a particular species of unstable atomic nucleus that occurs by two or more different decay processes. Some nuclei of a given radioactive species may, for example, decay by ejecting an electron (negative beta decay) and the rest by ejecting an alpha particle (alpha decay). Thus 99+ percent of any collection of atoms of bismuth-214 decay to polonium-214 by ejecting electrons, while the rest (0.021 percent) decay to thallium-210 by ejecting alpha particles.

branchiopod, any of more than 800 species of aquatic crustaceans of the subclass Branchiopoda that includes water fleas, tadpole shrimp, fairy shrimp, and other small, chiefly freshwater forms.

A brief treatment of branchiopods follows. For full treatment, *see* MACROPAEDIA: Crustaceans.

Branchiopods range in size from 0.25 millimetre (0.01 inch) for *Alonella* to 10 centimetres (4 inches) for *Branchinecta gigas.* They have few common features, although all forms have compound eyes, paddlelike limbs, simple mouthparts, and primitive nervous systems. Members of the order Anostraca, for example, have no carapace (a hard, horny shield covering the head and thoracic region), while those of the order Notostraca have only reduced antennae, if the antennae exist at all. Members of the order Conchostraca have a carapace, which has two valves that enclose the head and the trunk, and as many as 32 pairs of trunk limbs. The Cladocera also has a carapace with two valves, but its head is not enclosed, and it only has up to six pairs of trunk limbs.

The life cycle of a typical branchiopod begins in the form of a nauplius (free-swimming larva) with a simple undivided body and three pairs of appendages: antennae, antennules (smaller antennae), and mandibles. As the nauplius changes into adult form, the body becomes segmented and additional limbs appear. One conchostracan and some cladocerans develop in the egg and hatch as miniature adults.

The reproductive process varies from order to order, but all branchiopods mature rapidly, some being able to reproduce when only two days old. Under favourable conditions the Cladocera are parthenogenetic; females produce only female unfertilized eggs in a brood pouch under the carapace. No males are needed for this process unless food is scarce or there is a sudden temperature change, at which point some of the eggs develop as males. The females then begin producing some eggs that are able to withstand being frozen or dried if they have been fertilized by a sperm from a male.

Many branchiopods can alter their life cycles to coincide with favourable conditions and produce resting eggs that can remain dry for periods of up to several years. Environmental conditions can also affect the shape of some branchiopods. Some species of *Daphnia,* for example, escape being devoured by fish during the spring and summer by developing pointed heads that reduce the size of the carapace and allow them to be less conspicuous.

Branchiopods have anywhere from 4 pairs of trunk limbs to more than 70 pairs, depending on the order, but all use the trunk limbs to gather food. Fine hairs, or setae, serve as a filter to separate food particles, which can be as small as bacteria, from the water. Trunk limbs are used to propel notostracans and anostracans by beating in regular rhythms; the antennae, on the other hand, are used for locomotion by conchostracans and cladocerans.

The eyes of the four orders differ drastically, though all are able to perform rapid trembling motions, a process that seems to enable them to gain more information about their surroundings. Anostracans have eyes on movable stalks and turn their ventral surface to any light source. Cladocerans, which have two eyes joined together, respond to the colour of light. The *Daphnia,* for example, alters its swimming pattern to search wider areas when

the absence of such food as green algae results in less absorption of blue light in the water.

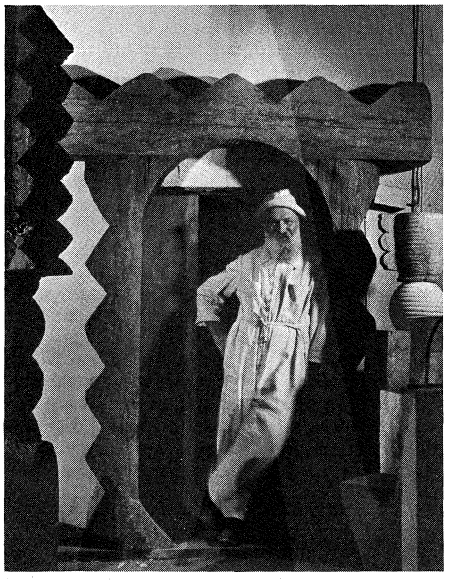
The blood of branchiopods contains the pigment hemoglobin dissolved in plasma, in contrast to the blood of other crustaceans (which lacks hemoglobin) and to that of other animals whose hemoglobin is contained in blood cells. When branchiopods are in water that has little oxygen their blood is rich in hemoglobin, but when they are transferred to water that is well aerated their colour becomes pale in about 10 days.

Branco, Cape, Portuguese CABO BRANCO, cape on the Atlantic coast of Paraíba state, eastern Brazil, that forms the easternmost point of the South American continent. Located 5 mi (8 km) southeast of João Pessoa, the state capital, in a zone of abundant rainfall, Cape Branco has beautiful white sand beaches bordered by flat-topped, mesa-like forms of sedimentary strata called *taboleiros*, which rise sharply above the beaches to heights between 150 and 500 ft (45 m and 150 m). Cape Branco is on the coastal highway connecting João Pessoa and the port of Cabedelo farther north.

Branco River, Portuguese RIO BRANCO, river, Roraima territory, northern Brazil, formed by the junction of the Rio Uraricoera, which rises in the Serra Parima on the Venezuela border, and the Rio Takutu, which descends from the Serra Pakaraimã on the Guyana border. The Branco follows a south-southwesterly course for 482 mi (775 km) before it joins the Negro River, a major tributary of the Amazon, via numerous channels. The lower course of the Branco is easily navigable, but the upper course contains numerous rapids. In dry periods the water level falls markedly, making travel between Boa Vista, the territorial capital, and the Negro River difficult.

Brancovan, Anna de Noailles, princess: *see* Noailles, Anna de.

Brancusi, Constantin, Romanian CONSTANTIN BRÎNCUŞI (b. Feb. 21, 1876, Hobiţa, Rom.—d. March 16, 1957, Paris), pioneer of modern abstract sculpture whose works



Brancusi, 1955
Wayne Miller—Magnum

in bronze and marble are characterized by a restrained, elegant geometry of form and exquisite finishing. A passionate wood-carver, he frequently carved prototypes for works later executed in other materials and produced numerous wood sculptures, often with a folk flavour. "The Kiss" (1908) was his first major work. From 1912 he produced numerous increasingly abstract sculptures of birds in flight.

Early life and works. Brancusi's parents, Nicolas and Maria Brancusi, were poor countryfolk, and, like other village children of that time, Constantin did not go to school. From the age of seven he worked as a herdsman, first watching the family flock, then working for other countrypeople in the Carpathian Mountains. It was then that the young shepherd learned to carve wood by fashioning tools and implements. This popular art had always been very widespread in the Romanian countryside, not only for making spoons, bedposts, or cheese presses, all of which were ornamented with carvings, but also for making the facades of homes. The style of these ornaments would influence several of Brancusi's works. And he himself maintained in his tastes, his carriage, and his way of life the mark of his country origins: simplicity, good sense, love of nature, and a side to his character that was at once both childlike and crafty.

He was no older than nine when he went to Tîrgu Jiu, a town near Pestisani, in the Oltenia region, to look for work. First he worked for a dyer; two years later he went into the service of a grocer in Slatina; and then he became a domestic in a public house in Craiova, Oltenia's chief town, where he remained for several years. His taste for working in wood, however, did not abandon him. On one occasion he even undertook the construction of a violin from an orange crate. Later he would become a violinist, and he would always remember his country's popular melodies. On another occasion he carved a lily. Such apparently small feats attracted the attention of an industrialist, who, in 1894, entered him in the Craiova School of Arts and Crafts, where Brancusi was particularly interested in woodwork. He had to learn how to read and write on his own.

In 1896, at the age of 20, he began to travel for the first time: he went to Vienna on the Danube and hired himself out as a woodworker to earn money for his stay. Nevertheless, since his ambition was to be a sculptor, in 1898 he entered the contest for admission to the Bucharest School of Fine Arts and was admitted. Although he was far more attracted to the work of the "independents" than to that of the academicians at his school, he nevertheless studied modelling and anatomy seriously. Among the sculptures of his school period, an "Anatomical Model" ("Ecorché," 1902) was bought by the school and served it a long time for the teaching of anatomy. In 1903 he received his first commission, a bust of Gen. Carol Davila, a founder of medical pedagogy in Romania.

In that same year, on return from his military service, Brancusi's interest was aroused by the fame of Auguste Rodin, which reached from Paris even to Bucharest. Rodin's audacious conceptions inspired the enthusiasm of the avant-garde and the indignation of the academicians. Brancusi became curious about what was going on beyond the boundaries of his country. First he went to Munich, where he stayed until the spring of 1904, and then he decided to go to Paris, a costly trip for one of modest means. He made the greater part of the trip on foot, with his pack on his back, and still had to sell his watch to pay for a boat crossing on Lake Constance. He arrived in Paris in July.

Brancusi entered the École des Beaux-Arts, and there he again entered an academician's workshop, that of Antonin Mercié (died 1916), who derived his work from Florentine Renaissance statuary. Brancusi worked with him for two years, but in order to earn a living he was, in succession, a dishwasher in a restaurant at night and the cantor of the Romanian Orthodox chapel. Orders for portraits from a few compatriots also helped him through those difficult times.

In 1906 he exhibited for the first time in Paris, in the Salon (Salon de la Société Nationale des Beaux-Arts) and then at the Salon d'Automne. With a spirit that was still quite classical but showing great energy, his first works were influenced by the sinewy work of Rodin. In order to get away from that influence, Brancusi refused to enter Rodin's workshop, for, he said, "one can do nothing beneath great trees."

In 1907, charged with executing a rich landowner's funeral monument in the Buzau Cemetery in Romania, he sculptured a statue of a young girl kneeling, "The Prayer," which represented the first stage of his evolution toward simplified forms. He participated for the first time in the Tinerimea Artistica exposition, an annual exhibition of new talent, in Bucharest, and he rented a workshop in Montparnasse, in Paris. Rodin's influence appeared for one last time in 1908 in the first version of the "Sleeping Muse," a woman's face in which the features suggest an unformed block of marble. In that same year, Brancusi executed his first truly original work, "The Kiss," in which the vertical figures of two entwined adolescents form a closed volume with symmetrical lines. Here he affirmed the geometrization that was to become his trademark and that would influence the work of numerous artists, most immediately a series of sculptures executed, following his advice, by his friend Amedeo Modigliani starting in 1910.

Mature life and works. An important work executed by Brancusi in 1910 was a new version of the "Sleeping Muse," a bronze in which the head is isolated, with all relief reduced so as to make it egg shaped. The "Sleeping Muse" was treated in this form by the artist in a dozen ways up to 1912, with variations in both plaster and bronze. The egg theme reappeared frequently in his sculpture, sometimes with a very light relief: to suggest the features of "Prometheus" in 1911; to break the curves of "The New-Born" in 1915. These tendencies finally led to the creation in 1924 of a pure marble egg shape, "The Beginning of the World," which the sculptor called "sculpture for a blind man." It may be Brancusi's most representative and most accomplished work.

Another theme occupying a privileged place in his work was that of the bird. It appears in 1912 with "Maiastra," the name of a miraculous bird in Romanian popular legends. This first version in marble, in which the bird, purified in form, is represented with its head raised in flight, was followed by 28 other versions until 1940; after 1919 "Maiastra" became the "Bird in Space"—a polished bronze, the elliptical, slender lines of which put into concrete form the very essence of rapid flight.

In 1912 Brancusi received the first prize for sculpture of the official Bucharest Salon. In 1913, while continuing to exhibit in the Paris Salon des Indépendants, he participated in the Armory Show in New York, Chicago, and Boston with five works including "Mademoiselle Pogany," a schematized bust that would have numerous variations until 1933. Already known in the United States, Brancusi found faithful collectors there. Meanwhile, the critics maintained their attacks.

Above all, Brancusi loved carving itself, which required, he said, "a confrontation without mercy between the artist and his materials." He often created in oak or in chestnut objects that he would later treat in bronze or marble. His first sculpture in wood, "The Prodigal Son," in 1914, was very close to abstraction: a piece of rudely carved oak with the scarcely perceptible features of a person. This would be the way with a whole series of wood sculptures that are among his strangest works. He attached great importance to the base of a work and always constructed it himself, sometimes of five or six superimposed pieces, making

frequent changes. He constructed his furniture with his own hands, even his bed, and most of his utensils, including his pipe.

In 1918 he sculptured in wood the first version of the "Endless Column." Created through the repetition of superimposed symmetrical elements, this column, inspired by the pillars of Romanian peasant houses, could, in fact, have been extended into the sky to infinity. It answered a need for spiritual elevation that Brancusi often expressed in his works. For, with the simple means that suited his attachment to the rustic life, he was always preoccupied with expressing a certain metaphysical relationship between man and the universe.

His contribution to the Salon of 1920, "Princess X," a portrait of an imaginary person in a curiously phallic form, created a scandal. The police intervened and forced him to retire a work that allowed for improper interpretation. In Bucharest he exhibited with the Arta Romana group. In 1922 he sculptured the first versions of "The Fish" in marble and the "Torso of a Young Man" in wood. In 1924 he returned to Romania for the first time, and in 1926 he visited the United States for an important exhibition of his works at the Brummer Gallery in New York. His shipments from France involved him in a two-year court case with U.S. customs officials, because a work in copper, "Bird in Space," was so abstract that officials refused to believe it was sculpture: Brancusi was accused of clandestinely introducing an industrial part into the United States. In 1928 he again travelled to the United States, where he had numerous buyers, and won his court case.

Late life and works. The Maharajah of Indore went to see him in Paris in 1933 and commissioned him to create a temple that would house his sculptures. Brancusi worked several years to create this Temple of Contemplation and Deliverance, and in 1937 he went to India on the Maharajah's invitation. The latter's death, however, prevented Brancusi from realizing the project. In the meantime he had returned to New York for a new exhibit at the Brummer Gallery in 1933, and in 1934 he participated in the exhibition "20th Century Painting and Sculpture" at the Chicago Renaissance Society. He returned to Romania again in 1937 and in 1938 for the inauguration of three monumental works in a public garden in Tîrgu Jiu: a new version, 30 metres (100 feet) high and in steel, of the "Endless Column"; "Gate of the Kiss"; and "Table of Silence."

In 1939 he made his last trip to the United States to participate in the "Art in Our Time" exhibition at the Museum of Modern Art in New York City. His last important work was the "Flying Turtle" in 1943. Henceforth, numerous expositions in the United States and in Europe would secure his fame. The largest was an exhibit of all of his work at the Solomon R. Guggenheim Museum in New York City in 1955. By a naturalization decree dated June 13, 1952, he acquired French nationality.

He willed to the Musée d'Art Moderne de la Ville de Paris everything his workshop contained (more than 80 sculptures) on the condition that the workshop itself be removed to the museum and restored to its original condition. His rustic furniture and his tools can be seen there, as well as his golf clubs, even though he never played golf once in his life.

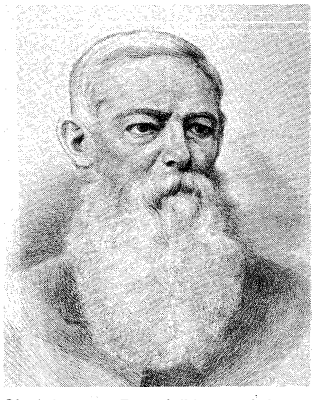
(Je.S.)

MAJOR WORKS. "General Dr. Carol Davila" (1903; bronze, Military Hospital of Bucharest); "The Prayer" ("La Prière"; 1907; bronze, Muzeul de Artă R.S.R., Bucharest); "Portrait of Nicolae Darascu" (1908; bronze, Muzeul de Artă, Bucharest); "Sleeping Muse" ("La Muse endormie"; 1908; marble, Muzeul de Artă, Bucharest; other versions in bronze—1910, 1911, 1912); "The Kiss" ("Le Baiser"; 1908; plaster, Muzeul de Artă, Craiova, Rom.; another version in stone, 1910, funeral monument, Montparnasse Cemetery, Paris); "The Wisdom of the Earth" (1909; stone, Muzeul de Artă, Bucharest); "Prometheus" (1911; marble, Philadelphia Museum of Art); "Muse" (1912; marble, Solomon R. Guggenheim Museum, New York City); "Maiastra" (1912; marble, Museum Modern Art, New York City); "Mlle Pogany" (1913; marble, Philadelphia Museum of Art); "The Prodigal Son" ("Le Fils prodigue"; 1914; oak, Philadelphia Museum of Art); "The New-Born" ("Le Nouveauné"; 1915; marble, Philadelphia Museum of Art); "Princess X" (1916; polished bronze, Philadelphia Museum of Art); "The Sorceress" (1916; wood, Solomon R. Guggenheim Museum); "Golden Bird" (1919; polished bronze, Arts Club of Chicago); "Adam and Eve" (1921; wood, Solomon R. Guggenheim Museum); "The Fish" ("Poisson"; 1922; marble, Philadelphia Museum of Art); "The Cock" (1924; wood, Museum of Modern Art, New York City); "The Beginning of the World" ("Le Commencement du monde"; 1924; marble, Philadelphia Museum of Art); "Miracle" ("The White Seal"; 1936; marble, Solomon R. Guggenheim Museum); "Endless Column" ("La Colonne sans fin"; 1937; steel, Tîrgu Jiu, Rom.); "Flying Turtle" ("La Tortue volante"; 1943; marble, Solomon R. Guggenheim Museum).

BIBLIOGRAPHY. Carola Giedion-Welcker (ed.), *Constantin Brancusi* (1958; Eng. trans. 1959), is the most important work on the sculptor, comprising a serious analysis of his work and numerous photographic documents. Sidney Geist, *Brancusi* (1968), is also an excellent monograph. The first study to reveal the sculptor to the United States was "Brancusi," by Ezra Pound, in *The Little Review* (Autumn 1921). Jean Selz, *Modern Sculpture: Origins and Evolution* (1963), contains an analysis of Brancusi's work and a biography.

Brand, Hennig (fl. 1670, Hamburg), German chemist who, through his discovery of phosphorus, became the first known discoverer of an element. A military officer and self-styled physician, Brand has often received the undeserved title "last of the alchemists" because of his continual search for the philosopher's stone, which reputedly could change base metals into gold. About 1669 he isolated from urine a white, waxy material and named it phosphorus ("light bearer"), because it glowed in the dark. Although Brand kept his process a secret, phosphorus was discovered independently in 1680 by an English chemist, Robert Boyle.

Brand, Sir Johannes Henricus (b. Dec. 6, 1823, Cape Town—d. July 14, 1888, Bloemfontein, Orange Free State), statesman and longtime president of the Orange Free State who sought harmony between the Boer republics and the British colonies in South Africa.



Sir Johannes Brand, lithograph by W.H. Schröder

By courtesy of the Africana Museum, Johannesburg

The son of Sir Christoffel Brand, speaker of the House of Assembly of Cape Colony, he was educated at South African College, Cape Town, and Leiden University, The Netherlands. He returned to Cape Town in 1849 to begin a successful law practice.

While serving as a member of the Cape Parliament, Brand was called to serve as president of the Orange Free State in 1864. He was to be reelected four times, and he occupied the office until his death. Firmly but tactfully he dealt with the almost insurmountable difficulties of the unstable republic. After a long and costly war with the Basuto (now called Sotho), he demanded such severe terms that their chief, Mshweshwe, persuaded the British to annex Basutoland, now Lesotho (1868). As a diplomat, Brand succeeded in gaining £90,000 in compensation from the British, who had annexed the diamond fields of Griqualand West in 1871. Throughout the war between Great Britain and the Transvaal in 1880–81, he worked tirelessly for peace and acted as mediator during the negotiations. He was knighted by Queen Victoria for his services in 1882. At home, Brand's prudent administration resulted in prosperity, despite limited resources, and gained for his country the sobriquet "the Model Republic."

Brand, Sir (Christopher Joseph) Quintin (b. May 25, 1893, near Kimberley, S. Af.—d. March 7, 1968, Umtali, Southern Rhodesia), pioneer aviator and an air marshal in the Royal Air Force who in 1920, with Pierre van Ryneveld, in a Vickers Vimy aircraft, made the first flight from London to Cape Town, via Cairo. Both Brand and Ryneveld were knighted for their feat.

Brand served with distinction in World War I and destroyed a German Gotha bomber in the last air raid carried out on the United Kingdom in that war.

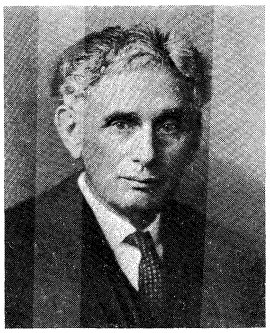
After the war he qualified in engineering at Cambridge University (1922) and later (1932–36) became director general of civil aviation in Egypt. During World War II, he commanded the No. 10 fighter group in the Battle of Britain. Brand retired from the RAF in 1943 and returned to Africa.

Brandan, SAINT: *see* Brendan, Saint.

Brandeis, Louis (Dembitz) (b. Nov. 13, 1856, Louisville, Ky., U.S.—d. Oct. 5, 1941, Washington, D.C.), lawyer, associate justice of the U.S. Supreme Court (1916–39), the first Jew to sit on the high court.

His parents, members of cultivated Bohemian Jewish families, had emigrated from Prague to the United States in 1849. Brandeis attended the public schools of Louisville and the Annen Realschule in Dresden, Ger., before entering the Harvard Law School, from which he was graduated at the head of his class in 1877. After less than a year of practice in St. Louis, Mo., he returned to Boston, where he maintained an active and prosperous practice until his appointment to the Supreme Court of the United States in 1916.

At the bar Brandeis came to be known as the people's attorney, by virtue of his representation of interests that had not commonly enjoyed such formidable advocacy. For the most part he took these responsibilities on condition that he receive no compensation; in this way he was able as a private citizen to indulge his passion for public service and, more important, to devise constructive solutions that would transcend the narrow concerns of client and class. When the affairs of the Equitable Life Assurance Society of New York precipitated widespread alarm in 1905, Brandeis became unpaid counsel for the New England Policy-Holders' Protective Committee. Eventually, to remedy abuses by life insurance firms, Brandeis devised a system, used in Massachusetts (from 1907), New York, and Connecticut, whereby life insurance was offered over the counter by savings banks at rates within the means of workingmen. From 1907 to 1914 he defended, against charges of



Brandeis

By courtesy of the Library of Congress, Washington, D.C.

unconstitutionality, statutes of various states prescribing maximum hours of labour and minimum wages. At that time he devised what is still known to lawyers as the Brandeis brief, in which economic and sociological data, historical experience, and expert opinions are marshalled to support the legal propositions. His most notable book, a volume of essays, *Other People's Money, and How the Bankers Use It* (1914), dealt with the control exercised by investment bankers over U.S. industry. His work attacking monopolies and interlocking directorates influenced the passage in 1914 of the Clayton Anti-Trust Act and the Federal Trade Commission Act, which strengthened the government's antitrust power. Brandeis' support of Pres. Woodrow Wilson's theory of enforced competition among businesses was repaid on Jan. 28, 1916, when the President appointed him to the Supreme Court. Over bitter opposition by numerous business interests and anti-Semites, the nomination was confirmed by the U.S. Senate, and Brandeis took office on June 5.

Although based on a thorough knowledge of the facts, Brandeis' major opinions were often considered didactic and frequently prophetic in tone. He mistrusted both the kind of democracy manifested in the unlimited exercise of governmental power in the name of the whole people and the conception of individual liberty resulting in the agreement of a few persons to monopolize an activity affecting everyone. He believed that, to preserve federalism, state legislatures must be able to make laws suited to varied and changing needs, but he wished to restrict them when they interfered with the freedom to express ideas. In the case of (Charlotte) Anita Whitney (*Whitney* v. *California,* 274 U.S. 357, 372 [1927]), a Communist who had been convicted under a state criminal syndicalism statute, he delivered a concurring opinion urging that penalties on speech be applied only if they met the "clear and present danger" (of inciting to admittedly illegal acts) test formulated earlier by Justice Oliver Wendell Holmes. Observing the procedural limits on the court, however, he voted to affirm the conviction because Whitney's lawyer had not properly raised the constitutional free-speech issue in the trial court. Previously he had dissented when the Supreme Court upheld convictions under the Espionage Act of 1917 for publishing criticisms of U.S. entry into World War I. In one of his most important majority opinions, *Erie Railroad Company* v. *Tompkins,* 304 U.S. 64 (1938), he held that, in diversity of citizenship cases (involving citizens of two or more states), federal courts must enforce the appropriate state law, whether made by judges or legislatures, rather than invoke a "federal common law," as had been done for almost 100 years. He retired on Feb. 13, 1939.

From 1912 Brandeis was an enthusiastic supporter of Zionism, the only cause with which he was publicly identified. Diaries and letters that did not come to light until 1982, however, revealed that he secretly continued his pre-court reform activities through the medium of his younger friend Felix Frankfurter. From 1916 to 1939, Brandeis sent Frankfurter a yearly stipend for legal research and for such social actions as the defense of Sacco and Vanzetti. Brandeis University, Waltham, Mass., opened in 1948, was named for him. His principal biography, *Brandeis: A Free Man's Life* (1946), was written by Alpheus Thomas Mason. Alexander M. Bickel prepared *The Unpublished Opinions of Mr. Justice Brandeis: The Supreme Court at Work* (1957).

Brandeis University, private coeducational institution of higher learning at Waltham, Mass., founded in 1948 as the first Jewish-sponsored nonsectarian university in the United States.

The university's School of Near Eastern and Judaic Studies offers programs and research in ancient and modern Jewish thought, history, and culture; a program for Jewish Communal Services prepares students for professional careers in Jewish communities; the Brandeis-sponsored Hiatt Institute in Israel offers social science and humanities programs. Faculties include African, Mediterranean, Near Eastern, and Judaic studies, biological sciences, computer and information sciences, fine and applied arts, modern languages, literature, mathematics, physical sciences, psychology, and social sciences.

Brandenburg, margraviate or mark, then an electorate of the Holy Roman Empire, in the northeastern lowlands of Germany; it was the nucleus of the dynastic power on which the kingdom of Prussia was founded. After World War I it was a province of the *Land* (state) of Prussia in Germany; after World War II Brandenburg west of the Oder was constituted as a separate *Land* on the dissolution of Prussia, but in 1952 its old administrative identity was lost when the East German *Länder* were dissolved into new *Bezirke* (districts).

For additional treatment of Brandenburg's geography and history, *see* MACROPAEDIA: Germany.

The ancient Semnones who occupied the region were later replaced by Slavs. German conquest began with the capture by the German king Henry I the Fowler (reigned 919–936) of Branibor (Brennabor, or Brennaburg), capital of the Slavic Havelli. Thereafter, the Slavs drove the Germans back, but, from 1106, under Lothair, duke of Saxony (later German emperor), and Albert I the Bear, whom he made margrave of the North March (Nordmark) in 1134, German conquest, colonization, and Christianization of the region began in earnest. The process continued over the next century under Albert's heirs, the Ascanians. The Slavs were gradually assimilated culturally, politically, and economically, and Brandenburg enjoyed prosperity in the 13th century. Berlin was one of the several new towns founded, and Brandenburg was divided into the Old March (Altmark), west of the Elbe River, Middle March (Mittelmark), between the Elbe and the Oder, and New March (Neumark), the additions of territory east of the Oder. Its ruler was recognized as an imperial elector (a prince who participated in electing the Holy Roman emperor) by the mid-12th century, and this right was confirmed by the Golden Bull of the emperor Charles IV (1356). After the Ascanian line became extinct in 1320, the electorate was beset by disunity. The administration of the German king Wenceslas of Luxembourg (1373–78) provided a measure of strong government, but generally in the 14th century the local nobility gained considerable power at the expense of the elector and of the formerly free peasantry.

The revival of stronger central government began with the appointment of Frederick of Hohenzollern as elector by the emperor Sigismund in 1415. Frederick II, Iron Tooth (reigned 1440–70), curbed the rebellious nobles and the towns and was periodically disturbed by wars with the neighbouring Pomeranians, over whom his brother and successor, Albert III Achilles (reigned 1470–86), finally established suzerainty. Joachim I (reigned 1499–1535) introduced the Roman law into Brandenburg; under his sons and heirs, Elector Joachim II and John, Lutheranism was accepted and the lands of secularized bishoprics taken over by the dynasty. John Sigismund (1600–20) acquired Cleves, Mark, Ravensburg, and Minden, the nucleus of Hohenzollern power in western Germany. Earlier the dynasty had achieved a foothold in Silesia (1537) and, most importantly, was recognized by the Polish king as duke of Prussia (1569). Acquisitions later in the 17th century included the secularized bishoprics of Halberstadt and Magdeburg.

During the electorate of George William (1619–40), Brandenburg at first sought neutrality in the Thirty Years' War (1618–48) but, nevertheless, suffered invasions and long occupation by the Swedes. His son Frederick William, the Great Elector (1640–88), freed the electorate from them and reestablished order. He became the leading Protestant prince in Germany and established Brandenburg-Prussia as an important European state with a sound fiscal basis, effective army, and bureaucracy. At his death on May 9, 1688, the state of Brandenburg, with Prussia behind it, was inferior to Austria alone among the principalities of the empire. The elector was regarded as the head of German Protestantism, his lands now covered more than 40,000 square miles, and his revenue had multiplied. His army, still small but unsurpassed for its effective training, gave him the place formerly held by Sweden in the political and military combinations of the period.

The new elector, Frederick III (Frederick I of Prussia), reaped the results of his father's policy under more favourable conditions. He assisted William of Orange to make his descent on England in 1688, allied himself with other German princes against Louis XIV, and afterward fought on the side of the empire against both France and Turkey. Frederick's chief adviser about this time was Eberhard Danckelmann (1643–1722), whose services in continuing the reforming work of the Great Elector were very valuable; but, having made many enemies, he fell from power in 1697 and was imprisoned for several years. The most important work of the Elector was to crown the labours of his father by securing the kingly title for himself and his descendants. Broached in 1692, this matter was brought up again in 1698 when the emperor Leopold I and his ministers, faced with the prospect of a fight over the Spanish succession, were eager to conciliate Brandenburg. It was at length decided that the title should be taken from Prussia rather than from Brandenburg because the former country lay outside the empire, and in return Frederick promised to assist Leopold with 8,000 men. The coronation ceremony when Frederick made himself "king in Prussia" took place at Königsberg on Jan. 18, 1701. In his later years Frederick was largely preoccupied with participation in the War of the Spanish Succession and with watching his country's interests in the vicissitudes of the Great Northern War. The territorial additions to Brandenburg during this reign were few and unimportant, but the state's comparative wealth and prosperity enabled the Elector to do a good deal for education and spend some money on buildings. In 1694 the University of Halle was founded; academies for arts and sciences were established; and Berlin was greatly improved.

Frederick died on Feb. 25, 1713. The sub-

sequent history of Brandenburg is merged in that of Prussia (*q.v.*).

Brandenburg, in full BRANDENBURG AN DER HAVEL, city, Potsdam *Bezirk* (district), central East Germany, on both banks of the Havel River, west of Berlin. It was founded as Branibor (Brennabor, or Brennaburg) by the West Slavic Hevelli tribe and was captured by Henry I the Fowler in 928. The Hevelli remained unsubdued, however, and it was not until 1157 that the city was brought finally into Brandenburg by Margrave Albert I the Bear. A bishopric was first established there in 948; the city was retaken by the Slavs in 983, but it was inherited from the childless Hevellian king Pribislav-Henry in 1134 by the Ascanian Albert I the Bear. He rebuilt the town and gave its name to the margravate (1157).

The bishopric was not reestablished permanently until 1161. In 1356 the margravate became the electorate of Brandenburg. The original Slavic settlement on the south bank became the Altstadt (Old City); the German settlement on the north bank the Neustadt (New City) and the seat of the margraves of Brandenburg. The two parts were not united under a single municipality until 1715. In 1539 the bishopric became Lutheran and in 1598 the see was incorporated into electoral Brandenburg.

Architectural monuments include a Romanesque cathedral whose foundations were laid on an island in the Havel in 1165; it was rebuilt in a Gothic style in the 14th century and extensively restored in the 1960s. Other monuments include St. Jacob's Chapel (1320) and St. Katherine's Church, dating from the same century. A 104-ft (32-m) round tower is all that remains of 10 towers that formed part of the town's original fortifications.

The major industries are based on local steelmaking and steelworking, which support fabrication of tractors and machinery; there are also textile (jute, clothing) and leatherworking industries. Major East German rolling and wiredrawing mills are nearby, as is the Plauensee (lake), a recreational centre. As a busy river port, at the eastern end of the Elbe-Havel Canal, the city is also the location of a major inland shipyard, producing fishing vessels. Pop. (1983 est.) 95,052.

Brandenburg Gate, German BRANDENBURGER TOR, the only remaining town gate of Berlin, at the western end of the avenue Unter

The Brandenburg Gate, East Berlin

Jerry Cooke—Photo Researchers

den Linden in East Berlin, German Democratic Republic, near the border to the western sectors. The gate, just behind the Berlin Wall, was built in 1788–91 by Carl G. Langhans after the model of the Propylaea in Athens. As Berlin's arch of triumph, it was surmounted by the famous "Quadriga of Victory," a statue of a chariot drawn by four horses. The entire structure was heavily damaged during World War II. In 1957–58 the gate was restored and the statue was recast from the original molds.

Brandes, (Carl) Edvard (Cohen) (b. Oct. 21, 1847, Copenhagen—d. Dec. 20, 1931, Copenhagen), writer and politician who was a major figure in the Danish left coalition that struggled for full parliamentary government in the last decades of the 19th century.

Edvard Brandes was a literary critic like his celebrated brother Georg Brandes but is primarily known for his activities as a Folketing (lower house) member of the Parliament from 1880 to World War I, during which he served as minister of finance in the Radical Party government (1913–20). Because of his Jewish origin, his atheism, and his "European," rather than "Danish," outlook, Brandes was, from the beginning of his political career, at odds with the more moderate faction of the left coalition that formed the Left Reform Party in the late 1890s. His influence greatly affected the Radical Party, which broke away from the Left Reform in 1905.

Brandes, Georg (Morris Cohen) (b. Feb. 4, 1842, Copenhagen—d. Feb. 19, 1927, Copenhagen), Danish critic and scholar who, from

Georg Brandes, 1866

By courtesy of the Kongelige Bibliotek, Copenhagen

1870 through the turn of the 20th century, exerted an enormous influence on the Scandinavian literary world.

Influenced by the French critics Taine and Renan and by the English political philosopher John Stuart Mill, all of whom he had met in Paris during his European travels (1865–71) after he had graduated from the University of Copenhagen in 1864, Brandes conceived it his mission to liberate Denmark from its cultural isolation and provincialism. He brought the liberal political and cultural trends of western Europe to his countrymen with the zeal of a reformer.

In 1871 he began a series of lectures at the University of Copenhagen, published as *Hovedstrømninger i det 19de aarhundredes litteratur,* 6 vol. (1872–90; *Main Currents in 19th Century Literature,* 1901–05). He became a friend of the dramatist Ibsen, who charged him to lead the revolution of the spirit for which he himself was fighting. Brandes also befriended and championed such other important writers as Bjørnson, Jens Peter Jacobsen, Jonas Lie, Alexander Kielland, and Strindberg. Though he gained a following among the Copenhagen liberal intelligentsia, he was strongly opposed by conservative countrymen, who attacked him as being an "atheist Jew." Disappointed at being denied the professorship of aesthetics at the University of Copenhagen, Brandes settled in Berlin (1877–83).

Brandes wrote many scholarly studies illustrating his radical ideas, including monographs on the religious philosopher Kierkegaard, the Socialist leader Ferdinand Lassalle, and the Danish playwright of the Enlightenment, Ludvig Holberg. Notable among his critical works are *Det moderne gjennembruds mænd* (1883; "Men of the Modern Break-Through"; *i.e.,* his own followers) and *Danske digtere* (1877; "Danish Poets").

In the late 1880s, influenced by Nietzsche, Brandes developed a philosophy of aristocratic radicalism, expressed in *Aristokratisk radicalisne* (1889, collected in English translations as *Friedrich Nietzsche,* 1909), and also in his later biographies of Shakespeare, Goethe, Voltaire, Julius Caesar, and Michelangelo. Though Brandes was invited to return to Denmark in 1902 as professor at the University of Copenhagen, he remained throughout his life a controversial figure. He never lacked the courage to denounce tyranny and reaction, and such works as *Sagnet om Jesus* (1925; *Jesus, a Myth,* 1926) made him many enemies.

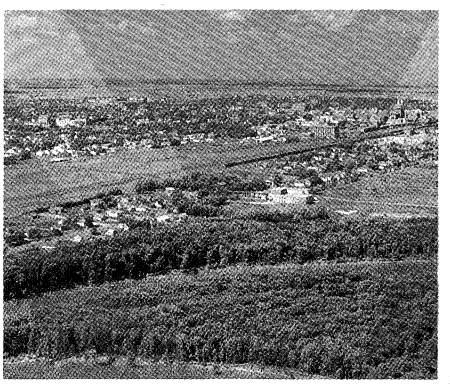
Brando, Marlon, (Jr.) (b. April 3, 1924, Omaha, Neb., U.S.), U.S. stage and motion-picture actor known for his visceral, brooding characterizations.

The son of a salesman and an actress, Brando grew up in Illinois and then went to New York and attended the Dramatic Workshop, playing in bit parts. His riveting performance as Stanley Kowalski in the Broadway premiere of Tennessee Williams' *A Streetcar Named Desire* (1947) brought critical raves and became perhaps the definitive interpretation of the role; in the late 1940s he became an early member of the famed Actors Studio. For his widely praised portrayal of an embittered paraplegic in his first film, *The Men* (1950), he prepared by spending a month in a physical therapy ward, a technique of immersion in the role central to the acting theory known as the method. Four successive nominations by the Academy of Motion Picture Arts and Sciences for best actor greeted his work in the filmed version of *A Streetcar Named Desire* (1951), *Viva Zapata!* (1952), *Julius Caesar* (1953), and *On the Waterfront* (1954), for which he received the Oscar. *The Wild One* (1954) enhanced his reputation as an actor and as a rebel in his personal life.

Brando formed Pennebar Productions in 1959 and produced, directed, and starred in *One-Eyed Jacks* (1961). He also appeared in *Desirée* (1954), *Guys and Dolls* (1955), *Teahouse of the August Moon* (1956), *Sayonara* (1957), *The Young Lions* (1958), *Mutiny on the Bounty* (1962), *The Chase* (1966), and *Reflections in a Golden Eye* (1967). Though honoured with another Academy Award for his performance as the title character of *The Godfather* (1972), he refused it in order to protest the plight of American Indians and Hollywood's stereotypical representation of them in movies. Later films included *Last Tango in Paris* (1973), *The Missouri Breaks* (1976), *Superman* (1978), and *Apocalypse Now* (1979).

From 1966 Brando lived on a privately owned Polynesian atoll, Tetiaroa.

Brandon, city, southwestern Manitoba, Canada, on the Assiniboine River, 131 mi



Brandon, Man.

Malak

(211 km) west of Winnipeg. It was founded after the arrival of the Canadian Pacific Railway (1881) near a Hudson's Bay Company trading post, Brandon House, that was established in 1793 and named for Douglas, duke of Brandon, a company shareholder. Located on the Trans-Canada Highway and two transcontinental railroads, the city is now an important transportation centre and has a busy airport. Known as the "Wheat City of Canada," it serves as a marketing and distribution centre for a rich grain-producing area and processes flour, meat, fertilizers, chemicals, and petroleum products. Brandon is the site of Brandon University (1899), Assiniboine Community College, and a government agricultural research farm. It is a tourist hub for Riding Mountain National Park, which lies 52 miles (84 km) to the north, and Spruce Woods Provincial Park and Spruce Woods Provincial Forest, which both lie to the southeast. Several lakes and Turtle Mountain Provincial Park, with the International Peace Garden (partly in the United States), are to the south. Annual events include the Royal Winter Fair and the Manitoba Provincial Exhibition (June–July, an agricultural and industrial show). Inc. 1882. Pop. (1987 est.) 39,286.

Brandon, SAINT: *see* Brendan, Saint.

Brandon, Charles: *see* Suffolk, Charles Brandon, 1st duke of.

Brandon Mountain, mountain on the Dingle peninsula, County Kerry, Ireland. It is 3,127 feet (953 m) high. The mountains of the western part of the peninsula are formed of rock strata known to geologists as the Dingle beds, and north of the town of Dingle they form the Brandon range—a high craggy ridge, of which Brandon Mountain is the highest point—which ends in cliffs at Brandon Head. The cliffs have been much modified by landslides.

Brandt, Alfred (b. Sept. 3, 1846, Hamburg, Ger.—d. Nov. 29, 1899, Brig, Switz.), German civil engineer who was primarily responsible for the successful driving of the Simplon Tunnel, largest of the great Alpine tunnels.

As a young railroad engineer in the 1870s, Brandt observed the difficulties of the construction of the St. Gotthard Tunnel (Italy–Switzerland) and was struck by the possibility of improving the drilling–blasting sequence by employing a hydraulic rather than a pneumatic drill. He designed a machine that was tried out in the next Alpine railroad tunnel built, the Arlberg (Austria–Switzerland), and it proved a great success. Commissioned to drive the 12½-mile (20-kilometre) Simplon Tunnel (Italy–Switzerland), Brandt produced a novel plan to combat the high temperatures resulting from the tunnel depth—two galleries (separate tunnel headings parallel to each other), connected by crosshatches, providing ventilation and a circuit for supply and debris-removal trains. The design proved brilliantly successful, but Brandt, working almost 24 hours a day, succumbed to strain and died a little more than a year after the work commenced.

Brandt, Bill, byname of WILLIAM BRANDT (b. May 1904, London—d. Dec. 20, 1983, London), photographer, known principally for his documentation of 20th-century British life and for his unusual nudes. His photographs are generally characterized by strong contrast—deep, flat blacks and stark whites.

Brandt worked in the Paris studio of the American artist and photographer Man Ray in 1929. In 1931 Brandt returned to England and became a free-lance photojournalist. He made a series of photographs that were published as *The English at Home* (1936). Many of these photographs reveal the influence of the French photographers Eugène Atget, Brassaï, and Henri Cartier-Bresson. Brandt's debt to French photographers is also evident in his subsequent collection, *Londres de nuit* (1938; "London at Night").

In 1937 Brandt began to photograph the industrial cities and the coal-mining districts of northern England, his photographs revealing the desperation of England's industrial workers during the 1930s. When World War II began, Brandt became a staff photographer for the British Home Office, photographing home-front scenes such as Londoners crowded into air-raid shelters improvised in the city's underground stations, basements, and church crypts. He also made such photographs as "St. Paul's Cathedral in the Moonlight" (1942), revealing the ghostly beauty of London's deserted streets during the blackouts.

After the war Brandt produced a series of landscapes associated with English literature, published as *Literary Britain* (1951). The landscapes and portraits that followed were increasingly nonnaturalistic. His experiments culminated in his best-known collection, *Perspective of Nudes* (1961). In several of these photographs he used the distortion produced at close range by his extremely wide-angle fixed-focus camera to transform the human body into abstract designs. In other photographs, however, the distorted human form

Nude by Bill Brandt, 1952
Bill Brandt

becomes an integral element of a stark landscape of cliffs and rocky beach. He also published two collections of his work, *Shadow of Light* (1966; rev. ed., 1977), a retrospective of the several phases of his career; and *Bill Brandt Nudes: 1945–1980* (1980).

Brandt, Georg (b. July 21, 1694, Riddarhyttan, Swed.—d. April 29, 1768, Stockholm), Swedish chemist who, through his discovery and isolation of cobalt, became the first person to discover a metal unknown in ancient times.

In 1727 Brandt was appointed director of the chemical laboratory of the Council of Mines, Stockholm, and three years later became warden of the Royal Mint. He discovered and named cobalt in 1730. His findings on the composition and solubility of arsenic compounds were published in 1733; and he then pursued research on antimony, bismuth, mercury, and zinc. His work on methods of producing hydrochloric, nitric, and sulfuric acids was published in 1741 and 1743. One of the first chemists to completely forswear alchemy, he devoted his later years to exposing fraudulent alchemical processes for producing gold.

Brandt, Willy, original name KARL HERBERT FRAHM (b. Dec. 18, 1913, Lübeck, Ger.), German statesman, leader of the German Social Democratic Party of Germany (Sozialdemokratische Partei Deutschlands, or SPD) from 1964 to 1987, and chancellor of the Federal Republic of Germany from 1969 to 1974.

He passed his university entrance examination in 1932. A year later, however, when the Nazis came to power, his activities as a young

Willy Brandt
Authenticated News International

Social Democrat brought him into conflict with the Gestapo, and he had to flee the country to escape arrest. It was at this time that he assumed the name Willy Brandt. He went to Norway and earned a living as a journalist. When the Germans occupied Norway he escaped to Sweden, where he remained for the duration of World War II. After the war he returned to Germany as a Norwegian citizen and for a time was press attaché at the Norwegian mission in Berlin.

Pressed to return to politics, he became a German citizen again and, after a period as Berlin representative of the Social Democratic Party Executive Committee, was elected a member of the federal parliament in 1949. Eight years later he became governing mayor of West Berlin (1957–66), a post in which he achieved world fame. He showed great moral courage when the Soviet Union demanded (1958) that West Berlin be given the title of a demilitarized free city and especially when the Berlin Wall was built in 1961. He succeeded Erich Ollenhauer as chairman of the SPD in 1964 and campaigned for the office of chancellor three times—in 1961, 1965, and 1969.

When the grand coalition government of Christian Democrats and Social Democrats was formed in 1966, Brandt became foreign minister and vice-chancellor. His party improved its performance at the federal election in 1969 and formed a coalition government with the small Free Democratic Party, pushing the Christian Democrats into the role of opposition party for the first time. The first major decision of his government was to revalue the German mark, and the second, to sign the nuclear nonproliferation treaty.

The year following his election as chancellor, Brandt concentrated on foreign affairs, and he particularly sought to improve relations with East Germany, other Communist nations in eastern Europe, and the Soviet Union, formulating a policy known as *Ostpolitik* ("East politics"). His efforts led to a treaty with the Soviet Union in August 1970 calling for mutual renunciation of force and the acceptance of current European borders; to a nonaggression treaty with Poland in December 1970 recognizing the Oder-Neisse line as Poland's western boundary; and to the Big Four agreement in September 1971 on the status of Berlin. His treaty with Poland was controversial; detractors claimed that it signaled the loss of German lands occupied after World War II, while supporters praised it for opening the possibility of reuniting Germany and stabilizing relations with eastern Europe. A firm supporter of a united Europe, Brandt exerted his influence to break down French objections to enlarging the European Economic Community (EEC). More than any other statesman he helped promote the entry of Britain and

other countries to the EEC. However, a spy scandal in his government forced his resignation in May 1974. After his resignation he headed the Independent Commission on International Development Issues, known as the Brandt Commission, a prestigious independent panel that studied world economic policies, particularly in regard to developing nations.

Brandt received the Nobel Peace Prize in 1971 for his continuing work toward reconciliation between East and West. He wrote several books, including *Willy Brandt in Exile: Essays, Reflections and Letters, 1933–1947*, translated from the German by R.W. Last (1971); and *People and Politics: The Years 1960–1975*, translated by J.M. Brownjohn (1978). The latter comprises Brandt's political memoirs.

brandy, alcoholic beverage distilled from wine or a fermented fruit mash. The term used alone generally refers to the grape product; brandies made from the wines or fermented mashes of other fruits are commonly identified by the specific fruit name. With the exception of certain fruit types, known as white types, brandies are usually aged. Aging in wooden containers deepens colour to amber, the use of paraffin-lined casks or earthenware maintains the original clear colour, and the addition of a caramel solution darkens colour. Beverage brandy contains about 50 percent alcohol by volume; brandy used to fortify sherry, Madeira, and the other dessert wines contains about 80–95 percent alcohol by volume. Like other distilled liquor, brandy does not improve after bottling. Star or letter designations, formerly indicating age, are used by shippers to express product quality.

The name comes from the Dutch *brandewijn* ("burnt wine"), referring to the application of heat in distillation. Commercial distillation of brandy from wine originated in the 16th century. According to one story, a Dutch shipmaster began the practice by concentrating wine for shipment, intending to add water upon reaching home port, but the concentrated beverage immediately found acceptance.

Most wine-producing countries also make brandy. Outstanding French brandies include cognac, from the Charente and Charente-Maritime *départements* of France, usually considered the finest of all brandies, and armagnac, from the Gers region. The sherry-producing centres of Spain and the port-producing centres of Portugal are also known for brandy. Greek brandy includes Metaxa, sweetened and usually darkened with caramel, and ouzo, colourless and flavoured with anise or licorice. U.S. brandy, produced mainly in California, tends to be neutral and uniform in character. Pisco, mainly produced in Peru, is distilled from muscat wines. Brandies distilled from grape pomace, or marc, the material remaining in the wine press after grape pressing, include the French *eau-de-vie de marc,* for which Burgundy is well known, and grappa, an unaged, sharp-tasting brandy produced in both Italy and California.

Apple brandies, produced from fermented cider, include calvados, from the Calvados region of France, and the U.S. applejack. The Alsatian area of France is known for *framboise,* distilled from raspberries, and *fraise,* distilled from strawberries. Other fruit brandies, often characterized by a bitter-almond flavour contributed by the release of oil from the fruit pits during mashing, include slivovitz, a golden-brown plum brandy produced in Yugoslavia and other Balkan countries; *barack palinka,* from Hungary, the best known of apricot brandies; *Kirschwasser,* or kirsch, produced mainly in Alsace, Germany, and Switzerland, distilled from cherries; and the French plum wines, from Alsace and Lorraine, including Mirabelle, made from a yellow plum, and *quetsch,* from a blue plum.

Brandies are usually served alone or with soda as after-dinner drinks. They are used to flavour mixed drinks and various dessert dishes and as fuel to produce the flame in such flamed dishes as crepes suzette and cherries jubilee. Brandy is also used as a base spirit in the production of another type of distilled liquor, the liqueur (*q.v.*).

Brandys, Kazimierz (b. Oct. 27, 1916, Łódź, Pol., Russian Empire), Polish novelist and essayist.

Born into a middle-class Jewish family, Brandys graduated in law from the University of Warsaw in 1939. Having survived the Nazi occupation of Poland, he joined in 1945 the editorial board of the Marxist weekly *Kuźnica* ("The Forge"). His literary debut was the novel *Drewniany Koń* (1946; "Hobby Horse"), in which he relates the ordeal of the Polish intelligentsia under the Nazi terror. In a more ambitious, four-volume epic novel, *Między wojnami* (1948–51; "Between the Wars"), he attempted to describe from a Communist viewpoint the moral and ideological experiences of a generation of Polish intellectuals before, during, and after World War II. For this work he was awarded the 1951 State Literary Prize (which he won again in 1955).

After Poland experienced a partial relaxation of government controls over its cultural life (1956), Brandys voiced mild criticisms of the Communist ideology in the novella *Obrona Grenady* (1966; "Defense of Grenada"). In his *Listy do Pani Z.,* 2 vol. (1958–60; "Letters to Lady Z."), as well as in a volume of short stories, *Romantyczność* (1960; "Romanticism"), he analyzed the moral and psychological transformations of contemporary Poland. Later works include *Wariacje pocztowe* (1972; "The Postal Variations") and *Nierzeczywistość* (1978; "Unreality").

Brandywine, Battle of the (Sept. 11, 1777), in U.S. War of Independence, engagement near Philadelphia in which the British defeated the Americans but left the Revolutionary army intact. The British general Sir William Howe was lured to Philadelphia in the belief that its large Tory element would rise up when joined by a British army and thus virtually remove Pennsylvania from the war. That move left the forces of Gen. John Burgoyne in northern New York to fend for themselves, directly resulting in the British disaster at Saratoga.

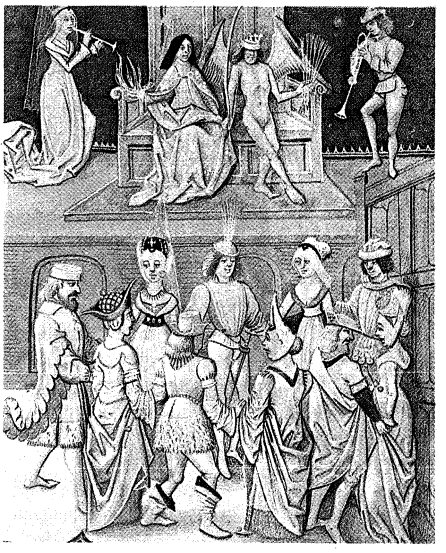
Embarking from New York City in July 1777, Howe's army of about 15,000 troops met Gen. George Washington's Continental Army of about 11,000 in the vicinity of Chadds Ford, on Brandywine Creek in southeastern Pennsylvania, about 25 miles southwest of Philadelphia. In the end, the British troops occupied the battlefield, but they neither destroyed Washington's army nor cut it off from the capital at Philadelphia. Thus the American army was kept intact and the Revolution remained alive.

Brandywine Creek, stream in southeastern Pennsylvania and western Delaware, U.S., rising in two branches in Chester County, Pa., which join near Coatesville. It flows about 20 mi (32 km) southeast past Chadds Ford and through Delaware to join the Christina River just above its confluence with the Delaware River at Wilmington. On its banks in 1777 was fought one of the major battles of the American Revolutionary War (*see* Brandywine, Battle of the). The river, called Wauwaset by the Indians and Fiskiekylen (Fish Creek) by Swedish immigrants, was probably named for Andrew Braindwine, an early settler.

Branford, town (township), New Haven County, southern Connecticut, on Long Island Sound, at the mouth of the Branford River, U.S. A southern suburb of New Haven, it includes the borough of Branford and the villages of Pine Orchard, Stony Creek, and Short Beach. The town was settled in 1644; its name is a corruption of Brentford, England. A saltworks there was used to preserve meat for the Revolutionary army. Several colonial buildings still stand. Branford's economy is based on agriculture, fishing, and light industry; manufactures include electric and metal products, toys, boats, and clothing. Its bays and beaches attract many summer residents. Pop. (1980) 23,363.

Branick's rat: *see* pacarana.

branle, 12th-century French chain dance adopted (*c.* 1450–*c.* 1650) by European aristocrats, especially in France and in England, where the word branle was anglicized as "brawl." Named for its characteristic side to side movement (French *branler,* "to sway"), the branle was performed by a chain of dancers who alternated large sideways steps to the left (frequently four) with an equal number of smaller steps to the right. Thus the chain, usually of couples intertwining arms or



Branle, miniature from "La Danse devant Amour," 15th century; in the Bibliothèque Nationale, Paris (MS. Fr. 1696, fol. 1)

By courtesy of the Bibliotheque Nationale, Paris

holding hands, progressed to the left in a circle or serpentine figure. Branles were danced with walking, running, gliding, or skipping steps depending on the speed of the music, which was composed in $\frac{4}{4}$ time.

Aristocrats frequently performed pantomimic branles in which they scolded each other like washerwomen or courted (as in the *branle de Poitou,* the possible ancestor of the minuet). Certain branles, especially in France, were designated for specific age groups, such as the lively branle de Bourgogne for the youngest dancers.

Branner, Hans Christian (b. June 23, 1903, Ordrup, near Copenhagen—d. April 24, 1966, Copenhagen), leading Danish novelist of the post-World War II period.

After studying philology at the University of Copenhagen, Branner tried his hand as an actor and worked in a publishing house before turning to writing. A collection of short stories, *Om lidt er vi borte* (1939; "In a Little While We Are Gone"), first attracted attention. *Two Minutes of Silence* (1966) has the same title as a collection, *To Minutters Stilhed* (1944), but consists of 16 translated stories selected by Branner before his death. *Historien om Børge* (1942), a story of a child's everyday life, was translated into English as *The Story of Borge* (1973). His special concern with psychoanalytic psychology became evident in his short novel *Rytteren* (1949; *The Riding Mas-*

ter, 1951) and in his play *Søskende* (1952; *The Judge,* 1955). Branner's themes are the moral and emotional tensions accompanying power and fear. After World War II he attempted to lead the way to a sort of modern humanism. In all his works he speaks for the right of the individual to an independent, dignified existence.

Bransfield, Edward (b. *c.* 1795—d. 1852), English naval officer believed to have been the first to sight the Antarctic mainland and to chart a portion of it.

Master aboard HMS "Andromache" at Valparaiso, Chile, he was appointed to sail the "Williams" in order to chart the recently sighted South Shetland Islands, which lie near the Antarctic Peninsula. With William Smith, Bransfield arrived at the South Shetlands in January 1820, landed on King George Island to take formal possession, and coasted to Deception Island. Turning southward, he sighted and charted "high mountains, covered with snow," possibly Mts. Bransfield and Jacquinot on the Antarctic mainland (Jan. 30, 1820). The charts survive in the hydrographic department of the British Admiralty.

Br'ansk (city and region, Russian S.F.S.R.): *see* Bryansk.

Branson, city, Taney County, southwestern Missouri, U.S., in the Ozark Mountains near the Arkansas state line, on Lake Taneycomo (formed by the White River) and near Bull Shoals, Table Rock Dam, and Table Rock Lake and State Park. It was named for Reuben S. Branson, an early settler who opened a store there *c.* 1800. The community and surrounding landmarks (including Inspiration Point, old cabins, and Marvel Cave) formed the setting for Harold Bell Wright's novel *The Shepherd of the Hills* (1907), and the book's popularity has made tourism Branson's largest industry; a reenactment of the story is presented in an outdoor amphitheatre nightly through the summer. Silver Dollar City, a replica of an 1870 Ozark mining town, is 9 mi (14 km) west. School of the Ozarks (1906), where students pay no tuition but work in college industries, is 4 mi south, at Point Lookout. Inc. 1912. Pop. (1980) 2,550.

brant, also called BRENT GOOSE (*Branta bernicla*), water bird that resembles small, short-necked forms of the Canada goose but is much darker and, though black-necked and black-headed, lacks white cheeks; instead it has a more or less extensive narrow white neck ring and is "bibbed" like the barnacle goose. It breeds in the Arctic and winters southward into Eurasia and North America. *See also* barnacle goose.

Brant, Joseph, Indian name THAYENDANEGEA (b. 1742, on the banks of the Ohio River—d. Nov. 24, 1807, near Brantford, Ont., Can.), Mohawk Indian chief who served not only as a spokesman for his people but also as a Christian missionary and a British military officer during the U.S. War of Independence (1775–83).

Brant was converted to the Anglican Church after two years (1761–63) at Moor's Charity School for Indians, Lebanon, Conn., where he learned English and became acquainted with Western history and literature. He left school to become an interpreter for an Anglican missionary and later aided in translating the prayer book and the Gospel of Mark into Mohawk (1787).

Brant's sister Molly was the wife of the British superintendent for northern Indian affairs, Sir William Johnson, whom he followed into battle at age 13. He fought for the British in the last French and Indian War (1754–63), and in 1774 he was appointed secretary to Sir William's successor, Guy Johnson. In 1775 he received a captain's commission and was sent to England, where he was presented at court.

Joseph Brant, portrait by Charles Willson Peale, 1797; in Independence National Historical Park, Philadelphia

By courtesy of the Independence National Historical Park Collection, Philadelphia

On his return, Brant led four of the six Iroquois nations on the British side in the U.S. War of Independence. He attacked colonial outposts on the New York frontier, skillfully commanding the Indian contingent in the Battle of Oriskany (Aug. 6, 1777) and winning a formidable reputation after the raid on the fortified village of Cherry Valley, N.Y. (Nov. 11, 1778). Cooperating with British regulars and Loyalists, Brant brought fear and destruction to the entire Mohawk Valley, southern New York, and northern Pennsylvania. He also thwarted the attempt of a rival chief, Red Jacket, to persuade the Iroquois to conclude a separate peace with the revolutionaries.

After the war, Brant discouraged further Indian warfare on the frontier and aided the U.S. commissioners in securing peace treaties with the Miamis and other western tribes. He retained his commission in the British Army, and was awarded a grant of land on the Grand River, in Ontario, where he ruled peacefully over his followers who settled there. He continued his missionary work and in 1785 again visited England, where he raised funds for the first Episcopal Church in Upper Canada.

Brant, Sebastian (b. 1458?, Strassburg—d. May 10, 1521, Strassburg), satirical poet best known for his allegory *The Ship of Fools,* the most famous German literary work of the 15th century.

Brant studied in Basel, where he was made doctor of laws (1489) and taught in the law

Sebastian Brant, detail of a woodcut from Nicolaus Reusner's *Icones sive Imagines virorum literis illustrium,* 1587, after a portrait by T. Stimmer

By courtesy of the Victoria and Albert Museum, London; photograph, J.R. Freeman & Co. Ltd.

faculty. When Basel joined the Swiss Confederation (1499), he returned to Strassburg, where in 1503 he was made city clerk. Maximilian I appointed him imperial councillor and count palatine.

Brant's writings are varied: legal; religious; political (in support of Maximilian, against the French and Turks); and, especially, moral (adaptations of the aphorisms of Cato, Faceto, and Freidank). His chief work, however, is *Das Narrenschiff* (1494; adapted as *The Shyp of Folys of the Worlde,* by Alexander Barclay, 1509), an allegory telling of a ship laden with fools and steered by fools setting sail for Narragonia, the "fool's paradise." The ship allegory is not sustained; instead Brant presents more than 100 fools representing every contemporary shortcoming, serious and trivial. Criminals, drunkards, ill-behaved priests and lecherous monks, spendthrifts, bribe-taking judges, busybodies, and voluptuous women are included in this unsparing, bitter, sweeping satire. Brant's aims are the improvement of his fellows and the regeneration of church and empire. The language is popular, the verse rough but vigorous, and each chapter is accompanied by a woodcut, probably by Albrecht Dürer, beautifully executed but often only loosely connected with the text. The work, an immediate success, was widely translated and gave rise to a whole school of fool's literature (*q.v.*). Yet Brant essentially looks backward. He is not a forerunner of the Reformation nor even a true humanist but rather a last embodiment of medieval thought and ideals.

Brantford, city, seat (1852) of Brant County, southeastern Ontario, Canada, on the Grand River. It originated as Brant's Ford, named for Joseph Brant, the famous Mohawk chief who was granted the site in 1784 for the settlement of the Six Nations Indians after the American Revolution. White settlement dates from 1805. Brantford is now an agricultural and industrial centre. Manufactures include agricultural, auto, and refrigeration equipment and textiles. The city, 20 mi (35 km) west of Hamilton, is the site of the province's oldest Protestant church, an Indian chapel (Her Majesty's Chapel of the Mohawks) built in 1785. Other Indian associations are reflected in the Brant County Museum, Chiefswood (the birthplace [1862] of the Indian poetess Pauline Johnson), the Woodland Indian Cultural Centre, the annual Six Nations Indian Pageant (August), and the Indian John Memorial Shoot (an archery contest held each June). The Alexander Graham Bell Homestead, now a museum commemorating his invention and development of the telephone, is in nearby Tutela Heights. Inc. town, 1847; city, 1877. Pop. (1981) 74,315.

Branting, Karl Hjalmar (b. Nov. 23, 1860, Stockholm—d. Feb. 24, 1925, Stockholm), Swedish statesman and pioneer of social democracy whose conciliatory international diplomacy in the first two decades of the 20th century was recognized by the award of the 1921 Nobel Peace Prize.

After studying science in Stockholm and Uppsala, Branting in 1883 began work for the radical newspaper *Tiden,* becoming its editor shortly thereafter. In 1886 he assumed the editorship of the *Social-Demokraten,* and when the Social Democratic Party was formed in 1889 he was prominent among its founders. Elected to the lower chamber of the Riksdag (parliament) for the first time in 1896, he was until 1902 its only Social Democratic member. After the unilateral withdrawal of Norway from union with Sweden in 1905, together with other Socialists and Liberals, Branting played an important part in quieting Swedish revanchist sentiment.

In 1907 Branting became leader of his party, mobilizing the working classes in support of the demand for adult, equal, and direct suffrage but at the same time facilitating cooperation with progressive Liberal elements: from this tactic resulted the Liberal–Socialist coalition government of 1917, in which he was minister of finance, and a constitutional reform of 1918 that facilitated the spread of social democracy throughout Sweden. An advocate of Swedish neutrality during World War I, he

was a delegate to the Paris Peace Conference (1919) and to the London discussions on the future of the Åland Islands (1920), over which Sweden was in conflict with Finland. He was also the first Swedish representative at the League of Nations and chairman of the Berne

Branting, detail from an oil painting by Richard Bergh; in Gripsholm Castle, Sweden

By courtesy of the Svenska Portrattarkivet, Stockholm

conference of the Second (Socialist) International (1919).

In March 1920 Branting formed Sweden's first Social Democratic government, but elections held the following September went against him. He returned to power in September 1921, retaining office until April 1923. In October 1924 he formed a third government, but illness led to his resignation on January 25.

Consult the INDEX *first*

Brantôme, Pierre de, in full PIERRE DE BOURDEILLE, ABBÉ ET SEIGNEUR (lord) DE BRANTÔME (b. *c.* 1540, Périgord, Fr.—d. July 15, 1614, France), soldier and chronicler, author of a valuable and informative account of his own life and times.

His works, characterized by frankness and naïveté, consist mainly of accounts of battles or tales of chivalry. Though he is not generally considered a reliable historian, his bold, capricious character well equipped him to be a chronicler of the 16th century.

Brantôme was the third son of the Baron of Bourdeille. He spent his childhood at the court of Marguerite de Valois, queen of Navarre, where his mother and maternal grandmother were members of the royal household. Upon Marguerite's death in 1549 he went to Paris to continue his education, which was completed at the University of Poitiers in 1555. He then visited the court of Henry II, by whom he was given the abbey of Brantôme, but, although he also held several other benefices, his contact with religious life was limited to the enjoyment of ecclesiastical revenues. His adventurous career as a courtier and soldier took him to Italy, Spain, Portugal, and the British Isles. In later years, a severe incapacity resulting from a fall from a horse provided him with the leisure to write.

The first edition of Brantôme's works was published posthumously as *Mémoires de Messire Pierre de Bourdeilles* (1665–66; "Memoirs of Pierre de Bourdeille"). It comprises *Les Vies des dames illustres* ("Lives of Illustrious Ladies"), *Les Vies des dames galantes* ("Lives of Gallant Ladies"), *Les Vies des hommes illustres et grands capitaines français* ("Lives of French Illustrious Men and the Great Leaders"), and *Les Vies des hommes illustres et des grands capitaines étrangers* ("Lives of Foreign Illustrious Men and the Great Leaders").

Braose FAMILY (of Scotland): *see* Bruce family.

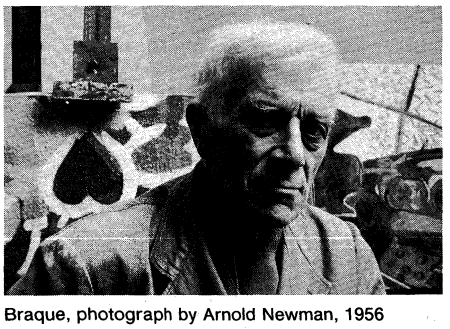
Braque, Georges (b. May 13, 1882, Argenteuil, Fr.—d. Aug. 31, 1963, Paris), French painter, one of the important revolutionaries of 20th-century art who, together with Pablo Picasso, developed Cubism.

His paintings consist primarily of still lifes, remarkable for their robust construction, low-keyed colour harmonies, and serene, meditative quality (*e.g.,* "Still Life with a Mandolin," 1935).

Early life. Braque was born just seven months after Picasso, in a small community on the Seine near Paris and one of the centres of the Impressionist movement in the 1870s. His father and a grandfather were the owners of a prosperous house-painting firm, and both were amateur artists. In 1890 the family moved to Le Havre, which had also been, in the time of the seascapist Eugène Boudin and the young Claude Monet, an early centre of Impressionism. The boy attended the local public school, accompanied his father on painting expeditions, and developed an interest in sports, including eventually boxing, that gave him, as an adult, the look of a professional athlete. He also learned to play the flute.

At 15 Braque enrolled in the evening course at the Le Havre academy of fine arts. He left school at 17 for a year of apprenticeship as a house painter and interior decorator, first in Le Havre and then in Paris; during this period he picked up his solidly professional handling of materials and his knowledge of the artisan's tricks—the imitation of wood grain, for instance—frequently utilized in his Cubist pictures. After a year of military service he decided, with the help of an allowance from his family, to become an artist. Between 1902 and 1904 he studied in a Paris private academy and, very briefly, at the official École des Beaux-Arts; in his free hours he frequented the Louvre, where he admired especially Egyptian and archaic Greek works.

His early paintings reveal, as might be expected from a childhood spent in Normandy, the influence of the Impressionists, in particular that of Monet and of Camille Pissarro. A little later came the revelation of the firm



Braque, photograph by Arnold Newman, 1956

© Arnold Newman

structures and the union of colour and tone values in the work of Paul Cézanne. But Braque can be said to have begun to find his way only in 1905, when he visited the Paris Salon d'Automne and saw the violent explosion of arbitrary colour in the room occupied by the paintings of the group nicknamed the Fauves (Wild Beasts). During the next two years he was a convinced, if rather prudent and tradition-minded, Fauvist, working for a while at Antwerp and then on the Mediterranean coast near Marseille, at L'Estaque and La Ciotat. Representative pictures from this period are "Le Port d'Anvers," "The Port of La Ciotat," and "View from the Hôtel Mistral, L'Estaque."

In the spring of 1907 he exhibited six paintings at the Paris Salon des Indépendants and sold them all. Later that year he signed a contract with a dealer, David Henry Kahnweiler, who had recently opened a small Paris gallery destined to play an important role in the history of modern art. Kahnweiler brought around the avant-garde poet and critic Guillaume Apollinaire, who introduced Braque to Picasso in the latter's Montmartre studio. Braque was at first disconcerted by Picasso's recently painted "Demoiselles d'Avignon" (Museum of Modern Art, New York City). "Listen," he is reported to have said, "in spite of your explanations your painting looks as if you wanted to make us eat tow, or drink gasoline and spit fire." But the two artists became close friends, and within a few months they were engaged in the unprecedented process of mutual influence from which Cubism emerged.

It is impossible to say which of the two was the principal inventor of the revolutionary new style, for at the height of their collaboration they exchanged ideas almost daily and produced pictures so alike as to be practically indistinguishable. Picasso provided, with his proto-Cubist "Demoiselles," the initial liberating shock. But it was Braque, largely because of his admiration for Cézanne, who provided much of the early tendency toward geometrical forms. During the summer of 1908 in southern France, he painted a series of radically innovative canvases, of which the most celebrated is "Houses at L'Estaque"; here already can be seen the slab volumes, sober colouring, and warped perspective typical of the first part of what has been called the analytical phase of Cubism. That fall he had a show at Kahnweiler's gallery and provoked from the Paris critic Louis Vauxcelles a remark about "cubes" that soon blossomed into a stylistic label.

By 1911 Braque—now teamed, as he said later, with Picasso as if they were roped alpinists—was well into the so-called hermetic part of the analytical phase of Cubism, of which "Man with a Guitar" is an example; here the colours are brown, gray, and green, the pictorial space is almost flat, viewpoints and light sources are multiplied, contours are broken, volumes are often transparent, and facets are turned into apparently illogical simultaneous views. Also in 1911, Braque stencilled letters into "The Portuguese" and thus significantly strengthened the idea, full of consequences for the future of art, that a picture was not a representation but an autonomous object. In 1912 he went further in the same direction and created what is generally considered the first papier collé (pasted-paper picture) by attaching three pieces of wallpaper to the drawing "Fruit Dish and Glass."

During the early part of the Cubist adventure, he had a studio in Montmartre but often worked elsewhere: in 1909 at La Roche-Guyon, on the Seine, west of Paris; in 1910 back at L'Estaque; and in 1911 at Céret, a village on the Mediterranean side of the foothills of the Pyrenees. In 1912 he married Marcelle Lapré and rented a house at Sorgues, a small town in the Rhône valley near Avignon. With the outbreak of World War I he entered the army as an infantry sergeant and served with distinction, being decorated twice in 1914 for bravery. In 1915 he suffered a serious head wound, which was followed by a trepanation, several months in the hospital, and a long period of convalescence at home at Sorgues. During this period he added to the aphorisms he had been in the habit of scribbling on the margins of drawings, and in 1917 a collection of these sayings, put together by his friend the poet Pierre Reverdy, was published in the review *Nord–Sud* as "Thoughts and Reflections on Painting." Even a brief sampling can suggest the quality, at once poetic and rational, of Braque's mind and the sort of thinking that lay behind Cubism:

> New means, new subjects. . . . The aim is not to *reconstitute* an anecdotal fact, but to *constitute* a pictorial fact. . . . To work from nature is to improvise. . . . The senses deform, the mind forms. . . . I love the rule that corrects emotion.

Released from further military service, the artist rejoined the Cubist movement, which by then was in what is sometimes called its synthetic phase—a not very adequate way of referring to a tendency to use more colour and to represent objects not by the previous spider web of analytical signs but by relatively large emblematic planes. In 1917–18 he painted, partly under the influence of his friend Juan Gris, a Spanish-born Cubist master whose paintings were strongly Synthetic Cubist, the geometrical, strongly coloured, nearly abstract "Woman Musician" and some still lifes in a similar manner. Rapidly, however, he moved away from austere geometry toward forms softened by looser drawing and freer brushwork; an example of the change is the 1919 "Still Life with Playing Cards." From this point onward his style ceased to evolve in the methodical way it had during the successive phases of Cubism; it became a series of personal variations on the stylistic heritage of the eventful years before World War I.

International acclaim. By now he was a prosperous, established modern master, much in the favour of the well-to-do, up-to-date members of postwar French society. Working again much of the time in Paris, he transferred his studio from Montmartre to Montparnasse in 1922 and three years later moved into a new Left Bank house designed for him by a modern-minded architect, Auguste Perret. In 1923 and again in 1925 he had commissions from Sergey Diaghilev, the great ballet impresario, for the design of stage sets. In 1930 he acquired a country residence at Varengeville, a group of hamlets on the Normandy coast near Dieppe. His painting during these years is most easily classified, because of its stylistic variety, on the basis of subject matter. From 1922 to around 1926 he did a series of *canéphores,* pagan-looking women carrying fruit. Overlapping with this group in time is the series of *cheminées,* fireplace mantelpieces laden with fruit and perhaps a guitar. By 1928 he was doing a series of *guéridons,* pedestal tables holding the material previously assigned to mantelpieces.

In 1931 he undertook a new medium of expression: incised, white drawings, reminiscent of ancient Greek pottery designs, executed on plaster plaques painted black. Later in the 1930s he began a series of figure paintings; first-rate examples are "Le Duo" and "The Painter and His Model," and in 1937 he won the Carnegie Prize. During World War II he produced a collection of small, generally flat, very decorative pieces of sculpture, in a style recalling again ancient Greece and on vaguely mythological themes. After the war he resumed his practice of doing a number of paintings on a single subject: first came a series of billiard tables, then one of studio interiors, and then one of birds—large, lumbering creatures that seem charged with some forgotten archaic symbolic meaning. During the last years of his life Braque was honoured with important retrospective exhibitions throughout the world, and in December 1961 he became the first living artist to have his works exhibited in the Louvre. (R.McMu.)

MAJOR WORKS. "Le Port d'Anvers" (1906; National Gallery of Canada, Ottawa); "L'Estaque, l'embarcadère" (1906; Musée National d'Art Moderne, Paris); "The Port of La Ciotat" (1907; John Hay Whitney Collection, New York); "View from the Hôtel Mistral, L'Estaque" (1907; Werner E. Joster Collection, New York City); "Houses at L'Estaque" (1908; Hermann Rupf Collection, Bern); "Piano and Lute" (1910; Solomon R. Guggenheim Museum, New York City); "Violin and Jug" (1910; Kunstmuseum, Basel); "Man with a Guitar" (1911; Museum of Modern Art, New York City); "The Portuguese" (1911; Kunstmuseum, Basel); "Fruit Dish and Glass" (1912; Douglas Cooper Collection, France); "Composition à l'as de trêfle" (*c.* 1912–13; Musée National d'Art Moderne, Paris); "Jeune Fille a la Guitare" (1913; Musée National d'Art Moderne, Paris); "The Musician's Table" (1913; Kunstmuseum, Basel); "Music" (1914; Phillips Collection, Washington, D.C.); "The Woman Musician" (1917–18; Kunstmuseum, Basel); "Musical Forms" ("Guitar and Clarinet," 1918; Philadelphia Museum of Art); "Café bar" (1919; Kunstmuseum, Basel); "Still Life with Playing Cards" (1919; Rijksmuseum Kröller-Müller, Otterlo); "The Mantelpiece" (1922; Richard K. Weil Collection, St. Louis, Mo.); "Nude Woman with Basket of Fruit" (1926; National Gallery of Art, Washington, D.C.); "Black Rose" (1927; Burton Tremaine Collection, Meriden, Conn.); "Still Life: The Table" (1928; National Gallery of Art, Washington, D.C.); "Lemons and Napkin Ring" (1928; Phillips Collection, Washington, D.C.); "Boats on the Beach, Dieppe" (1929; Willy Schniewind Collection, Neviges, W.Ger.); "Still Life: Le Jour" (1929; National Gallery of Art, Washington, D.C.); "The Round Table" (1929; Phillips Collection); "The Bathers" (1931; Walter P. Chrysler, Jr. Collection, New York City); "Still Life" (1934; Kunstmuseum, Basel); "The Yellow Tablecloth" (1935; Samuel A. Marx Collection, Chicago); "Still Life with a Mandolin" (1935; Louis Bergman Collection, New York); "Woman with Hat" (1937; Jacqueline Delubac Collection, Paris); "Le Duo" (1937; Musée National d'Art Moderne, Paris); "The Studio" (1939; private collection, U.S.); "The Painter and His Model" (1939; Walter P. Chrysler, Jr. Collection); "La Table de cuisine au gril" (1942; Gustav Zumsteg Collection, Zürich); "Le Tapis vert" (1943; Musée National d'Art Moderne, Paris); "Le Billard" (1945; Musée National d'Art Moderne, Paris); "The Studio, VI" (1950; Aimé Maeght Collection, Paris); "The Shower" (1952; Phillips Collection); "Seascape" (1953; private collection, Paris); "The Black Birds" (1957; Aimé Maeght Collection).

BIBLIOGRAPHY. Standard biographies are John Russel, *Georges Braque* (1959); and Jean Leymarie, *Braque* (1961), although written before the painter died. Edwin B. Mullins, *The Art of Georges Braque* (British title, *Braque;* 1969), provides a basic introduction to the subject.

Bras d'Or Lake, saltwater but tideless body of water in the centre of Cape Breton Island, Nova Scotia, Canada, in the northeastern part of the province, several miles southwest of Sydney and Glace Bay. The saltwater lake, which is 424 sq mi (1,098 sq km) in area, 44 mi (71 km) long, and up to 20 mi wide, is connected to the Atlantic Ocean on the north by the Great and Little Bras d'Or channels, which flow on either side of Boularderie Island. Another outlet, the man-made Saint Peters Canal, cuts through a narrow isthmus to the Atlantic at the lake's south end. Its name, popularly construed as French for "arm of gold," is actually a corruption of Labrador. The lake is a popular sailing, fishing, and summer-resort area. It is skirted by a rail line and two major roads—one the Trans-Canada Highway.

Braschi, Giannangelo (pope): *see* Pius VI.

Brasidas (d. 422 BC, Amphipolis, Macedonia), Spartan officer generally considered the only commander of genius produced by Sparta during the Archidamian War (431–421), the first decade of the Peloponnesian War (431–404) between Athens and Sparta. Through his eloquence and charm, qualities unusual in a Spartan, he earned the admiration of many of Athens' allies and thereby paved the way for the revolts against Athens that took place after the failure (413) of the Athenian expedition against Syracuse, Sicily.

Brasidas first distinguished himself in combat in 431. In 424 he frustrated an Athenian attack on Megara and immediately afterward set about breaking up the Athenian empire in the north, winning over to Sparta the cities of Acanthus and Stagirus (both in Chalcidice) and, most important, the Athenian colony of Amphipolis. Although a truce was concluded between Athens and Sparta in the spring of 423, Brasidas refused to give up Scione, and he occupied Mende (in Chalcidice) shortly afterward. In April 422 the truce with Sparta expired, and the Athenians sent Cleon to recover their former possessions on the coast of Thrace. By skillful generalship Brasidas routed the Athenians at Amphipolis, but both he and Cleon were killed, thereby removing the key members of the pro-war faction of both sides. The Peace of Nicias was concluded the following year.

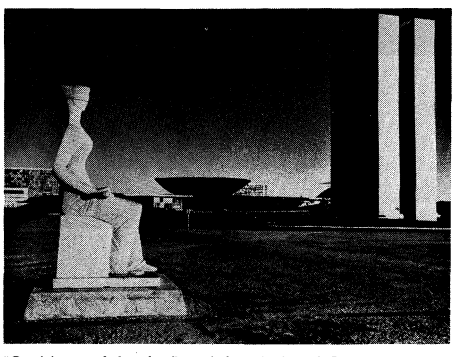
Brasil: *see* Brazil.

Brasil, Banco do, in full BANCO DO BRASIL SA, major Brazilian banking company, operating primarily in Brazil, with offices in several foreign countries. Headquarters are in Brasília.

The bank was established Oct. 12, 1808. It was reorganized in 1854 and again in 1906. The government of Brazil owns about three-fifths of its paid-up capital. It is associated with the Arab and International Investment Company in Paris.

Brasília, federal capital of Brazil, surrounded by the state of Goiás and located at the headwaters of the Tocantins, Paraná, São Francisco, and Corumbá rivers. The federal district has an area of 2,245 sq mi (5,814 sq km).

The idea of a capital city located in the interior was proposed in 1789. It was reiterated in 1822, when Brazil gained its independence



"Goddess of Justice" and the National Congress Building in the Square of Three Powers at Brasília
Per Olle Stackman—Tiofoto

from Portugal, and was embodied in the constitution of 1891. Eight years of surveying and testing in the interior preceded the selection of Brasília's present site in 1956. In April 1960 the central Square of Three Powers was dedicated and the federal government began its move from Rio de Janeiro.

An artificial lake surrounds much of the city and separates it from the suburban towns to the north. The cross-shaped plan of the central city is emphasized by the North–South Axis, Brasília's main transportation artery, and the East–West, or Monumental Axis, lined by the federal and civic buildings. At the west end of the Monumental Axis are municipal buildings, while at the east end, around the Square of Three Powers, stand the executive, judicial, and legislative buildings. The National Congress Building comprises dome and saucer forms atop a huge concrete platform and central twin administration towers. Many of these major buildings were designed by the Brazilian architect Oscar Niemeyer; the cathedral is considered by many to be his finest achievement. Highways and air routes link Brasília with the rest of Brazil, and there is regular national and international air service.

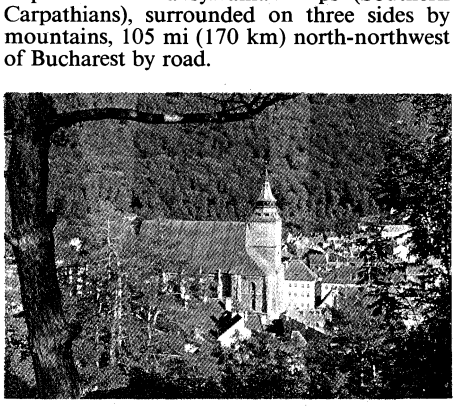
The major roles of construction and of food and related services in Brasília's economy reflect the city's status as a governmental, rather than an industrial, centre. Industries connected with construction and furnishings are important, as are publishing and printing. Many nationwide companies and associations have headquarters there.

The University of Brasília (1962) is central to much of Brasília's cultural life. The Cultural Foundation sponsors many national meetings in the arts and letters, and several foreign information centres are available. The National Theatre features dramatic, symphonic, and operatic works. Historical institutions include the Museum of Brasília, with a historical record of Brasília's creation, and the Institute of History.

An early lack of recreation facilities has been overcome in Brasília by numerous cinemas and nightclubs and a proliferation of sporting grounds in the city and suburbs. The city has more swimming pools than any other Brazilian city. A zoological park and forest reserves have been developed, and boating and fishing are popular activities. Pop. (1980 prelim.) 411,305.

Braşov, *judeţ* (district), central Romania, occupying an area of 2,066 sq mi (5,351 sq km). The Eastern Carpathians and the Transylvanian Alps (Southern Carpathians) rise above the settlement areas in the valleys. The area is drained southwestward by the Oltul River and its tributaries. Braşov (*q.v.*) city, the district capital, is one of the largest industrial and cultural centres in Romania. Machinery, metal products, chemicals, and textiles are manufactured there and in Săcele, Rîşnov, and Codlea. Factories in Zărneşti produce paper and cellulose, and Feldiora has a building-materials industry. Iron mines are worked in the district. Hărman and Prejmer villages were fortified between the 13th and 15th centuries and contain notable 13th-century churches. Persian-style carpets are made in Hărman, and a textile factory, agricultural cooperative, and trout hatchery operate in Prejmer. Poiana Braşov is a ski resort, located at the foot of Mount Postavarul (5,912 ft [1,797 m]). Other tourist areas are found in the Bucegi mountain range and on Mount Piatra Craiului. Teutonic Knights built a citadel on the summit of Mount Timpa (3,150 ft) during the 13th century. The citadel was destroyed by the *voïvode* (military governor) of Ioan Corvin in 1455, and the stones were later used to fortify Braşov city. Archaeological remains, found near Braşov city, date from the Neolithic, Bronze, and Iron ages. The area was subsequently occupied by Saxons (13th century), Turks (15th century), Austrians (17th century), and Germans (early 20th century). Highway and railway connections radiate in several directions from Braşov city, where there is a university. Pop. (1982 est.) 668,415.

Braşov, German KRONSTADT, Hungarian BRASSÓ, Romanian (1950–60) ORAŞUL STALIN (Stalin City), city, capital of Braşov *judeţ* (district), central Romania. One of the largest cities of the country, it is on the northern slope of the Transylvanian Alps (Southern Carpathians), surrounded on three sides by mountains, 105 mi (170 km) north-northwest of Bucharest by road.



Black Church, Braşov, Rom.
Mitchell Barosh—Shostal Assoc./EB Inc.

Founded by Teutonic Knights in 1211 and first mentioned in documents as Braşov in 1251, it became the centre of a Saxon colony trading in cloth, weapons, metalwork, and wax throughout much of Walachia and Moldavia. The substantial autonomy of its German inhabitants was ended in 1876 with the abolition of their separate national status. The old (inner) town, heavily fortified in the 15th century against the Turks, survived with little damage and contains many historic buildings, including the town hall (1420, restored 1777); the 190-ft (58-m) watchtower, also called Trumpeter's Tower (1528, restored 1910); the Orthodox St. Nicholas' Church (1392, restored 1751); and St. Bartholomew's Church (13th century, the oldest building in Braşov). The Gothic Protestant Church (1385–1477, restored 1711–15), is called the Black Church because of its smoke-blackened walls resulting from a 1689 fire. In Braşov are several theatres and museums and a university. "The Apostle of Transylvania," Johannes Honterus (1498–1549), who led the Reformation in the area, lived and died in Braşov (then Kronstadt) and established the first printing press in Transylvania there in 1535. The first book printed in the Romanian language, by the deacon Coresi, was published in Braşov in the mid-16th century. Education in Romanian was introduced there in the first Romanian school in 1559.

Toward the end of the 19th century the long tradition of merchants and craftsmen provided the foundation for industrial growth. In addition to factories manufacturing tractors, trucks, helicopters, and bearings, there are textile and chemical plants. Braşov is also an important road and rail junction. Pop. (1982 est.) 285,718.

Brass, town and minor port, Rivers State, southern Nigeria, on the Gulf of Guinea, at the mouth of the Brass River (in the Niger Delta). A traditional fishing village of the Nembe branch of the Ijaw people, it became a slave-trading port for the state of Brass (Nembe) in the early 19th century. Ruled by African merchant "houses," which were encouraged by the European traders, the state's chief slave-collecting centres (Brass and Nembe) often sent war canoes into the interior (especially through Ibo country) to capture slaves to exchange for Western cloth, tools, spirits, and firearms. Brass was one of the last slave-exporting depots (for markets in Brazil and Cuba) on the gulf; the rulers of the nearby Bonny kingdom used its concealed delta ports as an outlet for their slaves after the British had gained control of the Bonny River.

By the mid-19th century Brass had become a significant collecting point for palm oil and kernels. It remained a palm-oil port under the Oil Rivers Protectorate and the Niger Coast Protectorate; but it was eclipsed in importance by Akassa, the port of the Royal Niger Company. It is now a fishing port and a local trade centre in palm produce, cassava, taro, and plantains.

brass, alloy of copper and zinc, of historical and enduring importance because of its hardness and workability. The earliest brass, called calamine brass, dates to Neolithic times; it was probably made by reduction of mixtures of zinc ores and copper ores. In ancient documents, such as the Bible, the term brass is often used to denote bronze, the alloy of copper with tin.

Characteristics of the alloy. Malleability of brass depends on copper content; brasses that contain less than 55 percent are not workable, either hot or cold. Such brasses, known as white brasses, are of little industrial importance, though a granulated form is used in brazing. They also form the basis for certain alloys used in die-casting. The malleable brasses may be further subdivided into those, including Dutch metal, that can be worked cold, generally those with more than 62 percent copper, and those with lesser copper content, such as Muntz metal, that require hot working. Included in the former group are the alpha brasses, characterized by excellent cold-working properties and widely used in the manufacture of pins, bolts, and screws. Beta brasses are richer in zinc and correspondingly less ductile but stronger and thus are suitable for manufacture of faucet handles, sprinkler heads, window and door fittings, and other fixtures. A third group of brasses includes those with other elements besides copper and zinc to improve physical and mechanical properties, corrosion resistance, or machinability, or to modify colour. Among these are the aluminum brasses, which exhibit superior corrosion resistance; the lead brasses, which are more easily machined; the naval brasses, in which a small amount of tin improves resistance to corrosion by seawater; and nickel silver, in which nickel added to brass gives a white, or silver, colour.

Brass ware. The Romans used brass primarily in vessels, dress armour, jewelry, and brooches or clasps. Brass production declined after Rome withdrew from northern Europe but resumed during the Carolingian period. More malleable than bronze, brass was used to make ewers and basins, lamps, bowls, jugs, and numerous other household items.

From the 13th to the 17th century, monumental brasses were used to commemorate the dead. Engraved brass plates, depicting the deceased, were set into the surface of the tomb and often were embellished with inscriptions, heraldic devices, and other designs appropriate to the individual's life and circumstances. More than 4,000 of them still exist in England alone. In the 16th century, before silver from the New World flooded Europe, brass basins and plates gained enormous popularity as decorative showpieces for the homes of the bourgeoisie. Such pieces were hammered and embossed with elaborate designs. When the silver and gold of the Americas supplanted brass as a decorative metal, it found other uses in the manufacture of utilitarian household wares and chandeliers, candlesticks, sundials, and clocks. In addition, brass became a major material for the manufacture of fine instruments for astronomy, surveying, navigation, and other scientific pursuits. Brass was often forged, cast, chased, and decorated with engraving.

brass instrument, in music, any wind instrument—usually of brass or other metal but formerly of wood or horn—in which the vibration of the player's lips against a cup- or funnel-shaped mouthpiece causes the initial vibration of an air column; a more precise term is lip-vibrated instrument. Ethnologists frequently refer to any instrument of this class as a trumpet; but when they are made of or derived from animal horns, they are also often known as horns.

A lip-vibrated instrument consisting of a cylindrical or conical tube produces only a fundamental note and, when vigorously overblown, its natural harmonic series (as, for the fundamental note C: c–g–c′–e′–g′–bb′ [approximate pitch]–c″–d″–e″, etc.). Most modern brass instruments are provided with valves or slides that alter the length of the tube. This gives the players several fundamentals, each with its own harmonic series, thus making available a full chromatic (12-note) scale. Brass instruments, like all wind instruments, are classified as aerophones.

Brassaï, original name GYULA HALÁSZ, French JULES HALASZ (b. Sept. 9, 1899, Brassó, Transylvania, Austria-Hungary—d. July 8, 1984, Eze, near Nice, Fr.), Hungarian-born French poet, draftsman, sculptor, and photographer, known primarily for his dramatic photographs of Paris at night. His pseudonym, Brassaï, is derived from his native city.

He was trained as an artist and settled in

"'Bijoux' in Place Pigalle Bar," by Brassaï, 1932
Brassai—Rapho/Photo Researchers

Paris in 1924. There he worked as a sculptor, painter, and journalist and became familiar with other artists, such as Pablo Picasso, Joan Miró, Salvador Dalí, and writer Henry Miller. Although he despised photography at the time, he found it necessary to use a camera in his journalistic assignments and soon came to appreciate the unique aesthetic qualities of photography.

Brassaï's early photographs concentrated on the nighttime world of Montparnasse, a district of Paris noted at that time as a haunt of artists and criminals. His pictures were published in a photographic book, *Paris de nuit* ("Paris at Night"), in 1933, containing photographs such as "'Bijoux' in Place Pigalle Bar" and "Streetwalker." It was an immediate success, and his next book, *Voluptés de Paris* (1935; "Pleasures of Paris"), containing such powerful photographs as "Two Apaches," made him internationally famous.

When the German army occupied Paris in 1940, Brassaï escaped to the French Riviera. He returned to Paris, however, when he learned that the negatives he had hidden there were in danger of being ruined by moisture. During the occupation of Paris, open photography in the streets was forbidden, so Brassaï resumed drawing and sculpture and began writing poetry. After World War II, his drawings were published in book form as *Trente dessins* (1946; "Thirty Drawings") with a poem by the French poet Jacques Prévert. He resumed his work as a photographer in 1945. In 1947, a number of his photographs of dimly lighted Paris streets were greatly enlarged to serve as the backdrop for Prévert's ballet *Le Rendez-vous.* Many of Brassaï's postwar pictures continue the themes and techniques of his early work. But, such photographs as "Exotic Garden in Monaco" (1946) and "White Umbrella on the Riviera" (1948) show a new interest in varied subject matter as well as a heightened awareness of form and space.

Unlike many documentary photographers, Brassaï preferred static subjects to those that are active, as is seen in "Holy Week, Seville," a picture in his photographic book *Seville en fête* (1954). Yet, he imbued the most inanimate subjects, such as graffiti, with a warm sense of human life. *The Secret Paris of the 30's* was published in 1976. *Artists of My Life,* a collection of photographic and verbal portraits of well-known artists, art dealers, and friends, was published in 1982.

Brasseur de Bourbourg, Charles-Étienne (b. Sept. 8, 1814, Bourbourg, near Dunkirk, Fr.—d. Jan. 8, 1874, Nice), French missionary and ethnographer, who specialized in the prehistory of Central America and Mexico.

After study at Ghent and Rome, he entered the Roman Catholic priesthood (1845). He was professor of ecclesiastical history in the Quebec seminary in 1845 and vicar general at Boston in 1846 and, from 1848 to 1863, travelled as a missionary, chiefly in Mexico and Central America. He gave great attention to Mexican antiquities, published in 1857–59 a history of Aztec civilization, and from 1861 to 1864 edited a collection of documents in the indigenous languages. In 1863 he announced the discovery of a key to Mexican hieroglyphic writing, but it has since proved of little value. In 1864 he was archaeologist to the French military expedition in Mexico, and his *Monuments anciens du Mexique* was published by the French government in 1866. Perhaps his greatest service was the publication in 1861 of a French translation of the *Popol Vuh,* a sacred book of the Quiché Indians, together with a Quiché grammar, and an essay on Central American mythology. In 1871 he brought out his *Bibliothèque Mexico-Guatemalienne* and in 1869–70 gave the principles of his decipherment of Indian picture-writing in his *Manuscrit Troano, études sur le système graphique et la langue des Mayas.*

Articles are alphabetized word by word, not letter by letter

Brassey, Thomas (b. Nov. 7, 1805, Buerton, near Chester, Cheshire, Eng.—d. Dec. 8, 1870, Hastings, Sussex), early British railway contractor who built railway lines all over the world.

Brassey began his career as a surveyor. In 1835 he constructed a section of the Grand

Brassey, lithograph, 1862
BBC Hulton Picture Library

Junction railway and later helped complete the London and Southampton line. In 1841–43, with W. Mackenzie, he built the Paris–Rouen railway, followed by lines in France, The Netherlands, Italy, Prussia, and Spain.

The Grand Trunk railway in Canada, with 1,100 miles (1,800 kilometres) of track, was built (1853–59) by Brassey, Sir Samuel Morton Peto, and E.L. Betts. They also constructed the Crimean railway (1854). At one period, Brassey had work in hand in Europe, India, Australia, and South America, with a labour force estimated at 75,000. Coal, ironworks, and dockyards were among his other interests.

Thomas Brassey, 1st Earl Brassey (b. 1836—d. Feb. 23, 1918, London), his oldest son, became a recognized authority on English naval affairs. Elected to Parliament as a Liberal member from Hastings, he became civil lord of the Admiralty (1880–83) under Gladstone and then its parliamentary secretary (1884–85). He also he served as president of the Institution of Naval Architects (1893–95).

His other posts included service as governor of Victoria, Australia (1895–1900) and warden of the Cinque Ports (1908). He founded the *Naval Annual* (1886) and wrote *The British Navy* (1882–83). In 1886 he became a baron and in 1911 an earl.

Brassicaceae, also called CRUCIFERAE, the mustard family, of the caper order (Capparales), a large assemblage of 350 genera. The family, of mostly herbaceous plants with peppery-flavoured leaves, includes many plants of economic importance. The flowers are in the form of a Greek cross, with four petals, usually white, yellow, or lavender, and an equal number of sepals. There are four long and two short stamens and a two-chambered ovary positioned above the other flower parts. The seeds are produced in podlike fruits and often have a mucilaginous coating that swells when wetted.

The most important genus is *Brassica,* with about 50 Old World species and including the cabbages, mustards, and rapes. One species, *B. oleracea,* has many edible varieties, such as tree kale, cabbage, Brussels sprouts, cauliflower, broccoli, and Portuguese cabbage. Other species include the edible vegetables kohlrabi (*B. caulorapa*), kitchen kale (*B. fimbriata*), rutabaga (*B. napobrassica*), turnip (*B. rapa* or *B. campestris*), turnip broccoli (*B. ruvo*), and seven-top turnip (*B. septiceps*). *Brassica juncea* is the source of leaf mustard. The leaves of *B. napus* are used in salads and for cattle forage, and the seeds are added to birdseed mixtures and also are pressed for colza oil. Black mustard (*B. nigra*) seeds are the source of table mustard. The plant, native in Eurasia and naturalized in North America, is a widespread weed.

The radish (*Raphanus sativus*), a popular root vegetable, also has a variety with long, edible pods (*R. sativus* variety *caudatus*). Scurvy grass (*Cochlearia officinalis*), native to the North Temperate Zone, is the source of a medicine used in the treatment of scurvy. It has tarry-flavoured leaves that are used in salads. The pungent condiment known as horseradish is made from the long, hard root of *Armoracia lapathifolia,* a European herb. Tansy mustard (*Descurainia pinnata*) is a widely distributed North American annual weed with feathery foliage and yellow to white flowers.

Ornamental genera in the family include such varied plants as basket-of-gold (*Aurinia*), sweet alyssum (*Lobularia*), candytuft (*Iberis*), honesty (*Lunaria*), rose of Jericho (*Anastatica*), stock (*Matthiola*), and wallflower (*Cheiranthus*). Purple rock cress (*Aubrieta deltoidea*) is a popular rock garden and border plant.

Brassó (Romania): *see* Braşov.

Brasstown Bald, formerly MOUNT ENOTAH, highest peak (4,784 ft [1,458 m]) in Georgia, U.S., 8 mi (13 km) east of Blairsville in the Blue Ridge Mountains, on the border of Towns and Union counties, just south of the North Carolina border. Heavily wooded, the mountain is within Chattahoochee National Forest, and its bare summit is topped by a 40-ft lookout tower. The name Brasstown probably derives from a misinterpretation of a Cherokee Indian name Itse'yi, meaning "green place," which was confused with the name Untsai'yi, meaning "brass."

Brathwait, Richard (b. 1588, Kendal, Westmorland, Eng.—d. May 4, 1673, Catterick, Yorkshire), English poet best known for the lively *Barnabees Journal* (written in Latin rhymed verse under the pseudonym Corymbaeus, 1638; Eng. trans. 1638), containing amusing topographical information and unflagging gaiety.

After education at Oxford and Cambridge universities, Brathwait went to London to practice law but instead wrote plays and pastoral poetry of little merit. He later retired to

Westmorland as a country gentleman, writing *The English Gentleman* (1630) and *The English Gentlewoman* (1631), books on social conduct of interest to the social historian.

Brătianu, Constantin, also called DINU BRĂTIANU (b. Jan. 13, 1866, Florica, Rom.—d. 1952?), Romanian politician, head of the Liberal Party, one of the leaders of the party's opposition to the Communist ascendancy in Romania after World War II.

The son of the great 19th-century statesman Ion Brătianu and a parliamentary deputy from 1895, Constantin Brătianu held no government position until 1933–34, when he served as minister of finance. After the assassination of the Liberal premier Ion Duca in December 1933, he acceded to the leadership of the Liberal Party. Through the following years he opposed the dictatorial course of King Carol II and the compromising politics of the king's premier, Gheorghe Tătărescu.

During World War II, under the pro-Axis military dictatorship of Ion Antonescu, Brătianu initially supported the government's war policy against the Soviet Union; but, after the recovery of Romanian territory from the Soviets, he turned against the Antonescu regime and helped plot the successful anti-Fascist coup of Aug. 23, 1944. He subsequently served as minister without portfolio in two non-Communist liberation cabinets but refused appointment in the leftist regime of Petru Groza in March 1945. Brătianu's pro-Western, anti-Soviet position won him the enmity of the Communists, and, after the full Communist accession to power, he was eventually arrested and imprisoned without trial (1950?). He died in prison.

Brătianu, Ion (Constantin) (b. June 2, 1821, Piteşti, Walachia [now in Romania]—d. May 16, 1891, Florica, Rom.), statesman and long-time premier (1876–88) of Romania, who, with King Carol I, was the principal architect of modern Romania.

After taking part in the 1848 revolution at Bucharest, Brătianu withdrew to Paris, where he worked for the union and autonomy of the Danubian principalities, Moldavia and Walachia. With the principalities subsequently united as Romania under Prince Alexandru Cuza, Brătianu founded the Romanian Liberal Party with his brother Dumitru and in 1866 figured prominently in the deposing of Cuza and the election as prince of Romania of Karl of Hohenzollern-Sigmaringen, later (1881) King Carol I. As minister of finance, Brătianu played an important role in designing the Romanian constitution of 1866; but after an abortive antidynastic coup in 1870, he fell from favour. Eventually restored to it, he served from 1876 to 1888—except for a brief interval in 1881—as premier.

His autocratic, corrupt administration, redeemed somewhat by constitutional and land reforms and by his own personal character, was also marked by Romania's alliance with Germany and Austria-Hungary (1883). Advancing age and an army scandal finally forced him from office in 1888.

Brătianu, Ionel, also called ION I.C. BRĂTIANU (b. Aug. 20, 1864, Florica, Rom.—d. Nov. 24, 1927, Bucharest), politician who six times served as prime minister of Romania (1909, 1910–11, 1914–18, 1918–19, 1922–26, 1927) and was the chief spokesman for the ideal of Greater Romania—*i.e.,* the union of the old Regat (Moldavia and Walachia) with the Romanian lands of the Habsburg and Ottoman empires.

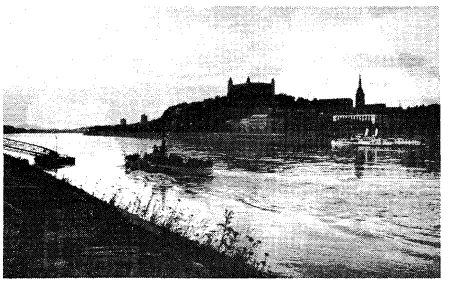
Son of the leading Romanian statesman Ion Brătianu, Ionel was appointed minister of the interior in 1907 and, two years later, prime minister. As leader of the Liberal Party, he marshaled party support for the realization of Greater Romania through territorial aggrandizement. His first and second premierships lasted until 1911; he was subsequently recalled

Ionel Brătianu, painting by Sava Henţia
By courtesy of the Editura Enciclopedica Romana, Bucharest

to office in 1914 as the proponent of large-scale land reform to assuage the land hunger of the peasantry. Through the early stages of World War I, he hoped to avoid conflict with Germany, but he eventually agreed to Romania's siding with the Allies (August 1916). After resigning the premiership in February 1918, he was again recalled the following December.

An insistent champion of a Greater Romania at the postwar peace negotiations at Paris, Brătianu once more resigned his office in September 1919 rather than accept a compromise on disputed territory with Yugoslavia. Again prime minister from 1922 to 1926, he was responsible for the adoption of a new constitution and the confirmation of national agrarian reform. He formed a final, short-lived government in June 1927.

Bratislava, German PRESSBURG, Hungarian POZSONY, city, capital of Západoslovenský *kraj* (region), Czechoslovakia, and capital of the Slovak Socialist Republic. It lies along the



Bratislava along the Danube River
John Lewis Stage—Photo Researchers/EB Inc.

Danube where that river has cut a gorge in the Little Carpathian Mountains near the meeting point of the frontiers of Czechoslovakia, Austria, and Hungary. Vienna is 35 miles (56 km) west.

Archaeological evidence suggests prehistoric habitation of the site, which was later fortified and settled by the Celts and Romans and finally in the 8th century was inhabited by the Slavs. The community developed as a trade centre and was granted the rights of a free royal town in 1291. The first university in what was then Hungary, the Academia Istropolitana, was founded there in 1467. Bratislava was the Hungarian capital from 1526 until 1784, and the Hungarian parliament continued to meet there until 1848. The Habsburg rulers were crowned kings of Hungary in the Gothic cathedral of St. Martin.

The city is dominated by its enormous castle standing on a plateau 300 feet (100 m) above the Danube. The castle was the residence of the Austrian royal family until destroyed by fire in 1811; it has since been largely restored. In 1741 Empress Maria Theresa of Austria fled to Bratislava when Vienna was threatened by French and Bavarian troops. The so-called Peace of Pressburg (1805) was signed by Napoleon and the Austrian emperor Francis II, after the Battle of Austerlitz, in the city's Baroque Archbishop's Palace. Following World War I, it was made the capital of Slovakia in the first Czechoslovakian Republic.

The modern city of Bratislava is a cultural centre and the seat of Comenius University (1919; successor to the medieval Academia Istropolitana), the Slovak Academy of Sciences (1953), several specialized schools and technical institutes, the Slovak National Theatre, and the Slovak National Gallery and Museum. An important road and rail junction and river port, Bratislava has diversified industries producing textiles, chemicals, and metal and electrical goods. Pop. (1986 est.) 417,103.

Bratsk, city, Irkutsk *oblast* (province), east-central Russian Soviet Federated Socialist Republic. It lies along the Angara River just below its confluence with the Oka. A fort was founded there in 1631, but the settlement remained unimportant until 1954, when the Tayshet–Lena railway through Bratsk was built and work started on the Bratsk hydroelectric station (completed in 1964), one of the world's largest. A huge aluminum works and a timber-processing plant were built to utilize the Bratsk Dam's power. Pop. (1987 est.) 249,000.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bratsk Dam, gravity earth-fill dam on the Angara River, U.S.S.R., completed in 1964. The dam is 410 feet (125 m) high, 14,488 feet (4,417 m) wide at the crest, and has a volume of 14,337,000 cubic yards (10,962,000 cubic m). It creates an unusually large reservoir of 137,227,000 acre-feet (169,270,000,000 cubic m) and has an electric power capacity of 4,500 megawatts. Concrete buttresses support a two-lane highway that runs across the downstream face of the dam's crest.

The dam was built under very difficult conditions. Siberian winter temperatures fall as low as −72° F (−58° C); there is frost 281 days per year. Bratsk is remote from materials, labour supplies, and construction facilities. It is the second of four power stations on the Angara River. The others are Irkutsk, Ust-Ilim, and Boguchany.

Brattain, Walter H(ouser) (b. Feb. 10, 1902, Amoy, China—d. Oct. 13, 1987, Seattle, Wash., U.S.), American scientist who, along with John Bardeen and William B. Shockley, won the Nobel Prize for Physics in 1956 for his investigation of the properties of semiconductors—materials of which transistors are made—and for the development of the transistor. The transistor replaced the

Brattain
By courtesy of Bell Laboratories, Murray Hill, N.J.

bulkier vacuum tube for many uses and was the forerunner of microminiature electronic parts.

In 1929 Brattain became a research physicist

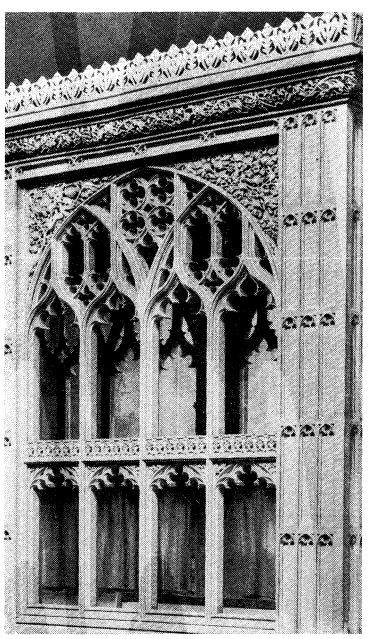
for Bell Telephone Laboratories. His chief field of research involved the surface properties of solids, particularly the atomic structure of a material at the surface, which usually differs from its atomic structure in the interior. He served as adjunct professor at Whitman College, Walla Walla, Wash. (1967–72), then was designated overseer emeritus. He was granted a number of patents and wrote many articles on solid-state physics.

Bratteli, Trygve (Martin) (b. Jan. 11, 1910, Nøtterøy, Nor.—d. Nov. 20, 1984, Oslo), politician, chairman of the Norwegian Labour Party (1965–75), and prime minister of Norway in 1971–72 and 1973–76.

Entering the Labour Party's youth organization in 1928, Bratteli became editor of the newspaper *Arbeiderungdommen* ("Labour Youth") in the 1930s and served as secretary of the organization until 1940 and as its chairman in 1945–46. From 1940 to 1942, during the early years of the German occupation of Norway in World War II, he participated in the Resistance. He was arrested and spent the rest of the war in German prisons and concentration camps.

After the war Bratteli continued to rise in the Labour Party, serving as vice chairman (1945–65) and as chairman after 1965. He was elected to the Storting (parliament) in 1950, and in 1951–55 and 1956–60 he was Norway's finance minister. He held the Ministry of Communications in 1960–64 and became prime minister in 1971 after having led the Labour parliamentary opposition since 1965. He resigned in 1972 when the proposal that Norway join the European Communities—a move he strongly supported—was defeated. He returned to power in 1973 but resigned his post on Jan. 9, 1976, though he remained a member of the Storting until 1981.

brattishing, also called CRESTING, decorative architectural repeat motif applied to the top of a wall, screen, or roof. Widely used during the Gothic period (the 12th through the 15th century), it was frequently found on the bres-



Brattishing from Abbot Bird's Chantry, Bath Abbey, Somerset, England, early 16th century

By courtesy of Maurice H. Ridgeway and the Courtauld Institute of Art, London; photograph, F.H. Crossley

summer, or superstructure, of a church and on the cornice of the church rood screen, a partition separating the east end of the nave from the chancel, or area around the altar.

Various ornamental designs have been used for brattishing. A continuous series of finials, for example, or small finishing spires, was often used; and the Tudor rose, as seen in the Henry VII Chapel (1503–19) at Westminster Abbey, was a favourite pattern in late medieval England.

Brattleboro, town (township), Windham County, southeastern Vermont, U.S. It is situated on the Connecticut River at the mouth of West River and is surrounded by the Green Mountains. The original settlement around Ft. Dummer (established in 1724) was chartered in 1753 and named for land speculator Col. William Brattle. The town includes Brattleboro Village and West Brattleboro.

The local economy is based on printing and the manufacture of paper and lumber products, optical goods, handbags, and footwear; agriculture (feed and grain); and resort activities in summer and winter. Brattleboro is the seat of the School for International Training, the Austine School for the Deaf, and the Brattleboro Retreat, one of the largest private psychiatric hospitals in the United States. The Holstein-Friesian (cattle) Association headquarters is there. Creamery Bridge, one of Vermont's best preserved covered bridges, is 2 mi (3 km) west. Rudyard Kipling, the English author, married Caroline Balestier of Brattleboro in 1892 and lived for several years at "Naulahka," an estate north of the town. Pop. (1982 est.) 11,950.

Bratton, Henry de: *see* Bracton, Henry de.

Brauchitsch, (Heinrich Alfred) Walther von (b. Oct. 4, 1881, Berlin—d. Oct. 18, 1948, Hamburg), German field marshal and army commander in chief during the first part of World War II, who was instrumental in planning and carrying out the campaigns against Poland (September 1939), The Netherlands, Belgium, France (May–June 1940), the Balkans (April–May 1941), and the Soviet Union (June–December 1941).

Commissioned to the Prussian guard in 1900, Brauchitsch was an officer on the general staff in World War I. As the advent of Hitler brought expansion of the army, he was chief of the East Prussian military district, commanded the 4th Army Group (1937), and, when Colonel General Werner Freiherr von Fritsch was forced to retire, succeeded him as head of the army in 1938. Hitler, however, was making most of the military decisions by the winter of 1941–42.

Brauchitsch successfully directed Germany's ground war until Hitler, after the army's near disaster before Moscow, blamed him and forced his resignation on Dec. 19, 1941. He survived the war but died before his trial by the Allies as a war criminal.

Braudel, (Paul Achille) Fernand (b. Aug. 24, 1902, Luméville, Meuse, Fr.—d. Nov. 28, 1985, Paris), French historian and educator who was one of the most important historiographers of the 20th century.

The son of a teacher, Braudel studied history in Paris at the Sorbonne and later taught that subject in Algiers from 1924 to 1932. He then taught history at secondary schools in Paris (1932–35) and at the University of São Paulo (1935–37), and in 1937 he joined the École Pratique des Hautes Études in Paris.

During the fall of France in 1940 Braudel was captured by the Germans while serving as a lieutenant in the French Army; he was held in a prisoner-of-war camp at Lübeck until 1945. While in captivity he wrote entirely from memory his thesis on the history of the Mediterranean region during the 16th century. In 1947 the Sorbonne awarded Braudel a doctorate for his thesis, which was published in 1949 in two volumes as *La Méditerranée et le monde méditerranéen à l'époque de Philippe II* (rev. ed. 1967; *The Mediterranean and the Mediterranean World in the Age of Philip II*). This work focuses on the conflict between the Spanish and Ottoman empires in the 16th century that culminated in the Mediterranean sea battle of Lepanto (1571). It is a comprehensive account of the Mediterranean region's geography, history, religion, agriculture, technology, and intellectual climate at the time. Braudel's classic work moves from the detailed analysis of long-term trends and changes and to the description of more transient historical events.

From 1956 to 1968 Braudel was editor of the influential historiographic journal *Annales: économies, sociétés, civilisations,* founded by the French scholars Lucien Febvre and Marc Bloch. The Annales school, of which these men and Braudel were the leaders, rejected established historians' emphasis on events of politics and diplomacy and examined instead the circumstances underlying such events—*e.g.,* climate, geography, demographics, and communications and transportation. In their close scrutiny of the details of trade and daily life in a given era, they also relied heavily on statistical analysis and quantification.

Braudel's second major work, the three-volume *Civilisation matérielle, économie et capitalisme, 15e–18e siècle* (vol. I, 1968; vols. II and III, 1979), was translated as *Civilization and Capitalism, 15th–18th Century.* The titles of the three individual volumes are *Les Structures du quotidien* (*The Structures of Everyday Life*), *Les Jeux de l'échange* (*The Wheels of Commerce*), and *Le Temps du monde* (*The Perspective of the World*). The work is a study of the social and economic history of the world from the Middle Ages to the Industrial Revolution. Once again Braudel presents the full range of human experiences, activities, and events in an attempt to explain why it was Western Europe that became the site of the Industrial Revolution.

Braudel returned to the École Pratique des Hautes Études after World War II and served as president of the school's prestigious Sixth Section (social sciences) from 1956 to 1972. He was also a professor in the Collège de France from 1949 and was elected to the Académie Française in 1984.

Brauer, Richard Dagobert (b. Feb. 10, 1901, Berlin—d. April 17, 1977, Belmont, Mass., U.S.), mathematician and educator, a pioneer in the development of algebra theory.

Brauer graduated from the University of Königsberg and received his Ph.D. in 1925 from the University of Berlin under Issai Schur. He accepted a teaching position at Königsberg and remained until 1933, when he left to work with Hermann Weyl on a classical exposition of spinors. The work of Brauer and Weyl later had a bearing on Nobel laureate A.M. Dirac's theory of the spinning electron. Brauer then became interested in the work of Georg Frobenius, who had introduced group characters in 1896. Brauer carried forward Frobenius' work and developed a theory of modular characters that gave new insights into the study of group characters and advanced the development of algebra.

In 1935 he accepted a position at the University of Toronto and remained there until 1948, when he left to join the faculty at the University of Michigan. He became a professor in Harvard University's mathematics department in 1952 and remained there until his retirement in 1971. He was chairman of the department from 1959 to 1963. In the late 1950s he began formulating a method for classifying finite simple groups, a task that absorbed his attention for the rest of his life. In 1971 Brauer was awarded the National Medal of Science.

Braun, Alexander Carl Heinrich (b. May 10, 1805, Regensburg, Bavaria—d. March 29, 1877, Berlin), chief botanist of the "nature philosophy" school, a doctrine attempting to

explain natural phenomena in terms of the speculative theories that dominated early 19th-century German science.

Despite his lifelong adherence to vitalistic principles, Braun added important qualifications to the cell theory—*i.e.*, the concept of the cell as the basic unit of life. He also did much to elucidate the sex cycles of primitive plants. Collaborating with the German biologist Karl Schimper, he attempted to establish an idealized plant model based on their observation that the arrangement of leaves on the plant stem (phyllotaxy) in many cases describes a spiral pattern according to fixed geometric rules.

Braun taught botany and zoology at the Karlsruhe polytechnic school (1833–46) and was professor of botany at the University of Freiburg, Breisgau (1846–50), before holding the same position and serving as director of the botanical garden at the University of Berlin (1851–77). He devoted much of his career to the study of cryptogams (non-seed-bearing plants), which led him to his theoretical system of plant structure expounded

Alexander Braun, engraving by Weger, *c.* 1875
Archiv fur Kunst und Geschichte, West Berlin

in *Betrachtungen über die Erscheinung der Verjüngung in der Natur* . . . (1851; "Observations on the Appearance of Rejuvenation in Nature . . ."). While he argued against the inductive reasoning characteristic of empirical research, his work encouraged the systematic study of plant morphology; his recognition of the basic unity of organisms in form and function by defining the cell in terms of cytoplasm enveloped by a flexible membrane constitutes perhaps his most important contribution.

Braun, Eva (b. Feb. 6, 1912, Munich, Ger.—d. April 30, 1945, Berlin), mistress and later wife of Adolf Hitler.

She was born into a lower middle-class Bavarian family and was educated at the Catholic Young Women's Institute in Simbach-am-Inn. In 1930 she was employed as a saleswoman in the shop of Heinrich Hoffman, Hitler's photographer, and in this way met Hitler. She became his mistress and lived in a house that he provided in Munich; in 1936 she went to live at his chalet Berghof in Berchtesgaden.

There is no evidence that the relationship between Hitler and Eva Braun was other than a normal one, except that the pleasures that she provided him were those of domesticity and relaxation rather than eroticism. She was an accomplished swimmer and skier, but her interests were generally frivolous. Hitler never allowed her to be seen in public with him or to accompany him to Berlin, and she had no influence on his political life.

In April 1945 she joined Hitler in Berlin, against his orders, determined to stay with him until the end. In recognition of her loyalty he decided to marry her, and the civil ceremony was carried out in the Chancellery

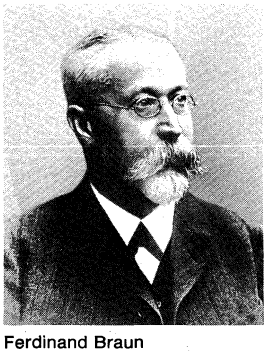
Eva Braun, 1944
Heinrich Hoffmann, Munich

bunker on April 29. The next day Eva Hitler ended her life by taking poison; her husband either poisoned or shot himself at her side. Their bodies were burned.

Braun, (Karl) Ferdinand (b. June 6, 1850, Fulda, Hesse-Kassel—d. April 20, 1918, Brooklyn N.Y., U.S.), German physicist who shared the Nobel Prize for Physics in 1909 with Guglielmo Marconi for the development of wireless telegraphy.

Braun received his Ph.D. from the University of Berlin in 1872. After appointments at Würzburg, Leipzig, Marburg, Karlsruhe, and Tübingen, he became director of the Physical Institute and professor of physics at the University of Strasbourg in 1895.

Braun was recognized by the Nobel committee for his improvement of Marconi's transmitting system. In early wireless transmission, the antenna was directly in the power circuit and broadcasting was limited to a range of about 15 kilometres. Braun solved this problem by producing a sparkless antenna circuit (patented in 1899) that linked transmitter power to the antenna circuit inductively. This invention greatly increased the broadcasting range of a transmitter and has been applied to radar, radio, and television. Braun's discovery



Ferdinand Braun
Historia-Photo

of crystalline materials that act as rectifiers, allowing current to flow in one direction only, led to the development of crystal radio receivers.

Braun is also known as the developer of the cathode-ray tube. He demonstrated the first oscilloscope (Braun tube) in 1897, after work on high-frequency alternating currents. Cathode-ray tubes had previously been characterized by uncontrolled rays; Braun succeeded in producing a narrow stream of electrons, guided by means of alternating voltage, that could trace patterns on a fluorescent screen. This invention, the forerunner of the television tube and radarscope, also became an important laboratory research instrument.

Braun traveled to New York City in 1915 to testify in a radio-related patent case. He was detained there because of his German citizenship when the U.S. entered World War I in 1917; he died before the war ended.

Braun, Lily, *née* VON KRETSCHMAN (b. July 2, 1865, Halberstadt, Prussia—d. Aug. 9, 1916, Zehlendorf, Ger.), leading German feminist and Socialist writer.

Passionate and enthusiastic, Lily was converted to atheism, pacifism, and feminism by Georg von Gizycki, whom she married in 1893. After his death (1895) she joined the Social Democratic Party. Never a conformist, she was criticized by orthodox Social Democrats and eventually left the party. She collaborated with her second husband, Heinrich Braun (married 1896), in publishing a weekly periodical, *Die neue Gesellschaft* ("The New Society"), and she and Minna Cauer founded the feminist newspaper *Die Frauenbewegung* ("The Women's Movement").

Perhaps her most important book was *Die Frauenfrage, ihre geschichtliche Entwicklung und wirtschaftliche Seite* (1901; "The Women's Question, Its Historical Development and Its Economic Aspect"), in which she argued that capitalism, by employing women in industry, destroyed the family and thus made Socialism inevitable.

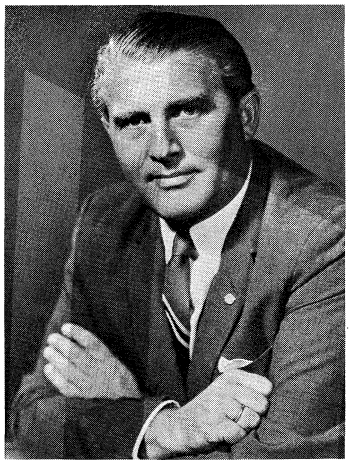
Braun, Otto (b. Jan. 28, 1872, Königsberg, Ger.—d. Dec. 14, 1955, Lugano, Switz.), German politician and leading member of the Social Democratic Party who was longtime prime minister of the provincial government of Prussia (1920–32).

A leader of the Königsberg Social Democrats, Braun became a member of the national party executive in 1911. Two years later he was elected to the Prussian lower house and, after World War I, to the Weimar constituent assembly (1919) and the Reichstag (parliament). His major political role, however, was realized in the government of Prussia, in which he served from 1920 to 1932—with brief interruptions in 1921 and 1925—as prime minister. His administration provided a strong democratic buttress for the government of the Weimar Republic, and, during the late 1920s and early 1930s, a last outpost for the beleaguered German Social Democrats. In July 1932 he and his ministerial colleagues were evicted from office by the German chancellor, Franz von Papen, but Braun still retained a shadowy advisory position in the Prussian government until he emigrated to Switzerland shortly after the Nazi accession to power in January 1933.

Braun, Wernher von (b. March 23, 1912, Wirsitz, Ger.—d. June 16, 1977, Alexandria, Va., U.S.), German engineer who played a prominent role in all aspects of rocketry and space exploration, first in Germany and, after World War II, in the United States.

Early life. Braun was born into a prosperous aristocratic family. His mother encouraged young Wernher's curiosity by giving him a telescope upon his confirmation in the Lutheran church. Braun's early interest in astronomy and the realm of space never left him thereafter. In 1920 his family moved to the seat of government in Berlin. He did not do well in school, particularly in physics and mathematics. A turning point in his life occurred in 1925 when he acquired a copy of *Die Rakete zu den Planetenräumen* ("The Rocket into Interplanetary Space") by a rocket pioneer, Hermann Oberth. Frustrated by his inability to understand the mathematics, he applied himself at school until he led his class.

In the spring of 1930, while enrolled in the Berlin Institute of Technology, Braun joined the German Society for Space Travel. In his spare time he assisted Oberth in liquid-fueled rocket motor tests. In 1932 he was graduated from the Technical Institute with a B.S. degree



Wernher von Braun, 1962
By courtesy of NASA; photograph, © Fabian Bachrach

in mechanical engineering and entered Berlin University.

By the fall of 1932 the rocket society was experiencing grave financial difficulties. At that time Capt. Walter R. Dornberger (later major general) was in charge of solid-fuel rocket research and development in the Ordnance Department of Germany's 100,000-man armed forces, the Reichswehr. He recognized the military potential of liquid-fueled rockets and the ability of Braun. Dornberger arranged a research grant from the Ordnance Department for Braun, who then did research at a small development station that was set up adjacent to Dornberger's existing solid-fuel rocket test facility at the Kummersdorf Army Proving Grounds near Berlin. Two years later Braun received a Ph.D. in physics from the University of Berlin. His thesis, which, for reasons of military security, bore the nondescript title "About Combustion Tests," contained the theoretical investigation and developmental experiments on 300- and 660-pound-thrust rocket engines.

By December 1934 Braun's group, which then included one additional engineer and three mechanics, had successfully launched two rockets that rose vertically to more than 1.5 miles (2.4 kilometres). But by this time there was no longer a German rocket society; rocket tests had been forbidden by decree, and the only way open to such research was through the military forces.

Since the test grounds near Berlin had become too small, a large military development facility was erected at the village of Peenemünde in northwestern Germany on the Baltic Sea, with Dornberger as the military commander and Braun as the technical director. Liquid-fueled rocket aircraft and jet-assisted takeoffs were successfully demonstrated, and the long-range ballistic missile A-4 and the supersonic anti-aircraft missile Wasserfall were developed. The A-4 was designated by the Propaganda Ministry as V-2, meaning Vengeance Weapon 2. By 1944 the level of technology of the rockets and missiles being tested at Peenemünde was many years ahead of that available in any other country.

Work in the United States. Braun always recognized the value of the work of U.S. rocket pioneer Robert H. Goddard. "Until 1936," said Braun, "Goddard was ahead of us all." At the end of World War II, Braun, his younger brother Magnus, Dornberger, and the entire German rocket development team surrendered to U.S. troops. Within a few months Braun and about 100 members of his group were at the U.S. Army Ordnance Corps test site at White Sands, N.M., where they tested, assembled, and supervised the launching of captured V-2s for high-altitude research purposes. Developmental studies were made of advanced ramjet and rocket missiles. At the end of the war the United States had entered the field of guided missiles with practically no previous experience. The technical competence of Braun's group was outstanding. "After all," he said, "if we are good, it's because we've had 15 more years of experience in making mistakes and learning from them!"

Moving to Huntsville, Ala., in 1952, Braun became technical director (later chief) of the U.S. Army ballistic-weapon program. Under his leadership, the Redstone, Jupiter-C, Juno, and Pershing missiles were developed. In 1955 he became a U.S. citizen and, characteristically, accepted citizenship wholeheartedly. During the 1950s Braun became a national and international focal point for the promotion of space flight. He was the author or coauthor of popular articles and books and made addresses on the subject.

In 1954 a secret army–navy project to launch an Earth satellite, Project Orbiter, was thwarted. The situation was changed by the launching of Sputnik 1 by the Soviet Union on Oct. 4, 1957, followed by Sputnik 2 on November 3. Given leave to proceed on November 8, Braun and his army group launched the first U.S. satellite, Explorer 1, on Jan. 31, 1958.

After the National Aeronautics and Space Administration (NASA) was formed to carry out the U.S. space program, Braun and his organization were transferred from the army to that agency. As director of the NASA George C. Marshall Space Flight Center in Huntsville, Braun led the development of the large space launch vehicles, Saturn I, IB, and V. The engineering success of each of the Saturn class of space boosters, which contained millions of individual parts, remains unparalleled in rocket history. Each was launched successfully and on time and met safe performance requirements.

In March 1970 Braun was transferred to NASA headquarters in Washington as deputy associate administrator for planning. He resigned from the agency in 1972 to become vice president at Fairchild Industries Inc., an aerospace company. In 1975 he founded the National Space Institute, a private organization whose objective was to gain public support and understanding of space activities.

In attempting to justify his involvement in the development of the German V-2 rocket, Braun stated that patriotic motives outweighed whatever qualms he had about the moral implications of his nation's policies under Hitler. He also emphasized the innate impartiality of scientific research, which in itself has no moral dimensions until its products are put to use by the larger society. During his later career Braun received numerous high awards from U.S. government agencies and from professional societies in the United States and other countries.

BIBLIOGRAPHY. *Books by Braun. Das Marsprojekt* (1952; *The Mars Project*), a technical treatise on an expedition of 10 spacecraft with 70 men to Mars; *Space Frontier,* rev. ed. (1971), an easily understandable discussion of the fundamental principles of rocketry and space flight.

Books by Braun and others. Across the Space Frontier (1952), *Conquest of the Moon* (1953), and *Exploration of Mars* (1956), a series of three popular books describing concepts for the exploration of space; *History of Rocketry and Space Travel,* rev. ed. (1969), an excellent history and reference work, profusely illustrated; *Moon* (1970), a tribute to the Apollo 11 lunar landing, including a history of man's study of the Moon.

Biographies. Erik Bergaust, *Reaching for the Stars* (1960), a definitive and authoritative biography.

Braunau, also called BRAUNAU AM INN, town, *Bundesland* Oberösterreich (federal province of Upper Austria), northern Austria, on the Inn River, opposite the Bavarian town of Simbach and north of Salzburg. The name is derived from *Brunnenau,* meaning a "place with many springs." Originally a possession of the dukes of Bavaria, it was chartered in 1260; it was strongly fortified in 1672–76. In 1779 it passed with the Innviertel (Inn District) to Austria. Braunau was the birthplace of Adolf Hitler, who was born (1889) in the former Gasthaus Pommer. The town has many 16th- to 17th-century houses and two Gothic churches—St. Stephan (1439–92) and the Spitalkirche (1417–30). Austria's largest aluminum plant is in the suburb of Ranshofen, and Braunau manufactures scales, fire extinguishers, and wood products. Pop. (1981) 16,318.

Braunschweig, English BRUNSWICK, *Regierungsbezirk* (administrative district), southeastern Niedersachsen *Land* (Lower Saxony state), northeastern West Germany. Braunschweig is bordered by East Germany to the east, Hessen (Hesse) *Land* to the south, and the *Regierungsbezirke* of Hannover (Hanover) to the west and Lüneberg to the northwest. The district occupies an area of 3,125 sq mi (8,093 sq km) and is coextensive with portions of the former German state of Hanover and the larger historic region of Saxony. Its present boundaries were created by an administrative reorganization in 1977 merging the former territories of Braunschweig *Verwaltungsbezirk,* southeastern Hildesheim *Regierungsbezirk,* and a small part of Lüneberg *Regierungsbezirk.* Braunschweig *Regierungsbezirk* takes its name from that of the largest city and administrative seat of the district.

Geography. The Harz mountain range thrusts into central Braunschweig from the northern edge of the Central German Uplands in East Germany. The northwestern and higher part of this slate-and-granite highland, the Oberharz (Upper Harz), lies largely within the district. Streams draining the Oberharz have cut narrow, steep-sided valleys, many of which are dammed to supply water to the North German Plain. The steep relief and a raw, damp climate have preserved the dense spruce and fir forests from the spread of agriculture dominant in the Unterharz (Lower Harz) in East Germany. Braunschweig's economy, rather, is based on forestry, light industries, and tourism. Once feared by plainsmen as a haven for witches, the Oberharz now attracts many vacationers to its scenic health spas, summer resorts, and winter sports centres; among the most famous are Bad Harzburg, Hahnenklee, and Braunlage. Goslar, a picturesque old-world imperial city, is situated on the northern fringe of the range. The Oberharz is surrounded by the Lower Saxon Hills on the north, west, and southwest. The horizontally bedded sandstone and limestone rocks of the southern plateaus are crossed from south to north by the wide routeway of the Leine River and the narrow, winding valley of the Weser. Göttingen, an important cultural centre, sits in the rich loess-filled agricultural valley of the Leine. Precision engineering and optical and electrical industries have developed in the outer districts of Göttingen. The Leinebergland (Leine Hills), a part of the Lower Saxon Hills largely devoted to agriculture, extends westward from the Harz into Hannover where it merges with the Weserbergland (Weser Hills). The escarpments of the Leinebergland also continue north but become increasingly wide-spaced between stretches of fertile loess-covered plain in the North Harz Foreland. The foreland forms one of West Germany's principal areas for the production of sugar beets; the beet scraps help support a large stall-fed cattle industry. Large wheat and vegetable crops are also grown there. The district's major industrial cities—Braunschweig, Salzgitter, and Wolfsburg—are located on the foreland along the Mittelland-Kanal; motor

vehicles are a chief product. Iron-ore deposits are mined near Salzgitter and Peine, and oil fields of the southwestern Lüneburger Heide (Luneburg Heath) are exploited in northern Braunschweig.

Population densities in the district range from fewer than 50 persons per sq mi (20 per sq km) in the Oberharz, to densities averaging more than 1,300 persons per sq mi (500 per sq km) in areas of the North Harz Foreland. The inhabitants are descended from the Upper and Lower Saxons, Franks, and Thuringians. The boundary line between the use of High and Low German dialects passes through the Harz mountains. More than three-quarters of the people are Protestants. The predominant rural settlement pattern is one of irregular, compact villages; few dispersed farms exist. Linear one-street villages are common in the narrow valleys of the Harz. Regional farmhouses are patterned after the Franconian half-timbered houses, utilizing local forest resources. Higher education in the district is centred at universities in Göttingen, Braunschweig, and Clausthal-Zellerfeld.

History. A possession of the Welf family, the duchy of Braunschweig (Brunswick-Lüneburg) was established in the area between the lower Elbe and Weser rivers by the emperor Frederick II in 1235 and given to Otto, grandson of the Welf family's founder, Henry the Lion. Beginning in the late 13th century it was partitioned among several different branches of the family. In subsequent centuries there were numerous divisions, amalgamations, and redivisions. One of the Welf lines, the House of Calenberg-Göttingen (Hanover), became dominant in the 17th century because of its marriage connections with the English royal family and succeeded to the throne of Great Britain and Ireland in 1714 as the House of Hanover. (*See* Hanover.)

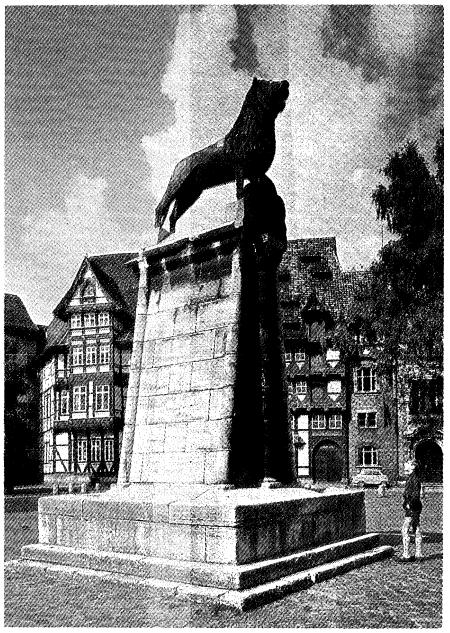
The constant partitions of the Braunschweig territories, however, and the quarrels of its separate lines of princes prevented Braunschweig from playing a great part in German politics; after the Peace of Westphalia in 1648 Braunschweig began to be wholly overshadowed by the power of Brandenburg and its successor Prussia. After 1806 Braunschweig was included by Napoleon in the Kingdom of Westphalia, but in 1814 it was restored to its legitimate ruler, Duke Frederick William, who fell at Quatre Bras in 1815. During the minority of his son Charles II, the duchy was ruled by George, prince regent of Great Britain. On coming of age, Duke Charles made himself very unpopular and, during the revolutionary upheaval of 1830, was forced to leave the country permanently. His brother William, who was formally proclaimed his successor in 1831, proved an able and popular ruler.

After 1866 the question of the succession became acute. William was unmarried and the next heir was the former king George of Hanover (Hannover), whose territories had been annexed to Prussia. The attitude of Prussia being prohibitive, Duke William, with the consent of the Braunschweig parliament, arranged in 1879 for a council of regency to take over the government on his death and, in the event of the heir being unable to succeed, to appoint a regent. On William's death (Oct. 18, 1884), Ernest, duke of Cumberland, son of George V of Hanover, claimed the succession; but since he had not formally renounced his claim to Hanover, the federal council declared that his accession would endanger the peace of the empire, and the council of regency therefore ignored his claim and elected Prince Albert of Prussia regent.

After his death, in 1906, the Braunschweig diet elected Duke John Albert of Mecklenburg-Schwerin regent (May 1907). The question was settled in 1913, when Prince Ernest Augustus of Cumberland, after renouncing his claim to Hanover, was recognized as duke of Braunschweig and married (May 24) to the princess Victoria Louise, only daughter of the German emperor William II. After 1919 the duchy became a separate state of the Weimar Republic.

During the Nazi era, Braunschweig was considerably reduced in area. In 1945, under the British military government, the major part of Braunschweig was reconstituted as a state; but in November 1946 it was incorporated into the new *Land* (state) of Niedersachsen. Pop. (1983 est.) 1,625,491.

Braunschweig, English BRUNSWICK, city, Niedersachsen *Land* (Lower Saxony state), northeastern West Germany, on the Oker River, 25 mi (40 km) west of the East German border. Legend says that it was founded *c.* 861 by Bruno, son of Duke Ludolf of Saxony, but it probably originated at a much later date. It was chartered and improved by Henry the Lion, duke of Saxony, in the 12th century and became a leading member of the Hanseatic League in the 13th century; it later declined



Bronze Lion Monument on the Burgplatz, in Braunschweig, W.Ger.
H. Krause-Willemberg—ZEFA

as a result of civil and external discords. An early supporter of the Reformed faith, Braunschweig belonged to the Protestant League of Schmalkalden. It was capital of the duchy of Brunswick before 1918 and of the *Land* of the same name until incorporated into the new *Land* of Niedersachsen in 1945. Captured by Allied forces in 1945 after suffering heavy damage, it has been rebuilt. Surviving medieval buildings include the 12th-century Romanesque Cathedral of St. Blasius, which contains the tombs of the founder, Henry the Lion, and his English consort, Matilda; in the vault are the tombs of the Guelf rulers of the Brunswick line from 1681. Other surviving medieval churches include St. Martin's, St. Katherine's, St. Andreas', and St. Aegidien's. The Burg Dankwarderode, a castle containing the Treasure of the Guelfs, dates from the 12th century; on the castle square (Burgplatz) is the bronze Lion Monument (Löwendenkmal), emblem of Braunschweig, carved in 1166 as a symbol of Henry the Lion. Also notable are the old town hall (14th–15th century), the Renaissance Cloth Merchants' Hall (Gewandhaus), and the Richmond Palace, built in 1768–69 by Prince Charles William Ferdinand, son of Charles I of Brunswick.

The city is internationally renowned for scientific research. The Technische Universität Carolo Wilhelmina Zu Braunschweig, the oldest technical university in Germany, was founded as the Collegium Carolinum in 1745. There are also federal institutes for physics and technology, biology, agriculture and forestry, and aeronautical research. The Herzog Anton Ulrich Museum and the municipal museum have fine art collections, and there is also a museum of natural history.

The city is a rail junction with an airport, and its chief industry is metalworking. Machinery, motor vehicles, office and calculating machines, and pianos are manufactured here; publishing and, most recently, electronics are also important. Braunschweig is a leading German sugar market and is famous for its sausages, asparagus, and gingerbread. Pop. (1983 est.) 257,780.

Brauwer, Adriaen (Flemish painter): *see* Brouwer, Adriaen.

Brava Island, Portuguese ILHA BRAVA, southernmost island of Cape Verde, located in the Atlantic Ocean, about 400 mi (640 km) off the West African coast. It has an area of 26 sq mi (67 sq km) and rises to Monte Fontainhas (3,201 ft [976 m]). The main economic activities are fishing and some agriculture. Vila de Nova Sintra, near the centre of the island, is the chief town. Pop. (1980 prelim.) 6,984.

Bravais, Auguste (b. Aug. 23, 1811, Annonay, Fr.—d. March 30, 1863, Le Chesnay), French physicist best remembered for his work on the lattice theory of crystals; Bravais lattices are named for him.

Bravais completed his classical education at the Collège Stanislas, Paris, and received his doctorate from Lyon in 1837. His interest in exploration prompted him to join the Navy, and he began teaching astronomy at the Faculté des Sciences at Lyon in 1841. In 1844 he was elected to the Académie Royal des Sciences, Belles-Lettres et Arts de Lyon. In 1845 he was appointed professor of physics at the École Polytechnique, Paris, and in 1854 was admitted to the geography and navigation section of the Académie des Sciences, Paris.

Bravais was responsible for the revival of interest in the study of the external forms of crystals and their internal structures. After intensive study of lattice properties, he derived in 1848 the 14 possible arrangements of points in space. In *Études cristallographiques* (1866) he exhaustively analyzed the geometry of molecular polyhedra.

Numerous other books and articles reflected Bravais's ceaseless curiosity that resulted in comprehensive studies of such diverse subjects as terrestrial magnetism, the northern lights, meteorology, botanical geography, astronomy, and hydrography.

Bravais lattice, any of 14 possible three-dimensional configurations of points used to describe the orderly arrangement of atoms in a crystal. Each point represents one or more atoms in the actual crystal, and if the points are connected by lines, a crystal lattice is formed; the lattice is divided into a number of identical blocks, or unit cells, characteristic of the Bravais lattices. The French scientist Auguste Bravais demonstrated in 1850 that only these 14 types of unit cells are compatible with the orderly arrangements of atoms found in crystals.

The lattices listed by Bravais are divided into six or seven major crystal symmetry systems. All crystallographers recognize the isometric, orthorhombic, monoclinic, tetragonal, triclinic, and hexagonal systems (*qq.v.*); some, however, define the hexagonal system so as to include the trigonal or rhombohedral system, which is considered a seventh system by others.

Bravo, Nicolás (b. *c.* 1786, Chilpancingo, Mex.—d. 1854, Chilpancingo), soldier and

statesman, one of the founders of republican Mexico, serving as its president or acting president at various times.

Bravo and his family joined the peasant leader José María Morelos y Pavón and his band in 1811 and thus became one of the first of the wealthy Creole (of Spanish origin) families to support the war against Spain. In this way they helped to turn what had been considered a peasant rebellion into a full-scale revolution. Bravo commanded the Mexican forces during the War of Independence against Spain (1810–21). He then joined the first independent government of Mexico, that of Agustín de Iturbide (1821–23), as a member of the executive group that founded the Republic of the United Mexican States (1823). Bravo served as a vice president of the Republic (1824–27) and as president for a time during the 1830s. During Mexico's war with the United States (1846–48) he also was at times acting president, as well as commander of the departments of Puebla, Veracruz, Oaxaca, and Tabasco. He was in command of the fortress of Chapultepec outside Mexico City when it was captured by U.S. forces in 1847.

Bravo, portrait by an unknown artist

By courtesy of the Library of Congress, Washington, D.C.

Bray, town ("parish"), Windsor and Maidenhead district, county of Berkshire, England, on the River Thames. "The Vicar of Bray," a well-known English ballad of unknown authorship, tells how the vicar of the community retained his ecclesiastical living by changing creed according to necessity from the time of Charles II until the accession of George I. The modern village is residential in character. Pop. (1981) 9,427.

Bray, Irish BRÉ, urban district and resort on the Irish Sea coast of County Wicklow, Ireland. The town developed during the 19th century; it has a long beach and esplanade, which terminate southward in Bray Head, a quartzite peak of 653 feet (199 m). It is an important tourist centre, both as a resort and as a centre for touring the scenic areas of County Wicklow. The remains of Ballyman church, rebuilt in the 12th and 13th centuries, are nearby in the Bray river valley. The area has electronics and engineering industries. Pop. (1981) 22,853.

Bray, Thomas (b. 1656, Marton, Shropshire, Eng.—d. Feb. 15, 1730, London), Anglican clergyman, promoter of the Church of England in the American colonies, who was known as a religious progressive and reformer.

A country rector, Bray was chosen in 1696 by the bishop of London to provide ecclesiastical assistance in the Maryland colony, where he lived for several months in 1700, but he worked for the most part in England and corresponded with the colony.

He recruited missionaries for Maryland and other colonies and established colonial libraries. Originally designed to be used by Anglican clergy, these libraries expanded in scope and patronage, and by 1699 there were 30 in the colonies. To support the libraries, Bray organized the Society for Promoting Christian Knowledge (1698/99); he also helped establish the Society for the Propagation of the Gospel in Foreign Parts (1701), the Trustees of Parochial Libraries (1710), and the still-active Associates of Dr. Bray (1723, dedicated to converting blacks and Indians to the Christian faith).

Braz, Anatole le: *see* Le Braz, Anatole.

Brazdžionis, Bernardas, pseudonym VYTE NEMUNELIS (b. Feb. 2, 1907, Stebeikėliai, Lithuania, Russian Empire), leading Lithuanian poet, editor, critic, and—under his pseudonym—author of popular children's books.

Brazdžionis studied Lithuanian language and literature at the University of Kaunas (1929–34) and showed originality with his third collection of verse, *Amžinas žydas* (1931; "The Eternal Jew"); his first two collections were written while he was still in high school. He taught Lithuanian, worked for a book publisher, and in 1940 was appointed director of the Maironis Museum of Literature, Kaunas. Near the end of World War II, with Soviet occupation imminent, he left Lithuania (1944) for Germany. In 1949 he moved to the United States and settled in Boston, where he worked as the editor of world literature for *Lietuvių enciklopedija* ("Lithuanian Encyclopaedia"). Six years later he became editor of the Lithuanian cultural magazine *Lietuvių dienos* ("Lithuanian Days"), published in Los Angeles.

A poet of great range, Brazdžionis moves surely from Romanticism to Realism, from local themes to universal ones; at times he is lyrical and serene, at others dramatic and stormy. Although his style is largely traditional, his poetry departs from that mold in his use of language: word order is broken up, words and sounds repeated. At the centre of his poetry lies his faith in God and in his providence. Brazdžionis' earlier religious poetry, written in Lithuania, has biblical themes and is marked by his use of liturgical language. After Lithuania lost its independence during World War II, patriotic and humanistic themes became dominant in his poetry.

Brazdžionis' verse for children is among the best and most popular in Lithuanian literature. He also edited several anthologies of Lithuanian literature.

Brazil, officially FEDERATIVE REPUBLIC OF BRAZIL, Portuguese REPÚBLICA FEDERATIVA DO BRASIL, country of South America, cover-

Brazil

ing an area of 3,286,487 square miles (8,511,965 square km), nearly half of the continent's total land area. The capital is Brasília. Brazil borders every country in South America except Ecuador and Chile, specifically, Uruguay on the south; Argentina, Paraguay, and Bolivia on the southwest; Peru on the west; Colombia on the northwest; and Venezuela, Guyana, Suriname, and French Guiana on the north. Brazil's entire easterly boundary is more than 4,600 miles (7,400 km) of South America's Atlantic coastline. The population in 1988 was estimated at 144,262,000.

A brief treatment of Brazil follows. For full treatment, *see* MACROPAEDIA: Brazil.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Brazil may be divided physiographically into numerous upland and lowland regions, but the Amazon River Basin in the north and the Brazilian Highlands, or Plateau, in the south so dominate the landscape that all other important areas are defined by their relationship to these two features. The Brazilian Highlands, a plateau ranging generally between 1,000 and 3,000 feet (300 to 900 m) above sea level, contains some rugged mountains—a few of which rise to more than 9,000 feet (2,700 m)—primarily in the southeast. The Brazilian Highlands themselves are bordered by the Rio de la Plata Basin (which is mostly located in Uruguay and Argentina) in the south; by the narrow coastal lowlands set off by the Serra do Mar, which is part of the Great Escarpment, to the east (where the Highlands often drop more than 2,500 feet [760 m] to sea level in a single steep slope); and on the north by the Amazon Basin, which lies generally at elevations less than 800 feet (250 m) above sea level.

The Amazon River with its more than 1,000 known tributaries constitutes the largest river basin in the world—more than 2,700,000 square miles (6,990,000 square km). About two-thirds of the Amazon Basin lies in northern Brazil and comprises about 45 percent of the nation's total territory. The river, which is navigable for nearly its entire 4,000-mile (6,400-kilometre) length, is a major transportation artery. Its gentle gradient, however, prevents its widespread use for hydroelectricity or for irrigation. The rapid increase in the irrigated agricultural area of Brazil during the 1970s occurred, for the most part, south of the Amazon in the country's other major river basins: those of the São Francisco and the Plata. Most of Brazil's hydroelectric capacity is provided by dams along the Paraná River in the Plata Basin (including Itaipu dam, with the world's largest hydroelectric power station, inaugurated in 1982).

Brazil's climate varies little within the Amazon Basin, with annual average temperatures of about 79° F (26° C). Most locations in the basin receive between 80 and 120 inches (2,000 and 3,000 mm) of rainfall annually, with some locations averaging as much as 200 inches (5,000 mm). Most of the rest of the country has adequate precipitation with the exception of the semiarid São Francisco Basin in the northeast, which averages only 25 inches (600 mm) annually (and often receives less than 10 inches [250 mm]). The southeastern coastal plain has a hot, moist climate similar to that of the Amazon Basin.

Only about 9 percent of Brazil's land area is considered arable, whereas two-thirds of the country is forested. The greater part of the arable land is in the Plata Basin and along the coastal areas. Brazil has a rich and varied tropical vegetation system that includes the immense tropical evergreen and rain forests in the Amazon Basin, as well as much smaller forests along the narrow southeastern coastline. There are tall grass prairies, remnants of larger grasslands, in the state of Rio Grande do Sul; in the drier northeast is a thorny deciduous scrub woodland known as *caatinga.*

Just west of the narrow coastal rain forests, at the highest elevations of the Brazilian Highlands, there are semideciduous forests, and the greater part of the interior highlands is a mixture of scrubby deciduous woodland and savanna. The less populous northern areas still abound in wildlife, with a variety of plant species unequaled on earth flourishing in the rain forests of the Amazon Basin.

Brazil is well-endowed with reserves of metals; it has the third largest reserves of bauxite in the world, the largest reserves of columbium, one of the largest of beryllium, high-grade iron ore, gold, and some of the world's largest reserves of manganese and tin. Brazil is one of the largest petroleum producers in Latin America; its oil and natural-gas reserves have become substantial with the development of offshore fields.

The people. Brazil has the largest population of any Latin-American state, and although its population has increased very rapidly, trebling in the period from 1940 to 1981, the country's mean population density remains relatively low. Its several different ethnic groups have intermixed progressively from the earliest days of its colonial history, when the Portuguese mixed with the Indians and with the Africans brought to work the plantations and mines. Unmixed ethnic elements are rare. Blacks are more numerous in Bahia, Rio de Janeiro, Maranhão, and Minas Gerais states. The south, on the other hand, has acquired almost all recent immigrants and is predominantly white. The areas primarily populated by Indians are restricted to the most remote, economically unattractive parts of the Amazon Basin.

Most Brazilians speak a Portuguese that has been somewhat transformed and enriched by Indian and African influences. Nearly all Brazilians profess the Roman Catholic religion; this means Brazil possesses the largest Roman Catholic population of any nation in the world. Neither the Indians nor the Africans, however, have completely abandoned their earlier forms of worship or their traditional beliefs, and Christian beliefs tempered with rites of African origin are the basis of popular cults.

The Brazilian population is characterized by its rapid growth, its youth, its diverse origins and its geographic mobility. The birth rate remains relatively high. A family-planning program has been developed to provide maternal and child health information and services for the population. The death rate has been progressively reduced. The youthfulness of the population (about half is less than 20 years of age) contributes directly to the high birth rate. There has been a substantial migration from rural areas to the cities, and the rapidly growing urban population now constitutes three-fourths of the total population.

The economy. Brazil has a developing market economy, based principally upon manufacturing, trade, agriculture, and financial services. The gross national product (GNP) per capita, which is growing more rapidly than the population, is about average for South American countries.

Agriculture accounts for about one-tenth of the GNP and employs somewhat less than one-third of the labour force. Cereals, mainly corn (maize), rice, and wheat, are the principal crop, occupying almost one-third of the arable land. Brazil is the world's leading producer of coffee, sugarcane, and cassava. It also ranks among the world's leading producers of soybeans, bananas, papayas, oranges, cocoa beans, tangerines and mandarin oranges, and avocados. Livestock raising is an important activity, and Brazil's cattle and pig stocks are among the largest in the world. Brazil's extensive forests are concentrated in the Amazon River region where there are large stands of still-unexploited tropical forest, although the rate of depletion of these forests (with much of the timber used for fuel) is now so rapid that environmental concerns may force the imposition of controls. Brazil's lumber industry is well-developed and based largely on harvests from plantations of eucalyptus, Honduras pine, and other exotic species raised in the southern part of the country. There are good fishing areas both in the ocean along the coast, which is fished commercially, and also inland in the long river systems, particularly along the Amazon.

Brazil's rich mineral deposits remain largely unexploited. The principal minerals produced include iron ore, tin, phosphates, petroleum, natural gas, limestone, bauxite, coal, salt, asbestos ore, manganese, kaolin clay, chrome ore, barite, uranium, zinc ore, gold, diamonds, and quartz crystals. About nine-tenths of the country's electrical energy is produced by hydroelectric power plants.

Manufacturing accounts for about one-fourth of the GNP and, together with mining, employs about 16 percent of the labour force. It is well-diversified, producing refined petroleum products, steel ingots, pig iron, cement, raw sugar, coke, fertilizers, rubber, paperboard products, ferrochromium alloy, machinery, aircraft, armaments, electrical goods (including computers), textiles, and automobiles and commercial vehicles.

Construction generates about one-twentieth of the GNP and employs a comparable proportion of the labour force. Construction is concentrated on industrial plants, roads, railroads, and dams and hydroelectric power plants. Tourism in Brazil is quite well-developed and is a growing industry, being concentrated on cities and beaches along the Atlantic coast.

Brazil's economy is basically a free-enterprise one, although petroleum and natural gas exploration, production, and refining are under the government monopoly, Petroleo Brasileiro, S.A. (Petrobrás). The government also has majority interest in companies in certain other industries, such as the automobile, shipbuilding, aircraft, and microelectronics industries. Multiyear development plans, started in 1970, have been used to guide economic development. The federal government's expenditures on developing industries, combined with budgetary deficits, however, have required Brazil to borrow heavily. Serious inflation has been chronic for some years, and in the mid-1980s the annual rate was more than 200 percent. There are a number of labour unions organized by economic sectors.

Brazil's major trading partners are the United States, Iraq, Nigeria, West Germany, Japan, and The Netherlands. The principal exports are metals (including iron and steel), coffee, animal foodstuffs, food products, machinery, textiles, transport equipment, and footwear; the principal imports include petroleum and other mineral products, chemicals (including fertilizers), food products, nonelectric machinery, and basic manufactures.

Brazil's railways, which are partly government-owned and partly privately owned, are only a minor factor in the nation's transport network, with the exception of certain commuter lines and bulk-oil carriers. Although only a small portion of the road network is paved, intercity bus services are well-developed. River-borne transport handles about one-tenth of all Brazilian domestic cargo, and there are numerous deepwater Atlantic ports. Air transport is very important, especially in the Amazon River region. There are 21 international airports; the airports at Rio de Janeiro and São Paulo, however, handle most of the international traffic.

Government and social conditions. Brazil is a federal republic. The 1969 constitution, promulgated under a military government, continued in force after civilian government was restored in 1985, although some amendments were made and a constituent assembly was formed. Legislative power is exercised by the National Congress (Congresso Nacional), which consists of a 487-member Chamber of Deputies (Câmara dos Deputados) and a 72-member Senate (Senado). Deputies are elected to four-year terms and senators to eight-year terms. In 1985 the Congress passed legislation that provided for direct elections every four years to the country's most powerful political position, the presidency. Brazil's major political parties include the moderate Brazilian Democratic Movement Party and the right-wing Social Democratic Party. Brazil's judiciary is headed by a Supreme Federal Tribunal, whose 11 members are appointed by the president with the approval of the Senate.

Health conditions in Brazil vary according to size of income and region. In general, however, health conditions are poorest in rural areas, which often suffer from a shortage of doctors and trained nurses. A health program initiated in the mid-1980s was designed to adapt available health-care resources to the needs of the public. Its effectiveness is limited, however, because the private sector operates the great majority of hospitals. The most significant health problems are diseases of the circulatory system, parasitic diseases (such as malaria), communicable diseases (such as influenza and tuberculosis), and malnutrition, which is most acute among infants and small children. Brazil's life expectancy of slightly more than 60 years is lower than that of Venezuela or Argentina. A large and continuing migration of rural people to urban centres has created a housing shortage, evident in the urban shantytowns called *favelas.*

Primary and secondary education in Brazil is free in official schools and compulsory between the ages of 7 and 14. In the late 20th century nearly all children of school age could read and write, but about one-fifth of all adults were still illiterate. The federal government plays a major role in higher education, operating more than two-thirds of Brazil's universities.

Since the end of military government in 1985, the news media in Brazil have enjoyed relative freedom from censorship. The country's principal newspapers are published in São Paulo and Rio de Janeiro. Brazil has the largest television market in South America. One of its major networks, TV Globo, is among the largest privately owned television networks in the world.

Cultural life. Brazil's varied racial and cultural past and its striking regional differences are reflected in its arts. In the 18th century the crippled mulatto architect and sculptor António Francisco Lisboa, known simply as Aleijadinho ("Little Cripple"), was the outstanding artist. Brazil's most famous modern painter, Cándido Portinari, was the son of an Italian immigrant; regional scenes are the subject of many of his works. The internationally famous contemporary composer Heitor Villa-Lobos incorporated folk themes from Brazilian African and Indian music into his compositions, as in his *Bachianas Brasileiras* and *Chôros.* The poetic, imaginative novels of Joaquim Maria Machado de Assis won international acclaim during the late 19th century.

History. Little is known of pre-Portuguese Brazil. The native inhabitants, mostly Tupí-Guaraní Indians, were not empire builders as were the Incas to the west or the Aztecs to the northwest. Their settlements were scattered, and their life-style was mostly nomadic.

The European discovery of Brazil is credited to the Portuguese naval commander Pedro Álvares Cabral, who was on his way to India when he veered westward enough to sight Brazil in 1500. Portuguese interest was minimal at first, but the discovery there of a type of wood containing a valuable red dye

known as brasil, from which Brazil takes its name, and the increased competition from the French who were also exploring the coast led Portugal to step up colonization attempts. The first colonizing effort began in 1530 under the direction of Martim Afonso de Sousa, who founded São Vicente in 1532. A donatary system of settlement was set up that created great landholdings with numerous feudal characteristics. Indians were used for manual labour on the great sugar plantations, then replaced by black Africans who were brought as slaves. Also significant at this time were the Jesuits, who did the work of Christianizing and educating the Indians and who generally served as their protectors. The westward expansion into the interior of Brazil originated mostly from São Paulo by Paulistas, or *bandeirantes,* who organized great expeditions to capture Indian slaves and to find gold and precious stones.

Rebellion in Brazil against Portuguese rule began as early as 1789, but independence came about in an unusual way. Fearing an invasion by Napoleon, the Portuguese prince regent, Dom John, fled to Brazil in 1808. He instituted certain reforms and by 1815 had made Brazil coequal with Portugal in the new United Kingdom of Portugal, Brazil, and the Algarves, with the seat of government at Rio de Janeiro.

Revolutionary movements at home forced John, now King John VI, to return to Portugal. The Portuguese Cortes wanted to return Brazil to colonial status. The Brazilians were incensed, and prince regent Dom Pedro, who had stayed in Rio de Janeiro, declared Brazil's independence on Sept. 7, 1822.

A shaky first two decades followed, but the long reign of Pedro II (1840–89) resulted in growth, prosperity, and stability for the kingdom. When military leaders staged a revolt in 1889, Pedro II abdicated and a republic was established.

Accompanying increased immigration and growth in manufacturing in the 20th century were frequent military coups and suspensions of civil liberties. Construction in the 1960s of a new capital at Brasília, intended to spur the development of the country's interior, increased Brazil's public debt and worsened the inflation rate. After 1979 the military government of President João Baptista de Oliveira Figueiredo began a phased return to democratic practices, which culminated in presidential elections in 1985 that returned the country to civilian rule and ended more than 20 years of government by the military.

Brazil Current, branch of the Atlantic South Equatorial Current, flowing southward in the South Atlantic Ocean along the eastern coast of South America from Cape St. Roque, Brazil, to about latitude 30°–40° S, where the north-flowing Falkland Current deflects it to the east. The current is characterized by warm temperatures that vary from 66° to 81° F (19° to 27° C) and a high salinity that averages 35 to 37 parts per thousand. It is relatively weak and shallow, with a surface speed of one to two knots and a depth of 330–660 feet (100–200 m), and has a volume of approximately 353,000,000 cubic feet (10,000,000 cubic m) per second.

Brazil nut, also called PARA NUT, BUTTERNUT, CREAM NUT, or CASTANEA, edible seed of a large South American tree, *Bertholletia excelsa* (family Lecythidaceae). It is one of the major commercially traded nuts in the world. The hard-walled fruit of the tree is 3 to 7 inches (8 to 18 cm) in diameter and is globular in shape, resembling a large coconut. This woody capsule contains 8–24 nuts, or seeds, that are arranged in it like the sections of an orange. Each nut has a very hard shell and is three-cornered in shape. Brazil nuts are high in fat and protein content and taste somewhat like almond or coconut. The tree itself grows wild in stands in the Amazon Basin and reaches heights of 150 feet (45 m) or more. During the period from January to June the capsules ripen and fall to the ground, where

Brazil nut fruit (*Bertholletia excelsa*)
Donald P. Watson—EB Inc.

they can be harvested. The nuts within them are then taken out, dried by the sun, washed, and exported while still in the shell.

Brazilian Highlands, Portuguese PLANALTO CENTRAL, eroded plateau region of southeastern Brazil. Located mainly in Minas Gerais and São Paulo states, the highlands rise to an average elevation of 3,300 feet (1,000 m) above sea level. The Brazilian Highlands are characterized by low mountains, hilly uplands, and tabular plateaus. They are geologically similar to the Guiana Highlands to the north, across the eastern Amazon Basin.

Brazilian pine (tree): *see* Paraná pine.

Brazilian tea: *see* maté.

brazilwood, dense, compact dyewood from any of various tropical trees whose extracts yield bright crimson and deep purple colours. Brazilwood is also used in cabinetwork. In ancient and medieval times, the brazilwood imported to Europe from the Middle East was *Caesalpinia braziliensis* and other species of *Caesalpinia. C. echinata* (called *pau-brasil* in Portuguese) is indigenous to the Brazilian coast and played a role in the naming of that country.

brazing, process for joining two pieces of metal that involves the application of heat and the addition of a filler metal. This filler metal, which has a lower melting point than the metals to be joined, is either pre-placed or fed into the joint as the parts are heated. In brazing parts with small clearances, the filler is able to flow into the joint by capillary action. The temperature of the molten filler used for brazing exceeds 800° F (430° C). In a related process called soldering, the filler metal remains below that temperature. Brazed joints are usually stronger than soldered joints.

Brazing can be carried out on most metals, and the range of available brazing alloys is increasing as new alloys and new service requirements are introduced. Heating by torch in air is satisfactory, provided the joint is adequately fluxed. Other forms of heating include inductive heating, electrical resistance, molten salts, and baths of molten metal. The wide use of these processes has led to the development of special furnaces and automatic equipment, with special attention being given to accurate control of the temperature and regulation of the atmosphere. Jigs and fixtures are necessary for dip brazing. Preparation of the surfaces by mechanical or chemical cleaning is important for brazing. The extensive use of silver-based brazing alloys melting at temperatures below 1,200° F (650° C) required development of fluxes that are fluid and active at 1,100° F (593° C). Combinations of borates, fluoborates, fluorides, chlorides, borax, and boric acid are commonly used as fluxes. Brazed joints are highly reliable and are used extensively on rockets, jet engines, and aircraft parts. *See also* welding.

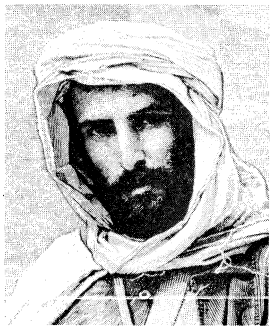
Brazos River, river rising in eastern New Mexico and western Texas, U.S., on the Llano Estacado ("Staked Plain") near Lubbock, Texas. The three main upper forks of the Brazos are the Double Mountain, Salt, and Clear forks. Formed from the confluence of the Double Mountain and Salt forks, the Brazos proper flows generally southeast to Waco, one of the largest cities on the river. From Waco the Brazos crosses the Texas Coastal Plain to enter the Gulf of Mexico at Freeport after a course of about 870 miles (1,400 km). Near its mouth the Brazos also connects with the Gulf Intracoastal Waterway. The river's chief tributaries are the Paluxy, Little, and Navasota rivers; it drains an area of about 42,800 square miles (110,850 square km). The Possum Kingdom Dam (1940) and the Whitney Dam (1953) on the upper Brazos provide hydroelectric power, flood control, and irrigation for the cotton grown in the Brazos River Valley. The river valley was a major site of early Anglo-American settlement in Texas, one of the first English-speaking colonies along the Brazos having been founded by Stephen F. Austin at San Felipe de Austin in 1822. Texans declared their independence from Mexico in 1836 at the settlement of Washington-on-the-Brazos. The original Spanish name for the river was Brazos de Dios ("Arms of God").

Brazosport, industrial complex, Brazoria county, southeastern Texas, U.S., comprising the cities of Freeport (*q.v.*), Lake Jackson, Clute, Lake Barbara, Brazoria, Richwood, and other communities. Located at the mouth of the Brazos River on the Gulf Intracoastal Waterway, 50 miles (80 km) south of Houston, it has deep-sea harbour facilities and a large chemical complex (based on local resources of gas, oil, salt, seawater, and sulfur). Manufactures include plastics, machinery, metal products, and fabricated vessels. Commercial fishing is also economically significant. Brazosport College was established in Lake Jackson in 1968.

Brazza (Yugoslavia): *see* Brač.

Brazza, Pierre-Paul-François-Camille Savorgnan de (b. Jan. 26, 1852, near Rome—d. Sept. 14, 1905, Dakar, Senegal, French West Africa), Italian-born French explorer and colonial administrator who founded the French (Middle) Congo, now the People's Republic of the Congo, and explored Gabon, which, like the Congo, became a part of French Equatorial Africa. He also founded the city of Brazzaville.

An Italian count, Brazza became a French citizen (1874) and an officer in the French

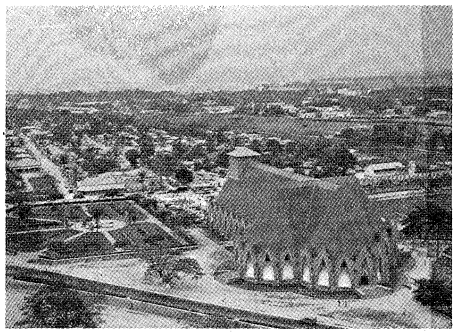


Brazza, detail from an engraving by F.-L. Méaulle
J.E. Bulloz

Navy. In Equatorial Africa, from October 1875 to November 1878, he explored the Ogooué (Ogowe) River and basin from the coast of Gabon to the interior, where he located its source, and reached a Congo tributary, the Alima River. Under French orders

he proceeded up the Ogooué again in 1880. Near Stanley Pool, on the Congo, he signed treaties establishing a French protectorate of the region that in 1891 became the French Congo. After further exploration of Gabon, he returned to France (June 1882) and saw ratification of the treaties he had concluded. In 1884 he went back to the Congo, founded the city of Brazzaville, and, with official financial backing, began to establish a colony that he governed from 1886 to 1897. Following his recall to France, large commercial concessions were granted in the colony. In 1905 he was sent on a mission to investigate charges of exploitation of the natives of the colony. He died on his return.

Brazzaville, commune (town), capital and river port of the Congo and former capital of French Equatorial Africa, lying on the north bank of the Congo River below Stanley Pool, across from Kinshasa, Zaire. It was founded in 1883, when the village of Ntamo was



Cathedral in Brazzaville, Congo
J. Naud—De Wys Inc.

"purchased" by the French, who developed it as a European administrative and residential centre. Until the early 1960s the centre of the city remained European, with African sections developing in the northeast (Poto-Poto) and southwest (Bacongo and Makélékélé). The centre city remains the focus of administration and commerce.

The river port forms the terminus of the Congo–ocean transport system, with steamer service to the upper reaches of the Congo River and a railroad to Pointe-Noire, on the Atlantic coast, 245 mi (394 km) west. The port facilities were expanded after World War II. Almost half of the shipping involved is transit trade for other Central African countries. Although the port is the focus of a rather extensive industrial and processing area, the primary activity of Brazzaville remains that of an administrative centre. It has a Roman Catholic cathedral, and in 1961 a teachers' training centre was established there, which was the nucleus for a national university established in 1972. Students are drawn to the centre from Gabon, Chad, and the Central African Republic. Brazzaville also has vocational and technical institutes, the Poto-Poto School of African Art, and the regional headquarters of the World Health Organization. The city is served by an international airport at Maya Maya. Pop. (1980 est.) 422,400.

Bré (Ireland): *see* Bray.

Brea, city, Orange County, southwestern California, U.S., at the foot of the Puente Hills. Early settlers dug the oil-soaked earth in the "Brea" canyon for fuel, and commercial production began in the 1890s after successful strikes in the Brea and Olinda fields. The influx of people inspired the Ontario Investment Company to file a subdivision map in 1908 for a town to be called Randolph; this was refiled in 1911 to change the name to Brea (Spanish: "pitch"). Oil-based industries developed, and Brea was incorporated in 1917. Pop. (1980) 27,913.

bread, baked food product made of flour or meal that is moistened, kneaded, and sometimes fermented. A major food since prehistoric times, it has been made in various forms using a variety of ingredients and methods throughout the world. The first bread was made in Neolithic times, nearly 12,000 years ago, probably of coarsely crushed grain mixed with water, with the resulting dough probably laid on heated stones and baked by covering with hot ashes. The Egyptians apparently discovered that allowing wheat doughs to ferment, thus forming gases, produced a light, expanded loaf, and they also developed baking ovens.

Flat breads, the earliest form of bread, are still eaten, especially in much of the Middle East, Asia, and Africa. The principal grains used in such breads are corn (maize), barley, millet, and buckwheat—all lacking sufficient gluten (elastic protein) to make raised breads—and wheat and rye. Millet cakes and chapaties (crisp, whole-meal cakes) are popular types in India. Corn is used to make the small, flat cakes known as tortillas, important throughout much of Latin America; and in Brazil small cakes are made from cassava.

Although Far Eastern peoples have traditionally preferred rice, consumed as a grain, consumption of Western breads was increasing there in the latter half of the 20th century; and in Japan the bread-baking industry, using U.S. processes, expanded rapidly after World War II. Raised black bread, common in East and West Germany, the Soviet Union, and Scandinavia, is made chiefly from rye. Lighter rye loaves, with wheat flour added, are popular in the United States. Raised wheat breads include white bread, made from finely sifted wheat flour; whole wheat bread, made from unsifted flour containing much of the outer and inner portions of the wheat kernel normally removed for white flour; gluten bread, lower in sugars because much of the starch is removed from the flour; and Vienna and French bread, long, narrow, crusty loaves. Other forms of raised breads include rolls and buns, chemically leavened quick breads, and yeast-leavened sweet goods that are rich in sugar and shortening.

Although raised bread originally relied upon spontaneous fermentation, bakers learned to produce fermentation with yeast. Specific strains have been developed with useful bread-making qualities, including stability, rapid fermentation capacity, and the ability to withstand high temperatures, all permitting production of a uniform product. Only wheat and rye flours produce the necessary gluten to make raised loaves, and wheat gluten is more satisfactory for this purpose. Other ingredients include liquids, such as milk or water, shortenings of animal or vegetable origin, salt, and sugar.

Improvements in the commercial production of bread include better temperature control, handling methods, fuels, and refrigeration. Modern commercial bread making is highly mechanized. Mixing is performed by the straight-dough or sponge-dough methods or the newer continuous-mixing process. In the straight-dough method, frequently used in small bakeries, all ingredients are mixed at one time. In the sponge-dough method, only some of the ingredients are mixed, forming a sponge that is allowed to ferment and is then mixed with the remaining ingredients to form the dough. The mixed dough is divided into appropriately sized pieces, deposited in bakery pans, and allowed to rise. The pans then pass through a travelling tray oven, baking the bread. The continuous-mixing process eliminates many individual operations.

bread-crumb sponge (*Halichondria panicea*), member of the class Demospongiae (phylum Porifera), so called because of the way in which it crumbles when handled. *H. panicea* is a common sponge that encrusts hard substrata and seaweed on the shore and in shallow subtidal regions. Varying in colour from dark green to light yellow, it is frequently found in shaded crevices or under overhangs. Its surface is characterized by numerous conical protuberances, each with a hole at the top. Rhythmic beating of whiplike hairs (flagella) situated on the inner body wall draws water in through minute pores in the body surface. Oxygen and food particles are extracted from the water, which is then driven out through the holes at the top of the conical protuberances.

bread of the Presence (Judaism): *see* shewbread.

bread palm, also called KAFFIR BREAD, any of several species of *Encephalartos*, cycads (palmlike gymnosperms) native to southern Africa. The names are derived from a breadlike foodstuff prepared from the mealy, starchy centre of the stem and perhaps also from the seeds, which have fleshy coverings. The trees, reaching nearly 20 feet (6 metres) in height, have very stiff, spreading pinnate leaves 3 to 4 ft long and recurving at the tip. Several species of *Encephalartos* form handsome greenhouse and conservatory plants.

Breadalbane, historic district of 1,020 sq mi (2,642 sq km) in the modern districts of Perth and Kinross and Stirling, Grampian region, Scotland, bordered north by Loch Rannoch, east by Strathtay, south by Strathearn, and west by the district of Argyll and Bute. It includes Loch Tay and Ben Lawers (3,984 ft [1,214 m]) in The Grampians. Population centres are Aberfeldy, Fortingall, Kenmore, and Killin. Breadalbane is primarily a region of deer forests and shooting and fishing, with a little cultivation limited to the glens and river valleys. The Breadalbane hydroelectric power scheme is composed of seven stations and dams, covering a catchment area of 200 sq mi.

Breadalbane and Holland, John Campbell, 1st earl of, also called (1677–81) EARL OF CAITHNESS (b. *c.* 1635—d. March 19, 1717), Scottish politician, chiefly remembered for his alleged complicity in the Massacre of Glencoe.

The son of Sir John Campbell of Glenorchy, 4th Baronet (d. 1686), he took part in the Royalist uprising under the Earl of Glencairn in 1654 and later encouraged the restoration of Charles II in 1660. Charles created him earl of Caithness and viscount of Breadalbane in 1677; but, when this stirred up animosities in Caithness, Charles corrected himself and gave Campbell a new patent as earl of Breadalbane and Holland (1681).

To gain the support of the rebellious Highlanders after the Revolution of 1689, London entrusted him with the mission of securing the submission of the clans, partly through bribery. He apparently kept the government's money for his own uses and sought to win over the rebels with threats and wile; he may even have consorted with them. Subsequently, in the Massacre of Glencoe (Feb. 13, 1692), several of the MacDonald clan were butchered in cold blood by troops to whom they had given hospitality. Opinion was strong against Breadalbane, who may well have welcomed the opportunity of destroying a clan that for generations had lived by plundering his lands and those of his neighbours; but, although he was aware that violent action was planned, it is less likely that he was personally involved in organizing the massacre. No real evidence against him was disclosed, and his imprisonment (September 1695) was on the ground of earlier dealings with the Jacobite chiefs. He was released when William III announced that Breadalbane had acted with royal approval.

Breadalbane did not vote for the union of

England and Scotland in 1707, but he was a representative peer in the Parliament of Great Britain (1713–15). He maintained his contacts with the Jacobites, whom he encouraged in 1708, without, however, committing himself on paper. At the time of the Jacobite rising in 1715 he excused himself (September 19) from obeying a summons to Edinburgh on the ground of his age and infirmities; but the next day he visited the Earl of Mar's camp at Logierait and afterward the camp at Perth, his real business being, according to the master of Sinclair, "to trick others, not to be trickt," and to obtain a share of French subsidies. He is said to have promised and taken money for 1,200 men in the Jacobite cause, but he sent only 300 or 400, who acquitted themselves well at Sheriffmuir (1715) but were withdrawn after that battle. Breadalbane's younger son was imprisoned, but he himself escaped any punishment for his part in the rising because of his age.

Breadalbane's elder surviving son, Duncan, was passed over in the succession, allegedly because of a retarded mind. The younger son, John Campbell (1662–1752), became 2nd earl of Breadalbane and Holland.

breadfruit, fruit of either of two closely related trees belonging to the family Moraceae. One of these, *Artocarpus communis,* also called *A. incisa* or *A. altilis,* provides a staple food of the South Pacific. The tree grows 12 to 18 metres (40 to 60 feet) high and has large, oval, glossy green leaves, three- to nine-lobed toward the apex. Male and female flowers are borne in separate groups of flowers on the same tree: the staminate (male) ones appear in dense, club-shaped catkins; the numerous female, or pistillate, ones are grouped and form a large prickly head upon a spongy receptacle. The ripe fruits, or matured ovaries, of these pistillate flowers are roundish, 10 to 20 centimetres (4 to 8 inches) in diameter, greenish to brownish green, and have a white, somewhat fibrous pulp. The *Treculia africana,* native to tropical Africa, is less important as a food crop.

The breadfruit has been cultivated in the Malay Archipelago (where the species is held to be indigenous) since remote antiquity. From this region it spread throughout the tropical South Pacific region in prehistoric times. Its introduction into the New World was connected with the memorable voyage of Capt. William Bligh in HMS "Bounty," a voyage recommended by Capt. James Cook, who had seen the breadfruit in the Pacific islands and considered that it would prove highly useful as a foodstuff for Negro slaves in the West Indies. After the failure of Bligh's first voyage, a second resulted in the successful establishment of the tree in Jamaica, where it failed to live up to expectations because the slaves preferred bananas and plantains.

Breadfruit (*Artocarpus communis*)
George Holton—The National Audubon Society Collection/Photo Researchers

The breadfruit is not a fruit in the popular sense of the term; it contains considerable amounts of starch and is seldom eaten raw. It may be roasted, baked, boiled, fried, or dried and ground into flour. In the West Indies and on the American mainland from Mexico to Brazil the breadfruit tree is grown in dooryards, and the fruit is sold at market. Seedless forms are propagated by means of root suckers or root cuttings.

Numerous varieties are cultivated in the Pacific islands, but these are not known in tropical America. The tree cannot tolerate frost and has not been successfully grown even in the southernmost parts of Florida.

In the South Seas cloth is made from the fibrous inner bark, the wood is used for canoes and furniture, and glue and caulking material are obtained from the milky juice.

breadnut, any of several tropical American trees of the genus *Brosimum* in the mulberry family (Moraceae) closely related to the breadfruit. The seeds of *B. alicastrum* and *B. paraense* are roasted and ground into a flour or used as a coffee substitute. The leaves are fed to livestock. Both species provide a hard, fine-grained whitish wood used in carpentry.

break, either of two types of vehicle. One is a heavy four-wheeled carriage frame used for the training and exercising of horses, either singly or in teams of two or four. It has no body parts except for a high seat upon which the driver sits and a small platform for a helper immediately behind.

The other is a team-drawn conveyance of the heavy phaeton type that is used for pleasure excursions by six or more people. It is a four-wheeled, straight-bodied, open carriage, usually with no doors or side pieces in front of the seats.

breakbone fever (disease): *see* dengue.

breakfast cereal, grain food, usually precooked or ready-to-eat, that is customarily eaten with milk or cream for breakfast in the United States and elsewhere, often sweetened with sugar, syrup, or fruit. The modern commercial concept of cereal food originated in the vegetarian beliefs of the American Seventh-day Adventists, who in the 1860s formed the Western Health Reform Institute, later renamed the Battle Creek Sanitarium, in Battle Creek, Mich. The entrepreneurial possibilities of the ground, thin-baked cereal dough served to the Sanitarium's patients inspired two men, C.W. Post and W.K. Kellogg, each to found his own business. In the late 20th century the ready-to-eat breakfast cereal industry sold the equivalent of several billion bowls of cereal to Americans yearly, having far surpassed the market for the traditional "hot" cereals made from rolled oatmeal or enriched wheat farina.

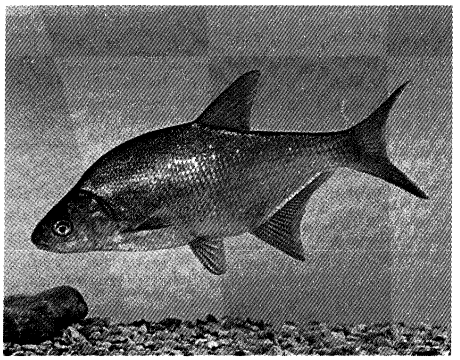
Ready-to-eat breakfast cereals are of four basic types: flaked, made from corn, wheat, or rice that has been broken down into grits, cooked with flavours and syrups, and then pressed into flakes between cooled rollers; puffed, made by exploding cooked wheat or rice from a pressure chamber, thus expanding the grain to several times its original size; shredded, made from pressure-cooked wheat that is squeezed into strands by heavy rollers, then cut into biscuits and dried; and granular, made by a process in which a stiff dough made from wheat and malted barley flour, salt, yeast, and water is fermented, baked thoroughly, and then, after being crumbled and rebaked, is ground into rough grains. As a final step in each process, the cereal is treated to restore vitamins lost through cooking and often coated with sweet flavouring.

Until the mid- to late 1950s, the market for ready-to-eat breakfast cereal was relatively small, making its subsequent rapid growth one of the most dramatic success stories in modern advertising. By skillful product diversification and promotion, ready-to-eat products took over the breakfast food market—children found a prize in every package or associated a cereal with their favourite cartoon characters, while their parents, ever reminded of the convenience and the nutritional value of fortified cereals, could enter manufacturer-sponsored contests for prizes of their own. Late in the century, the majority of breakfast cereals continued to be directed toward the children's market, with entertainment-oriented packaging and a wide variety of "treat" flavours. Alongside these, the so-called health food movement fostered, or revived, cereals composed of "natural" whole grain and fruit in the old-fashioned granola style.

Breakspear, Nicholas (pope): *see* Adrian IV.

breakwater, artificial offshore structure protecting a harbour, anchorage, or marina basin from water waves. Breakwaters intercept longshore currents and tend to prevent beach erosion. Over the long term, however, the processes of erosion and sedimentation cannot be effectively overcome by interfering with currents and the supply of sediment. Deposition of sediment at one site will be compensated for by erosion elsewhere; this phenomenon occurs whether one breakwater or a series of such structures is erected. *Compare* jetty.

bream (*Abramis brama),* common European food and game fish of the carp family, Cyprinidae, found in lakes and slow rivers.



Bream (*Abramis brama*)
W.S. Pitt—Eric Hosking

The bream lives in schools and eats worms, mollusks, and other small animals. It is deep bodied, with flat sides and a small head, and is silvery with a bluish or brown back. Length is usually about 30–50 centimetres (12–20 inches), weight to 6 kilograms (13 pounds).

The silver bream (*Blicca bjoorkna*) is a relatively unimportant European relative of the bream. Other fishes called bream include the golden shiner, a minnow, and the sea breams of the family Sparidae.

Bream, Julian Alexander (b. July 15, 1933, London), internationally celebrated English guitarist and a lutenist who inspired new interest in the music of the Renaissance lute.

After studying with his father and performing locally from age 14, Bream attended the Royal College of Music while pursuing private extracurricular study of the guitar. He was much influenced by the styles of Andrés Segovia and Francisco Tárrega, the great Spanish guitarist of the 19th century. After Bream's first appearance as a public recitalist (London, 1950), he performed in concerts throughout England, often to audiences unfamiliar with the classical guitar repertory. In the 1950s he began touring internationally. He had taken up the lute in 1950, and that interest led to a collab-

oration with the British tenor Peter Pears in performances of lute songs by John Dowland and other Elizabethan composers. In 1961 he organized the Julian Bream Consort, one of the first groups to specialize in early ensemble music. The Consort is composed of violin, alto flute, bass viol, pandora, cittern, and lute. Composers who wrote music for Bream include Benjamin Britten, William Walton, and Malcolm Arnold. Another great influence on Bream was Django Reinhardt, the Belgian jazz guitarist. Bream was noted for his rhythmic precision and the exquisite lyricism of his tones, which were equaled by only a few other guitarists in the world.

breast cancer, malignant tumour in the mammary glands of either a male or a female; tumours in the male, however, are rare. Most cancers in the female breast form shortly before, during, or after menopause (ceasing of menstruation). Generally, the older the patient is, the greater the likelihood of cancer.

Certain conditions enhance cancer growth. Prolonged body exposure to estrogen (female hormone), as when menstruation starts early and lasts into the fifth decade, favours development of cancer. Breasts that have never given milk or that have had certain kinds of benign tumours are more prone to develop cancer. Injury to the breast does not seem to stimulate cancer formation, but it may cause a rapid acceleration of growth after the tumour has started.

More than 90 percent of malignant tumours start their growth in the mammary ducts. Lesions located far out on the periphery of the breast often spread to the lymph nodes, while those in the central portion spread to the chest. In appearance there are two principal types of tumour. The first is a single, hard, poorly movable lump. When cut, the tissue is dry, gritty, and interspersed with bands of yellow and white tissue. This type of tumour radiates out into the fat tissue and may involve the nipple. The second type of tumour is opaque white or pink; it is soft and may contain cysts (sacs containing liquid or semisolid material) and may show signs of bleeding; and it tends to bulge more than the first type. Tumours are classified and named according to their outward appearance, cellular composition, cellular origin, and activity. Most breast cancers are of the type called adenocarcinomas. These occur at about age 50. This type of tumour is hard and immobile and measures two to three centimetres (about 0.8–1.2 inches) in diameter when detected. It causes dimpling of the skin or retraction of the nipple. Another type, called a medullary carcinoma, is more cystic. It is usually situated in deep tissue, encapsulated, and movable. When first defined, the tumour is five centimetres (two inches) or larger in diameter, soft, fluid, and slow growing. In the type of cancer called comedo carcinoma, there are grayish dots in the skin, from which a yellow-gray ribbonlike pasty material can be extruded on pressure. The skin may ulcerate and the nipple may produce a discharge. The tumour is slow growing and soft. Paget's disease begins at the nipple with a burning, itching, or tender sensation. Eventually the lesion becomes enlarged, cracks, oozes, forms crusts, and finally ulcerates to destroy the nipple. The type of cancer called acute inflammatory carcinoma occurs in the pendulous breasts of young women. There is a sudden onset, swelling, reddening, and tenderness. The colour then changes to more of a purple, which starts to spread; the skin is hot, dry, and scaly. The nipple usually becomes crusted and retracted.

Any lumps found in the breast need investigation because of the possibility of cancer. If a lump, upon removal, is found to be cancerous, treatment may entail breast removal (mastectomy; either radical [removing breast and underlying muscle] or modified). Sometimes only the tumour is removed. Such an operation, called a lumpectomy, when combined with radiation therapy, has been shown to be as effective as a radical mastectomy in treating early breast cancer. A mastectomy may be followed by X-ray therapy, removal of the ovaries or adrenal glands, or the administration of hormones or other chemotherapeutic agents. *See also* mastectomy.

breastbone (anatomy): *see* sternum.

Breasted, James Henry (b. Aug. 27, 1865, Rockford, Ill., U.S.—d. Dec. 2, 1935, New York City), American Egyptologist, archaeologist, and historian who promoted research on ancient Egypt and the ancient civilizations of western Asia.

After graduate studies at Yale and Berlin, Breasted began teaching Egyptology at the University of Chicago in 1894. He compiled a record of every known Egyptian hieroglyphic

Breasted
By courtesy of the Oriental Institute, the University of Chicago

inscription and published a translation of these in a five-volume work, *Ancient Records of Egypt* (1906). He led expeditions to Egypt and the Sudan (1905–07) and copied inscriptions from monuments that had been previously inaccessible or were perishing. His *History of Egypt* (1905) and his high school textbook, *Ancient Times* (1916), both lucidly written, enjoyed extraordinary success. A pioneer work in a specialized field was *Development of Religion and Thought in Ancient Egypt* (1912).

Through financial aid from John D. Rockefeller, Jr., Breasted organized the Oriental Institute (1919) at the University of Chicago. This institution became an internationally renowned centre for the study of ancient cultures in southwest Asia and the Middle East. Under his directorship, the institute undertook a number of important excavations, including one at Megiddo that uncovered a large riding stable thought to have been King Solomon's and one at Persepolis that yielded some Achaemenid sculptures.

breath analyzer, also called BREATHALYZER, device used by police to determine the amount of alcohol in the system of persons suspected of being intoxicated. In the analyzer, a precise amount of the suspect's exhaled breath is passed through a solution of potassium dichromate and sulfuric acid; the change in the colour of the solution is proportional to the amount of alcohol in the air sample, which, in turn, is directly related to the alcohol content of the blood. Driving ability is seriously impaired when the alcohol concentration in the blood exceeds 80 milligrams per 100 millilitres.

breathing, the action of moving air or water across the surface of a respiratory structure, such as a gill or lung, to facilitate respiration (the exchange of oxygen and carbon dioxide with the environment). *See* respiration.

breathy voice (phonetics): *see* vocal fry.

Brébeuf, Saint Jean de (b. March 25, 1593, Condé-sur-Vire, Normandy—d. March 16, 1649, Saint-Ignace, New France; canonized 1930; feast day October 19), Jesuit missionary to New France who became the patron saint of Canada.

Brébeuf entered the Society of Jesus in 1617, was ordained priest in 1623, and arrived in New France in 1625. Assigned to Christianize the Huron Indians between Georgian Bay and Lake Huron, he lived in danger of death until forced by the English to return to France in 1629. Back again in "Huronia" in 1634, Brébeuf laboured for 15 years in primitive surroundings. He was a veteran of 18 missions when, in 1647, peace was made between the French and the Iroquois, who were competitors with the Hurons in the fur trade and their bitter enemies. The Iroquois, determined to destroy the Huron confederacy, continued their fierce war against the Hurons and in 1648–50 destroyed all villages and missions. They seized Brébeuf and his fellow missionary Gabriel Lalemant and tortured them to death near Saint-Ignace. Brébeuf endured stoning, slashing with knives, a collar of red-hot tomahawks, a "baptism" of scalding water, and burning at the stake. Because he showed no signs of pain, his heart was eaten by the Iroquois. He was canonized with Lalemant and other Jesuits (collectively, the Martyrs of North America) in 1930.

Brébeuf's writings, which are source materials for historians and ethnologists, include a Huron grammar and a translation of the catechism into Huron. His annual narratives are translated in R.G. Thwaites' *Jesuit Relations and Allied Documents,* 73 vol. (1896–1901).

breccia, lithified sedimentary rock consisting of angular or subangular fragments larger than 2 millimetres (0.08 inch). It differs from a conglomerate, which consists of rounded clasts.

A brief treatment of breccias follows. For full treatment, *see* MACROPAEDIA: Minerals and Rocks.

There are three categories of breccia: sedimentary, pyroclastic or igneous, and cataclastic. The constituent fragments may be of one lithology such as a rock fractured in position, or of many lithologies suggesting accumulation from preexisting rocks. Void spaces between these clasts may be filled with a cementing material of carbonate, silica, or silt.

In one class of breccia, clast material, breccia formation, and cement are all closely related in time. Typically these occur because of a volume change of sedimentary material and the subsequent redeposition of the same material to fill voids. Several examples are (1) volume loss during dolomitization, causing self-brecciation; (2) selective solution such as limestone formations, resulting in the collapse of weakened structures; and (3) mudcracks forming because of a loss of water and cemented by mud in the next wet cycle. All of these examples result in clasts of one lithology.

A second class of breccia has clasts that are not related to their cement and do not form in place. Examples of such include (1) submarine landslides in regions of active faulting; (2) subaerial landslides, talus, and mudflows common in certain regions; and (3) limestone pebble breccias that result from wave action and downward movement on flanks of reefs yielding clasts of coral and limestone. These examples are characterized by lateral transport with gravity as the driving force and clasts that may be mixtures of several rock types.

Brechin, small royal burgh (1641), district of Angus, Tayside region, Scotland, situated on the South Esk River, in the fertile vale of Strathmore. One of Scotland's three round towers (10th century) adjoins the 12th-century cathedral. In 1296 Scotland was ceded to the English at Brechin; the castle subsequently made a gallant stand against the English forces

of Edward I in 1303. Modern industries include flax and jute weaving and the manufacture of machine tools. Pop. (1981) 7,692.

Brecht, Arnold (b. Jan. 26, 1884, Lübeck, Ger.—d. Sept. 11, 1977, Eutin, W.Ger.), exiled German public servant, who became a prominent political scientist and made major contributions in the area of clarifying scientific theory.

After studying at several universities, Brecht received a law degree from the University of Leipzig in 1906 and, after in-service training, was appointed a judge in Lübeck in 1910. In the same year he began an administrative career in Berlin in the Ministry of Justice, where he served for more than seven years. He served briefly in the Ministry of Economics and then in October 1918 became a chancellery aide for three years. In 1921–27 he served as ministerial director and reformist head of the Division for Policy and Constitution in the Ministry of the Interior. Dismissed for political reasons in the spring of 1927, he was appointed one of the three chief delegates of Prussia to the federal Reichsrat and participated in unsuccessful efforts at German constitutional reorganization. Brecht was arrested in April 1933 by the National Socialist regime of Adolf Hitler but was soon released through the intervention of non-Nazi ministers. In November 1933 he sought refuge in the United States, where he had a distinguished academic career at the New School for Social Research in New York City until his retirement in 1954.

Brecht's scholarly work focussed on developing the study of politics as a scientific discipline. In *Political Theory* (1959) he distinguished scientific from nonscientific theory. Brecht clarified the doctrine (known as standard value relativism) that ultimate values cannot be validated by science, since the value of particular goals and purposes cannot be set scientifically without knowing their relation to other goals and purposes.

Brecht also wrote prolifically on the institutional and constitutional problems of federalism and totalitarianism. Author of numerous articles, he wrote *Prelude to Silence—The End of the German Republic* (1944), *Federalism and Regionalism in Germany* (1945), *The Political Philosophy of Arnold Brecht* (1954), *Political Theory—Foundations of Twentieth-Century Thought* (1959), and *The Political Education of Arnold Brecht* (1970).

Brecht, Bertolt, original name EUGEN BERTHOLD FRIEDRICH BRECHT (b. Feb. 10, 1898, Augsburg, Ger.—d. Aug. 14, 1956, East Berlin), German poet, playwright, and theatrical reformer whose epic theatre departed from the conventions of theatrical illusion and developed the drama as a social and ideological forum for leftist causes.

Bertolt Brecht, 1931
Ullstein Bilderdienst

Until 1924 Brecht lived in Bavaria, where he was born, studied medicine (Munich, 1917–21), and served in an army hospital (1918). From this period date his first play, *Baal* (produced 1923); his first success, *Trommeln in der Nacht* (Kleist Preis, 1922; *Drums in the Night*); the poems and songs collected as *Die Hauspostille* (1927; *A Manual of Piety,* 1966), his first professional production (*Edward II,* 1924); and his admiration for Wedekind, Rimbaud, Villon, and Kipling.

During this period he also developed a violently antibourgeois attitude that reflected his generation's deep disappointment in the civilization that had come crashing down at the end of World War I. Among Brecht's friends were members of the Dadaist group, who aimed at destroying what they condemned as the false standards of bourgeois art through derision and iconoclastic satire. The man who taught him the elements of Marxism in the late 1920s was Karl Korsch, an eminent Marxist theoretician who had been a Communist member of the Reichstag but had been expelled from the German Communist Party in 1926.

In Berlin (1924–33) he worked briefly for the directors Max Reinhardt and Erwin Piscator, but mainly with his own group of associates. With the composer Kurt Weill (*q.v.*) he wrote the satirical, successful ballad opera *Die Dreigroschenoper* (1928; *The Threepenny Opera*) and the opera *Aufstieg und Fall der Stadt Mahagonny* (1930; *Rise and Fall of the Town of Mahoganny).* He also wrote what he called "*Lehr-stücke*" ("exemplary plays")—badly didactic works for performance outside the orthodox theatre—to music by Weill, Hindemith, and Hanns Eisler. In these years he developed his theory of "epic theatre" and an austere form of irregular verse. He also became a Marxist.

In 1933 he went into exile—in Scandinavia (1933–41), mainly in Denmark, and then in the United States (1941–47), where he did some film work in Hollywood. In Germany his books were burned and his citizenship was withdrawn. He was cut off from the German theatre; but between 1937 and 1941 he wrote most of his great plays, his major theoretical essays and dialogues, and many of the poems collected as *Svendborger Gedichte* (1939). The plays of these years became famous in the author's own and other productions: notable among them are *Mutter Courage und ihre Kinder* (1941; *Mother Courage and Her Children*), a chronicle play of the Thirty Years' War; *Leben des Galilei* (1943; *The Life of Galileo*); *Der gute Mensch von Sezuan* (1943; *The Good Woman of Setzuan*), a parable play set in prewar China; *Der Aufhaltsame Aufstieg des Arturo Ui* (1957; *The Resistible Rise of Arturo Ui*), a parable play of Hitler's rise to power set in prewar Chicago; *Herr Puntila und sein Knecht Matti* (1948; *Herr Puntila and His Man Matti*), a Volksstuück (popular play) about a Finnish farmer who oscillates between churlish sobriety and drunken good humour; and *The Caucasian Chalk Circle* (first produced in English, 1948; *Der kaukasische Kreidekreis,* 1949), the story of a struggle for possession of a child between its highborn mother, who deserts it, and the servant girl who looks after it.

Brecht left the United States in 1947 after having had to give evidence before the House Un-American Activities Committee. He spent a year in Zürich, working mainly on *Antigone-Modell 1948* (adapted from Hölderlin's translation of Sophocles; produced 1948) and on his most important theoretical work, the *Kleines Organon für das Theater* (1949; "A Little Organum for the Theatre"). The essence of his theory of drama, as revealed in this work, is the idea that a truly Marxist drama must avoid the Aristotelian premise that the audience should be made to believe that what they are witnessing is happening here and now. For he saw that if the audience really felt that the emotions of heroes of the past—Oedipus, or Lear, or Hamlet—could equally have been their own reactions, then the Marxist idea that human nature is not constant but a result of changing historical conditions would automatically be invalidated. Brecht therefore argued that the theatre should not seek to make its audience believe in the presence of the characters on the stage—should not make it identify with them, but should rather follow the method of the epic poet's art, which is to make the audience realize that what it sees on the stage is merely an account of past events that it should watch with critical detachment. Hence, the "epic" (narrative, nondramatic) theatre is based on detachment, on the *Verfremdungs-Effekt* (distancing effect), achieved through a number of devices that remind the spectator that he is being presented with a demonstration of human behaviour in scientific spirit rather than with an illusion of reality, in short, that the theatre is only a theatre and not the world itself.

In 1949 Brecht went to Berlin to help stage *Mutter Courage und ihre Kinder* (with his wife, Helene Weigel, in the title part) at Reinhardt's old Deutsches Theater in the Soviet sector. This led to formation of the Brechts' own company, the Berliner Ensemble, and to permanent return to Berlin. Henceforward the Ensemble and the staging of his own plays had first claim on Brecht's time. Often suspect in eastern Europe because of his unorthodox aesthetic theories and denigrated or boycotted in the West for his Communist opinions, he yet had a great triumph at the Paris Théâtre des Nations in 1955, and in the same year in Moscow he received a Stalin Peace Prize. He died of a heart attack in East Berlin the following year.

Brecht was, first, a superior poet, with a command of many styles and moods. As a playwright he was an intensive worker, a restless piecer-together of ideas not always his own (*The Threepenny Opera* is based on John Gay's *Beggar's Opera,* and *Edward II* on Marlowe), a sardonic humorist, and a man of rare musical and visual awareness; but he was often bad at creating living characters or at giving his plays tension and shape. As a producer he liked lightness, clarity, and firmly knotted narrative sequence; a perfectionist, he forced the German theatre, against its nature, to underplay. As a theoretician he made principles out of his preferences—and even out of his faults.

BIBLIOGRAPHY. A complete bibliography of Brecht's writings published up to the time of his death by Walter Nubel may be found in the Second Special Brecht Number of the East German periodicial *Sinn und Form* (1957); a concise summary of Brecht literature is contained in *Bertolt-Brecht-Bibliographie by* Klaus-Dietrich Petersen (1968). Collected works in the original German are available in an edition in 8 thin-paper or 20 paperback volumes; *Gesammelte Werke* (1967). This edition, however, is far from complete and the principles according to which it was edited are open to doubt. A major collected edition of Brecht's work in English, under the joint editorship of John Willett and Ralph Manheim started publication with the first volume of *Collected Plays* (1970). Eric Bentley has edited *Seven Plays by Bertolt Brecht* (1961), a series of paperback volumes of Brecht's plays, and has translated the poetry collection, *Hauspostille* (1927; *Manual of Piety,* 1966). A good selection of Brecht's theoretical writings is *Brecht on Theatre,* trans. by John Willett (1964).

Critical and biographical works available in English include: John Willett, *The Theatre of Bertolt Brecht* (1959); Martin Esslin, *Brecht: A Choice of Evils* (1959; revised edition under the title, *Brecht: The Man and His Work,* 1971); and Frederic Ewen, *Bertolt Brecht: His Life, His Art and His Times* (1967, 1970). Max Spalter, *Brecht's Tradition* (1967), analyzes the chief influences on Brecht in German literature.

Breckinridge, John (b. Dec. 2, 1760, Staunton, Va.—d. Dec. 14, 1806, Lexington, Ky., U.S.), Kentucky politician who sponsored Thomas Jefferson's Virginia and Kentucky Resolutions advocating a states' rights view of the Union.

Breckinridge grew up on the Virginia frontier but nonetheless managed to attend William and Mary College for two years. While a student there he was elected to a seat in the Virginia legislature by his home district. Too young for the office, Breckinridge was elected twice more before finally being allowed to take his seat.

In 1792 he moved to Kentucky, giving up his newly won seat in the U.S. House of Representatives. He settled near Lexington and developed a successful legal practice. In 1795 he was appointed attorney general for the state, and in 1797 he was elected to the legislature. There, in 1798, he introduced and guided to passage Jefferson's Virginia and Kentucky Resolutions that saw the Union as a compact among sovereign states and the federal government as a creation of the states.

Breckinridge served in the Kentucky legislature (two years as speaker of the House) until 1801. Elected to the U.S. Senate, he became an outspoken champion of the West during his tenure as a senator (1801–05). He solidly backed the purchase of the Louisiana Territory in 1803. In 1805 he resigned his Senate seat to become attorney general of the United States.

Breckinridge, John C(abell) (b. Jan. 21, 1821, near Lexington, Ky., U.S.—d. May 17, 1875, Lexington), U.S. vice president (1857–61), unsuccessful presidential candidate of Southern extremists (November 1860), and Confederate officer during the Civil War (1861–65).

Descended from an old Kentucky family distinguished in law and politics, Breckinridge, an attorney, began his political career in 1849 as a member of the state legislature. In 1851 he was elected to the U.S. House of Representatives. During this troubled antebellum period, he established his reputation as a faithful Democrat, and when his party nominated James Buchanan of Pennsylvania for president in 1856, Breckinridge was a natural choice to "balance the ticket" between North and South. Once in office, however, Buchanan and Breckinridge were unable to fend off the sectional conflict. Challenged by the newly formed Republican Party, which resisted extension of slavery into the territories, the Democrats broke apart at their national convention in the summer of 1860. The Northern wing nominated Stephen A. Douglas on a platform favouring popular sovereignty (local option), while the Southerners chose Breckinridge on a separate ticket demanding federal intervention in behalf of slave property in the territories. Breckinridge insisted that he was not anti-Union but held that slavery could be banned in a territory only after it had become a state. Defeated in the November election by Republican Abraham Lincoln, Breckinridge succeeded John J. Crittenden as U.S. senator from Kentucky in March 1861, but he resigned later that year. He never ceased working for accommodation and compromise, but after the firing on Ft. Sumter, S.C. (April 12), he maintained that the Union no longer existed and urged Kentucky to feel free to secede (it temporarily remained neutral).

His formal expulsion from the Senate in December was a meaningless gesture because he had already been commissioned a brigadier general in the Confederate Army in November. After the Battle of Shiloh (April 6–7, 1862), in which he commanded the reserve, he was promoted to the rank of major general and thereafter took part in many campaigns, including Vicksburg (June 1863), the Wilderness (May 1864), and Shenandoah Valley (1864–65). In the final months of the war, Breckinridge served as Confederate secretary of war, and at the end of hostilities he fled to England. After a self-imposed exile of three years, he returned to resume his law practice in Lexington, where he died seven years later. Biographies include A.J. Hanna, *Flight into Oblivion* (1938).

Breckinridge, Sophonisba Preston (b. April 1, 1866, Lexington, Ky., U.S.—d. July 30, 1948, Chicago), welfare worker who led the social work education movement in the United States.

Breckinridge received a B.A. from Wellesley College (Mass.) in 1888 and earned from the University of Chicago in 1901 the first Ph.D. in political science ever awarded to a woman. After also earning a law degree in 1904, she taught household administration at Chicago until 1912.

In 1907 Breckinridge began also teaching at the Chicago School of Civics and Philanthropy, a social worker training institution; her efforts there led to the incorporation of that school by the University of Chicago to form the Graduate School of Social Service Administration in 1920. There she became a full professor by 1925, and her ideas about rigorous course work and training techniques set the standards for social work education in the United States, bringing the school an international reputation.

Breckinridge also contributed to the growth of the idea that the state must be involved in social welfare programs, a view not widely accepted in the United States until the New Deal of the 1930s. She popularized the doctrine through her books and teaching and in the pages of the *Social Service Review*, a highly regarded journal of which she was cofounder in 1927 and which she edited in 1948.

Breckinridge is also known for her activities with the National American Woman Suffrage Association, the Illinois Consumer's League, the Children's Bureau, Chicago's Immigrants' Protective League, the National Association for the Advancement of Colored People, and Hull House in Chicago.

Breckinridge was the author of 12 books, including *The Delinquent Child and the Home*, with Edith Abbott (1912), *Public Welfare Administration* (1927), *Women in the Twentieth Century* (1933), and *The Family and the State* (1934).

Breckland, district, county of Norfolk, England, with an area of 504 sq mi (1,305 sq km). Landscape features include poor, sandy soils overlying chalk or clay, heathland vegetation, small lakes, or meres, whose water level is variable, and plantations of trees.

The name Breckland was first applied to part of rural East Anglia in 1894 by the Norfolk naturalist W.G. Clarke. It refers to medieval times when the region's infertile soils were farmed by rotation, each section being ploughed perhaps one year in 10 and lying fallow in the intervals. This gave a series of "breaks," or "brecks," a kind of shifting agriculture. Eventually this spasmodic farming ceased, and the region became mainly shooting preserves and rabbit warrens, remaining so until shortly before World War II.

Since then much of the region has been transformed. New agricultural techniques have brought wide areas of the Breckland into permanent and stable agricultural use, while the spread of forest plantations has obliterated much of the earlier heathland. Preserved are relics of an earlier era, for the Breckland was once a major centre of flint production; some of the Neolithic flint mines have been reexcavated and preserved at Grime's Graves, near Brandon, a town which long supported a flint-working, or flint-knapping, industry in the age of flintlock firearms. Pop. (1982 est.) 97,500.

Brecknock, district, Powys County, eastern Wales, named for Brychan, a 5th-century prince later known as Brycheiniog. Created in 1974 from the former county of Breconshire, Brecknock district covers 693 sq mi (1,794 sq km) of mountainous terrain and moorlands intersected by river valleys and rolling farmland. About one-half of the district lies within the Brecon Beacons National Park; several mountain peaks in the southern highlands, including Pen y Fan (2,906 ft [866 m]), the highest peak in the park, reach elevations of more than 2,400 ft above sea level. Brecknock district borders the districts of Radnor to the north; Ceredigion and Dinefwr to the west; Lliw Valley, Neath, Cynon Valley, Mertyr Tydfil, Rhymney Valley, Blaenau Gwent, and Monmouth to the south; and the English district of South Herefordshire to the east. Because of its location in the southern Welsh Marches (border country), Brecknock has been historically a centre of conflict between the Welsh and various invading forces. The Romans built a large fort in what is now central Brecknock, not far from the town of Brecon, and the Normans built castles at Brecon and Hay-on-Wye, in eastern Brecknock. The Welsh made their last stand for independence at Builth Wells in the north when Llywelyn ap Gruffudd rode through the town and was killed at nearby Cilmery in 1282.

Brecknock district today is essentially agricultural, with the emphasis on sheep and cattle rearing, although tourism is an increasingly significant industry. Popular health spas in the 18th century, Builth Wells and Llanwrtyd Wells now attract tourists appreciative of easy access to Brecon Beacons National Park, the uplands of Irfon and Towy forests in the northwest, and the Dan yr Ogof caves in the southwest. The Brecknock museum is located in the cathedral city of Brecon, a market and service centre as well as the administrative seat of the district. Pop. (1982 est.) 40,800.

Brecknock (town, Wales): *see* Brecon.

Brecknock, John Jeffreys Pratt, 1st earl of: *see* Camden, John Jeffreys Pratt, 2nd Earl and 1st Marquess.

Brecon, also called BRECKNOCK, Welsh ABERHONDDU, cathedral town, seat of Brecknock district, Powys county, Wales, on the River Usk at its confluence with the Honddu and Tarell. The town grew up around a Norman castle, built in 1092. The Benedictine Priory of St. John was founded about the same time; the former priory church, dating from the 13th century, became in 1923 the cathedral for the newly constituted diocese of Swansea and Brecon of the Church in Wales.

Brecon by the early 16th century had become one of the most important towns in Wales, lying on the main route across southern Wales from London to Fishguard. In 1542, Henry VIII set up a chancery and exchequer at the castle and converted an earlier Dominican friary into a collegiate church and school (Christ's College). Brecon lost its premier status in the southeast to Cardiff after the Industrial Revolution, but it has retained some importance as a shopping and service centre. Pop. (1981 prelim.) 7,422.

Brecon Beacons National Park, Welsh PARC CENEDLAETHOL BANNAU BRYCHEINIOG, southern Wales, national park designated in 1957. The park occupies 519 sq mi (1,344 sq km) of mountains, moors, forests, pastureland, lakes, and the broad Usk valley. The easternmost highlands in the park are the Black Mountains (old red sandstone) of Powys county, lying east of the River Usk between Abergavenny and Hay-on-Wye, with their highest point at Waun Fach (2,660 ft [811 m]). Centrally located within the park,

south of Brecon, are the Brecon Beacons (old red sandstone), including Pen-y-Fan (2,906 ft [886 m]), the highest peak in the park. To the west lies the Black Mountain (chiefly millstone grit) of Dyfed county, east of Llandeilo and south of Llandovery. The park offers a considerable variety of scenery and recreational opportunities, including hill walking, caving, pony trekking, sailing, and angling.

Breconian Stage, division of the Old Red Sandstone of the Devonian Period in western Europe (the Devonian Period began about 395,000,000 years ago and lasted about 50,000,000 years); the Breconian Stage follows the Dittonian and precedes the Farlovian Stage. It was named for exposures studied at the Brecon Beacons in southern Wales. The rocks of the Breconian consist of red, gray, and green sandstones in which plant remains frequently occur. Other European sections consist of brown sandstones, conglomerates, and breccias; the fossil vertebrate *Rhinopteraspis* is characteristic.

Breda, *gemeente* (municipality), Noordbrabant *provincie* (province), southwestern Netherlands, at the confluence of the Mark (Merk) and Aa rivers. It was a direct fief of the duchy of Brabant; its earliest known lord was Godfrey I (1125–70), in whose family it continued until it was sold to Brabant in 1327. Chartered in 1252, it passed to the house of Nassau in 1404 and, ultimately, to William I of Orange (1533–84). Fortified (1531–36) by Count Henry III of Nassau, who restored the old castle built by John I of Polanen in 1350, it remained an important fortress on the Mark until the 19th century.

The Compromise of Breda (1566) was the first move against Spanish dominion, but Breda was captured by the Spanish in 1581. Retaken by Maurice of Nassau in 1590, it fell again to the Spanish in 1625 (the subject of a famous painting by Velázquez), was captured by Prince Frederick Henry of Orange in 1637, and was finally ceded to the Netherlands by the Treaty of Westphalia (1648). The exiled Charles II of England resided in Breda, and his Declaration of Breda (1660) dictated the terms for his acceptance of the English throne. In 1667 the Treaty of Breda ended the second naval war between the Netherlands and England and confirmed British possession of New York and New Jersey and Dutch control of the East Indies and Dutch Guiana. In 1696 William of Orange, king of England, completed the castle (now the Royal Military Academy). During the French Revolution, the town was taken by the French, who occupied it until 1813.

Industrial activities include food processing and the manufacture of machinery, rayon, and matches. Architectural features include the Protestant Grote Kerk, a medieval Gothic church with a massive tower; the town hall (1766); Sint Barbaras church (1869), the seat of a Roman Catholic bishop; and several museums. Pop. (1983 est.) 118,819; metropolitan area, 152,449.

Breda, Treaty of (July 31, 1667), treaty between England, the Dutch Republic, France, and Denmark, which brought to an inconclusive end the second Anglo-Dutch War (1665–67), in which France and Denmark had supported the Dutch. The Dutch had the military advantage during the war (fought mostly at sea) but were compelled to make peace quickly to deal with Louis XIV's invasion of the Spanish Netherlands in the War of Devolution. The English Navigation Acts were changed in favour of the Dutch to permit Dutch ships to carry to England goods that had come down the Rhine River. Several Dutch trading principles were accepted, including confining the definition of "contraband" to implements of war. The Dutch position in world trade had not been shaken, and England had failed to take over a part of the spice trade. England, however, received the New Netherland (New York, New Jersey) and some outposts in Africa from the Dutch, and recovered Antigua, Montserrat, and St. Kitts, in the West Indies, from France. The Dutch retained Surinam and, in the East Indies, Pulo Run. France retained French Guiana and recovered Acadia from England.

Bredero, Gerbrand Adriaenszoon (b. March 16, 1585, Amsterdam—d. Aug. 23, 1618, Amsterdam), poet and playwright who wrote folk songs, farces, and comedies on cosmopolitan Dutch life. The conflict between Bredero's experiences of the medieval, full-blooded life of the backstreets of Amsterdam and the sophistication of the Renaissance intelligentsia was most evident in his earliest poetry, contained in *Groot Liedt-Boeck*

Bredero, engraving by H. Goltzius, 1618
By courtesy of the Iconographisch Bureau, The Hague

(1622). The humorous poems revealed the same power of observation for which some critics have praised the painters Jan Steen and Adriaen van Ostade. The sensuality of the amorous songs and sonnets contrasts with the sincerity and often the remorse of the devotional poetry.

In addition to three tragicomedies based on Spanish romances, Bredero wrote three farces that mark the zenith of this medieval genre: *Klucht van de Koe* (1612), *Klucht van den Molenaar* (1613), *Klucht van Symen sonder Soetigheyd* (1612 or 1613). Day-to-day existence in the burgeoning metropolis of Amsterdam provided material for two comedies: *Het Moortje* (1615), inspired by Terence's *Eunuchus*, and *Spaanschen Brabander* (1617), inspired by the Spanish picaresque novel *Lazarillo de Tormes* and known for its humanity and wit.

Breeches Bible: *see* Geneva Bible.

breed (taxonomy): *see* taxon.

breed association, organization that promotes the respective breeds of horses and registers horses that meet certain qualifications. A new association may admit horses that meet certain qualifications but whose parents are not registered; this is called an open association. The qualifications may be type, colour, or speed. Standardbred horses, for example, are admitted to the registry if they can trot a mile in 2 minutes 30 seconds, or pace a mile in 2 minutes 25 seconds. Older associations generally require that each horse have a registered sire and dam in order to qualify for registration. These are known as closed associations.

Perhaps the oldest association for registering horses is the General Stud Book of England. An *Introduction to a General Stud Book* was published in 1791, and volume 1 in 1793. To establish the registry, the publishers used various records accumulated from horse racing in England. The General Stud Book is recognized as the official registry for the English Thoroughbred. Other nations have their own stud books for registering Thoroughbred horses. Registration certifications of Thoroughbred horses in one nation are usually recognized by other Thoroughbred registering organizations.

Other registries and organizations have been established as new breeds developed.

breeder reactor, nuclear reactor that produces more fissionable material than it consumes to generate energy. This special type of reactor is designed to extend the nuclear fuel supply for electric power generation. Whereas a conventional nuclear reactor (*q.v.*) can use only the readily fissionable but scarce isotope uranium-235 for fuel, a breeder reactor employs either uranium-238 or thorium, of which sizable quantities are available. Uranium-238, for example, accounts for more than 99 percent of all naturally occurring uranium. In breeders, approximately 70 percent of this isotope can be utilized for power production. Conventional reactors, in contrast, can extract less than one percent of its energy.

The first experimental breeder reactor, designated EBR I, was developed in 1951 by U.S. scientists at the National Reactor Testing Station (now called Idaho National Engineering Laboratory), near Idaho Falls, Ida. Since that time, France, Great Britain, Japan, and the Soviet Union have built experimental breeders. As yet, however, no nation has developed a breeder suitable for high-capacity commercial use.

The most promising type of breeder, the liquid-metal fast breeder reactor, converts uranium-238 into the fissionable isotope plutonium-239 by means of artificial radioactive decay. The plutonium-239 is then bombarded with high-speed neutrons. When a plutonium nucleus absorbs one such free neutron, it splits into two fission fragments. This fissioning releases heat as well as neutrons, which in turn split other plutonium nuclei, freeing still more neutrons. As this process is repeated again and again, it becomes a self-sustaining chain reaction, yielding a steady source of energy, chiefly in the form of heat, which is transported from the reactor core by a liquid sodium coolant to a system of heat exchangers. This system utilizes the heat to produce steam for a turbine that drives an electric generator.

Another type of experimental breeder, the thermal breeder reactor, employs thorium-232 as its basic fuel, or fertile material. It converts this isotope into fissionable uranium-233, which is capable of creating a chain reaction. In the thermal breeder, whose technology is much simpler than that of the liquid-metal fast breeder, ordinary water is employed as a coolant to remove the heat produced by the continuous series of fission reactions.

breeding, animal: *see* animal breeding.

breeding, plant: *see* plant breeding.

breeze, air current designation on the Beaufort scale; it is weaker than a wind, which in turn is weaker than a gale. Breeze also denotes various local winds (*e.g.,* sea breeze, land breeze, valley breeze, mountain breeze) generated by unequal diurnal heating and cooling of adjacent areas of the Earth's surface. These breezes are strongest in warm, clear, dry weather, when daytime insolation, or solar radiation, is most intense. They may be reinforced or prevented by winds of passing pressure systems.

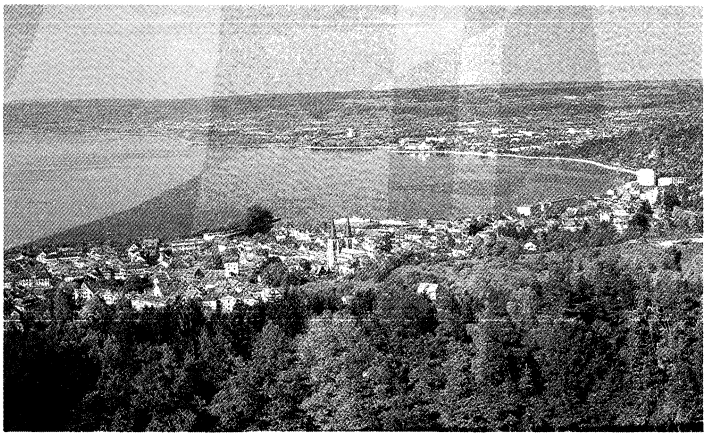
Land areas warm and cool more rapidly than do water bodies. For that reason, cooler, denser air often flows from water to land (sea or lake breeze) during the day, and from land to water (land breeze) at night. Because the temperature contrast is usually greater during the day in summer, the sea breeze is the stronger; it sometimes reduces maximum temperatures by 8° C (15° F) or more along a

narrow coastal strip and greatly modifies the local climate.

Similarly, a valley breeze is produced by rapid warming of the valley floor that causes the air to expand and flow up the slopes. The rising currents sometimes trigger thunderstorms over the mountains. Nighttime land-surface radiation cools the slopes, causing cooler, denser air to drain into the valley (mountain breeze). Usually light, a mountain breeze may become a violent, gusty wind when it is funnelled through a narrow gorge into which cold air has drained from many higher valleys. A glacier breeze is a draft of cold air that is cooled by contact with a glacier, descends along its edge, and then dies out within a short distance.

Bregendahl, Marie (b. Nov. 6, 1867, Fly, Den.—d. July 22, 1940, Copenhagen), Danish writer of regional literature, who portrayed the life of the inhabitants of rural areas with sympathy and a deep understanding of their social problems. Bregendahl's father was a farmer in the Viborg district, and she lived most of her life in that area, making it the milieu of her books. Her marriage in 1893 to the folk poet Jeppe Aakjær ended in divorce. She started to write rather late in life, publishing her first stories in 1902. Her best known novel is *En dødsnat* (1912; *A Night of Death*). *Billeder af Sødalsfolkenes liv,* 8 vol. (1914–23; "Pictures from the Life of the People of Sodal"), however, is considered her main contribution to Danish literature.

Bregenz, town, capital of *Bundesland* (federal province) Vorarlberg, western Austria, on the eastern shore of Lake Constance (Bodensee). The town lies at the foot of the Pfänder Mountain (3,487 ft [1,063 m]; ascended by suspension railway). Inhabited in prehistoric times, it was later the site of a Celtic settlement and then of a Roman camp (Brigantium).



Bregenz and Lake Constance, Austria
Toni Schneiders—Bruce Coleman

Settled by the Alemanni, a Germanic people, in the 6th century, it was ruled by the counts of Bregenz until 1206, when it passed to the counts of Montfort. It had been chartered in 1200 and was sold in 1451 and 1523 to the Habsburgs, who made it one of their principal seats after 1726. The state museum has Celtic and Roman collections, and remains of the 13th-century town walls still stand. Other notable historical landmarks include the medieval Martins-Turm with St. Martin's Chapel (1362–66), the Gothic parish church (1097; most recent reconstruction 1738), the Gothic Seekapelle (altered 1696–98), and the old town hall (1511). Bregenz is a tourist centre with winter and summer sports facilities and the site of a summer arts festival by the lake, with a special stage measuring 361 ft by 984 ft and a dais for 6,300 spectators, the largest of its kind in Europe. Bregenz manufactures textiles, electrical goods, chemicals, and machinery and is served by a large hydropower plant nearby. Pop. (1981) 24,683.

Bregenzerwald, English BREGENZ FOREST, forested mountain range in *Bundesland* (federal province) Vorarlberg, western Austria. The range, part of the Allgäuer Alps, is drained by the Bregenzer Ache (stream) and has been partly deforested. Its hilly Vorderwald (foothill area toward Bregenz) supports pasture and dairy farming, while winter-sports centres and climatic health resorts in its Hinterwald (mountainous interior) make the tourist trade a major economic factor.

Bregenzerwald, Austria
Toni Schneiders—Bruce Coleman

Breguet, Abraham-Louis (b. Jan. 10, 1747, Neuchatel, Switz.—d. Sept. 17, 1823, Paris), the leading French horologist of his time, known for the profusion of his inventions and the exactitude of their execution.

Breguet was apprenticed in 1762 to a watchmaker at Versailles. He took refuge in London during the French Revolution and, upon his return to France, became a principal watchmaker of the Empire. Among Breguet's many inventions and innovations were the overcoil, an improvement of the balance spring that was incorporated into most precision watches, and the tourbillon, an improvement in the lever escapement that rendered it immune to errors due to the changing position of the watch while being carried. Breguet succeeded Ferdinand Berthoud as the official nautical horologist in 1807 and was admitted to the French Academy of Sciences in 1816. Considered to be one of the greatest watchmakers of all time, Breguet had in his lifetime a worldwide reputation and clientele, and he influenced watchmaking throughout Europe.

Bréguet, Louis-Charles (b. Jan. 2, 1880, Paris—d. May 4, 1955, Paris), French airplane builder, many of whose planes set world records, and founder of Air France.

Bréguet was educated at the Lycée Condorcet and Lycée Carnot and at the École Supérieure d'Électricité. He joined the family engineering firm, Maison Bréguet, becoming head engineer of its electric service.

Bréguet built his first airplane in 1909, set a speed record for a flight of 10 kilometres in 1911, and in that year founded the Société des Ateliers d'Aviation Louis Bréguet. In 1912 he constructed his first hydroplane and in 1917 designed and flew a "gyroplane," the forerunner of the helicopter. During World War I he manufactured military planes; his Bréguet-XIX was especially noteworthy.

In 1919 he founded the Compagnie des Messageries Aériennes, which ultimately became Air France. A Bréguet plane made the first nonstop crossing of the South Atlantic in 1927; another made a 4,500-mile flight across the Atlantic in 1933, the longest nonstop Atlantic flight up to that time. Bréguet remained an important manufacturer of military planes during World War II and afterward produced a series of large four-engined transports.

Brehon laws, Gaelic FEINECHUS, ancient laws of Ireland. The text of these laws is written in the most archaic form of the Gaelic language, dating back to the 8th century and so difficult to translate that the official renderings are to some extent conjectural. The ancient Irish judge, or Brehon, was an arbitrator, umpire, and expounder of the law, rather than a judge in the modern sense.

Analysis of the extant remains of the Brehon law manuscripts has revealed the character of ancient Irish life, society, and social institutions. The basis of that society was the clan. Kinship with the clan was an essential qualification for holding any office or property. The rules of kinship largely determined status, with its correlative rights and obligations. The solidarity of the clan was its most important characteristic. The entire territory occupied by a clan was the common and absolute property of that clan, although in the course of time a large and increasing proportion of the good land became limited private property. Thus, the area of arable land available for the common use of the clansmen was gradually diminished.

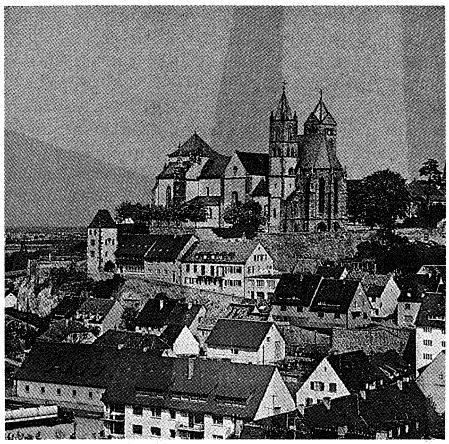
Land was seldom sold and not often rented in ancient Ireland. Nobles and other persons holding large areas would not rent the land itself to clansmen but rather the right to graze cattle, sometimes even renting out the cattle. There were two distinct methods of letting and hiring: *saer* ("free") and *daer* ("unfree"). The conditions of *saer* tenure were largely settled by the law; the clansman was left free within the limits of justice to end the relationship, and no liability was imposed on the clansman's joint family. On the other hand, *daer* tenure, whether of cattle or of the right to graze cattle, was subject to a security. The members of the tenant's joint family were liable to make good out of their own property any default in the payments.

No contract affecting land was valid unless made with the consent of the joint family. Other contracts had to be made in the presence of the noble or magistrate. The parties to a contract had to be free citizens, of full age, free to contract, and under no legal disability. A witness was in all cases important and, in some, essential to the validity of a contract.

The criminal laws uniformly discountenanced revenge, retaliation, the punishment of one crime by another, and capital punishment. Reparations were paid to the family of the victim.

Breisach, in full BREISACH AM RHEIN, city, Baden-Württemberg *Land* (state), southwestern West Germany, on the right bank of the Rhine opposite Neuf-Brisach, Fr. As ancient Brisiacum, it was a stronghold of the

Celtic Sequani. Captured in the time of Julius Caesar, it became known as Mons Brisiacus. Fortified by the emperor Valentinian in 369, it remained one of the chief Rhine bulwarks of medieval Germany and gave its name to the Breisgau district. Taken by the German



Cathedral of St. Stephan overlooking Breisach, W.Ger.
K. Jung—ZEFA

king Otto I in 939, it fell to the bishops of Basel in 1254 and 1262. Made an imperial city in 1275, it was held by the Habsburgs after 1331. It fell to the Protestants in the Thirty Years' War (1638), to the French in 1648, and was restored to Austria in 1697. It was incorporated into Baden by the Treaty of Pressburg (1805), and its fortifications were razed. Although devastated in World War II, it has been rebuilt in the original style. Two medieval gates and the Romanesque-Gothic Cathedral of St. Stephan (11th and 15th centuries) escaped destruction.

Breisach trades in wines, agricultural produce, textiles, electrical goods, and paper. Pop. (1983 est.) 9,684.

Breisgau, historic region between the Rhine and the Black Forest in southwestern Germany, now in the South Baden district of the *Land* (state) Baden-Württemberg. It was part of the frontier region of the Roman Empire known as the Agri Decumates; from *c.* AD 260 it was occupied by the Germanic Alemanni. The Zähringen family was invested with the countship of Breisgau in the early Middle Ages. In 1120 it founded Freiburg im Breisgau as a free market town. In the 14th century the Habsburgs incorporated most of Breisgau into their domains. Albert VI of Austria established the University of Freiburg in 1457. During the Peasants' Revolt and the Thirty Years' War, Breisgau was subjected to destructive sieges and was for a time held by the Swedes. The Habsburgs lost Freiburg to Louis XIV of France by the Treaty of Nijmegen in 1679 but regained it by the Treaty of Rijswijk in 1697. By the Treaty of Pressburg in 1805, the county was divided between Württemberg and Baden; the latter acquired full possession of it in 1806.

Breitenfeld, Battle of (Sept. 17, 1631), the first major Protestant victory of the Thirty Years' War, in which the army of the Roman Catholic Habsburg emperor Ferdinand II and the Catholic League, under Johan Isaclaes, Graf von Tilly, were destroyed by the Swedish-Saxon army under King Gustavus II Adolphus of Sweden. It marked the emergence of Sweden as a great power and the triumph of the new Swedish flexible linear tactics over the old massive infantry formations that had long dominated European warfare.

In early September Tilly, the imperial commander, invaded Saxony and, after seizing Leipzig on September 15, arrayed his army in the suburb of Breitenfeld to meet the Swedish-Saxon advance. The Saxons, on the Swedish left, were routed by Tilly's initial attack. However, Tilly's attempt to turn this flank was repulsed when the commander of the Swedish left, Gustav Karlsson Horn, shifted troops to form a new front to his flank in the heat of battle—the first time this was done in modern warfare. Meanwhile the Swedish right withstood seven hours of imperial cavalry charges. Gustavus then personally led a furious counterattack around Tilly's left, captured the Saxon guns lost earlier, as well as the imperial artillery, and mowed down the massive imperial infantry squares. The imperial army broke and fled, with losses of 12,000 men. Tilly, seriously wounded, escaped with only a few thousand men. Gustavus entered Leipzig the next day.

Breitinger, Johann Jakob (b. March 1, 1701, Zürich—d. Dec. 13, 1776, Zürich), German writer, one of the most influential 18th-century literary critics in Germany.

He studied theology and became professor at the Collegium Carolinum. He lectured on Hebrew, Greek, Latin, logic, and rhetoric; showed excellence as a philologist in many editions; and advocated education on humanist lines (Zürich school reform, 1765–75).

Under the inspiration of *The Spectator* papers of Addison and Steele, Breitinger founded and

Breitinger, engraving by Johann Jacob Haid after a portrait by Johann Caspar Füssli
Archiv fur Kunst und Geschichte, West Berlin

wrote essays for the weekly *Discourse* (1721–23). The most important of his many publications was the *Critische Dichtkunst* (1740), in which he attacked the narrowly rationalist *Dichtkunst* of the Leipzig "literary pope" J.C. Gottsched (1730). Breitinger stressed the place of the imagination and the wonderful in poetry; fired the German public with enthusiasm for Homer; and spread the ideas of John Locke, Lord Shaftesbury, and Alexander Pope. He was visited by Goethe and others, and his pupils included the poet and prose writer J.K. Lavater and the writer and educator J.H. Pestalozzi.

Breiz: *see* Brittany.

Bremen, in full FREIE HANSESTADT BREMEN (German: Free Hanseatic City-State of Bremen), *Gemeinde* (municipality), *Kreisfrei Stadt* (municipal district), and capital of the *Land* (state) of Bremen, which comprises the two cities of Bremen and Bremerhaven, Federal Republic of Germany. It is situated on the Weser River some 43 mi (70 km) from the North Sea, is one of the largest ports of West Germany, and is one of the more dynamic of that nation's cities. Bremen is also one of the major industrial cities of northern Europe. Together with the port of Bremerhaven, situated 37 mi to the north, it forms the smallest *Land* of the 10 *Länder* of the Federal Republic of Germany but is of vital economic significance. This article describes both the *Land* and the city that dominates it.

The earliest settlement (called *Breme* or *Bremum*) on the right bank of the river was favoured by an advantageous position at the junction of important early trading routes from the Rhine River to the Elbe and from the North Sea to southern Germany. In 787 Charlemagne, the Western (Holy Roman) emperor, established the diocese of Bremen (to become an archbishopric in 845), which became the base for missionary activity covering the whole of northern Europe. The market rights—including customs and coinage—that were conferred on Bremen in 965 brought increased mercantile activity, and the young city soon became one of the commanding religious and economic centres of northern Germany, especially after entering the Hanseatic League—an economic and political association of the rising urban mercantile class—in 1358. The imperial free city, as Bremen became known, occupying a strongly fortified position on either side of the Weser, defended its independence in the Thirty Years' War (1618–48) and later repelled both Swedish and Hanoverian aggression. As an autonomous republic—the oldest in Germany—it joined the German Confederation in 1815 and the reconstituted German Empire in 1871. It attained increasing economic importance as a leader in international trade and world shipping by entering the German customs union (Zollverein) in 1888, through expanding its port facilities, and by developing manufacturing industry.

The city of the late 20th century is an interesting amalgam of medieval and modern architecture. The outstanding features in the Altstadt, or Old Town, in the restored heart of the city, are the famous marketplace with its 11th-century cathedral; the Gothic Town Hall with its Renaissance facade; the statue of Roland (1404), symbolizing market rights and imperial jurisdiction; a picturesque row of old, gabled houses; and the modern-style Parliament. Districts heavily bombed in World War II (69 percent of the houses were destroyed) have since been rebuilt, allowing for growing traffic and extensive public parks. About 3 mi from the city centre, the modern satellite town of Neue Vahr, built between 1957 and 1962, is one of a ring of peripheral settlements that have coalesced with the expanding and dynamic city.

The land. Located at the first ford above the river estuary, the Old Town grew on a sand dune, sited above flood level on the Weser spillway, the glacially widened river channel. The windblown sand accumulated, in the postglacial period, up to a height of 45 ft (15 m) above the flat marshes and moors of the Bremer Becken (lowlands). Because of the effect of North Sea tides and of the high subterranean water level, 71 mi of dikes, associated with a complicated drainage system, play an important role in the Bremen urban area. The dune—25 mi long and 2 mi wide—has thus decisively influenced the northward and southward expansion of the city. The territorial possessions of the city also included large sections of the swampy, cultivated lowlands and stretches along the Weser, which became associated with the rise of further smaller settlements. The gradual incorporation of these rural communities—which had always had close economic relations with Bremen—started in 1849 and in 1945 brought the administrative area of the city of Bremen to its contemporary size of approximately 125 sq mi (324 sq km).

The people. Bremen ranks among the 10 largest cities in the Federal Republic of Germany. A small town of only 30,000 inhabitants a century and a half ago, its subsequent growth, closely linked with its economic development, occasioned a population rise that reached 162,000 by 1880 and 264,000 in 1920. By the end of World War II, the population of the war-torn city had dropped from 424,000

(1939) to 362,000, but it rose sharply with the extensive postwar reconstruction. By the late 20th century, Bremen population was characterized by an annual birth rate of less than 2 percent. This, together with an insignificant inward migration rate, made it one of the more demographically stable German cities. The age structure of the population shows that the majority is in the age group from 15 to 65. As might be expected in an industrial city, nearly half of the 15 to 65 age group are employed. Living as they are in the heart of the strongly Protestant north of Germany, the vast majority of Bremen citizens are members of the Protestant Church, with a small minority adhering to the Roman Catholic faith.

The economy. In the late 20th century the economic life of the *Land* continued to reflect the historic interconnection of shipping, foreign trade, and industry. The port facilities of Bremen and Bremerhaven, which, administratively and economically, form one unit, incorporate free-port status, whereby imported goods can be handled and stored without time limits and without customs formalities. Bremerhaven handles about one-fourth of the total tonnage of goods in the two ports, just over half of which is mixed cargo, the remainder being composed of such bulk goods as grain, coal, ore, and oil. The merchant fleet of Bremen—whose number rose sharply after the foundation of the Norddeutscher Lloyd Shipping Company in 1857—consisted by the late 20th century of several hundred seagoing vessels and many barges. The port of Bremerhaven was the home of the largest German fishing fleet.

In Hanseatic times, Bremen's importance rested almost entirely on its character as a trading centre and as a seaport for handling raw materials and foodstuffs. Grain from the Baltic countries, for example, was sent to western Europe via the city, and, in return, wine, salt, and, later, colonial products—notably cotton, for which it was the European marketing centre—passed through it. Since the end of the 18th century, the port has handled, in increasing quantities, grain, timber, coffee, tobacco, wool, and cotton. These items are processed by local firms, which are among the biggest of their kind in the country.

Originally, the city's entire industrial potential—except for food industries—depended upon the shipyards and their supporting firms. By means of industrial enterprises founded after 1900, the Bremen economy increasingly became more diversified, supplying the internal market and ensuring sufficient freight for outward-sailing ships. Steel for the city's shipbuilding industry—the seven major companies of which comprise a substantial proportion of the national shipyard capacity—derives from local steelworks. In addition, machine-building industries specialize in engines and equipment for ships and trucks and machinery for growth industries. The aircraft industry comprises a large part of the total West German capacity. Production in the electrical industry ranges from industrial equipment to radio and television sets and modern electronic materials. By the late 20th century, several hundred industrial firms in the region employed many thousands of workers, with capital goods industries accounting for half of the workers, the food industry for one-fifth, consumer goods industries for about one-sixth, and raw materials industries for about one-fifth.

Administrative and social conditions. Bremen *Land,* the overall administrative unit, has a total area of 156 sq mi (404 sq km). The city of Bremerhaven, which covers 31 sq mi, was founded as an outer port for Bremen because of the silting up of the lower Weser; it joined the Bremen *Land* in 1947.

A new constitution, adopted in the same year, placed the legislative power in the City Council (Bürgerschaft). The council appoints the executive body (Senate), which is composed of a president (Bürgermeister) and nine senators. The major political parties of the *Land* are the Social Democrats, Free Democrats, and Christian Democrats. The council—which has 80 members from Bremen and 20 from Bremerhaven—and the Senate are elected every four years. The *Land* has three seats in the Upper House of the Federal Council (Bundesrat).

In the late 20th century, about half of all Bremen employees worked in commerce, transport, and various services. Bremen is the home of several banks, insurance companies, a stock exchange, and cotton- and tobacco-marketing centres. The importance of its overseas connections is illustrated by the presence of consulates of about 30 countries. Warehouses, stores, and specialist shops also cater to people from the surrounding rural area, while imports and exports are dealt with by numerous shipping companies and agents. The railways are an important factor in the transportation of piece (cloth) goods. Quick electric passenger trains and motorways link modern Bremen with the country's major cities; and, apart from direct flights to London and Amsterdam, Bremen airport is connected with many inland airports.

The city has a few hundred primary and secondary schools, several vocational schools and academies, a number of technical schools—among which are a school of engineering, and a merchant marine school—and a teacher's training college. A university was founded in 1971. Bremen has a radio and television transmitting station, and several daily and weekly newspapers are published.

Cultural life. Numerous theatres, libraries and archives, and museums and galleries contribute to the rich cultural life of Bremen. Most of these facilities are concentrated in the pleasant surroundings of the old town, especially in the Schnoorviertel, a district that was restored to its original 16th- and 17th-century appearance in the post-World War II reconstruction. In keeping with the worldwide connections of the city, international congresses are often held in Bremen, which offers numerous hotels, several conference halls, and a congress hall seating 10,000 people. As in many other West German industrial cities, there are extensive sports grounds, associated with several hundred clubs. Parks, located all over the city, offer a relaxing contrast to the often hectic pace of economic activities. The best known are the Bürgerpark, with its famous rhododendron gardens, and the former ramparts, which were demolished in 1802 and which now form promenades surrounding the Old Town. Pop. (1983 est.) city, 547,619; state, 685,388.

BIBLIOGRAPHY. G.O.A. Bessell, *Bremen: Geschichte einer deutschen Stadt,* 3rd ed. (1955), a general review of the history of the city; *Freie Hansestadt Bremen: Werden, Vergehen und Wiederaufbau* (1947), an atlas of views and maps of the city (1567–1945), with descriptive text; Bremen, Senator für Wirtschaft und Aussenhandel, *Bremen/Bremerhaven: Industrie am Strom* (1969), a discussion of the individual branches of industry and their development within the Bremen economy, *Die Wirtschaftsstruktur Bremens,* 2nd ed. (1969), a general review of the Bremen economy; G. Deissmann (ed.), *Wachsende Städte an der Unterweser,* 2nd ed. (1965), a general review of the economy of the cities of Bremen and Bremerhaven and their individual development, with valuable statistics and maps of the ports; *Zuhause in Bremen* (1970), a guide through Bremen with particular reference to cultural life and recreation, with detailed statistics and an extensive bibliography.

Bremer, Fredrika (b. Aug. 17, 1801, Åbo, Swedish Finland—d. Dec. 31, 1865, Årsta, near Stockholm), writer, reformer, and champion of women's rights; she introduced the domestic novel into Swedish literature.

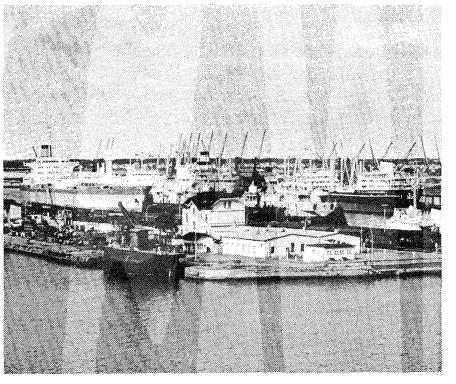
The daughter of a wealthy merchant who settled in Sweden when she was three, she was

Fredrika Bremer, detail of an oil painting by J.O. Södermark, 1843; in the Svenska Porträttarkivet, Stockholm
By courtesy of the Svenska Portrattarkivet, Stockholm

carefully educated and travelled extensively in Europe. After her father's death, her private means enabled her to devote her life to social work, travel, and writing. Her quiet domestic novels such as *Familjen H.* (1831; *The H——— Family,* 1842), *Grannarna* (1837; *The Neighbours,* 1853, reprinted 1973), and *Hemmet* (1839; *The Home,* 1843) were popular at home and abroad. They were translated into English by the poet Mary Howitt (11 vol., 1844–45). Bremer visited the United States, where she was welcomed in New England as a kindred spirit for her antislavery sentiments. She met Emerson, Longfellow, and Hawthorne and wrote about her impressions in *Hemmen i den nya verlden,* 3 vol. (1853–54; *The Homes of the New World,* 1853; *America of the Fifties,* 1924). Her later novels *Hertha* (1856; Eng. trans., 1856) and *Fader och dotter* (1858; *Father and Daughter,* 1859) deal with the social effects of the assertion of women's rights.

Bremer Beiträger, group of mid-18th-century German writers, among them Johann Elias Schlegel, who objected to the restrictive, Neoclassical principles (laid down in 1730 by Johann Christoph Gottsched) according to which "good" literature was to be produced and judged. They demanded room for the play of genius and inspiration. Their organ was the *Bremer Beiträger* (1745–48).

Bremerhaven, city, Bremen *Land* (state), northern West Germany, on the east side of the Weser estuary, on both banks of the Geest River at its junction with the Weser. It became a municipality by the amalgamation of three separate towns: Bremerhaven, founded (1827)



Bremerhaven docks, West Germany
Shostal—EB Inc.

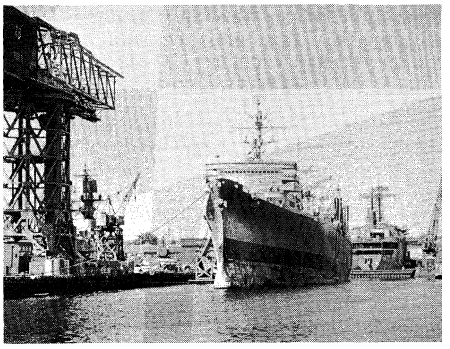
as a port for Bremen by its burgomaster, Johann Smidt, on territory ceded by Hanover; Geestemünde, founded by Hanover in com-

petition in 1845; and Lehe, a borough dating from medieval times that attained town status in 1920. The union of Lehe and Geestemünde in 1924 formed the town of Wesermünde, which in turn absorbed Bremerhaven in 1939, under Hanoverian jurisdiction. This unified city, restored to Bremen in 1947, was thereafter known by the name of Bremerhaven.

Repeated cessions of Prussian territory expanded the docks after the opening of the "Old Harbour" in 1830, and Bremerhaven developed as Germany's largest fishing port. After 1857, as headquarters of the North German Lloyd Shipping Company (Norddeutsche Lloyd), it became the largest passenger port, with its Columbus Quay and Columbus Station dealing with transatlantic traffic. Most freight traffic was diverted to Bremen after improvements to the Weser Channel (1883–94). Industry is based primarily on fishing (fish processing and the manufacture of cans, barrels, and nets), and shipbuilding also flourishes. Although heavy damage in World War II demolished the city centre, the docks were substantially unimpaired. The construction of the Columbus-Center in 1971 revitalized the commercial functions of the city center. There are museums containing prehistoric and protohistoric relics of the region and an oceanographic institute. Pop. (1983 est.) 137,769.

Bremersdorp (Swaziland): *see* Manzini.

Bremerton, city, Kitsap County, western Washington, U.S., on Port Orchard Bay across Puget Sound from Seattle (connected by ferry). William Bremer laid out the site in 1891 and promoted the establishment of the Puget Sound Naval Shipyard. Incorporated in 1901, it expanded as the northern home of the U.S.



Puget Sound Naval Shipyard, Bremerton, Wash.
Ray Atkeson—EB Inc.

Pacific Fleet and consolidated with Manette (East Bremerton), annexing Charleston (West Bremerton) in 1927. There are lumber and dairy industries, and Olympic Technical Community College was established there in 1946. Bremerton is a gateway to the recreational areas of the Olympic Peninsula. The battleship USS "Missouri," site of Japan's surrender to the United States and its allies (Sept. 2, 1945), terminating World War II, is anchored adjacent to the naval shipyard and is opened to visitors. The Navy's Polaris Missile Facility, Pacific, is in Bremerton. Pop. (1980) city, 36,208, metropolitan area (SMSA), 146,609.

bremsstrahlung (German: "braking radiation"), electromagnetic radiation produced by a sudden slowing down or deflection of charged particles (especially electrons) passing through matter in the vicinity of the strong electric fields of atomic nuclei. Bremsstrahlung, for example, accounts for continuous X-ray spectra—*i.e.,* that component of X-rays the energy of which covers a whole range from a maximum value downward through lower values. In generating bremsstrahlung, some electrons beamed at a metal target in an X-ray tube are brought to rest by one head-on collision with a nucleus and thereby have all their energy of motion converted at once into radiation of maximum energy. Other electrons from the same incident beam come to rest after being deflected many times by the positively charged nuclei. Each deflection gives rise to a pulse of electromagnetic energy, or photon, of less than maximum energy.

Bremsstrahlung is one of the processes by which cosmic rays dissipate some of their energy in the Earth's atmosphere. Solar X-rays have been attributed to bremsstrahlung generated by fast electrons passing through the matter in the part of the Sun's atmosphere called the chromosphere.

Internal bremsstrahlung arises in the radioactive disintegration process of beta decay, which consists of the production and emission of electrons (or positrons, positive electrons) by unstable atomic nuclei or the capture by nuclei of one of their own orbiting electrons. These electrons, deflected in the vicinity of their own associated nuclei, emit internal bremsstrahlung.

Consult the INDEX *first*

Bren machine gun, British adaptation of a Czech light machine gun. Its name originated as an acronym from Brno, where the Czech gun was made, and Enfield, where the British adaptation was made. Gas operated and air cooled, the Bren was designed in 1937 and became one of the most widely used weapons of its type. It was produced in .303 calibre for British use and was manufactured as a 7.92-millimetre weapon for Chinese Nationalist troops.

Acclaimed as one of the best light machine guns of World War II, the Bren appeared in four models that varied principally in the butt assembly. The Mark 4 model had an overall length of 42.9 inches (109 centimetres), with a 22.25-in. barrel. It had a cyclic rate of fire of 550 rounds per minute, weighed 20 pounds (10 kilograms), and had a range of about 1,800 feet (550 metres). Easy to load, clean, and operate, it had variable-length bipods and a curved magazine. Its barrel could be changed quickly; because machine gun barrels lose accuracy when overheated, they must be changed often in sustained fire situations. The Bren is no longer in first-line service in the British Army, but it is still used by the armies of many countries.

Brendan, SAINT, Brendan also spelled BRANDON, or BRANDAN, also called BRENDAN OF CLONFERT, BRENDAN THE VOYAGER, or BRENDAN THE NAVIGATOR, Gaelic BRÉNAIND (b. *c.* 484/486, Tralee, now in County Kerry, Ire.—d. 578, Annaghdown, County Galway; feast day May 16), Celtic saint, monastic founder, abbot, and hero of legendary voyages in the Atlantic Ocean. Reputedly raised and educated by Abbess St. Ita at her boys' school in what later became County Limerick, he later studied under Abbot St. Jarlath of Tuam. After becoming a monk and priest, he was entrusted with the abbey of Ardfert, and subsequently established monasteries in Ireland and Scotland, the chief one being Clúain Ferta Brénaind (Anglicized Clonfert), founded in 561. He is called Brendan of Clonfert to distinguish him from several namesakes.

A noted traveller, Brendan voyaged to the Hebrides (according to St. Adamnan's life of Abbot St. Columba of Iona) and to western Scotland and perhaps to Wales and Brittany. Later, possibly as early as the 8th century, Brendan was immortalized as the hero of a legendary Christian tale of sea adventure, *Navigatio Brendani* ("Voyage of Brendan"). This Irish epic, a narrative masterpiece, was translated into Latin prose early in the 10th century. According to the *Navigatio,* Brendan makes an astonishing Atlantic journey with other monks to the "Promised Land of the Saints" (later identified possibly as the Canary Islands), which he reaches after a prolonged search. St. Brendan's Island, somewhere in the Atlantic and long sought by sailors, was believed in Columbus' time to have been sighted by inhabitants of the Azores, probably the effect of mirage. G.A. Little's *St. Brendan the Navigator* appeared in 1945, followed by G. Ashe's *Land to the West: St. Brendan's Voyage to America,* 1962. *Navigatio Sancti Brendani Abbatis* was edited by C. Selmer in 1959.

Brendel, Alfred (b. Jan. 5, 1931, Wiesenberg, Czech.), internationally renowned Austrian pianist whose recordings and numerous concert appearances secured his reputation.

Brendel studied the piano with Sofia Dezelic, Ludovika von Kaan, Eduard Steuermann, and Edwin Fischer. He made his debut in Graz (Austria) in 1948 and won a prize at the Concorso Busoni at Bolzano in 1949. He performed extensively throughout Austria; in 1962 he performed the Beethoven sonatas in London and in 1963 made his first North American tour.

Although known primarily for his interpretation of Beethoven's works, he was also a noted performer of Liszt and featured in his unusually comprehensive repertoire such composers as Schubert, Haydn, and Mozart. Brendel is credited with almost single-handedly rescuing from oblivion the piano pieces of Schubert composed between 1822 and 1828. Known for his intellectual approach to music, Brendel also displayed a sensitivity to tone and colour. In *Musical Thoughts and Afterthoughts* (1977), he discusses Beethoven, Schubert, Liszt, Ferruccio Busoni, and Edwin Fischer.

Brennan, Christopher (John) (b. Nov. 1, 1870, Sydney—d. Oct. 5, 1932, Sydney), poet and scholar whose highly personal verse never was popular with the Australian public but was highly regarded by critics for its vitality and sincerity. For many years much of his work was virtually unobtainable, having originally been produced in small editions or circulated privately in typescript. A collected edition in 1958 helped rescue his reputation from obscurity.

He was educated at the University of Sydney (M.A., 1892) and was a fine classical scholar. His verse shows the influence of Greek and Latin poets. While in Germany on a travelling scholarship, he became interested in the Symbolists. Returning home, he became a library cataloger, lectured part time at the University of Sydney, and, in 1920, was appointed associate professor of German and comparative literature at the University of Sydney. He was dismissed from this post in 1925 because of his unconventional life-style; he then lived in poverty for some years.

In 1897 *XXI Poems: Towards the Source* was published in an edition of only 200 copies. *Poems* (1914) was followed by *A Chant of Doom* (1915).

Brennan, Tim (U.S. author): *see* Conroy, John Wesley.

Brennan, William J(oseph), Jr. (b. April 25, 1906, Newark, N.J., U.S.), associate justice of the United States Supreme Court (from 1956).

Brennan studied law under Felix Frankfurter at the Harvard Law School and graduated in 1931 to join a Newark law firm. He specialized in labour law and, except for military service during the war, practiced until his appointment in 1949 to the New Jersey Superior Court. He was named to the appellate division in 1950 and to the state Supreme Court

in 1952. His service on the state bench is marked by his administrative skill in speeding litigation and clearing a calendar severely in arrears. He was named to the U.S. Supreme Court by Republican president Dwight D. Eisenhower in 1956 despite his Democratic party affiliations.

A liberal constructionist and articulate defender of the Bill of Rights, Brennan was nonetheless able to secure general consensus among the justices by narrow construction of constitutional questions. He is remembered for his role in a series of "obscenity cases" beginning with *Roth* v. *United States* (1957) (the most famous of which was *Ginzburg* v. *United States*), many of which broadened the protection accorded to publishers but which also showed an attempt to balance individual freedoms with the interests of the community. In *New York Times Co.* v. *Sullivan* (1964) Brennan wrote for the court that even false statements about public officials were entitled to protection under the 1st and 14th Amendments unless "actual malice" could be demonstrated.

Brennan was a strong believer in the importance of an independent judiciary and of the impact of procedure upon substantive rights. These concerns informed his opinions in the loyalty oath cases; in his dissent in *State* v. *Tune* (1953), in which the defendant was denied a copy of the confession; and in *Jencks* v. *United States* (1957), in which Brennan gave the court's opinion, establishing a defendant's right to examine the reports of government witnesses. In his dissents in *Ker* v. *California* and *Lopez* v. *United States* (both 1963), Brennan argued for the right to privacy as implicit in the 4th Amendment. His decision for the court in *Baker* v. *Carr* (1962) provided the grounds for national legislative redistricting.

Brenner Pass, Italian PASSO DEL BRENNERO, German BRENNERPASS, mountain pass, one of the lowest (4,498 ft [1,370 m]) and most important through the main chain of the Alps on the Austrian–Italian border. It separates the Ötztal and Zillertal Alps (*qq.v.*).

Brenner Pass, open all year long, has been one of the main entrances to Italy from the north and, since Roman times, the principal road between the Eastern Alps in Germany and the Po River Valley of Italy. Since the 14th century it has been one of Europe's great trade routes. A carriage road (built 1772) and a railway (completed 1867) climb steeply from Innsbruck through the Wipp Valley up to the Brenner Pass and then descend through the Isarco and Adige river valleys to Verona. The modern Brenner Highway (completed early 1970s) links Kufstein, Austria, with Modena, Italy; the Wipp Valley is spanned by the Europabrücke (Bridge of Europe). The nearby town of Brennero was the site of three wartime meetings between Adolf Hitler and Benito Mussolini.

Brennus (fl. early 4th century BC), according to tradition, the leader of the band of Gauls who captured Rome about 390. Most scholars accept his historicity even though he is first mentioned by the Roman historian Livy (59 or 64 BC–AD 17) and not by earlier writers of comprehensive histories such as Polybius (2nd century BC).

Evidently Brennus invaded Italy and severely defeated the Roman army at the Allia River about 12 miles north of Rome. He then appears to have delayed a day or two in the field, giving his enemy time to fortify the Capitoline, one of the hills of Rome. He sacked the city and, after having besieged the Capitoline for seven months, accepted the offer of the defenders to ransom themselves and departed safely with his booty. The details provided by Livy are less credible. They include Brennus' utterance of the famous phrase *Vae victis* ("Woe to the vanquished") after the Gauls were caught cheating in measuring the ransom money.

Brennus (d. 279 BC), Gallic chieftain who led an unsuccessful invasion of Greece in the autumn of 279. He advanced through Macedonia to Greece shortly after another group of Gauls had overrun Macedonia and killed its king. At the narrow pass of Thermopylae, on the east coast of central Greece, Brennus suffered heavy losses while trying to break through the Greek defense. Eventually he found a way around the pass—in much the same manner as the Persian invaders had done in 480 BC—but the Greeks escaped by sea. Brennus pushed on to Delphi, where he was wounded in battle; in the subsequent retreat northward few Gauls escaped. Brennus avoided capture by committing suicide.

Brent, outer borough of Greater London, comprising Victorian and later residential suburbs, industrial tracts, and growing office centres. The Edgware Road, on the line of the Roman Watling Street, forms the eastern margin of the borough, which was formed in 1965 by the amalgamation of Wembley and Willesden, which flanked the small River Brent. The borough has an area of 17 sq mi (44 sq km).

Wembley developed between World Wars I and II mainly as a residential area but with some strictly controlled industrial development. Wembley Stadium, which can accommodate more than 100,000 spectators, was built for the British Empire Exhibition (1924–25). A swimming pool, ice rink, and indoor tennis courts adjoin the stadium, which is best known for international football (soccer) matches and cup finals. It was the venue of the 1948 Olympic Games.

The Park Royal industrial estate, Willesden, is one of London's major industrial areas, having developed from a munitions factory of World War I. Various food and engineering industries are now located there. Brent Reservoir, popularly known as the Welsh Harp, is used for sailing and is frequented by many species of migratory wildfowl. Pop. (1982 est.) 254,000.

Brent, Margaret (b. *c.* 1600, Gloucestershire, Eng.—d. 1669/71, Westmoreland County, Va.), powerful British colonial landowner who, because of her remarkable business and legal acumen, has been called North America's first feminist.

Attracted by the promise of natural abundance in the New World, Brent migrated in 1638 from England to the Chesapeake Bay area and settled at St. Mary's, Maryland's principal town. On the basis of letters from the English proprietor of the colony, Cecilius Calvert, Lord Baltimore, she obtained a patent for 70½ acres, making her the first Maryland woman to hold land in her own right. By 1657 she had become one of the largest landowners in the colony.

In a Maryland–Virginia border dispute, she gathered a group of armed volunteers to support Maryland governor Leonard Calvert (August 1646). Calvert appointed her sole executrix of his estate, and after his death in 1647 she settled a dispute (over back pay owed to the governor's soldiers) that had nearly brought the colony to civil war.

Convinced that she needed a voice in the Maryland Assembly if she was to discharge her obligations, on Jan. 21, 1648, she requested one vote for herself and another as Calvert's administrator and Baltimore's attorney. The votes were denied her and Lord Baltimore condemned her actions. Resenting his lack of support, she moved to Westmoreland County, where she spent the remainder of her life.

brent goose: *see* brant.

Brentano, Bettina: *see* Arnim, Bettina von.

Brentano, Clemens (b. Sept. 9, 1778, Ehrenbreitstein, near Koblenz—d. July 28, 1842, Aschaffenburg, Bavaria), poet, novelist, and dramatist, one of the founders of the Heidelberg Romantic school, the second phase of German Romanticism, which placed its emphasis on German folklore and history.

Brentano's mother, Maximiliane Brentano, was Goethe's friend in 1772–74, and his sister, Bettina von Arnim, was a correspondent of Goethe's. As a student in Jena, he became acquainted with Friedrich von Schlegel and Ludwig Tieck, the leaders of the earlier phase of Romanticism. Giving up his studies, he travelled throughout Germany. Settling temporarily in Heidelberg, he met Achim von Arnim, with whom he published the collection

Clemens Brentano, detail of an etching by Ludwig Grimm, 1837

By courtesy of the Staatsbibliothek, West Berlin

of German folk songs *Des Knaben Wunderhorn* (1805–08), which became an important inspiration to later German lyric poets.

Among Brentano's most successful works are his fairy tales, particularly *Gockel, Hinkel and Gackeleia* (1838). His well-known "Geschichte vom braven Kasperl und dem schönen Annerl" (1817; Eng. trans., "The Story of the Just Casper and Fair Annie," 1927) is a brilliantly executed short story in which themes from German folklore are used to sustain the fantasy atmosphere of the story. His other major works include the dramas *Ponce de Leon* (1801) and *Die Gründung Prags* (1815; "The Foundation of Prague") and the novel *Godwi* (1801), which forms an important link between the older and the newer Romanticism.

Brentano was known for his great wealth of imagination and the extraordinarily musical quality of his writing. His personal life, too, reflected the atmosphere associated with the German Romantics. Emotionally unstable and given to extremes of character and mood, he led a troubled and unsettled life. In 1817 he suffered a severe depression and turned to Catholic mysticism, spending six years in a monastery.

Brentano, Franz (Clemens) (b. Jan. 16, 1838, Marienberg, Hesse-Nassau—d. March 17, 1917, Zürich), German philosopher generally regarded as the founder of act psychology, or intentionalism, which concerns itself with the acts of the mind rather than with the contents of the mind. He was a nephew of the poet Clemens Brentano.

He was ordained a Roman Catholic priest (1864) and appointed *Privatdozent* (unsalaried lecturer) in philosophy (1866) and professor (1872) at the University of Würzburg. Religious doubts, exacerbated by the dogma of papal infallibility (1870), led to his resignation from his post and the priesthood (1873).

Brentano then began writing one of his best known and most influential works, *Psychologie vom empirischen Standpunkte* (1874; "Psychology from an Empirical Standpoint"), in which he tried to present a systematic psychology that would be a science of the soul.

Concerned with mental processes, or acts, he

revived and modernized the scholastic philosophical theory of "intentional existence," or, as he called it, "immanent objectivity"; in psychical phenomena, he held, there is a "direction of the mind to an object"—*e.g.,* one sees *something.* The object seen is said to "inexist" within the act of seeing or to have "immanent objectivity." He suggested that, fundamentally, the mind can refer to objects by perception and ideation, including sensing and imagining; by judgment, including acts of acknowledgment, rejection, and recall; and by loving or hating, which take into account desires, intentions, wishes, and feelings. The ideas expressed in the *Psychologie* formed the credo of his followers and became the starting point of their work.

In 1874 Brentano was appointed professor at the University of Vienna. His decision to marry in 1880 was blocked by Austrian authorities, who refused to accept his resignation from the priesthood and, considering him still a cleric, denied him permission to marry. He was forced to resign his professorship, and he moved with his wife to Leipzig. The following year he was allowed to return to the University of Vienna as a *Privatdozent,* and he remained there until 1895. He enjoyed wide popularity among his students, among whom were Sigmund Freud, psychologist Carl Stumpf, philosopher Edmund Husserl, and Tomáš Masaryk, the founder of modern Czechoslovakia. Another major work of Brentano's, *Untersuchungen zur Sinnespsychologie* ("Inquiry into Sense Psychology"), appeared in 1907. Completing his early masterwork was *Von der Klassifikation der psychischen Phänomene* (1911; "On the Classification of Psychological Phenomena").

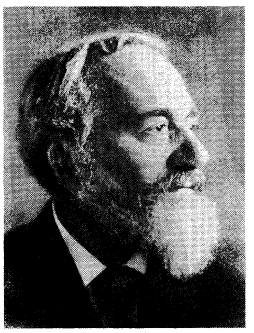
Brentano, Heinrich von (b. June 20, 1904, Offenbach, Ger.—d. Nov. 14, 1964, Darmstadt, W.Ger.), German politician, founding member, and longtime parliamentary leader of the Christian Democratic Union who, as foreign minister of the Federal Republic of Germany (1955–61), pursued an anti-Communist policy.

First entering politics in 1945, Brentano helped found the Christian Democratic Union of Hesse and was subsequently elected president of the national organization committee of the Christian Democratic Union and Christian Social Union (CDU/CSU) coalition. After serving in the provisional assembly that drafted the constitution of the new republic, he was elected to the first federal Bundestag (lower house of parliament) in August 1949. From 1949 to 1955 and again from 1961 to 1964, he was parliamentary leader of his party. A dedicated internationalist, he served through 1952–53 as president of the six-nation Schuman Plan committee charged with drafting a constitution for a proposed European federation—the future Common Market. Named foreign minister under Chancellor Konrad Adenauer in June 1955, he followed a policy of cooperation with France and opposition to the Soviet Union.

Brentano, Lujo, byname of LUDWIG JOSEF BRENTANO (b. Dec. 18, 1844, Aschaffenburg, Bavaria—d. Sept. 9, 1931, Munich), German economist whose research linked modern trade unionism to the medieval guild system.

He received his Ph.D. in economics in 1867 from the University of Göttingen, and he was professor of political theory from 1871 to 1931, successively, at the universities of Berlin, Breslau, Strassburg, Vienna, Leipzig, and Munich.

In 1868 Brentano made a thorough study of trade unionism in England which resulted in his *Die Arbeitergilden der Gegenwart* (1871–72; "Workers' Guilds of the Present"). In it he argued that modern trade unions were the successors of the medieval guilds; it soon became an authoritative source on modern associations of workmen. His other works, which are of a more theoretical nature, relate chiefly to political economy.



Lujo Brentano, *c.* 1905
By courtesy of the Staatsbibliothek, Berlin

Brentano ardently opposed the rise of German militarism and was for many years an outspoken pacifist in Germany.

Brentwood, district, county of Essex, England, just outside the northeastern border of Greater London. It has an area of 57 sq mi (149 sq km). The district is to a considerable extent residential, with some light industry, but it extends into the farmlands of the Essex countryside and London's Greenbelt. Brentwood became an assize town when judges first went on circuit, and the Elizabethan assize house remains. Brentwood School was founded in 1557. Pop. (1981 prelim.) town, 55,762; (1982 est.) district, 72,000.

Brenz, Johannes (b. June 24, 1499, Weil, Württemberg—d. Sept. 11, 1570, Stuttgart), German Protestant, principal leader of the Reformation in Württemberg.

He studied at Heidelberg and was ordained priest in 1520; by 1523 he had ceased to celebrate mass and had begun to speak in favour of the Reformation. Brenz supported the views of Martin Luther; in *Syngramma Suevicum* (1525) he expounded Luther's doctrine of Real Presence in the Eucharist.

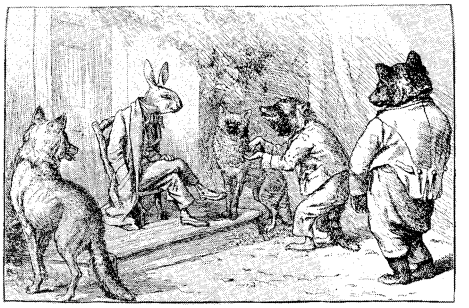
Bréquigny, Louis-Georges-Oudard-Feudrix de (b. Feb. 23, 1714, Gaineville?, Fr.—d. July 2, 1794, Paris), French scholar who carried out a major compilation of the annals of French history in England.

Sent to search English archives at the end of the Seven Years' War in 1763, Bréquigny returned with copies of 70,000 documents, largely bearing on the history of the western

Bréquigny, oil painting by an unknown artist
By courtesy of the Bibliotheque Nationale, Paris; photograph, J.P. Ziolo

French provinces that had been under English rule in the Middle Ages. These documents were bound into a collection of 109 volumes in the Bibliothèque Nationale, Paris. In 1777 Bréquigny was elected to the Académie Française, just after beginning work on another massive project—a collection of documents on Chinese history, letters, and art, of which 14 volumes appeared before the work was interrupted by the French Revolution.

Brer Rabbit, trickster figure originating in African folklore and transmitted by African slaves to the New World, where it acquired attributes of similar native American tricksters (*see* trickster tale); Brer, or Brother, Rabbit was popularized in the United States in the stories of Joel Chandler Harris (1848–1908). The character's adventures embody an idea considered to be a universal creation among oppressed peoples—that a small, weak, but ingenious force can overcome a larger, stronger, but dull-witted power. Brer Rabbit continually



Brer Rabbit conversing with Brer Fox, Brer Wolf, Brer Coon, and Brer Bear from Joel Chandler Harris' story, "Brother Rabbit Takes Exercise"
From Joel Chandler Harris, *Nights With Uncle Remus* (1883), Houghton Mifflin Company

outsmarts his bigger animal associates, Brer Fox, Brer Wolf, and Brer Bear.

Brera, Pinacoteca di (Italian: Brera Picture Gallery), art museum in Milan, founded in 1809 by Napoleon I, and one of Italy's largest art galleries. Its original collection was that of the Accademia di Belle Arti, though its most important works were acquired later. It is especially rich in frescoes and in paintings of the Venetian school.

The gallery is housed in a 17th-century palace that was originally built, from plans by Francesco Maria Ricchini, as a Jesuit college. The same building also houses the Accademia and the Brera library.

Brescia, Latin BRIXIA, city, capital of Brescia province, Lombardia (Lombardy) region, in the Alpine foothills of northern Italy at the lower end of the Val (valley) Trompia, east of Milan. It originated as a Celtic stronghold of the Cenomani that was occupied by the Romans *c.* 200 BC; the emperor Augustus founded a civil colony there in 27 BC. Plundered by Attila the Hun in 452, it later became the seat of a Lombard duchy. In the 11th century it became an independent commune, and it was active in the Lombard League from 1167. After falling to the tyrant Ezzelino da Romano in 1258, it was held successively by the Veronese Scaliger family and the Milanese Visconti before passing to Venice in 1426. One of the wealthiest cities in Lombardy in the early 16th century, it never recovered from its sack by the French under Gaston II, comte de Foix, in 1512. It was dominated by the French after 1797 and passed to Austria in 1814. It was the only Lombard town to aid Charles Albert of Sardinia in withstanding an Austrian assault in 1849. It became part of Italy in 1859.

Roman remains include part of the street plan, remnants of a theatre, and the Tempio Capitolino (Capitoline Temple), erected by Vespasian in AD 73, which now houses the museum with a rich Roman collection (including the bronze "Winged Victory" found in 1826). Notable secular buildings include the 14th-century castle; the Broletto (1230), the original town hall, now the prefecture and law courts; and the Loggia (1492–1574), the present town hall.

An episcopal see, Brescia is noted for the art

treasures housed in its numerous churches, its picture gallery (Pinacoteca Tosio-Martinengo), and its medieval museum. Heavily represented are the painters of the 15th- and 16th-century Brescia school. Notable among the churches are the 8th-century church of S. Salvatore; 11th- and 12th-century Duomo Vecchio (Old Cathedral), on the site of an earlier foundation; the church of S. Francesco (1255–65), with a fine Gothic cloister; the church of Sta. Maria dei Miracoli (1488–1523); and the Duomo Nuovo (New Cathedral, 1604). The city of Brescia also has more than 70 public fountains.

A centre of transportation, industry, and agriculture, the city manufactures metalware (particularly firearms), machinery, vehicles, hosiery, and textiles. Pop. (1981 prelim.) mun., 206,460.

Brescia, Girolamo, also called HIERONYMUS DE BRESCIA: *see* Romanino, Il.

Brescia, Girolamo da: *see* Savoldo, Giovanni Girolamo.

Bresdin, Rodolphe (b. 1822, Montrelais, Fr.—d. Jan. 14, 1885, Sèvres), eccentric and visionary French engraver, lithographer, and etcher noted for his highly detailed and technically precise prints and drawings. Many of his works had elements of the fantastic, the exotic, or the macabre. He pioneered in lithography, producing such unusual works as "Comedy of Death," which inspired similar works by other lithographers. Bresdin's work was admired by such contemporaries as Victor Hugo, Théophile Gautier, and Charles Baudelaire.

Little is known of Bresdin's early life. When the Revolution of 1848 broke out, however, he was living in Paris and decided to take an extended walking tour of France. He stayed in Toulouse from 1853 to 1857 and in Bordeaux from 1860 to 1861, where he produced one of his most famous lithographs, "The Good Samaritan." Further wanderings included an extended stay in Canada in the early 1870s, after which he returned penniless to France (1876). He remained a solitary figure, working outside of any school, misunderstood and mostly unappreciated. The strange, bizarre imagery of his more than 200 prints, however, was a powerful influence on the Symbolists and the Surrealists of the 20th century.

Breslau (Poland): *see* Wrocław.

Bressanone, German BRIXEN, town, Bolzano (Südtirol) province, Trentino-Alto Adige region, northern Italy; it lies at the confluence of the Rienza (Rienz) and Isarco (Eisack) rivers, on the Brenner railway at an altitude of 1,834 ft (559 m), northeast of Bolzano. An episcopal see was transferred to Bressanone from Sabiona in 992. In the 11th century, Bressanone became the seat of an ecclesiastical principality that was in constant conflict with the counts of Tirol. Secularized in 1803, it passed to Austria as part of the Tirol and was ceded to Italy in 1918. The population is largely German speaking. Notable landmarks include the Baroque cathedral (rebuilt 1745–54), the Palazzo dei Principi Vescovi (Archbishop's Palace; 13th century), 12 churches, including the round church of S. Michele (12th and 15th centuries), and 5 monasteries. Wool and hydroelectric power are produced, orchards and vineyards are cultivated, and there is a busy tourist trade. Pop. (1981 prelim.) mun., 16,109.

Bresse, natural region of eastern France, embracing parts of the Ain and Saône-et-Loire *départements.* It extends for 60 mi (100 km) from the Dombes region in the south to the Doubs River in the north, and for 20 mi from the Jura in the east to the Saône River (west), toward which it gradually slopes. A moderately prosperous agricultural area, it is renowned for its poultry.

The Antigny, Sainte-Croix, and Coligny families and the lords of Vienne were powerful landowners in the north until displaced by the dukes of Burgundy. With the death of Charles the Bold (1477) Bresse passed, with the rest of Burgundy, to the French crown. The southern part, where after 1272 the House of Savoy superseded smaller nobles in power, became the Province of Bresse, with Bourges as its capital in the 15th century; it was ceded to France under the Treaty of Lyons (1601). The whole of Bresse was later attached to the French military *gouvernement* of Burgundy and belongs today to the economic planning region of Rhône-Alpes.

Bresson, Robert (b. Sept. 25, 1907, Bromont-Lamothe, Puy-de-Dôme, Fr.), celebrated director of the post-World War II French cinema whose motion pictures are intense psychological probings executed in a pristine, formal photographic style.

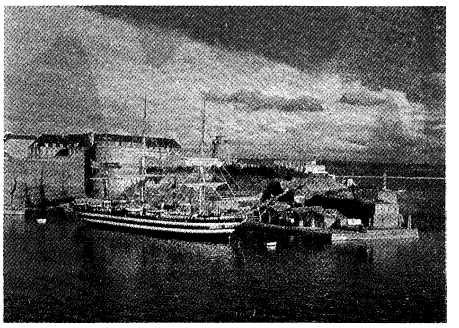
Bresson was a painter and photographer before he released his first film, *Les Affaires publiques,* in 1934. *Les Anges du péché* (1943; "The Angels of Sin"), the story of a cloistered nun who is proud and condescending beneath an outward veneer of humility, established

Bresson, 1968
Keystone

his reputation as a director. Bresson's austere, intellectual style lends itself well to spiritual probing.

Subsequent films—*Les Dames du Bois de Boulogne* (1945; "The Ladies of the Bois de Boulogne"), with dialogue by Jean Cocteau; the prizewinning *Le Journal d'un curé de campagne* (1950; *The Diary of a Country Priest*), based on Georges Bernanos' novel of a dying cleric plagued by conflicts of conscience; and *Un Condamné à mort s'est échappé* (1956; *A Man Escaped*), presenting psychological investigations within the framework of a prison escape—were increasingly concerned with the internal conflicts of the individual. He also directed *Pickpocket* (1959), *Le Procès de Jeanne d'Arc* (1961; *The Trial of Joan of Arc,* 1962), *Au hasard, Balthazar* (1966; *Balthazar*), *Mouchette* (1966), *Une Femme douce* (1969; "A Gentle Creature"), *Quatre nuits d'un rêveur* (1971; *Four Nights of a Dreamer*), *Lancelot du Lac* (1974; *Lancelot of the Lake*), *Le Diable probablement* (1977; *The Devil Probably*), and *L'Argent* (1983).

Brest, port city, Finistère *département,* Bretagne region, western France, on two hills divided by the Penfeld River. Its magnificent roadstead, the Rade de Brest, is 14 mi (23 km) long; it is protected from the sea by the Quélern Peninsula, and the Goulet Passage (1–2 mi wide) leads to open water. Brest was ceded about 1240 by Count Hervé V of Léon to John I, duke of Brittany. The English occupied it from 1342 until 1397. By marriage it passed (1491) from Brittany to the French crown. Cardinal de Richelieu decided in 1631 to make it a major naval base. It was improved by Jean-Baptiste Colbert and fortified by Sébastien Le Prestre de Vauban. The former instituted the Inscription Maritime, still functioning, which inducted Breton fishermen



Training ship in the naval port at Brest, Fr.
Editions d'Art JOS Le Doare

(18–48 years old) into the Naval Reserve. In exchange for this obligation, the Inscription offers them family security for life. Brest has been the seat of the French Naval Academy since 1830.

Brest was the debarkation point for U.S. troops during World War I. Afterward its importance as a naval and transatlantic passenger port increased. The Germans, who occupied it in June 1940, built concrete submarine pens and used the port as a base against Allied shipping. The city, almost completely destroyed during World War II, has been rebuilt, its port restored and re-equipped. The naval port, behind the Lanion breakwater, is in part excavated from the rock, and some of the installations are in deep caves in the cliffs. The commercial port, which has large shipfitting installations, is separated from the city by the Cours Dajot, an excellent promenade constructed on the old ramparts in 1769 by convicts from the notorious prison hulks of Brest (closed in the 19th century when Devil's Island and the penal colony of French Guiana were established). It is, with Toulon, one of the two major bases of the French navy.

In the 1960s three industrial zones were created to offset a decline in naval construction. Metallurgy, associated with shipbuilding and repair, is important; planned diversified industries include precision mechanics, gas bottling, and the manufacture of electronic equipment, fertilizers, chemicals, and paper. Pop. (1982) 154,110.

Brest, *oblast* (administrative region), Belorussian Soviet Socialist Republic, occupying an area of 12,475 sq mi (32,300 sq km) in the basin of the upper Pripyat River and its tributaries. Centred on Brest city, it was formed in 1939 from areas held by Poland from 1919. Except in the north, where the land rises to the morainic hills of the Belorussian Ridge (*q.v.*), the *oblast* is exceptionally flat and swampy, with huge areas of reed and grass marsh, peat bog, and standing waters. Higher and drier areas are mostly forested. Some drainage has been undertaken since 1873; these reclaimed areas are cultivated for flax, hemp, potatoes, and sugar beets. Dairying and forestry are both important, and the towns are engaged chiefly in processing agricultural produce and timber. Peat is used for power generation. The Dneprovsko–Bugsky Kanal links the Pripyat and Dnepr rivers to the Bug and Vistula, and the *oblast* is crossed by the Moscow–Warsaw railway and highway. Pop. (1983 est.) 1,391,000.

Brest, formerly BREST-LITOVSK, city and administrative centre of Brest *oblast* (region), Belorussian Soviet Socialist Republic, on the right bank of the western Bug River. First mentioned in 1019 as Berestye, it has had a stormy history because of its location. It passed to Lithuania in 1319 and later to Poland. In 1795 Russia acquired Brest, although it reverted to Poland from 1919 to 1939. In 1918 the Treaty of Brest-Litovsk was signed be-

tween Germany and the Soviet government. Its fortress made a prolonged defense against the Germans in 1941. Brest is a major point of rail entry to the Soviet Union and a river port with light industries. Pop. (1983 est.) 208,000.

Brest-Litovsk, treaties of, peace treaties signed at Brest-Litovsk (in Belorussia) by the Central Powers with the Ukrainian Republic (Feb. 9, 1918) and with Soviet Russia (March 3, 1918), which concluded hostilities between those countries during World War I. Peace negotiations, which the Soviet government had requested on Nov. 8, 1917, began on December 22. They were divided into several sessions, during which the Soviet delegation tried to prolong the proceedings and took full advantage of its opportunity to issue propaganda statements, while the Germans grew increasingly impatient.

When no substantial progress had been made by January 18, the German general Max Hoffmann firmly presented the German demands, which included the establishment of independent states in the Polish and Baltic territories formerly belonging to the Russian Empire and in the Ukraine. Leon Trotsky, head of the Soviet delegation since January 9, called for a recess (January 18–30). He returned to Petrograd where he persuaded the reluctant Bolsheviks (including Lenin) to adopt a policy under which Russia would leave the war but sign no peace treaty ("neither war nor peace").

When negotiations resumed, the Soviet delegation again tried to stall; but after the Central Powers concluded a separate peace with the nationalist Ukrainian delegation (February 9), Trotsky announced the new Soviet policy. Negotiations came to a halt on February 10. But when the Germans renewed their military offensive (February 18), the Russians immediately requested that talks be resumed. On February 23, the Germans responded with an ultimatum allowing the Russians two days to open talks and three more to conclude them. Lenin, realizing that the new Soviet state was too weak to survive a continuation of the war, threatened to resign if the German terms were not met.

On March 3 the Soviet government accepted a treaty by which Russia lost the Ukraine, its Polish and Baltic territories, and Finland. (The Ukraine was recovered in 1919, during the Russian Civil War.) The treaty was ratified by the Congress of Soviets on March 15. Both the Ukrainian and Russian treaties were annulled by the Armistice on Nov. 11, 1918, which marked the Allied defeat of Germany.

Brest-Litovsk, Union of, an agreement in 1596 that united with the Roman Catholic Church several million Ukrainian and Belorussian Orthodox Christians living under Polish rule in Lithuania.

Inspired by the Council of Florence (1438–39), which sought the reunion of all Eastern churches with Rome, the metropolitan of Kiev, Michael Ragoza, began negotiations with Catholic churchmen and the Polish king Sigismund III, a Roman Catholic. At a synod held at Brest, the Ukrainian Orthodox hierarchy declared their wish to submit to Rome. The Polish monarchy, fearful of Russian influence, particularly through its Orthodox Church, also sought to unify the various peoples under its rule through Catholicism. Hence the King was pleased, and he promised the Ukrainian Orthodox the rights and privileges enjoyed by the Latin rite as well as the preservation of traditional Eastern rites and customs. These guarantees were proclaimed by Sigismund on Aug. 2, 1595; and in 1596 the terms of Pope Clement VIII and the King were accepted at another Orthodox synod at Brest, attended by the bishops of Vladimir, Lutsk, Polotsk, Pinsk, and Kholm, as well as the Metropolitan of Kiev.

A peaceful reunion, however, did not result. The bishops of Lvov and Przemyśl refused to comply, and Orthodox laymen founded brotherhoods to oppose union. The opponents of the Brest-Litovsk union felt that their tradition and autonomy were being given away and feared that the union would breed hybridism or the tendency toward Latinization and hence a betrayal of ancient and nationalistic tradition.

Breszé, Pierre II de: *see* Brézé, Pierre II de.

Bret Hanover (foaled 1962), U.S. harness racehorse (Standardbred), selected as Harness Horse of the Year in each of his three racing seasons (1964–66). In 1971 the membership of the Hall of the Trotter named him outstanding pacer of the 20th century. In 68 starts he scored 62 victories (35 consecutively) and won $922,616, then a record for Standardbreds. On 31 occasions he paced 1 mile in less than 2 minutes, exceeding the world record established by Dan Patch more than 50 years earlier. In 1965 he won the Triple Crown for three-year-old pacers: the Little Brown Jug, the William H. Cane Futurity, and the Messenger Stake. In 1966 he set a world 1-mile pacing record of 1:53⅗ (subsequently broken). A bay colt, he was sired by the great pacer Adios out of Brenna Hanover.

Bretagne: *see* Brittany.

Bretagne, Ville de (France): *see* Morlaix.

bretenanwealda (Anglo-Saxon ruler): *see* bretwalda.

Breteuil, Gabrielle-Émilie Le Tonnelier de (French scientific writer): *see* Châtelet, Gabrielle-Émilie Le Tonnelier de Breteuil, marquise du.

Brethren, a group of Protestant churches that trace their origin to Schwarzenau, Hesse, in 1708, in which year a group of seven persons under the leadership of Alexander Mack (1679–1735) covenanted to form a brotherhood following the commandments of Jesus Christ as revealed in the New Testament. The course of the brotherhood was shaped by three influences—the Protestant faith in which its organizers had been raised, the Pietist reform movement (*see* Pietism), and Anabaptist teachings from the Radical Reformation of the 16th century.

The first Brethren were known in Europe as New Baptists (to distinguish them from the Mennonites [*q.v.*], the direct descendants of the Anabaptists, whom they resembled in many ways) or as Schwarzenau Baptists (because of their place of origin). The largest congregation after Schwarzenau was organized in the Marienborn area near Büdingen, Ger. In 1715 the Marienborn congregation was forced to leave because of a change in the religious policy of the local government. The members moved to Krefeld on the Lower Rhine, where they soon came into conflict with the authorities because of their proselyting. Several were sentenced to long terms of imprisonment. Added to this pressure was internal disagreement, which facilitated the decision of the majority of the congregation to move from Krefeld to Pennsylvania in 1719.

In the meantime, a new and intolerant count, together with low agricultural productivity, forced the original congregation out of Schwarzenau. In 1720 the group under Mack's leadership migrated to West Friesland. In 1729 they joined the earlier migrants in America. Others left Europe in the 1730s with the result that no organized congregation of Brethren was left on the Continent after 1750, other than a group in Denmark that claims to trace its origin to the Schwarzenau Brethren. From the initial stronghold in Germantown, north of Philadelphia, the Brethren settled in the surrounding areas of Pennsylvania and New Jersey. Some moved into Maryland and the southern colonies. By 1770 the Brethren had 1,500 adult members with a total following of about 5,000 in 28 congregations along the Atlantic seaboard. An interesting offshoot of the colonial Brethren was the monastic Ephrata Community (*q.v.*) in Lancaster County, Pa.

The most influential family connected with the 18th-century Brethren was that of Christopher Sower (Sauer; 1695–1758), the noted Germantown printer. Although the first Sower was a Separatist in his religious views, he shared many convictions with the Brethren. His namesake, Christopher Sower II (1721–84), continued his father's business and became a Brethren elder. The Sower Press was famed for its three editions of the German Bible (1743, 1763, 1776). The Eliot Indian Bible of New England was the only previous biblical publication in the Colonies.

As pacifists, the Brethren were put in a difficult position by the outbreak of the American Revolution. Some of them tended toward loyalism, because they were grateful to the British crown for freedoms enjoyed in America. There were scattered instances of mob violence and deprivation of Brethren property by action of the American revolutionary government. The shock that the Brethren suffered at this time may well have been a cause of their isolation and withdrawn character in the 19th century.

The Brethren joined in the general push westward following the Revolution and were the first settlers in some sections of Ohio, Indiana, and Illinois and other prairie states. Almost all Brethren were agriculturalists, and they sought good limestone soil to establish their fertile farms. They tended to settle in groups, often migrating as colonies to new locations. The first Brethren reached the Pacific coast by 1850. When the transcontinental railroads were completed, more Brethren moved west, settling in the Dakotas, the Pacific Northwest, and California.

Although the Brethren avoided schism during the Civil War (unlike most American denominations), the cultural changes of the latter half of the 19th century shattered their unity. A younger and progressive element pressed for the adoption of new methods and practices such as other American churches used. These included Sunday schools, revival services, institutions of higher learning, salaried pastors, foreign missions, and a free religious press. As the Brethren emerged from rural cultural isolation, which had been enhanced by their rural life and Germanic speech, such practices seemed essential to a vocal minority in the brotherhood. The periodicals of Henry Kurtz (1796–1874) and James Quinter (1816–88), although moderate in their proposals, were influential in creating these demands.

The reform issue precipitated a three-way split among the Brethren in the early 1880s. The conservative wing called itself the Old German Baptist Brethren to emphasize the conviction that it was holding to the earlier beliefs. The liberal party, led by Henry Holsinger (1833–1905), chose to be called the Brethren Church. The middle-of-the-road majority continued as the German Baptist Brethren until 1908 when the title Church of the Brethren was officially adopted. In 1939 the Brethren Church divided into the Brethren Church (Ashland, Ohio) and the National Fellowship of Brethren Churches (Grace Brethren).

In general, the Brethren churches accept no creed but the New Testament and stress obedience to Christ and a simple and temperate way of life. Members old enough to confess their faith are baptized by being immersed three times. The love feast (Holy Communion) is observed twice each year and includes feet washing, a fellowship meal, and anointing for physical and spiritual health.

The Brethren are considered one of the three historic "peace churches," along with the Religious Society of Friends (Quakers) and Men-

nonites, because of a continuing (but not unanimous) adherence to the principle of conscientious objection to all wars. They usually affirm rather than swear oaths. All branches of the Brethren have been active in sponsoring missionaries, with the exception of the Old German Baptist group.

During the 19th century the Brethren uniformly wore the plain style of dress similar to the Amish, with beards and broad-brimmed hats for the men and aprons and bonnets for the women. This garb now has almost entirely disappeared, except for the Old German Baptist Brethren and, in some parts of eastern Pennsylvania, the Church of the Brethren.

Brethren in Christ, also called RIVER BRETHREN, Christian Church in the United States and Canada. It developed among European settlers along the Susquehanna River in Pennsylvania who came to America *c.* 1750 and who were primarily Anabaptists and Pietists. Known for many years as River Brethren, the church was not officially organized under the name Brethren in Christ until 1863, when the drafting of young men into the Union Army made necessary its formal organization as a body of conscientious objectors.

The church stands for equality of all members, though the ultimate authority in policy and doctrine is vested in a general conference held annually. There are six regional conferences, five in the United States and one in Canada.

The teachings of the church are generally conservative. The Brethren in Christ accept the Bible as the inspired Word of God and consider it the final authority for faith and practice. Adult Baptism by immersion, partaking of the Lord's Supper, and washing of members' feet are all practiced. Other teachings include the expectation of the Second Coming of Christ and the general resurrection of the dead, nonconformity to the world, and nonresistance in war.

The church supports home missions and foreign missions. Internal disputes resulted in the establishment of two smaller groups: the Old Order, or Yorker, Brethren (1843) and the United Zion Church (1855).

Brethren of Purity (Islām): *see* Ikhwān aṣ-Ṣafā'.

Brethren of the Common Life: *see* Common Life, Brethren of the.

Břetislav I, byname BŘETISLAV THE RESTORER, Czech BŘETISLAV OBNOVITEL (b. 1005?—d. Jan. 10, 1055), prince of Bohemia from 1034 to 1055, who permanently attached the province of Moravia to Bohemia.

Břetislav succeeded his father, Oldřich, to the throne after a period of dynastic struggles. He proceeded to win back lands that earlier had been lost to Poland, regaining in two great campaigns not only all of Moravia but also Silesia and Kraków. He also captured Poznań and Gniezno, but his ambitions for a greater West Slav nation troubled the emperor Henry III, who mounted an armed invasion and compelled Břetislav to evacuate all of Poland except Silesia (which nevertheless was returned to Poland some years later). Břetislav's efforts to regain Slovakia from Hungary were unsuccessful (it did not return to Czech control until 1918).

To obviate the incessant struggles that had endangered Bohemia at every vacancy of the throne, Břetislav, with the consent of the nobles, decreed that the oldest member of the House of Přemysl should be the ruler of Bohemia. Břetislav was therefore succeeded first by his eldest son, Spytihněv II (1031–61), and then by his second son, Vratislav II (*c.* 1035–92).

Breton, André (b. Feb. 18, 1896, Tinchebray, Fr.—d. Sept. 28, 1966, Paris), French poet, essayist, critic, and editor, chief promoter and one of the founders of the Surrealist movement.

As a medical student, Breton was interested in mental illness; his reading of the works of Sigmund Freud (whom he met in 1921) introduced him to the concept of the unconscious. Influenced by psychiatry and Symbolist poetry, he joined the Dadaists. In 1919, with Louis Aragon and Philippe Soupault, he cofounded the review *Littérature;* in its pages, Breton and Soupault published "Les Champs magnétiques" (1920; "Magnetic Fields"), the first example of the Surrealist technique of automatic writing. In 1924, Breton's *Manifeste du surréalisme* defined Surrealism as "pure psychic automatism, by which it is intended to express . . . the real process of thought. It is the dictation of thought, free from any control by the reason and of any aesthetic or moral preoccupation." Surrealism aimed to eliminate the distinction between dream and reality, reason and madness, objectivity and subjectivity. Breton's novel *Nadja* (1928) merged everyday occurrences with psychological aberrations. *L'Immaculée Conception* (1930), written with Paul Éluard, attempted to convey a verbal impression of different types of mental disorder. *Les Vases communicants* (1932; "The Communicating Vessels") and *L'Amour fou* (1937; "Mad Love") explored the connection between dream and reality. Breton also wrote theoretical and critical works, including *Les Pas perdus* (1924; "The Lost Steps"), *Légitime Défense* (1926; "Legitimate Defense"), *Le Surréalisme et le peinture* (1926; "Surrealism and Painting"), *Qu'est-ce que le surréalisme?* (1934; *What is Surrealism?*), and *La Clé des champs* (1953; "The Key to the Fields").

The Surrealist movement eventually became politically involved in the ferment of the 1930s, and Breton and several colleagues joined the Communist Party. His second Surrealist manifesto, published in 1930, explored the philosophical implications of Surrealism. Breton broke with the Communist Party in 1935 but remained committed to Marxist ideals. With Leon Trotsky in Mexico he founded the Fédération de l'Art Revolutionnaire Independant in 1938. During the German occupation of France, Breton escaped to the United States. In 1942 at Yale University he organized a Surrealist exposition and issued yet another Surrealist manifesto. In 1946 Breton returned to France, where, the following year, he produced another Surrealist Exhibition. His *Poèmes* appeared in 1948 in Paris, and *Selected Poems* was published in London in 1969.

Breton, Nicholas (b. 1553?—d. 1625?), prolific English writer of religious and pastoral poems, satires, dialogues, and essays. His life was spent mainly in London. He dedicated his works to many patrons, including James I; his chief early patron was Mary Herbert, countess of Pembroke.

In 1598 Breton was accounted one of the best lyrical poets, but he outlived his reputation. His satires are rather mild and general; more successful are the descriptions of simple country pleasures, whether in the pastoral poetry of *The Passionate Shepheard* (1604) or in the prose descriptions of the months and the hours in his *Fantasticks* (1604?), which in some respects anticipates the fashion for character books. Modeled on the *Characters* of the Greek philosopher Theophrastus, which became available in Latin translation in 1592, these books contained brief sketches, describing a dominant virtue or vice in such characters as the thieving servant, the cringing courtier, the generous patron, or the pious fraud. Breton himself wrote two character books, *The Good and the Badde* (1616) and *Characters Upon Essaies* (1615), the latter containing essays as well.

Bretón de los Herreros, Manuel (b. Dec. 19, 1796, Quel, Spain—d. Nov. 8, 1873, Madrid), Spanish poet and one of the most important and prolific comic playwrights of the 19th century in Spain.

He began his education in Madrid, where his family moved in 1806, later serving in the army from 1812 to 1822. He held various governmental positions throughout his life and was director of the National Library from 1847. *A la vejez, viruelas* ("In Old Age, Chickenpox"), his first play, was produced in 1824 and brought him immediate success. Of the almost 180 plays he produced during his lifetime, including translations from French and German playwrights and adaptations of such earlier Spanish dramatists as Lope de Vega, he is chiefly noted for his comedies, mostly written in verse, dealing with the day-to-day life of the Spanish middle class.

Breton language, Breton BREIZ, a member of the Brythonic group of Celtic languages, spoken in Brittany in northwestern France. Breton was introduced into northwestern France in the 5th and 6th centuries by Brythonic Celtic refugees displaced from southern England by the influx of Anglo-Saxons. The language is closely related to Cornish and Welsh but has been influenced by French and perhaps by a continental Celtic language formerly spoken in the region.

After the 17th century, Breton occurs in four major dialects: those of Léon, Tréguier, Cornouaille, and Vannes. Two standardized forms of Breton were developed in the mid-20th century in attempts to encourage the literary development of the language; but the French government encourages the use of French rather than Breton, and the number of Breton speakers is declining.

Breton lay, Middle English LAI BRETON, poetic form so called because Breton professional storytellers supposedly recited similar poems, though none are extant. A short, rhymed romance recounting a love story, it includes supernatural elements, mythology transformed by medieval chivalry, and the Celtic idea of faerie, the land of enchantment. Derived from the late 12th-century French lais of Marie de France, it was adapted into English in the late 13th century and became very popular. The few extant English Breton lays include *Sir Gowther* (*c.* 1400), a version of the story of Robert the Devil; the incomplete, early 14th-century *Lai le Freine; Sir Orfeo,* a recasting of the Orpheus and Eurydice story; the 14th-century *Sir Launfal,* or *Launfalus Miles,* an Arthurian romance by Thomas Chestre; *Sir Emare,* of the late 14th or early 15th century, on the theme of the constant wife; and the 15th-century *Sir Landeval,* a variant of *Sir Launfal.* Some of Chaucer's *Canterbury Tales* are derived from Breton lays. *See also* lai.

Breton literature, the body of writings in the Breton language of northern France. Both the language and the literature may be divided into three periods: Old, Middle, and Modern. Remains of Old Breton written between the 8th and the 11th century consist entirely of names and glosses in documents.

The earliest literary text in the Breton language, from the 15th century, is a dialogue between King Arthur and a seer called Guinclaff. Other texts in Middle Breton (1200–1650) are predominantly religious in character.

Modern Breton linguistically is said to begin in 1659, but this has little literary significance because many works of the Middle Breton type were written up to the 19th century. Much religious prose and poetry was published, but the bulk of Breton literature of the 17th and 18th centuries consisted of mystery and miracle plays. Interest in the Breton language revived in the early 19th century as a reaction against the French government's at-

tempt to eradicate the regional language. Several authors of prose, poetry, and drama are maintaining the vitality of Breton literature in the 20th century.

Bretonneau, Pierre-Fidèle (b. April 3, 1778, Tours, Fr.—d. Feb. 18, 1862, Passy), French epidemiologist who in 1825 performed the first successful tracheotomy (incision of and entrance into the trachea through the skin and muscles of the neck).

He received his M.D. degree in Paris in 1815 and became chief physician of the hospital at Tours the following year. Bretonneau made the clinical distinction of diphtheria, to which he gave its name. He also distinguished between typhoid and typhus. In his doctrine of specific causes of infectious diseases, he foreshadowed the germ theory of Pasteur.

Bretscher, Willy (b. Oct. 26, 1897, Winterthur, Switz.), editor of *Neue Zürcher Zeitung* (NZZ) of Zürich, one of the world's leading daily newspapers, from 1933 to 1967. Bretscher carried forward for two generations the NZZ tradition of careful, thorough reporting that dated back to the paper's founding in 1780. He built a staff of highly qualified writers and was many years ahead of his time in employing numerous journalists with university degrees.

Bretscher became known in the 1930s for his opposition to Nazism and other forms of totalitarianism, his dedication to objectivity, and his courage. The Hitler government banned the NZZ from Nazi Germany in 1934 after the paper revealed that Nazis, not Communists, had burned the Reichstag, the German parliament building in Berlin. Bretscher later took stands against Communism and some forms of Socialism.

Bretscher was educated in Swiss public schools, the Commercial School of the Swiss Merchants' Association, and the University of Zürich. He began his career in journalism in 1914 on the *Neues Winterthure Tagblatt,* leaving in 1917 to join NZZ. He served as the paper's Berlin correspondent from 1925 to 1929. He wrote a number of books, including *History of the Socialist Movement in Switzerland* (1924), *The Political Situation in Switzerland at the End of the War* (1945), and *Swiss Foreign Policy in the Postwar Period* (1951).

Bretton, Henry de: *see* Bracton, Henry de.

Bretton Woods Conference, formally UNITED NATIONS MONETARY AND FINANCIAL CONFERENCE, meeting at Bretton Woods, N.H. (July 1–22, 1944), during World War II to make financial arrangements for the postwar world after the expected defeat of Germany and Japan.

The conference was attended by experts noncommittally representing 44 states or governments, including the Soviet Union. It drew up a project for the International Bank for Reconstruction and Development (IBRD) to make long-term capital available to states urgently needing such foreign aid, and a project for the International Monetary Fund (IMF) to finance short-term imbalances in international payments in order to stabilize exchange rates. Although the conference recognized that exchange control and discriminatory tariffs would probably be necessary for some time after the war, it prescribed that such measures should be ended as soon as possible. After governmental ratifications the IBRD was constituted late in 1945 and the IMF in 1946, to become operative, respectively, in the two following years.

bretwalda, also spelled BRYTENWALDA, BRETENANWEALDA, or BRYTENWEALD, any of several Anglo-Saxon kings said to have had overlordship of kingdoms beyond their own. The word is used in the Anglo-Saxon Chronicle under the date 827 and also in a charter of Aethelstan, king of the English, and probably means "ruler of the Britons" or "ruler of Britain." In the Chronicle the title is given to Egbert (died 839) of Wessex, "the eighth king that was Bretwalda," and retrospectively to seven much earlier kings: Aelle of Sussex (flourished late 5th century), Ceawlin of Wessex (d. 593), Aethelberht of Kent (d. 616), Raedwald of East Anglia (d. 616–627), Edwin of Northumbria (d. 632), Oswald of Northumbria (d. 641), and Oswiu of Northumbria (d. 670). These seven names are copied from the Venerable Bede's *Historia Ecclesiastica.* It has been assumed that these seven kings exercised a certain superiority over a large part of England, but if such superiority existed it is certain that it was extremely vague. Another theory is that the Bretwalda refers to a war-leadership or *imperium,* over the English south of the Humber and has nothing to do with Britons or Britannia.

Breuer, Josef (b. Jan. 15, 1842, Vienna—d. June 20, 1925, Vienna), Austrian physician and physiologist who was acknowledged by Sigmund Freud and others as the principal forerunner of psychoanalysis. Breuer found, in 1880, that he had relieved symptoms of hysteria in a patient, (called Anna O. in his case study), Bertha Pappenheim, after he had induced her to recall unpleasant past experiences under hypnosis. He concluded that

Josef Breuer, detail of a crayon drawing by Emil Fuchs, 1897
Archiv fur Kunst und Geschichte, West Berlin

neurotic symptoms result from unconscious processes and disappear when these processes become conscious.

Breuer described his methods and results to Freud and referred patients to him. With Freud he wrote *Studien über Hysterie* (1895), in which Breuer's treatment of hysteria was described. Later disagreement on basic theories of therapy terminated their collaboration.

Breuer's earlier work had dealt with the respiratory cycle, and in 1868 he described the Hering–Breuer reflex involved in the sensory control of inhalations and exhalations in normal breathing. In 1873 he discovered the sensory function of the semicircular canals in the inner ear and their relation to positional sense or balance. He practiced medicine and was physician to many members of the Viennese medical faculty.

Breuer, Marcel (Lajos) (b. May 21, 1902, Pécs, Hung.—d. July 1, 1981, New York City), architect and designer, one of the most influential exponents of the International Style; he was concerned with applying new forms and uses to newly developed technology and materials in order to create an art expressive of an industrial age.

From 1920 to 1928 Breuer studied and then taught at the Bauhaus school of design, where modern principles were applied to the industrial as well as to the fine arts. There he followed the lead of Walter Gropius in espousing unit construction; *i.e.,* the combination of standardized units to form a technologically simple but functionally complex whole. In 1925, inspired by the design of bicycle handlebars, he invented the tubular metal chair; his original version is known as the Wassily chair.

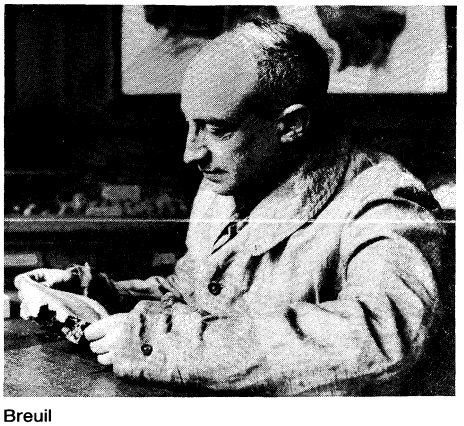
In 1928 Breuer began the private practice of architecture in Berlin. For the Swiss

Marcel Breuer, 1969
Tamas Breuer

architectural historian Sigfried Giedion, he designed the Dolderthal Apartments, Zürich (built 1934–36). During his two years of architectural practice in London, in partnership with F.R.S. Yorke, he designed for the Isokon firm some laminated plywood furniture that became widely imitated. In 1937 he went to Harvard University to teach architecture, and from 1938 to 1941 he practiced with Gropius in Cambridge, Mass. Their synthesis of Bauhaus internationalism with New England regional aspects of wood-frame building greatly influenced domestic architecture throughout the United States. Examples of this style of building were Breuer's own house at Lincoln, Mass. (1939), and the Chamberlain cottage at Wayland, Mass. (1940).

Breuer moved to New York City in 1946 and thereafter attracted numerous major commissions: the Sarah Lawrence College Theatre, Bronxville, N.Y. (1952); the United Nations Educational, Scientific and Cultural Organization (UNESCO) Headquarters, Paris (1953–58; with Pier Luigi Nervi and Bernard Zehrfuss); St. John's Abbey, Collegeville, Minn. (1953–61); De Bijenkorf department store, Rotterdam (1955–57); the International Business Machines (IBM) research centre, La Gaude, Fr. (1960–62); and the Whitney Museum of American Art, New York City (completed 1966); and the headquarters for the Department of Housing and Urban Development (HUD), Washington, D.C. (1963–68). He retired from practice in 1976.

Breuil, Henri-Édouard-Prosper (b. Feb. 28, 1877, Mortain, Fr.—d. Aug. 14, 1961, L'Île-Adam), French archaeologist especially noted



Breuil
Boyer—H. Roger-Viollet

as an authority on prehistoric cave paintings of Europe and Africa.

Shortly after being ordained (1897), Breuil developed a strong interest in Paleolithic art, and he devoted much of his life to studying examples of prehistoric art in southern France, northern Spain, and, during and after World War II, in southern Africa. He was professor at the Institute of Human Paleontology, Paris, from 1910 and at the Collège de France from 1929 to 1947.

Among his more than 600 publications, illustrated with his own copies of cave paintings and engravings, are *La Caverne de Altamira* (1906; "The Cave of Altamira"), with Émile Cartailhac; *La Caverne de Font-de-Gaume* . . . (1910; "The Cave of Font-de-Gaume . . ."), with Louis Capitan and Denis Peyrony; and *Les Combarelles* . . . (1924; "The Combarelles . . ."), also with Capitan and Peyrony. His *Quatre cents siècles d'art pariétal* (1952; "Four Hundred Centuries of Cave Art") reveals Breuil's great scope of activities in this field. His paper "Les Subdivisions du Paléolithique supérieur et leur signification" (1912; "The Subdivisions of the Upper Paleolithic and Their Meaning") established a classification system for the period that has remained of enduring value. A biography by Alan H. Broderick, *Father of Prehistory; the Abbé Henri Breuil: His Life and Times* (1963), was published in England as *The Abbé Breuil: Prehistorian.*

brevet, form of military commission formerly used in the U.S. and British armies. Under the system in which an officer was customarily promoted within his regiment or corps, a brevet conferred upon him a rank in the army at large higher than that held in his corps. Frequently it carried with it the pay, right to command, and uniform of the higher grade. In the United States especially, brevet rank was widely bestowed as a reward for outstanding service; it became the subject of extensive confusion and controversy during the American Civil War. After 1865, U.S. brevet rank was gradually stripped of its benefits, and officers were rewarded instead by decorations. Commission by brevet was declared obsolete in 1922. Special commissions bearing some of the characteristics of the brevet have been used in other armies.

Where the same name may denote a person, place, or thing, the articles will be found in that order

breviary, liturgical book in the Roman Catholic Church that contains the daily service for the divine office, the official prayer of the church consisting of psalms, readings, and hymns that are recited at stated hours of the day. The breviary (Latin *breviarium,* "abridgment") as a condensed tome appeared only after the divine office itself was fixed and widely used and after the recitation of the office had come to be regarded as obligatory for individual persons not residing in a community.

The form and content of the office were fixed in the Roman rite by the 7th century and in Carolingian Europe by the 10th; the office was celebrated by communities in solemn form requiring many ministers using several books. The congregation recited its parts from memory. The first breviaries, which appeared in the 11th century, were choir books containing the whole office in one book. After the appearance in the 13th century of the mendicant orders—religious orders whose work, primarily itinerant preaching and teaching, often did not allow them to reside in common—the need arose for portable breviaries. Innocent III (pope, 1198–1216) had approved a shortened form of the office for his Curia, and this book was adopted, with modifications, by the Franciscan order, whose rapid expansion made the book known and ultimately accepted throughout Europe.

In 1568 Pius V issued the breviary in a revised form and imposed its use on the Latin Church. Since that time there have been piecemeal revisions, particularly in the 20th century. The second Vatican Council (1962–65) permitted the use of vernacular translations and called for a thorough revision. *See also* divine office.

Brewer, David J(osiah) (b. June 20, 1837, Smyrna, Turkey—d. March 28, 1910, Washington, D.C.), U.S. Supreme Court justice, 1889–1910.

Brewer's parents, American missionaries in Turkey, returned to the United States after his birth. He grew up in Connecticut, attended Yale University, and, after being admitted to the bar in 1858, worked as a notary public in Leavenworth, Kan. He served in various local judgeships (1861–70), on the Kansas Supreme Court (1870–84), and on the federal circuit court (1884–89).

In 1889 he was appointed to the U.S. Supreme Court by President Benjamin Harrison. During his 21 years on the bench, Brewer generally joined conservatives in resisting the trend toward an increase in the power and responsibility of the federal government. Yet, speaking for the majority in the principal injunction case of the period, *In re Debs* (1895), he upheld the government's use of the injunction against unlawful strikes. In a notable liberal departure, he wrote the majority opinion in *Muller* v. *Oregon* (1908), sustaining a state law that limited to 10 the daily working hours of women factory employees. From 1895 to 1897 he served as president of the commission appointed by Congress to investigate the boundary dispute between Venezuela and British Guiana.

Brewster, Sir David (b. Dec. 11, 1781, Jedburgh, Roxburghshire, Scot.—d. Feb. 10, 1868, Allerby, Melrose, Roxburghshire), Scottish physicist noted for his experimental work in optics and polarized light—*i.e.,* light in which all waves lie in the same plane. When light strikes a reflective surface at a certain angle (called the polarizing angle), the reflected light becomes completely polarized. Brewster discovered a simple mathematical relationship between the polarizing angle and the refractive index of the reflective substance. This law is useful in determining the refractive index of materials that are opaque or available only in small samples.

Brewster was educated for the ministry at the University of Edinburgh, but his interest in science deflected him from pursuing this profession. In 1799 he began his investigations of light. His most important studies involved polarization, metallic reflection, and light absorption. He was elected a fellow of the Royal Society in 1815, and he invented the kaleidoscope the following year. He was knighted in 1831. In the early 1840s he improved the stereoscope by utilizing lenses to combine the two dissimilar binocular pictures and produce the three-dimensional effect. Brewster was instrumental in persuading the British to adopt the lightweight, flat Fresnel lens for use in lighthouses. In 1838 he became principal of the United College of St. Salvator and St. Leonard of the University of St. Andrews and in 1859 principal of the University of Edinburgh.

Of his many published works, his *Treatise on Optics* (1831) and *Memoirs of the Life, Writings and Discoveries of Sir Isaac Newton* (1855) are the most important.

Brewster, Kingman, Jr. (b. June 17, 1919, Longmeadow, Mass., U.S.), American educator and diplomat who as president of Yale University was noted for his handling of student protests.

Brewster was educated at a private school in Boston and at Yale. After working briefly in Washington, D.C., and as a Navy fighter pilot in World War II, he enrolled at Harvard Law School, obtaining his LL.B. degree in 1948. The following year he spent in Europe, helping to administer the Marshall Plan. After brief service as a research associate in economics at the Massachusetts Institute of Technology, Brewster joined the Harvard law faculty in 1950.

In 1960 Yale president A. Whitney Griswold chose Brewster to be provost at Yale. Simultaneously, he became a professor in the Yale Law School. Griswold died early in 1963, and Brewster became acting president of Yale; the appointment was made permanent later that year. He became the first Yale president ever who was also a lawyer and the first since 1900 not to hold a Ph.D.

As president, Brewster concentrated on improving science education while maintaining Yale's high standing in the humanities. During his administration Yale opened the admissions policy, enrolling more black students and, in 1969, admitting undergraduate women to what had been a men's university.

Despite severe criticism by some Yale alumni, Brewster publicly opposed the U.S. role in the Vietnam War and denounced inequities in the military draft. His support for protest demonstrations drew further objections, but throughout the early 1970s, when many other campuses were torn by storms of dissent, Brewster managed to keep the Yale campus open and relatively tranquil. In the meantime, however, his attitudes led to serious erosion of financial support from alumni.

He was appointed ambassador to Great Britain (1977) by President Jimmy Carter and filled that position until 1981. He then joined a private law firm. Brewster was the author of *Antitrust and American Business Abroad* (1959; rev. ed. 1981) and coauthor of *The Law of International Transactions and Relations* (1960).

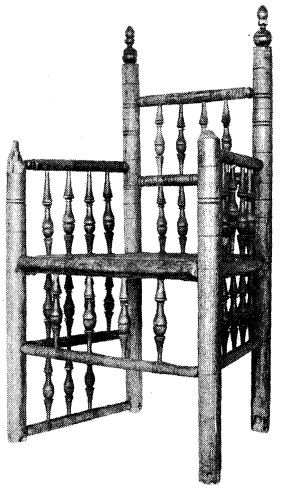
Brewster, William (b. 1567, England—d. April 1644, Plymouth, Mass.), leader of the Plymouth Colony in New England.

He spent his early life at Scrooby, Nottinghamshire, and acquired his first Separatist ideas while at Peterhouse College, Cambridge, which he attended for a short time. In 1583 he became the personal secretary to William Davison, an Elizabethan diplomat. Because of disillusionment with diplomatic and court life, and because of his father's illness, he returned to Scrooby (1589), where he became the leader of the Puritan congregation that separated from the Established Church in 1606.

He and John Robinson led the Puritan migration to Amsterdam in 1608 and the move to Leiden in 1609. While in Holland, Brewster made his living by printing Puritan books by English authors and exporting them to England; pressure by the English government eventually forced him to abandon that enterprise. He accompanied the first group of Pilgrims on the *Mayflower* in 1620. Brewster, the only university-trained member of the Plymouth community, was the real leader of the church. As its senior elder he dominated the formulation of its doctrines, worship, and practices. He was not a magistrate, but by virtue of his close association with the governor, William Bradford, he played a major role in civil as well as in religious affairs.

Brewster chair, chair made in New England in the mid-17th century, characterized by rectilinear design and turned (shaped on a lathe) wood components—high posts at the back terminating in decorative finials, and ornamental spindles incorporated in the back and sides. The seat was woven of rush.

The chair was named after William Brewster,



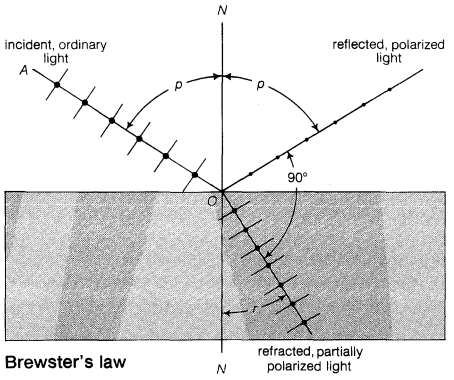
Brewster armchair, ash, American, *c.* 1660–80; in Pilgrim Hall Museum, Plymouth, Mass.

By courtesy of Pilgrim Hall, Plymouth, Mass.

a Pilgrim father. It was a heavier, more ornate spool chair than the related Carver chair.

Brewster's law, relationship for light waves stating that the maximum polarization (vibration in one plane only) of a ray of light may be achieved by letting the ray fall on a surface of a transparent medium in such a way that the refracted ray makes an angle of 90° with the reflected ray. The law is named after a Scottish physicist, Sir David Brewster, who first proposed it in 1811.

The Figure shows a ray of ordinary (nonpolarized) light of a given wavelength incident on a reflecting surface of a transparent



Brewster's law

medium; *e.g.,* water or glass. Waves vibrating in the plane of the page are indicated by short lines crossing the ray and those vibrating at right angles to the page, by dots. The plane of incidence (*AON*) is the plane that contains the incident ray and the normal (*ON,* a line perpendicular to the surface) and lies in the plane of the page. Most of the waves of the incident ray will be transmitted across the boundary (the surface of the water or glass) as a refracted ray making an angle *r* with the normal, the rest being reflected. For a specific angle of incidence (*p*), called the polarizing angle, all reflected waves will vibrate perpendicular to the plane of incidence (*i.e.,* to the page), and the reflected ray and the refracted ray will be separated by 90°. Brewster's law also states that the index of refraction (a constant characteristic of each substance) for a ray passing from air into a substance is equal to the tangent of the angle of polarization. For example, a certain wavelength of light has a refractive index of 1.575 in a particular glass; this number is the tangent of 57° 35′, which is thus the polarizing angle (*p*).

Brézé, Pierre II de, Brézé also spelled BRESZÉ (b. 1410?—d. July 16, 1465, Montlhéry, Fr.), trusted soldier and statesman of Charles VII of France.

He made his name in the Hundred Years' War when in 1433 he joined with Yolande (the queen of Sicily), the Constable de Richemont, and others in chasing from power Charles VII's minister, La Trémoille. Brézé also won distinction in the Praguerie (*q.v.*), when he supported the royal cause against the dauphin Louis and the rebels, a service remembered against him after Louis came to the throne (as Louis XI). He was made seneschal of Anjou in 1437 and of Poitou in 1441; fought the English in Normandy in 1440–41 and in Guienne in 1442; and became chamberlain to Charles VII and gained the chief power in the state through the influence of Agnès Sorel. The years of his ascendancy (1444–50) were the most prosperous of Charles VII's reign.

The dauphin Louis in 1448 brought against him accusations which led to a formal trial, resulting in a complete exoneration of Brézé and his restoration to favour. He played a large part in the reconquest of Normandy (1449–51), especially in the Battle of Formigny, and became seneschal of the province in 1451. He made an ineffective descent on the English coast at Sandwich in 1457 and was preparing an expedition in favour of Margaret of Anjou when the accession of Louis XI brought him disgrace and a short imprisonment.

He accompanied Margaret to Scotland with a force of 2,000 men in 1462 and brought her back to Flanders on the collapse of her plans in 1463. Brézé was reappointed seneschal of Normandy and was killed in the Battle of Montlhéry. He was succeeded as seneschal by his eldest son Jacques de Brézé (*c.* 1440–90), comte de Maulévrier; and by his grandson Louis de Brézé (d. 1531), husband of the famous Diane de Poitiers.

Brezhnev, formerly (until 1930) CHELNY, or (1930–82) NABEREZHNYE CHELNY, city, Tatar Autonomous Soviet Socialist Republic, Russian S.F.S.R., on the left bank of the Kama River. The city is best known for its Kama truck plant, the world's largest. Also located at Brezhnev is the Lower Kama hydroelectric station. Because of these developments, Brezhnev was the Soviet Union's most rapidly growing city in the 1970s. Pop. (1970) 37,923; (1983 est.) 394,000.

Brezhnev, Leonid Ilich (b. Dec. 19, 1906, Kamenskoye, Russia—d. Nov. 10, 1982, Moscow), Soviet statesman and Communist Party official who was, in effect, the leader of the Soviet Union for 18 years.

Having been a land surveyor in the 1920s, Brezhnev joined the Communist Party of the Soviet Union (CPSU) in 1931 and studied at the Dneprodzerzhinsk Metallurgical Institute. After graduating (1935), he worked as an engineer and director of a technical school and

Brezhnev

Sven Simon—Katherine Young

also held a variety of local party posts; his career flourished under Stalin's regime and by 1939 he had become secretary of the regional party committee of Dnepropetrovsk. During World War II he served as a political commissar in the Red Army, advancing in rank until he became a major general (1943) and head of the political commissars on the Ukrainian front.

After the war Brezhnev again held posts as chief of several regional party committees in the Ukraine; then in 1950 he became first secretary of the Central Committee of the Moldavian Communist Party. In 1952 he advanced from that post to become a member of the Central Committee of the CPSU, a candidate member of the Presidium of the Central Committee, and a member of its Secretariat.

When Stalin died (March 1953), Brezhnev was obliged to give up his posts on the Central Committee and accept the position of deputy head of the political department of the Ministry of Defense with the rank of lieutenant general. Shortly afterward, however, he was transferred to the post of second secretary of the Kazakhstan Communist Party (1954). In that capacity he became a protégé of Khrushchev, and vigorously implemented the latter's ambitious Virgin and Idle Lands Campaign in Kazakhstan. Brezhnev was soon promoted to first secretary of the Kazakhstan Communist Party (1955), and in 1956 he was reelected to his posts on the Central Committee of the CPSU. A year later, after he loyally worked against the "antiparty group" that tried to remove Khrushchev, Brezhnev was made a full member of the Presidium, and on May 7, 1960, he became chairman of the Presidium of the Supreme Soviet; *i.e.,* the titular head of the Soviet state. On July 15, 1964, he resigned that post to become Khrushchev's assistant as second secretary of the Central Committee; three months later, Brezhnev joined the coalition which forced Khrushchev out and replaced him as first secretary (after 1966, general secretary) of the CPSU (Oct. 15, 1964). After a brief period of "collective leadership" with Premier Aleksey Kosygin, Brezhnev emerged clearly as the dominant figure.

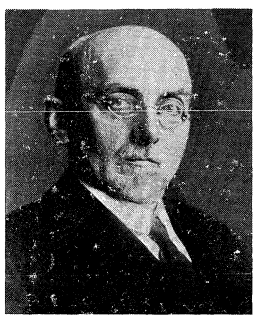
As head of the party Brezhnev left many affairs of state—*e.g.,* diplomatic relations with non-Communist states and internal economic development—to his colleagues Kosygin and Nikolay V. Podgorny, chairman of the Presidium, in a system of collective leadership. Brezhnev concentrated on foreign and military affairs and undertook measures to curtail ideological dissidence within the Soviet Union. He travelled extensively to foreign countries between 1961 and 1964 and also made visits to all the eastern European Communist countries (except Albania) to improve solidarity within the Communist bloc (1965). Nevertheless, when Czechoslovakia under Alexander Dubček attempted to liberalize its Communist system of government and party control (1968), Brezhnev developed the concept (known in the West as the Brezhnev Doctrine) that justified the invasion of Czechoslovakia by its Warsaw Pact partners.

During the 1970s Brezhnev attempted to ease tensions with the West, and especially the United States, in a new policy of coexistence. At the same time under Brezhnev's aegis Soviet military power was significantly increased and modernized, and the Soviet Union pursued a policy of supporting "wars of national liberation" in developing countries. In domestic policy he was preoccupied with neutralizing internal dissent and seeking—without conspicuous success—to improve the performance of the Soviet economy, particularly in agriculture and consumer goods. On April 9, 1971, he was reelected to the post of general secretary of the CPSU and on May 8, 1976, he was made marshal of the Soviet Union (the only party leader except Stalin to hold the highest military rank). The system of collective leadership ended with his dismissal

of Podgorny as chairman of the Presidium on May 24, 1977. On June 16 Brezhnev was unanimously elected to that position. He thus became the first person to hold concurrently the leadership of the Presidium and of the CPSU, and he continued to hold both offices until his death.

Březina, Otakar, pseudonym of VÁCLAV JEBAVÝ (b. Sept. 13, 1868, Počátky, Bohemia, Austria-Hungary—d. March 25, 1929, Jaroměřice, Czech.), poet who had a considerable influence on the development of 20th-century Czech poetry.

Březina spent most of his life as a schoolmaster in Moravia, isolated from the political and literary movements that influenced the work of many of his contemporaries. His lasting



Březina
Telepress, Prague

poetical achievement is contained in a lyrical cycle of five books: *Tajemné dalky* (1895; "The Mysterious Distances"), *Svitani na zapade* (1896; "Dawn in the West"), *Vrěty od pólů* (1897; "Polar Winds"), *Stavitelé chrámu* (1899; "Builders of the Temple"), and *Ruce* (1901; "Hands"). Earlier poems, written under the pseudonym Vaclav Donsovsky, are of less account. From a position of metaphysical pessimism Březina advanced to a positive love of humanity and acceptance of life.

Bṛhaspati (Sanskrit: Lord of Spells), in Vedic mythology, the preceptor of the gods, the master of sacred wisdom, charms, hymns, and rites, and the sage counsellor of Indra in his war against the titans or *asuras*. As such, he is the heavenly prototype of the caste of Brahmans and, most particularly, of the earthly *purohita*, or family priest. To him is attributed a hymn in the Rigveda. An ancient sage and a founder of a heretical sect also bear his name. He is the regent of the planet Jupiter.

Brialmont, Henri-Alexis (b. May 25, 1821, Venlo, Neth.—d. June 21, 1903, Brussels), Belgian military engineer primarily responsible for development of a new type of permanent fortification capable of withstanding artillery firepower.

Educated at the Brussels military school, Brialmont entered the Belgian Army in 1843 and rose to the rank of major general and the post of inspector general of fortifications. Studying the problem of defense of cities against the new rifled artillery, he adopted a system consisting of a perimeter of detached forts, employing steel as well as masonry, with guns mounted in disappearing cupolas and steel turrets. In 1877 he undertook to fortify Bucharest for the Romanian government, carrying out the work despite a protest from Austria-Hungary that forced his own government to disavow him. In 1885 he returned home and was made inspector general of the general staff corps. In World War I fortifications built by Brialmont or modelled on his ideas played a considerable role, notably at Verdun.

Brian, also called BRIAN BORU (b. 941, near Killaloe, Ire.—d. 1014, Clontarf, near Dublin), high king of Ireland from 1002 to 1014. In 976 he became king of a small state, later called Dál Cais, and also king of Munster, whose Eóghanachta rulers had been defeated (964) by Brian's half brother. Brian destroyed first the Eóghanachta septs and then the Northmen, constructing a fleet to drive them from the Shannon. Under his rule Munster became a unified and powerful state. He invaded Ossory (983), won control of the southern half of Ireland from the high king Maelsechlainn II (997), replaced him as high king (1002), and in due course received the submission of every lesser ruler. The men of Leinster and the Northmen of Dublin united against him in 1013, enlisting help from abroad. The decisive battle at Clontarf, near Dublin, on April 23, 1014, found Brian too old to take active part, and the victory was won by his son, Murchad. A little group of Northmen, flying from the battlefield, stumbled on Brian's tent, overcame his bodyguard, and hacked the aged Brian to death. His fame was so great that the princes descended from him, the O'Briens, subsequently ranked as one of the chief dynastic families of the country.

Brian, (William) Havergal (b. Jan. 29, 1876, Dresden, Staffordshire, Eng.—d. Nov. 28, 1972, Shoreham, Sussex), English musician and self-taught composer who in his youth played violin, organ, piano, and cello. His chief love, however, came to be composition. Between the ages of 20 and 45, he wrote more than 100 songs and about a dozen orchestral works, in addition to two cantatas and an opera, *The Tigers* (begun in 1916), considered to be a remarkably pointed satire on war.

Between World Wars I and II, Brian was a music journalist. Though performances of his music were infrequent from 1922 until 1958, he continued to compose prolifically. In the 1960s, especially through the efforts of the British Broadcasting Corporation, a growing audience for his music developed. By then he had completed a vast lyric drama *Prometheus Unbound,* two concerti, four more operas, and 13 symphonies. His most famous work, *Gothic Symphony* (1919–27; first performance 1961), requires an orchestra of 200 performers and choirs of 400 to 600. Between 1959 and 1968—*i.e.,* between the ages of 83 and 92—Brian wrote 20 more symphonies, bringing the total to 33.

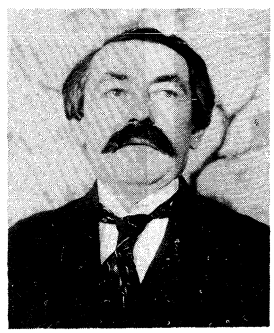
Brianchon, Charles-Julien (b. Dec. 19, 1783, Sèvres, Fr.—d. April 29, 1864, Versailles), French mathematician who derived a geometrical theorem (now known as Brianchon's theorem) useful in the study of the properties of conics (circles, ellipses, parabolas, and hyperbolas) and innovative in applying the principle of duality (interchangeability) to geometry.

In 1804 he entered the École Polytechnique, Paris, where he became a student of the noted French mathematician Gaspard Monge. While still a student, he published his first paper, "Mémoir sur les surfaces courbes du second degré" (1806; "Memoir on Curved Surfaces of Second Degree"), in which he recognized the projective nature of a theorem of Pascal, and then proclaimed his own famous theorem: If a hexagon is circumscribed about a conic (all sides made tangent to the conic), then the lines joining the opposite vertices of the hexagon will meet in a single point.

Brianchon graduated first in his class in 1808 and joined Napoleon's armies as a lieutenant in the artillery. Though his courage and ability distinguished him in the field, particularly in the peninsular campaigns, the rigours of field service affected his health. In 1818 he gained a professorship in the École d'Artillerie de la Garde Royale, Vincennes, where his mathematical work was slowly replaced by other interests.

Briançon, city, capital of an *arrondissement,* Hautes-Alpes *département,* Provence-Alpes-Côte-d'Azur region, southeastern France, at the confluence of the Durance and Guisanne rivers. Its location at a crossing point for commerce across the Alps made the city important historically. The upper city preserves 17th-century fortifications designed by Sébastien Le Prestre de Vauban; the lower city extends along both banks of the Durance. Military activity connected with the city's location near the frontier with Italy has long held first place in the city's economic life; it is also known, however, as a curative resort, with numerous sanatoriums. Pop. (1982) 9,289.

Briand, Aristide (b. March 28, 1862, Nantes, Fr.—d. March 7, 1932, Paris), statesman who served 11 times as premier of France, holding a total of 26 ministerial posts between 1906 and 1932. His efforts for international cooperation, the League of Nations, and world peace brought him the Nobel Prize for Peace in 1926.



Briand, 1913
H. Roger-Viollet

As a law student, Briand became associated with left-wing causes, writing for such publications as *Le Peuple, La Lanterne,* and *Petite République,* and in 1904 he joined Jean Jaurès in founding *L'Humanité.* In 1894 Briand succeeded in getting the sharply divided French trade unionists to adopt the general strike as a political tactic at a workers' congress at Nantes. That decision led to a further estrangement between the moderate Socialists led by Jaurès and the militant Marxists headed by Jules Guesde. After three unsuccessful attempts (1889, 1893, and 1898) to be elected to the Chamber of Deputies, Briand became secretary-general of the Socialist Party (1901). In 1902 he finally won election as a deputy from the Loire *département* and remained a member of the Chamber until his death.

Briand's first great success in government came with his work on the commission that drafted a law of separation of church and state in 1905; his report was published as *La Séparation des églises et de l'état.* This achievement led to his appointment as minister of public education and culture in March 1906, but his acceptance of a post in a bourgeois government widened his break with Jaurès and other Socialists. After serving another term as education minister in the first government of Georges Clemenceau (1906–09), he became premier from July 1909 to November 1910. He served two more terms, briefly, before his plan for proportional representation met defeat in the Senate in March 1913.

On the fall of the Cabinet of René Viviani in October 1915, Briand again became premier; he also took control of foreign affairs. He formed his sixth Cabinet in December 1916, but still failed to cope with the lagging war effort. Forced to resign (March 1917) because of mounting pressures and the unsuccessful Balkan campaign, he spent the next three years taking little part in public affairs except for his outspoken advocacy of the League of Nations and the concept of collective security. He returned to the premiership in January

1921, but his failures in foreign policy forced his resignation on Jan. 12, 1922.

In April 1925, under Premier Paul Painlevé, he again took the post of foreign minister—a post he held in 14 successive governments, four of which (three in 1925–26, the last in 1929) he headed himself. During that period his successes were the Pact of Locarno (1925), in which he, Gustav Stresemann of Germany, and Austen Chamberlain of Britain sought to normalize relations between Germany and its former enemies; and the Kellogg–Briand Pact (Aug. 27, 1928), in which 60 nations agreed to outlaw war as an instrument of national policy. In December 1930 Briand publicly, and boldly for the times, advocated a federal union of Europe. He finally retired in January 1932, after an unsuccessful campaign for the presidency of the French Republic, and died shortly thereafter.

Briand–Kellogg Pact (1928): *see* Kellogg–Briand Pact.

Brianka (Ukrainian S.S.R.): *see* Bryanka.

Briansk (Russian S.F.S.R.): *see* Bryansk.

briard, French sheepdog breed mentioned in French records of the 12th century and depicted in medieval French tapestries. It is

Briard
Sally Anne Thompson—EB Inc.

known in France as *berger de Brie* (sheepdog of Brie) but is found throughout the French provinces. The briard is a lithe, strongly built dog with bushy brows and a long, more or less waterproof coat. It stands 22 to 27 inches (56 to 69 centimetres), weighs about 80 pounds (36 kilograms), and is usually black, gray, or tawny. Briards are also used for guard, police, and military work.

Briareus, also called AEGAEON, in Greek mythology, one of three 100-armed, 50-headed Hecatoncheires (from the Greek words for "hundred," "hands," and "arms"), the sons of the deities Uranus and Gaea. According to one legend, Briareus and his brothers successfully aided Zeus, the king of the gods, against the attack by the Titans. Another account made Briareus an opponent of Zeus and one of the assailants of Olympus, who, after his defeat, was buried under Mt. Etna. Still another tradition made him a giant of the sea, an enemy of Poseidon (the god of the sea), and the inventor of warships. The Hecatoncheires may have represented the gigantic forces of nature manifested in earthquakes and other convulsions or the motion of the sea waves.

bribery, penal offense defined as the giving or receiving of consideration for official favour. Though originally involving interference with or by public officials, bribery has to a limited extent been expanded to include actions by private citizens as well.

Modern bribery legislation covers all public employees. Sometimes this legislation, in its application to minor functionaries, is restricted to attempts to induce the official to "violate his duty," thus excluding favours given to officials who possess little or no discretionary power. Special provisions have been enacted in various jurisdictions to punish bribery of voters, jurors, witnesses, and other lay participants in official proceedings. Some codes also penalize bribery in designated classes of private or commercial transactions—*e.g.,* bribery of labour-union officials by employers.

As to the nature of the consideration given or received, the main issue is whether to limit bribery to cases in which money or property is the inducement or to extend the crime to cases in which any benefit or advantage is conferred or promised. Most statutes are of the latter form. Practical limitations on the interpretation of such broad language are inevitable, since few legislative or executive compromises could stand if the principle were applied fully. One limitation on any charge of bribery is that some element of "corrupt purpose" must be implied or proved. This means that in the absence of a complete statutory prohibition on the granting of favours to a public official, a gift is not a bribe unless there has been some intent to influence the official behaviour of the recipient. *See also* extortion.

Bribie Island, island off the southeastern coast of Queensland, Australia, at the northern extremity of Moreton Bay. The island is 20 mi (32 km) long and from 1 to 5 mi wide and has an area of 59 sq mi (153 sq km). Its surface, generally low with some higher sand ridges, is wooded with cypress pine. Matthew Flinders, the English navigator, landed in 1799 at its southern tip, which he named Skirmish Point after his party was attacked by Aborigines. Long a holiday resort offering good beaches, fishing, and a wildlife reserve, Bribie has also developed as a residential area for Brisbane (39 mi southwest by road), its principal town being Bongaree. An oil terminal and refinery, completed in 1963, was built on reclaimed land. A bridge from Toorbul Point, on the mainland, crosses Pumicestone Channel to Bribie's southwestern corner.

Bribrí, Indians of the tropical forests of eastern Costa Rica, closely associated with the Talamancan peoples of Panama and also with the Guaymí. Their language belongs to the Chibchan family. The Bribrí are agriculturists, growing traditional staples such as corn (maize), beans, and sweet manioc (yuca), planted with the digging stick. They also hunt, fish, gather wild foods, and keep poultry and occasionally cattle. They live in small communities of single-family houses, often scattered over farmland; their houses may be conical, square, rectangular, or pyramidal, built of poles with thatched roofs coming down to the ground. Their crafts include pottery, basketry, netting, and rope making; cotton weaving is no longer done. The Bribrí's government and religion are both in states of transition from aboriginal to European types.

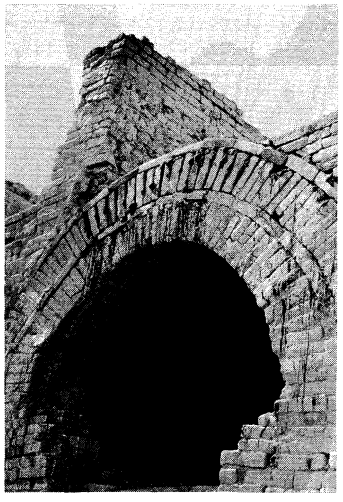
Brice, Fanny, original name FANNIE BORACH (b. Oct. 29, 1891, New York City—d. May 29, 1951, Los Angeles), popular singing comedienne long associated with the *Ziegfeld Follies.* She is especially remembered for her satiric sketches of ballet dancers, fan dancers, and "vamp" actresses, for her rendition of the torch song "My Man," and for her "Baby Snooks" radio series.

Fanny Brice as Baby Snooks
Culver Pictures

In 1910 Florenz Ziegfeld heard her singing in a burlesque house and made her a headliner in his *Follies* of that year. She subsequently appeared in almost every annual *Follies;* she also played vaudeville and occasionally acted in motion pictures—*e.g.,* as herself in *The Great Ziegfeld* (1936). The character of Baby Snooks, an incorrigible little girl, originally created to amuse her friends, was brought to radio in 1938 in a series that played almost continuously until Brice's death.

She was married three times, first to Frank White, a Springfield, Mass., barber (1911, annulled); to Jules W. (Nicky) Arnstein, a convicted gambler (1918, divorced 1927); and to producer Billy Rose (1929, divorced 1938). The Broadway and motion-picture musical *Funny Girl* (staged 1964, filmed 1968) was based on her life.

brick, a small rectangular block, usually of fired clay, used in the construction of foundations, walls, piers, buttresses, and arches of buildings and other structures and in the construction of the ducts, flues, linings, and chimneys of furnaces. By massing bricks in quantity, with mortar joints, in definite patterns or bonds, greatly varied forms of construction can be erected, having massive or delicate proportions as required, to carry loads, to provide screens or protection against the weather, or to resist the action of heat.



Ancient brickwork from the ruins of Babylon
BBC Hulton Picture Library

A brief treatment of brick follows. For full treatment, *see* MACROPAEDIA: Industrial Glass and Ceramics.

Throughout their long history, bricks have varied greatly in size. Although today the term brick is usually associated with a unit approximately 8–9 in. (20–22 cm) long by 3¾–4½ in. (9–11 cm) wide by 2–3 in. (5–7.5 cm) deep, the larger hollow clay units, invented in the mid-19th century and quite widely used for building in Europe and the United States, can be considered to be a development of the brick. The raw material from which these larger units are made and the processes used for their manufacture are similar to those used for bricks. Some building bricks are made from a mixture of sand and hydrated lime pressed together in a high-pressure press and subsequently autoclaved; such sand-lime bricks and concrete bricks are usually not considered in the category of ordinary bricks.

Clays suitable for ordinary bricks are widely distributed. Most of these natural clays are complex mixtures of one or more of the clay minerals (hydrous aluminum silicates) with salts of common elements, such as iron and calcium.

The use of bricks may date to more than 6,000 years ago. Primitive bricks were sun-dried, but the brick kiln was invented at an early date; bricks used in Middle Eastern temples and ziggurats built in the 3rd millenium BC were kiln-fired. Sun-dried bricks proved effective only in climates having low humidity and rainfall, and even then they required safeguards against dissolution. From Babylon and other such centres the ancient craft of brickmaking appears to have spread westward to Egypt and the Mediterranean and eastward to India and China. The Romans acquired this knowledge and improved the durability of both brick and mortar, using them in combination with concrete to form the characteristic Roman arches, vaults, and domes. Roman techniques of brickwork were passed on to the Byzantines who, in turn, influenced the Seljuq and Ottoman Turks. Byzantine brick buildings in Italy furnished prototypes for the great Lombard development of brick architecture beginning in the 11th century. Inspired by the Italian example (and perhaps also by the East through the Crusades), brickwork then began to appear elsewhere and came to dominate the architecture of northern Germany, Denmark, the Low Countries, and parts of England.

Modern brick manufacture begins with mining the clay, which is crushed and ground in a mill to a fine grain, then mixed with water to make a stiff paste. The paste is then formed into bricks either by pressing it into molds or by extruding it in a continuous rectangular column, which is then sliced with wires to size. The "green" or partially dried bricks are then fired in a kiln at 1,750–2,100° F (950–1,200° C) for about 12 hours.

The three general classes of brick are face brick, used where appearance is important; common brick, made of lower-quality clays and used for ordinary construction; and refractory brick, which can resist extremely high temperatures and is used in the construction of furnaces and fireplaces. Each layer of bricks in a wall is called a course. Courses laid end-to-end are stretchers, courses laid side-to-side are headers. Bricks are held together with mortar, an adhesive usually made of cement, lime putty, and sand in various proportions.

Briçonnet, Guillaume (b. *c.* 1472—d. Jan. 24, 1534, Saint-Germain-des-Prés, Fr.), influential Catholic reformer, one of the most energetic personalities in the French church at the beginning of the Reformation.

Briçonnet, etching, 16th century
By courtesy of the Bibliotheque Nationale, Paris

Briçonnet was the son of Charles VIII's counsellor Guillaume Briçonnet (1445–1514), who after his wife's death took holy orders and became bishop of Saint-Malo, archbishop of Reims, archbishop of Narbonne, and cardinal. The younger Briçonnet was made bishop of Lodève (1489), abbot of Saint-Germain-des-Prés (1507), and bishop of Meaux (1516). He took part in the Council of Pisa in 1511 and was entrusted by Francis I of France in 1516 with the negotiations in Rome over the application of the Concordat of Bologna.

It is thought that the influence of some Italian bishops of the Oratory of the Divine Love—particularly Gian Matteo Giberti, bishop of Verona—prompted Briçonnet to begin reforms in his diocese of Meaux, where he made frequent visitations, encouraged devotion to the Blessed Sacrament and to the Virgin Mary, and promoted a religious revival by means of sermons and tracts printed in his own palace.

Briçonnet moreover was the leader of the Meaux group of evangelicals, which included Jacques Lefèvre d'Étaples, Gérard Roussel, Guillaume Farel, Jodocus Clichtove, François Vatable, and Martial Mazurier. The group combined Humanism with a return to the study of the Bible and, especially, of St. Paul's epistles as the primary source of Christian doctrine. Its members, however, differed in their attitude to Lutheranism, which Briçonnet condemned. Even so, Briçonnet had to appear twice before the Paris Parlement on suspicion of heresy. The group was finally dispersed about 1525.

Bricriu's Feast, Irish Gaelic FLED BRICRENN, in early Irish literature, a comic, rowdy account of rivalry among Ulster warriors. One of the longest hero tales of the Ulster cycle, it dates from the 8th century and is preserved in *The Book of the Dun Cow* (*c.* 1100). Bricriu, the trickster, promises the hero's portion of his feast to three different champions, Lóegaire, Conall Cernach, and Cú Chulainn. A violent dispute over precedence ensues, which leads to a series of contests. One night a giant carrying an ax challenges the knights of Ulster to behead him in exchange for a chance to behead them in turn. On successive nights, Conall and Lóegaire behead the giant, who each time replaces his head and leaves but comes back to take his turn only to find that the warriors have departed. At last Cú Chulainn beheads the giant and, when the giant returns, places his own head on the block, true to his bargain. The giant, really the wizard Cú Roi in disguise, proclaims Cú Chulainn the first hero of Ulster. This is considered the source for the beheading game used in *Sir Gawayne and the Grene Knight.*

Bridalveil Fall, cataract on the west slope of the Sierra Nevada in Yosemite National Park, 150 mi (240 km) east of San Francisco, in east central California, U.S. Fed mainly by melting snow, the waterfall has a height of 620 ft (189 m) and forms one of the most scenic features in the park.

Bride OF IRELAND, SAINT: *see* Brigit of Ireland, Saint.

bride-price, also called BRIDEWEALTH, the payment made by the groom or his kin to the kin of the wife in order to ratify a marriage. The practice is common in all parts of the globe in one form or another, but as an instrument for the legitimation of a marriage, bride-price is most highly developed in Africa. In many African societies the husband may not assume full rights over the sexual, economic, or procreative powers of his wife until a standard portion of the bride-price has been transferred. Consistently, a marriage is not reckoned to have ended until the return of bride-price has been acknowledged, signifying divorce.

The payment of bride-price is most often a matter of social and symbolic as well as economic reciprocity, being part of a long series of exchanges between the two intermarrying families, consolidating friendly relations between them if they are not already united by ties of kinship. It is a pledge that the wife will be well treated and is also in some sense a compensation for her loss.

Payment may consist of goods or, less frequently, of services; and it may be paid in one sum or regularly over a long period of time. The goods transferred vary considerably from specified amounts of livestock or spears to bolts of cloth, drink, food, money, or even an exchange of women.

Bridel, Philippe-Sirice (b. Nov. 20, 1757, Begnins, Switz.—d. May 20, 1845, Montreux), man of letters, known as *le doyen* Bridel, who encouraged the development of an indigenous Swiss literature and tried to awaken a national consciousness in all areas of life. A French-language writer, Bridel helped to bring both French-speaking and German-speaking Swiss together in politics as well as in literature and science.

While serving as a pastor at Basel, Château-d'Oex, and Montreux, Bridel devoted most of his attention to literature and to questions of linguistics, natural science, and Swiss history. His poetry is less important than his philological work, *Glossaire du patois de la Suisse romande* (posthumous, 1866), and two series of miscellaneous writings: *Étrennes helvétiennes* (1783–87) and *Conservateur suisse* (1813–31). The Swiss literary patriotism that he espoused influenced the poet Juste Olivier (1807–76).

Bridel, etching after a portrait by Franz Doyen, *c.* 1800
Archiv fur Kunst und Geschichte, West Berlin

bridewealth: *see* bride-price.

bridge, structure that surmounts an obstacle, such as a river or declivity, and is used as a passageway for pedestrian, motor, or rail traffic.

A brief treatment of bridge design and construction follows. For full treatment, *see* MACROPAEDIA: Public Works.

The simplest bridge is the beam (or girder) bridge, consisting of straight, rigid beams placed across a span. The most basic example of this type, and probably the oldest form of bridge, is a log set over a stream. Support for the girder bridge comes from the foundations at either end, which bear the entire weight of the bridge and its traffic.

A major improvement over the simple beam was the circular arch, the basic design of which was perfected by the Romans. Because the forces on an arch bridge extend outward as well as downward (a condition called compression), they could be built with longer spans and with masonry blocks rather than with single timbers or slabs of stone.

A refinement of the beam, called a cantilever, is used to construct bridges with even longer spans. In simple cantilever bridges, such as those that are found in many parts of Asia, the structure rests on crisscrossed log foundations with narrow bases that flare outward as they rise to support the roadway. A modern cantilever bridge may use only two intermediate piers set a short distance from either bank. These act something like fulcrums. The

Table 1: Longest bridges of the world

bridge	location	type	year completed	length of bridge (m)
Lake Pontchartrain No. 2	Metairie–Lewisburg, La., U.S.	precast prestressed concrete	1969	38,422
Lake Pontchartrain No. 1	Metairie–Lewisburg, La., U.S.	precast prestressed concrete	1956	38,352
Lake Pontchartrain trestle	near New Orleans	timber railway trestle	1883	34,600*
Chesapeake Bay bridge/tunnel	Va., U.S.	steel trestle	1964	28,500
Sunshine Skyway	Tampa Bay, Fla., U.S.	steel and concrete cantilever	1954	24,500
Lucin Cut-Off (Great Salt Lake)	Lakeside, Utah, U.S.	...	1904†	19,300
Presidente Costa e Silva	Rio de Janeiro–Niterói, Braz.	steel plate and box girder	1974	13,900
Chesapeake Bay (two identical bridges)	Va., U.S.	steel trestle	1952 1972	12,900 12,900
San Mateo–Hayward	San Francisco Bay, Calif., U.S.	...	1929‡ 1967	11,670 11,270
Seven Mile	Knight's Key–Pacet Key, Fla., U.S.	...	1912	11,270
Zárate–Brazo Largo§	Paraná River, Argentina	steel plate and box girder	...	10,000 ‖
Tappan Zee	Hudson River, N.Y., U.S.	steel cantilever	1956	9,700
Lake Pontchartrain (twin bridges)	near New Orleans	...	1965	8,700
Transbay (Oakland Bay)	San Francisco–Oakland, Calif., U.S.	steel suspension	1936	8,400
General Rafael Urdaneta	Maracaibo, Venezuela	concrete	1962	8,300
Albermarle Sound	Skinner's Point/Mackay's Ferry, N.C., U.S.	timber railway trestle	1910	8,200
Huey P. Long	Mississippi River, La., U.S.	railway¶	1935	7,100
Öland Island	Kalmar–Island, Swed.	...	1972	6,070
Zeelandbrug	Oosterschelde, Neth.	...	1965	5,022
Porte delle Libertá (Ponte Littoria)	Italy	...	1933	4,000

... Not available. *The trestle was shortened in 1890–96 to 9,200 m. †Original bridge was 43,400 m long shore-to-shore, and was replaced in 1960 by an embankment. ‡The later bridge replaced the original. §Two bridges connected by embankments; total length including embankments is 30,000 m. ‖ Figure given includes railway approaches. ¶The longest railway bridge in the world (trestles excepted).
Sources: Dominique and Michèle Frémy, *Quid* 1984; *Engineering News Record* (various issues); John H. Stephens, *Towers, Bridges, and Other Structures* (1976).

first span of the bridge extending from bank to pier is called the anchor arm, and the next span projecting towards the middle is called the cantilever arm. The cantilever arms from either end are joined at the middle by a suspended span. Top structures connect the anchor arms to towers above the piers, and the cantilever arms support the midsection by the force of tension. Downward forces are absorbed by the piers.

The weight of a suspension bridge is also partially supported by intermediate piers crowned with towers; but instead of the rigid superstructure of a typical cantilever, the main support members of a suspension bridge are parallel cables composed of thousands of individual strands of wire. These run, supported by each tower and curving down at the middle, the entire length of the bridge and are anchored on either end. The deck (roadway) is supported by hanger cables that are hung from the main cables. Most of the weight of the bridge is thus transferred to the cable anchors at either end of the bridge. Although the suspension concept is one of the oldest bridge designs (foot bridges utilizing vines instead of steel cables have been built in jungle and mountainous areas for centuries), it has found its widest application in the 20th century.

These three bridge designs are sometimes combined, but the features of each are generally recognizable. Bridges are normally characterized by the length of their main spans; those of the suspension type are usually the longest. In the mid-1980s the Humber Bridge over the Humber estuary in England was the world's longest, with a main span of 4,626 feet (1,410 metres). (For longest span bridges of the world, *see* Table 2, page 512.)

Besides design, the other great challenge in building durable bridges has been in the methods and materials used in their construction. Roman engineers introduced two significant innovations, the cofferdam and cement. The widespread use of a third major innovation, ferrous-metal structural members, did not occur until the late 18th century. Technological advances in these areas have made possible the large modern bridges.

The Romans surmounted the problem of building bridge foundations in water by using cofferdams, which were temporary enclosures made out of timbers that were driven into the river bottom, made watertight with clay, and then pumped dry to facilitate the setting of a foundation. This method was long used and only significantly improved with the development of the pneumatic caisson in the 19th and 20th centuries. Water is forced out of the caisson (a large concrete or steel cylinder that rests on the bottom) with compressed air, allowing workers to descend through an airlock and dig to bedrock. As material is removed the caisson sinks, and after bedrock is reached, it is filled with concrete to become the foundation of the bridge pier. In the early days of caisson use there were many casualties among workers who came out of the compressed chambers and developed caisson disease, or bends. This situation has been corrected by the institution of safety procedures. Caissons are also sunk by mechanically pounding them down to bedrock with powerful drivers, thus eliminating the need for manual excavation.

Roman builders also came up with the first concrete—made of volcanic rock, lime, sand, and water—which they poured into cofferdams. Often concrete is the main construction material in modern bridges. Reinforced concrete, to which emplanted steel bars add strength, was introduced in the 19th century; its first significant application was in an arched bridge built in France in 1898. Engineers later learned to apply tension to the bars before pouring the concrete. This process, called prestressing, significantly reduces the amount of structural material needed for a bridge, since the built-in stress counteracts much of the weight of the load. Prestressed concrete bridges often have a graceful look, which cannot be achieved by iron and steel bridges with their geometric configurations.

Although iron chains had been used in suspension bridges for centuries, the world's first all-iron bridge was not built until 1779. Numerous cast- and wrought-iron structures were subsequently built, but by the last quarter of the 19th century steel had largely supplanted iron as the primary construction material. With its high strength-to-weight ratio and great malleability, steel is the ideal material to use for the increasingly sophisticated and ambitious projects of modern bridge designers. New alloys and alloying processes have vastly improved its tensile strength, ductility, and resistance to fatigue and corrosion, making possible bridges that incorporate innovative uses of steel in plates and box girders, cable bracing, and continuous trusses.

In addition to providing a passage for traffic, bridges have often had other functions, including service as fortifications and as business districts. The Old London Bridge, for example, which stood from the 13th to the 19th century, was a crowded thoroughfare, full of shops and houses. The original functions of bridges have also been modified for new uses. The drawbridge, or bascule, originally used for protection against intruders, has been turned into a means for allowing the passage of water traffic. The classic drawbridge, in which the bridge leaf is hoisted by rope or chain, has been improved by the development of gears and counterweights. Design variations include leaves that roll back on tracks, bridges whose entire span is lifted vertically by cables run over tall towers to counterweights, and bridges that swing on a central turntable.

Bridge, any of a group of card games including Bridge Whist, Auction Bridge, and Contract Bridge, all derived from Whist.

The name Whist seems to have been first used in the early 17th century to describe a card game that had evolved from several other games, principally Triumph. By the mid-18th century Whist had become the preeminent card game in both Europe and America. The introduction of the exposed, or dummy, hand in the 1870s led to the development of Bridge (the name Bridge Whist was coined later to distinguish it from Auction Bridge). By the early 1900s, however, Auction Bridge, which introduced competitive bidding, had rendered Bridge Whist obsolete. The final refinements that resulted in the modern game of Contract Bridge were made in the 1920s; by 1929 it had become the standard game.

The game is played by four players arranged into two partnerships. The full pack of 52 cards is used, and the play comprises 13 tricks, each of which consists of one card per player. The two partnerships first bid to establish which side will contract to take a given number of tricks in its chosen trump suit or with no-trump. A "trump" suit is one of which any card beats any card of the other suits; "no-trump" is a situation in which no suit overcomes the one that is led. Suits are ranked, in ascending order, clubs, diamonds, hearts, spades, with no-trump outranking any suit. Thus, the lowest possible contract is one club, which means that a "book" of six tricks plus one must be taken with clubs as trumps. Two clubs means eight tricks, and so on up to seven clubs (13 tricks). The highest possible contract is seven no-trump.

Bidding starts with the dealer, who may bid or pass (in Britain, "No bid"), and proceeds clockwise. Each player is free to pass, but if a bid is made it must outrank the previous bid. When a bid is followed by three passes it becomes the contract (the player who made the bid is the "declarer"), and play can begin. The partners who lost the bidding become the defenders, and the player to the left of the declarer makes the opening lead. The declarer's partner (the dummy) then puts his cards face up on the table. The declarer instructs him as to which card to play on each trick.

Points are scored in two ways: tricks contracted for and fulfilled count toward "game" and are registered "below the line"; bonuses and penalties are entered "above the line." Game is made when one side scores 100

Table 2: Longest span bridges of the world

bridge	location	year of completion (scheduled)	span (m)
Steel suspension			
Akashi Ōhashi (U)*†	Akashi Straits, Japan	(1988)	1,780
Humber	near Hull, Humberside, Eng.	1981	1,410
Verrazano Narrows	New York City	1964	1,298
Golden Gate	San Francisco	1937	1,280
Mackinac	Mackinac Straits, Mich., U.S.	1957	1,158
Bosphorus	Istanbul	1973	1,074
George Washington	New York City	1931	1,067
Ponte 25 de Abril (Salazar)	Lisbon	1966	1,013
Forth (Road)	Queensferry, Scot.	1964	1,006
Severn	Beachley, Gloucestershire, Eng.	1966	997
Pierre-Laporte	Quebec City	1970	908
Naruto Ōhashi†	Naruto Straits, Japan	1983	876
Tacoma Narrows II	Puget Sound, Wash., U.S.	1950	853
Innoshima†	Innoshima, Japan	1982	770
Angostura	Ciudad Bolívar, Venezuela	1967	712
Kanmon Straits	Shimonoseki, Japan	1973	712
Transbay (Oakland Bay)	San Francisco–Oakland, Calif., U.S.	1936	2 spans, each 704
Bronx–Whitestone	New York City	1939	701
Delaware I	Wilmington, Del., U.S.	1951	655
Delaware II	Wilmington, Del., U.S.	1968	655
Cantilever			
Québec	Quebec City	1918	549
Forth (Road)	Queensferry, Scot.	1890	2 spans, each 521
Nanko	Ōsaka–Amagasaki, Japan	1974	510
Commodore John J. Barry	Delaware River, Pa., U.S.	1971	501
Greater New Orleans	Mississippi River, La., U.S.	1958	480
Howrah	Calcutta	1943	457
Steel arch			
New River Gorge	Fayette County, W.Va., U.S.	1977	518
Bayonne	Bayonne, N.J.–New York City	1931	511
Sydney Harbour	Sydney	1932	509
Fremont	Portland, Ore., U.S.	1971	383
Ždákov	Vltava River, Czech.	1967	380
Port Mann	Fraser River, B.C., Canada	1964	366
Thatcher Ferry	Balboa, Panama	1962	344
Laviolette	Trois-Rivières, Que., Canada	1967	336
Runcorn–Widnes	Mersey River, Eng.	1961	330
Birchenough	Sabi River, Zimbabwe	1935	329
Nagasaki Sasebo	Kyushu, Japan	1955	318
Glen Canyon	Colorado River, Ariz., U.S.	1959	313
Steel cable-braced			
Annacis Island Crossing	Vancouver, B.C., Canada	In planning	465
. . . (U)	Yokohama Bay, Japan	(late 1980s)	463
Hooghly River (U)	Calcutta	(1986)	457
Nagoya Harbour	Nagoya, Japan	. . .	405
St. Nazaire	Loire River, Fr.	1975	404
Puente de Strande	near Vigo, Spain	1978	400
Luling	Mississippi River, near New Orleans	1983	372
Flehe	Rhine River, Düsseldorf, W.Ger.	1980	367
Reinforced concrete arch			
Krk I	near Zagreb, Yugos.	1980	390
Gladesville	Sydney	1964	305
Amizade	Paraná River, Foz do Iguaçu, Braz./Paraguay	1964	290
Arrábida	Porto, Port.	1963	270
Sando	Angerman River, Kramfors, Swed.	1943	264
Steel span truss			
Astoria	Columbia River, Ore., U.S.	1966	376
Francis Scott Key	Baltimore	1977	366
Ōshima Ōhashi	Yanai City–Ōshima, Japan	1976	325
Kuronoseto Kaikyo	Akune City–Nagashima, Japan	1974	300
Prestressed concrete			
Brotonne	Seine River, near Rouen, Fr.	1977	320
Pasco–Kenewick	Columbia River, Wash., U.S.	1978	299
Wadi el-Kuf	al-Baydā', Libya	1971	282
Tiel	River Waal, Neth.	1974	267
Steel plate and box girders			
Presidente Costa e Silva	Rio de Janeiro–Niterói, Braz.	1974	300
Sava I	Belgrade	1956	261
Zoobrücke	Cologne	1966	259
Sava II (The Gazelle)	Belgrade	1970	250
Prestressed concrete cantilever			
Koror–Babelthuap	Pacific Islands, Trust Terr. of the	1977	241
Hamana	Shizuoka, Japan	1976	240
Hikoshima	Yamaguchi, Japan	1973	236
Urado	Kōchi, Japan	1972	230
Vertical lift (movable)			
Arthur Kill	Elizabeth, N.J., U.S.	1959	170
Cape Cod Canal	Cape Cod, Mass., U.S.	1935	166
Delair	Delair, N.J., U.S.	1960	165
Marine Parkway	New York City	1937	165
Elbe	Hamburg	1973	106
Swing Span (movable)			
al-Firdan	Suez Canal, Egypt	1965	168
Mississippi River	Fort Madison, Iowa, U.S.	1927	160
Willamette River	Portland, Ore., U.S.	1908	159
Missouri River	East Omaha, Neb., U.S.	1893	158
George P. Coleman Memorial	Yorktown, Va., U.S.	1952	152
Bascule (movable)			
South Capitol Street	Washington, D.C.	1949	118
Sault Sainte Marie	Mich., U.S.–Ont., Canada	1941	102
Erie Avenue	Lorain, Ohio, U.S.	1940	101
Tennessee River	Chattanooga, Tenn., U.S.	1917	94
José León de Cananza	Cádiz, Spain	1969	90

. . . Not available. *(U) indicates bridge was uncompleted at time of compilation. †Part of an extensive bridge-building project underway in Japan; approximately 20 bridges are involved in forming three separate routes linking the island of Honshu with the island of Shikoku.

points below the line. Clubs and diamonds are known as the minor suits, with tricks that are bid and made scoring 20 points each; hearts and spades are the major suits and score 30 points each; no-trumps score 40 for the first trick and 30 thereafter. Thus, game can be made on one hand with 5 of a minor (11 tricks); 4 of a major (10 tricks) or 3 no-trump (9 tricks). Bonuses are also added for a "small slam" (12 tricks bid and made) and a "grand slam" (13 tricks bid and made). Penalty ("set") points are incurred for failing to fulfill a contract.

In Rubber Bridge, which is often played for a stake, several hands are played until one partnership wins two games. In Tournament or "Duplicate" Bridge—where each hand is played by two or more tables and the results compared—each deal is scored separately, with set and bonus points being added if a game is made. The many forms of pair and team competition are conducted according to the duplicate principle, usually under the auspices of a regional, national, or international league. Individual rankings are determined through the awarding of master points for success in tournaments.

Each partnership is allowed its own understanding of what information is conveyed by certain sequences of bids, which are characterized as either "systems" or "conventions." Bidding systems are usually of two types: "natural" systems, in which an opening is made with a bid of one on a moderate hand and with a bid of two on a strong hand; and "strong-club" systems, in which a powerful hand is announced with an artificial bid of one club. Common to both types is the "preemptive" bid with an opening bid at the three level; it is made on a weak hand with a long suit of seven or more cards in an attempt to keep the opponents from bidding accurately to a high-scoring contract.

Conventions are nonsystematic bids that partnerships arrange to convey special meanings that are not obvious on the surface. They often carry the name of their inventors, who are usually well-known players, such as Ely Culbertson and Easley Blackwood. Systems and conventions have to be licensed by the game's ruling bodies for use in tournaments, and their meanings must be explained to opponents.

Tactics form a large part of bridge, with many subtleties in the play, including false-carding and occasional bluff bids ("psyches") to confuse the opposition. The declarer plans the play of the two hands in concert. His chances for success depend upon the distribution of the opponents' unseen cards, and he endeavours to develop the play based on his assumptions about the location of those cards. The defenders, however, do not know what cards their partners hold and must rely on information gained during bidding and through leads.

bridge, in electrical measurement, instrument for measuring electrical quantities. The first such instrument, invented by Sir Charles Wheatstone in 1843, measures resistance by comparing the current flowing through one part of the bridge with a known current flowing through another part. The Wheatstone bridge has four arms, all predominantly resistive. A bridge can measure other quantities in addition to resistance, depending upon the

type of circuit elements used in the arms. It can measure inductance, capacitance, and frequency with the proper combination and arrangement of inductances and capacitances in its arms.

bridge, in stringed musical instruments, piece of elastic wood that transmits the vibrations of the string to the resonating body. Bridges are of two kinds. In the pressure bridge, the string is fastened at one end to a tuning peg or a wrest pin and at the other to a pin or a tailpiece; it passes over the bridge (or bridges), which may be glued to the soundboard (as in the piano) or held in position solely by the pressure of the strings (as in the violin). In the tension bridge, one end of the string is fastened to a tuning peg or wrest pin and the other to the bridge itself, which is glued to the soundboard (as in the guitar and the lute).

Bridge, Frank (b. Feb. 26, 1879, Brighton, Sussex, Eng.—d. Jan. 10, 1941, Eastbourne, Sussex), English composer, viola player, and conductor, one of the most accomplished musicians of his day, known especially for his chamber music and songs.

He studied violin at the Royal College of Music, London, but changed to viola, becoming a virtuoso player. After a period in the Joachim Quartet (1906) he played with the English String Quartet until 1915. He also held various positions as a conductor.

Although he composed in many genres he was particularly successful in his smaller forms, such as the *Phantasie Quartet* for piano and strings (1910), four string quartets, and songs and piano pieces. His early works were Romantic in style; later, while he never abandoned Romanticism, he moved toward atonality. He was widely respected as a teacher, and his pupils included Benjamin Britten.

Bridge, The (artists): *see* Brücke, Die.

Bridge Whist, card game popular from the 1890s through 1910, the second step in the historical progression from Whist to Bridge Whist to Auction Bridge to Contract Bridge. Like its precursor and successors, it is a four-handed game with partnerships of two.

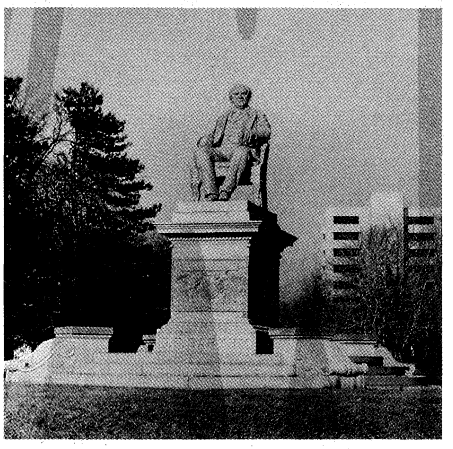
Bridge Whist introduced the option of playing at no-trump, the exposed dummy hand, a different scoring system, and the right to double and redouble scoring values indefinitely during play unless limits were predetermined. It was more intellectually challenging than Whist and virtually supplanted Whist as a fashionable game. The new game was known at first simply as Bridge but was renamed Bridge Whist to distinguish it from Auction Bridge, which followed within a few years.

Trump was named by the dealer or, at the dealer's option, by his partner; a hand could also be played at no-trump. The dealer's partner always became the dummy; his hand was exposed after the first lead and played by the declarer. The scoring was more elaborate than at Whist: after the dealer (or his partner) had declared the trump suits, either the player on his left or his partner could double, which meant doubling the scoring value of the tricks. The first side to score 30 or more points won a game, and the first to win two games won the rubber and a 100-point bonus.

The new game, appealing equally to men and women, became the favourite card game of the fashionable world. Its reign was relatively brief, and its popularity did not extend to the middle and lower classes as did that of Auction Bridge. Exposing the dummy gave the other three players a basis for reasoning and inference about play that had been lacking before, and the new method of determining the trump suit introduced another element of volition. The no-trump call brought with it a new range of tactical problems in the development of long suits. By 1897 almost all leading Whist players had switched to Bridge Whist. Even Henry Jones, who, under the pseudonym Cavendish, was the leading writer on Whist, became a convert.

Bridgend, Welsh PEN-Y-BONT AR OGWR, town, Ogwr district, Mid Glamorgan county, Wales, on the Ogmore River. It has grown up on the site of medieval riverside twin villages (Oldcastle and Newcastle) with a 12th-century castle and 15th-century hospice; a stone bridge was built over the river *c.* 1435. Historically, Bridgend has been the market town for the western Glamorgan lowland and the valleys immediately north. In addition, the town's industrial base was expanded after World War II with the conversion of a wartime ordnance factory into a large industrial estate, and the Ford Motor Company opened an automobile engine factory southeast of the town. Pop. (1981) 31,579.

Bridgeport, city, coextensive with the town (township) of Bridgeport, Fairfield County,



Statue of P.T. Barnum, Bridgeport, Conn.
Mark Sexton

southwestern Connecticut, U.S. The city is a port of entry on Long Island Sound at the mouth of the Pequonnock River. Settled in 1639, it was first known as Newfield and later as Stratfield. In 1800 it was incorporated as a borough and named Bridgeport for the first drawbridge over the river. Its advantageous geographical location, situated around an excellent harbour on the Sound, encouraged Bridgeport's shift from agrarian to mercantile and manufacturing pursuits. It grew to be an industrial centre producing electrical and transportation equipment, plastics, machine tools, automotive parts, and a wide range of consumer goods. P.T. Barnum, the well-known showman, was once the mayor of Bridgeport, and one of his star attractions Charles S. Stratton, "Tom Thumb," was born there. The Barnum Museum exhibits colourful circus memorabilia. The much-publicized Socialist mayor, Jasper McLevy, was elected there in 1933 to begin a 24-year administration. The city is the home of the University of Bridgeport (1927), Bridgeport Engineering Institute (1924), Sacred Heart University (1963), and Housatonic Community College (1966). Inc. town, 1821; city, 1836. Pop. (1984 est.) city, 142,140; metropolitan area (PMSA), 441,500.

Bridger, Jim, byname of JAMES BRIDGER (b. March 17, 1804, Richmond, Va., U.S.—d. July 17, 1881, near Kansas City, Mo.), American fur trader, frontiersman, scout, the "mountain man" par excellence.

Bridger joined his first fur-trapping expedition in 1822, and for the next 20 years he passed repeatedly on foot through an enormous area whose boundaries were the Canadian border, the Missouri River, the Colorado–New Mexico border, and Idaho and Utah, constantly exploring new territory; he is, for example, believed to have been the first white man to visit (1824) Great Salt Lake. In 1843 he established Ft. Bridger, in southwestern Wyoming, as a way station for emigrants traveling westward on the Oregon Trail and as a fur-trading post. (The fort later served the U.S. Army, and it was not abandoned till 1890.) When the Mormons took over the fort, Bridger entered government service as a scout and guided numerous expeditions, including the Utah invasion of Col. Albert Sidney Johnston in 1857–58 and the Berthoud party that was trying to discover a direct route from Denver to Great Salt Lake in 1861. His knowledge of the territory and its Indian inhabitants (he had three successive Indian wives) was unrivaled. He is commemorated in the Bridger National Forest in western Wyoming.

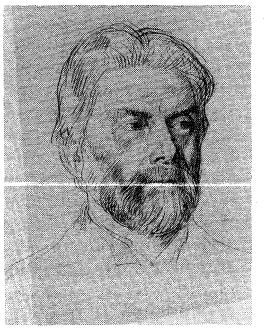
Bridges, Calvin Blackman (b. Jan. 11, 1889, Schuyler Falls, N.Y., U.S.—d. Dec. 27, 1938, Los Angeles), American geneticist who helped establish the chromosomal basis of heredity and sex.

The year after he entered Columbia University (1909), Bridges obtained a position there as laboratory assistant to the geneticist Thomas Hunt Morgan. He and Morgan designed experiments using the fruit fly, *Drosophila melanogaster,* which showed that heritable variations in the insect could be traced to observable changes in its chromosomes. These experiments led to the construction of "gene maps" and proved the chromosome theory of heredity. Bridges, with Morgan and Alfred Henry Sturtevant, published these results in 1925. That same year he published "Sex in Relation to Chromosomes and Genes," demonstrating that sex in *Drosophila* is not determined simply by the "sex chromosomes" (X and Y) but is the result of a "chromosomal balance"—a mathematical ratio of the number of female sex chromosomes (X) to the number of "nonsex" chromosomes (autosomes). In 1928 Bridges moved with Morgan to the California Institute of Technology, Pasadena, where he constructed detailed gene maps of the giant chromosomes found in the salivary gland cells of the fruit fly larva. Later he discovered an important class of *Drosophila* mutants caused by gene duplications.

Bridges, Robert (Seymour) (b. Oct. 23, 1844, Walmer, Kent, Eng.—d. April 21, 1930, Boar's Hill, Oxford), English poet noted for his technical mastery of prosody and for his sponsorship of the poetry of his friend Gerard Manley Hopkins.

Born of a prosperous landed family, Bridges went to Eton College and then to Oxford, where he met Hopkins. His edition of Hopkins' poetry that appeared in 1916 rescued it from obscurity.

From 1869 until 1882 Bridges worked as a medical student and physician in London hospitals. In 1884 he married Mary Monica Waterhouse, and he spent the rest of his life in virtually unbroken domestic seclusion, first



Robert Bridges, gold-point drawing by W. Strang; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

at Yattendon, Berkshire, then at Boar's Hill, devoting himself almost religiously to poetry, contemplation, and the study of prosody. Although he published several long poems and poetic dramas, his reputation rests upon the lyrics collected in *Shorter Poems* (1890, 1894). *New Verse* (1925) contains experiments using a metre based on syllables rather than accents. He used this form for his long philosophical poem *The Testament of Beauty,* published on his 85th birthday. Bridges was poet laureate from 1913 until his death.

Bridget OF IRELAND, SAINT: *see* Brigit of Ireland, Saint.

Bridget OF SWEDEN, SAINT, Bridget also spelled BIRGIT, or BRIGID, Swedish SANKTA BIRGITTA AV SVERIGE (b. *c.* 1303, Sweden—d. July 23, 1373, Rome; canonized Oct. 8, 1391; feast day July 23, formerly October 8), patron saint of Sweden, founder of the Brigittine Order, and a mystic whose revelations were influential during the Middle Ages.

The daughter of Birger Persson, governor of Uppland, she had from an early age remarkable visions, including one of Christ crucified, which influenced her entire life and outlook. In 1316 she married Ulf Gudmarsson, later governor of the province of Nericia, and bore eight children, including St. Catherine.

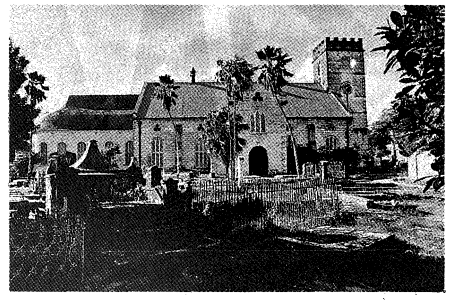
On the death of her husband in 1344, Bridget retired to a life of penance and prayer near the Cistercian monastery of Alvastra on Lake Vetter. To the prior, Peter Olafsson, she dictated the revelations that came to her, and he translated them into Latin. One was a command to found a new religious order, which she was not able to fulfill until near the end of her life, receiving papal permission in 1370. She went to Rome for the Holy Year of 1350 and, except for several pilgrimages, remained there for the rest of her life, constantly accompanied by Catherine. She exercised a wide apostolate among rich and poor, sheltering the homeless and sinners, giving God's messages of warning in times that were full of unrest and corruption. She worked untiringly for the return of the pope from Avignon to Rome. She prophesied the meeting of 1368 between Pope Urban V and Emperor Charles IV. Spurred by a vision to visit the Holy Land (1372), she died soon after her return to Rome.

Bridget's revelations were first published in 1492. A 15th-century English version was edited by W.P. Cumming (1929). H.M. Redpath's *God's Ambassadress* (1947) was followed by J. Jorgensen's *Saint Bridget of Sweden* (Eng. trans. by I. Lund, 1954).

Bridgeton, city, seat (1749) of Cumberland County, southwestern New Jersey, U.S., on Cohansey Creek 38 mi (61 km) south of Philadelphia. Founded by Richard Hancock in 1686, its first name was Cohansey Bridge for a bridge (1718) that spanned the creek. It was then called Bridgetown, later Bridgeton. A woollen mill (1811), a nail works and ironworks (1815), and a glass factory (1863) were early industrial enterprises. Food processing and the manufacture of glass and textiles are now the main industries. The churchyard of the Broad Street Presbyterian Church (1792) contains the graves of Gen. Joseph Bloomfield, who became governor of New Jersey in 1801, and many Revolutionary soldiers. Lafayette was entertained at the Gen. Giles Manor House (1792) during his tour of the U.S. (1824–25). The Courthouse contains the Liberty Bell cast in 1763 and rung to celebrate the Declaration of Independence. Tumbling Dam State Park surrounds a dam built (1814) to form a millpond, now Sunset Lake. Inc. 1865. Pop. (1980) city, 18,795; metropolitan area (SMSA), 132,866.

Bridgetown, capital and only port of entry of the island-state of Barbados, in the West Indies. It is on the southwestern end of the island, on the wide curve of Carlisle Bay. A built-up coastal strip stretches for several miles on each side of the town.

The town, founded in 1628 and originally called Indian Bridge, provoked much criticism from early visitors because of its situation by a noxious swamp and its unplanned development. The name St. Michael's Town came into favour around 1660 and remained in use into the 19th century. When the pioneer settlers reached a population of 2,000, the town had more than 100 taverns. Much of the town was destroyed repeatedly by fires, and in 1854 a cholera epidemic killed some 20,000 people.



St. Michael's Anglican Cathedral, Bridgetown, Barbados
Felix Kerr Associates

Bridgetown is a crowded and picturesque mixture of the old and new. St. Michael's Anglican Cathedral was built of coral rock, largely from the proceeds of a lottery to replace a building destroyed in a hurricane of 1780. Two blocks of public buildings, also made of coral and opened in 1874, face each other in an attractive square. Across the larger Trafalgar Square (with a statue of the English admiral Lord Nelson) lies the Careenage, a narrow basin of the sea (also called the Constitution River) housing dry docks and wharves. The Constitution River and the remnants of the swamp were filled in during 1962 and replaced with a canal. A deepwater harbour for commercial shipping, lying 0.75 mi (1.2 km) to the northwest, became operational in 1961. Government House dates from the early 18th century, and large modern ministerial buildings are by the shores of Carlisle Bay. George Washington's House recalls the visit in 1751 by Washington, then a young surveyor. Other notable landmarks include the Savannah, once the garrison parade ground, now used for race meetings and other gatherings; and Queen's Park, with its tropical vegetation. Bridgetown is the seat of Codrington College (affiliated with the University of Durham in England).

Sugar refining and rum distilling, along with the port activity and a growing tourist trade, constitute the town's economic mainstays. Pop. (1980) 7,552.

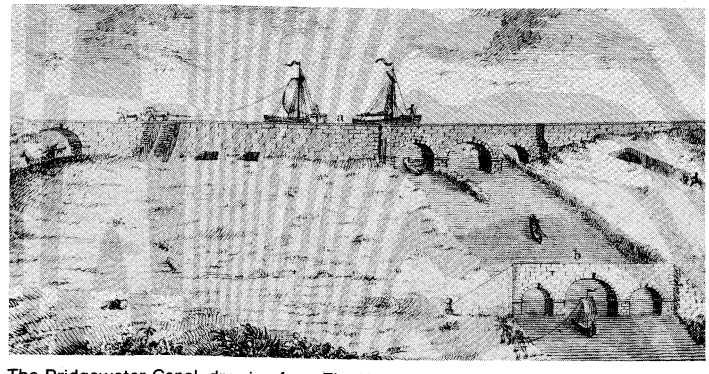
Bridgettine, also spelled BRIGITTINE, member of ORDER OF THE MOST HOLY SAVIOR (O.SS.S.), a religious order of cloistered nuns founded by St. Bridget of Sweden in 1344 and approved by Pope Urban V in 1370. Bridget believed that she was called by Christ to found a strictly disciplined religious order that would contribute to the reform of monastic life. She went to Rome to gain approval of her order and died there in 1373. Her foundation began to grow and contributed greatly to the culture of Scandinavia and Germany. The celebrated Syon Abbey at Isleworth, Middlesex, was founded in 1415. Attached to each house was a monastery for monks who lived under the same rule and under the government of the abbess. At the time of the Protestant Reformation, the order was nearly destroyed when its houses were suppressed and confiscated. The modern Sisters of the Most Holy Savior of St. Bridget, founded at Rome in 1911 by Mother Elisabeth Hasselblad, were recognized by the Holy See in 1942 as an offshoot of the ancient order. Its members are contemplatives whose prayer life is directed to the reunion of all Christians and, in particular, to the return of Scandinavia to the Catholic Church.

Bridgewater, county, southwestern Nova Scotia, Canada, at the head of navigation on La Have River, 59 mi (95 km) west-southwest of Halifax. One of the first schools in Canada was established by Capuchin missionaries in the original French village of Cap de la Have (or Hève), settled in 1632; it was later moved to Port Royal. The village was destroyed by a Boston privateer in 1705; and Bridgewater, founded on the site in 1812, was named for the first bridge that spanned La Have. A lumber-shipping port, it has dairy, woodworking, and marine engine plants. Its Des Brisay Museum houses a collection of pioneer relics. Inc. 1899. Pop. (1981) 6,669.

Bridgewater, Francis Egerton, 3rd duke of, MARQUESS OF BRACKLEY (b. May 21, 1736, Worsley, Lancashire, Eng.—d. March 8, 1803, London), founder of British inland navigation, whose canal, built from his estates at Worsley to Manchester, is called the Bridgewater canal.

His father, who was created duke in 1720, was the great-great-grandson of Lord Chancellor Ellesmere. Francis Egerton succeeded to the dukedom on the death of his brother, the 2nd duke, in 1748. Retiring to Worsley after a broken engagement, he instructed the engineer James Brindley to construct the canal for the transport of coal obtained on his estates. This, with the exception of the Sankey Canal from the River Mersey to St. Helen's, was the first canal of its kind to be built in modern Britain. Bridgewater also obtained parliamentary powers (1762) to provide a canal between Manchester and Liverpool.

Bridgewater Canal, British waterway now extending from Worsley to Liverpool. An en-



The Bridgewater Canal, drawing from *The History of Inland Navigations. Particularly those of the Duke of Bridgewater,* 1779
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

gineering masterpiece of the 18th century, the Bridgewater Canal was executed by James Brindley, a brilliant, self-taught mechanic and engineer in the service of the Duke of Bridgewater. The Duke wanted a canal to facilitate transporting coal from his mines at Worsley to Manchester, a distance of 10 mi (16 km), and envisaged a conventional canal with a number of locks. Brindley, however, after reconnoitring the route, persuaded the duke to allow him to construct a gravity-flow canal crossing the Irwell Valley on a viaduct carried on arches. The highly successful canal, completed in 1761, extended deep into the coal field and cut the cost of coal in Manchester in half. In 1776 the canal was extended from Manchester to Liverpool, an additional 30 mi (48 km).

Bridgman, Laura Dewey (b. Dec. 21, 1829, Hanover, N.H., U.S.—d. May 24, 1889, Boston), one of the first blind deaf-mute persons for whom systematic education proved successful.

At the age of two an attack of scarlet fever permanently destroyed her sight and hearing.

Laura Bridgman, 1878
By courtesy of the Bostonian Society, Old State House

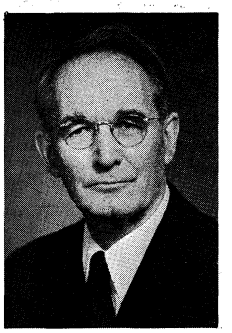
Her case was brought to the attention of Samuel Gridley Howe, head of the Perkins School for the Blind at Boston, and in October 1837 she entered the school.

Howe at once set himself to teach her the alphabet by touch. He first prepared labels with raised letters and pasted them on several common articles, such as keys, spoons, and knives. As soon as Laura learned all the names, she was taught the individual letters and gradually learned the alphabet and the 10 digits. In January 1842 Charles Dickens visited the institution and afterward wrote enthusiastically in *American Notes for General Circulation* of Howe's success with Laura. Bridgman lived at the school for the rest of her life, eventually helping with the teaching and household work. Her importance in the history of the education of the deaf and blind occasioned several biographies, including those by Mary S. Lamson (1878), Maud Howe and Florence Howe Hall (1903), and Laura E. Richards (1928).

Consult the INDEX *first*

Bridgman, P(ercy) W(illiams) (b. April 21, 1882, Cambridge, Mass., U.S.—d. Aug. 20, 1961, Randolph, N.H.), U.S. experimental physicist noted for his studies of materials at high temperatures and pressures. For that work he was awarded the Nobel Prize for Physics in 1946.

Bridgman was the son of a journalist. He entered Harvard University in 1900, receiving his M.A. in 1905 and his Ph.D. in 1908. His experimental work on static high pressures was begun in 1908. It was at first confined to pressures of about 6,500 atmospheres (one atmosphere = 14.7 pounds per square inch), but he gradually extended the range to more than 100,000 atmospheres and ultimately reached



P.W. Bridgman
By courtesy of the Harvard University News Service

about 400,000 atmospheres. In this unexplored field, he had to invent much of the equipment himself. His most important invention was a special type of seal, in which the pressure in the gasket always exceeds that in the pressurized fluid, so that the closure is self-sealing; without this his work at very high pressures would not have been possible. Later he was able to make full use of the new steels and of alloys of metals with heat-resistant compounds such as carboloy (tungsten carbide cemented in cobalt). Most of this work involved measurements of the compressibilities of liquids and solids, studies of the phase changes of solids under pressure (which included the discovery of high-pressure forms of ice), and measurements of the physical properties of solids (such as electrical resistance). As the range of pressures was extended, new and unexpected phenomena appeared; thus he discovered that the electrons in cesium undergo a rearrangement at a certain transition pressure.

Although Bridgman did not himself synthesize diamonds, despite repeated attempts, his pioneer work led directly to their synthesis by scientists of the General Electric Company in 1955. Many other minerals have been synthesized by the adoption and extension of his techniques; a new school of geology, based on experimental work at high pressures and temperatures, developed from his endeavours.

He was something of an individualist. He liked to work by himself, spending long hours in the laboratory and eschewing attendance at academic committees. He published more than 260 papers (only two of which listed a co-author) and 13 books. His papers are a mine of information for the experimentalist; they also reveal a masterly grasp of mathematical physics.

During a course of lectures he gave in 1914 on advanced electrodynamics, he was struck by the obscurities and ambiguities inherent in defining scientific ideas. This led him to the "operational" approach to scientific meaning, discussed in his first philosophical book, *The Logic of Modern Physics* (1927). He defined concepts (*e.g.*, length) in terms of the operations, both physical and mental, involved in their measurement. Since all measurements are relative to the frame of reference of the observer, concepts are also relative; length, for example, is a different concept when measured terrestrially than when measured astronomically. His views had affinities with those of the Austrian positivist Ernst Mach, the American empiricists Charles Peirce and William James, and the logical positivists of the Vienna school, although he retained an individual approach. He was motivated in his logical explorations by the uncritical use of the current language in physics. He noted that the apparent precision of mathematical equations concealed a mass of crude observations and approximate verbal explanations. He wrote in *The Logic of Modern Physics:*

> In general, we mean by any concept nothing more than a set of operations; *the concept is synonymous with the corresponding set of operations.* . . . If a specific question has meaning, it must be possible to find operations by which answers may be given to it. It will be found in many cases that the operations cannot exist, and the question therefore has no meaning.

He rose steadily through the hierarchical levels of university status, becoming a full professor at Harvard in 1919, Hollis Professor in 1926, and Higgins Professor in 1950. He was awarded the Nobel Prize for Physics in 1946 for his discoveries in the domain of high-pressure physics. After retirement, he continued his scientific work until he died.

One of Bridgman's strongest characteristics was his concern for intellectual integrity in every activity, from the laboratory experiment to the conduct of life itself. When he found himself dying of cancer, he asked his doctors to put an end to his life; when they refused, he found his own way, leaving behind a two-sentence note: "It isn't decent for Society to make a man do this thing himself. Probably this is the last day I will be able to do it myself. P.W.B." (R.S.B.)

BIBLIOGRAPHY. Bridgman's scientific papers have been published in *Collected Experimental Papers,* 7 vol. (1964). His best known book on philosophy is *The Logic of Modern Physics* (1927, reprinted 1960).

Bridgnorth, district, county of Shropshire (formerly Salop), England. It has an area of 245 sq mi (634 sq km).

The town of Bridgnorth lies on a high red sandstone rock, bounded on the east by the River Severn, and has been a bridging point since Saxon times. William I the Conqueror granted the manor to Roger de Montgomery, earl of Shrewsbury, whose son built a castle on the rock in 1101; only the tower remains.

The town is divided into Low Town and High Town, the two being joined by flights of steps, including the 200 Stoneway Steps, and by the Castle Hill Railway, the steepest in England. There are many half-timbered buildings, and several houses have cellars cut in the rock. Industries include carpet weaving and the manufacture of electrical equipment; a market dates from 1226. Pop. (1971) town, 10,491; (1982 est.) district, 49,700.

Bridgwater, Bristol Channel seaport, county of Somerset, England. The town, in Sedgemoor district, lies east of the Quantock Hills, mainly on the right bank of the River Parrett. The first of several charters dates from 1200, and wine and wool fairs were important in medieval times. The Church of St. Mary dates from the 14th century. The port's trade, revived with the building of a new dock in 1841, still continues; the river is navigable to the town for vessels up to 200 tons. The varied industries include brickmaking and tile making, heavy engineering, brewing, and the manufacture of electrical equipment and preserves. Pop. (1981 prelim.) 26,132.

Bridie, James, pseudonym of OSBORNE HENRY MAVOR (b. Jan. 3, 1888, Glasgow—d. Jan. 29, 1951, Edinburgh), playwright whose popular, witty comedies were significant to the revival of the Scottish drama during the 1930s.

Trained at the University of Glasgow's medical school, Bridie maintained a successful general practice (until 1938) and served as a physician in World War I and World War II. His first play, *The Sunlight Sonata* (1928), written under the pseudonym of Mary Henderson, was staged by the Scottish National Players. Three years later Bridie achieved success

with his London production of *The Anatomist* (1931), based on a well-known criminal case. Considered distinctively Scottish in their unexpected twists of fancy and thought-provok-

Bridie
T. & R. Annan & Sons Ltd., Glasgow

ing contents, his plays include *Jonah and the Whale* (1932); *A Sleeping Clergyman* (1933), also based on a criminal case; *Marriage Is No Joke* (1934); *Colonel Wotherspoon* (1934); *The King of Nowhere* (1938); *One Way of Living* (1939), an autobiographical drama; *Mr. Bolfry* (1943); *Dr. Angelus* (1947); and *The Queen's Comedy* (1950).

bridle, headgear by which a horse or other burden-bearing or pulling animal is governed, consisting of bit, headstall, and reins. The bit is a horizontal metal bar placed in the animal's mouth and held in place by the headstall, a set of straps over and around the head. Bits of bone and antler were in use in the Bronze Age, about 3000 BC.

The reins, lines held in the hand of the rider or driver, are connected to either side of the bit so that a tug on either side turns the animal in that direction. The headstall sometimes includes blinkers—leather flaps that inhibit side vision to keep the animal from being frightened or distracted.

Bridport, parish (town), West Dorset district, county of Dorset, England, west of Dorchester. Its name is derived from the small River Brit, and the town is reputed to be the Port Bredy of Thomas Hardy's Wessex novels. The town centre lies about a mile inland from the English Channel coast but is connected by a winding street with the fishing village of West Bay. Bridport was of some importance before the Norman Conquest (1066) but was first mentioned as a borough in 1189. The earliest royal charter was granted (1253) by Henry III, markets and fairs were granted by Elizabeth I, and the town was incorporated by James I in 1619. As early as 1213 Bridport was noted for the manufacture of ropes and cables; sailcloth, cordage linen, and fishing nets and lines are still produced. The harbour is accessible only to small vessels. Pop. (1981 prelim.) 6,876.

Brie, natural region of northern France between the Seine and Marne valleys. It occupies most of Seine-et-Marne *département* and parts of adjacent *départements.* The region was historically divided between the king of France (the Brie Française) and the duke of Champagne (the Brie Champenoise) from the 9th to the early 13th century, when the crown took it over. Broken here and there by forests, its fertile *limon* soil produces wheat and sugar beets, and cattle are raised as well. The region is known for rose culture, introduced about 1795 by the navigator Louis-Antoine de Bougainville, and for the soft white cheese called Brie.

Brie, soft-ripened cow's-milk cheese named for the district in northeastern France in which it is made.

The preliminary soft curd of Brie is molded in flat, pancake-like rounds 9–15 inches (23–38 centimetres) in diameter and 1 to 1½ inches in thickness. After the curd becomes firm, the cheese is sprayed with spores of *penicillium candidum,* a mold that forms a thin, downy white crust. The cheese ripens within three to four weeks. The interior is an ivory-coloured paste that has a semisoft, chalky centre when young but becomes soft and creamy throughout when fully ripened. Highly perishable, it remains in this state only briefly; at advanced stages of ripeness ammoniated odours develop, and the cheese begins to dry out and harden.

Brie originated near Paris, where unpasteurized, farm-produced Brie de Meaux and Brie de Melun are the most highly esteemed versions. Most Brie today is made in factories from pasteurized milk, which prolongs the life of the cheese but weakens its flavour. Brie is now widely imitated in many cheese-producing countries.

Brie, Simon de (pope): *see* Martin IV.

brief, in law, a document often in the form of a summary or abstract. The term is used primarily in common-law countries, and its exact meaning varies.

In the United States a brief is a written legal argument presented to a court to aid it in reaching a conclusion on the issues of law involved in the case. It is used primarily in appellate courts and is of the utmost importance when no oral argument is made; it is used less frequently at the trial level. The usual procedure calls for the party seeking the relief asked for in the brief to present his written argument to his opponent and to file it with the court. The opponent then files and serves an answering brief. Usually, the first counsel will have an opportunity to file a reply brief. On unusual occasions, specifically in constitutional cases, the brief may include extensive economic and sociological data; such a brief has become known as a "Brandeis brief," after the U.S. Supreme Court justice Louis Brandeis, who in his days as a lawyer made effective use of it. When a court allows an outsider to file a brief in a case to which he is not a party, it is generally called a brief amicus curiae ("friend of the court").

In England a brief is a document of instructions prepared by a solicitor for a barrister to follow in court. Only the latter may appear before the high court (*see* barrister; solicitor), but he cannot act on behalf of a litigant except pursuant to instructions from a solicitor. In his brief, the solicitor will report on the evidence and proof available and include statements and interviews of witnesses or summaries thereof.

Brieg (Poland): *see* Brzeg.

Brienne, Étienne-Charles de Loménie de: *see* Loménie de Brienne, Étienne-Charles de.

Brienza, Francesco Caracciolo, duca di (duke of): *see* Caracciolo, Francesco.

Brieux, Eugène (b. Jan. 19, 1858, Paris—d. Dec. 6, 1932, Nice, Fr.), French dramatist, one of the leading exponents of the Realist drama, whose somewhat didactic works attacked the social evils of his day. Brieux's works formed part of the repertory of the famed Théâtre-Libre of André Antoine, which had a far-reaching effect on the spread of the new naturalistic style. His reputation has declined, however, since the writer George Bernard Shaw described him as, of his kind, "incomparably the greatest writer France has produced since Molière." His principal works were *Blanchette* (1892), the story of a peasant girl educated above her station, and *La Robe rouge* (1900; *The Red Robe,* 1915), an attack on the magistracy. In 1901 he caused a scandal by tackling the subject of venereal disease in *Les Avariés* (*Damaged Goods,* 1914).

brigade, a unit in military organization commanded by a major general, brigadier or brigadier general, or colonel and composed of two or more subordinate units, such as regiments or battalions (*qq.v.*).

brigadier general, also called BRIGADIER, a military rank just above that of colonel. In both the British and U.S. armies of World War I, a brigadier general commanded a brigade. When the British abolished the brigade, they discontinued the rank of brigadier general but revived it as plain brigadier in 1928. In the U.S. and French military services, the brigadier general is the lowest-ranking general officer.

Brigadier Gerard (foaled 1968), English racehorse (Thoroughbred) who won all but one of his 18 races in his three-year racing career, winning more than $581,000. He was sired by Queen's Hussar and foaled by La Paiva. John Hislop bred him, Mrs. Hislop owned him, and Maj. Dick Hern trained him at West Ilsley in Berkshire. In 1970 he entered four races and won them all. The following year he was again unbeaten, this time in six races, most notably the Two Thousand Guineas. In 1972, his last year of racing, he came in first in seven contests, losing only to the U.S.-bred Roberts. Retired from racing after the 1972 season, Brigadier Gerard was sent to stud.

Brigantes, in ancient Britain, a tribe conquered by the Romans during the reign of Antoninus Pius (*c.* AD 155). The Brigantes occupied the region south of the Antonine Wall, extending to the Humber estuary in the east and to the Mersey River in the west. Their chief city was Isurium (Aldborough) and later Eboracum (York); they had forts at Cataractonium (Catterick), Olicana (Ilkley), and Vinovium (Binchester). They were twice defeated by the Romans (*c.* AD 50 and *c.* 71) before their final subjection by Antoninus, and during his reign the Brigantes lost even more of their land to the Romans.

Brigantia (Celtic goddess): *see* Brigit.

Brigantinus, Lacus (Europe): *see* Constance, Lake.

Brigate Rosse (terrorist group): *see* Red Brigades.

Briggs, Henry (b. February 1561, Warleywood, Yorkshire, Eng.—d. Jan. 26, 1630, Oxford), English mathematician who invented the common, or Briggsian, logarithms. His writings were mainly responsible for the widespread acceptance of logarithms throughout Europe. His innovation was instrumental in easing the burden of mathematicians, astronomers, and other scientists who must make long and tedious calculations.

In 1592 Briggs became reader of the Linacre Lecture and in 1596 first professor of geometry at Gresham House (later, College), London. In his lectures at Gresham he proposed that the logarithms of the Scottish mathematician and inventor of logarithms, John Napier, would be more useful if they had a base of 10. In conferences with Napier the alteration proposed by Briggs was agreed upon, and on his return from a second visit to Edinburgh in 1617 he accordingly published the first 1,000 of his logarithms. In 1619 he was appointed Savilian professor of geometry at Oxford University.

He published a small tract entitled *A Treatise of the Northwest Passage to the South Sea, Through the Continent of Virginia and by Fretum Hudson* (1622) and *Arithmetica Logarithmica* (1624), a work containing the logarithms of 30,000 natural numbers to 14 places, in addition to a table of natural trigonometric sine functions to 15 places, and trigonometric tangent and secant functions to 10 places. These tables were printed at Gouda, Neth., in 1631 and published in London in 1633 under the

title of *Trigonometria Britannica.* The latter work remained in general use until the early 19th century.

Brigham City, city, seat of Box Elder County, near Bear River Bay of Great Salt Lake, northern Utah, U.S., at the foot of the Wasatch Range, 21 mi (34 km) north of Ogden. Settled in 1851 by Mormons, it was named in 1877 for the Mormon leader Brigham Young. A shipping and processing centre for products (fruits, wheat, and beets) of surrounding irrigated farmlands, the city also manufactures aircraft parts and textiles. Peach Days, a harvest festival, has been held annually since 1904. Brigham City is the site of the Intermountain School (1950, a boarding school for Indians), and the Bear River Migratory Bird Refuge is nearby. The Golden Spike National Historic Site (commemorating the linking of the Union Pacific and Central Pacific railroads) is 30 mi west. Inc. 1867. Pop. (1980) 15,596.

Brighella, stock character of the Italian commedia dell'arte; a roguish, quick-witted, opportunistic, and sometimes lascivious and cruel figure. Originally one of the comic servants, or

Brighella, etching by Maurice Sand, 1860

From *The Italian Comedy* by Pierre Louis Duchartre, Dover Publications, Inc., New York (1929, 1966); reprinted through permission of the publisher

zanni, of the commedia, Brighella was a jack-of-all-trades whose loyalty as a soldier, hangman's varlet, assassin, or gentleman's valet could be easily bought. Because of his almost sentimental view of love, though, the young lovers could trust him.

Brighella's costume was suitably picaresque. The half mask of olive green with licentious eyes and a hooked nose was atop a rakish cavalier's mustache and a black shaggy beard. His jacket and full trousers were striped with green braid, and he wore a short cloak, a green bordered toque, and yellow shoes and belt; he carried a dagger that later became a wooden prop and a large leather purse.

In the 16th and 17th centuries the role of Brighella was gradually reduced to that of an unreliable valet. By the 18th century he was scarcely more than a flunky dressed in the livery of the period and locale.

Articles are alphabetized word by word, not letter by letter

Bright, Sir Charles Tilston (b. June 8, 1832, Wanstead, Essex, Eng.—d. May 3, 1888, Abbey Wood, near London), British engineer who superintended the laying of the first Atlantic telegraph cable.

In 1852 he became an engineer for the Magnetic Telegraph Company, for which he laid

Sir Charles Tilston Bright, detail of a lithograph, 1850

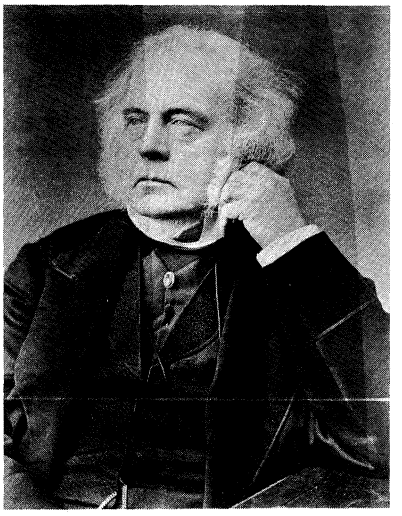
BBC Hulton Picture Library

thousands of miles of underground telegraph lines in England as well as the first undersea cable (1853) from Portpatrick, Scot., to Donaghadee, Ire. In 1856, Bright, with Cyrus Field and J.W. Brett, formed the Atlantic Telegraph Company, whose purpose was to lay the first Atlantic cable between Ireland and Newfoundland. Bright was made engineer in chief. After two failures, Bright landed the Irish end of the line at Valentia, County Kerry, in August 1858. A few days later he was knighted in Dublin. Although the cable broke down in October, its success had proved the practicability of the scheme. He was consulting engineer for the second and third Atlantic cables of 1865 and 1866. Subsequently, he supervised the laying of submarine cables in several other regions.

With Joseph Latimer Clark, he invented an asphalt-composition insulation for submarine cables. A paper on electrical standards read by them in 1861 before the British Association for the Advancement of Science led to the establishment of a committee whose work founded the system still in use. From 1865 to 1868 Bright was Liberal member of Parliament for Greenwich.

Bright, John (b. Nov. 16, 1811, Rochdale, Lancashire, Eng.—d. March 27, 1889, Rochdale), British reform politician and orator active in the early Victorian campaigns for free trade and lower grain prices (he was a co-founder of the Anti-Corn Law League), as well as campaigns for parliamentary reform.

Bright was the eldest surviving son of Jacob Bright, a self-made cotton-mill owner. John Bright inherited bluntness of manner from his father, imaginative sensitivity from his mother. The Brights were Quakers, and John was educated at a succession of Quaker schools in the



John Bright, photographed by Herbert Barraud

By courtesy of the Gernsheim Collection, The University of Texas at Austin

north of England, where, instead of receiving a classical education, he developed a lifelong love of the Bible and of the 17th-century English Puritan poets (especially Milton), a love often revealed in his speeches. Quaker beliefs shaped his politics, which consisted mainly of demands for an end to inequalities (social, political, or religious) between individuals and between peoples. While still in his 20s he had led a successful campaign in his native borough against the payment of compulsory taxes for the Anglican church.

In the same spirit he became a founder-member of the Anti-Corn Law League, which fought for lower grain prices, and by 1841 he had emerged as the chief supporting speaker to Richard Cobden, the leader of the league. For five years, until repeal of the Corn Laws in 1846, Cobden and Bright spoke frequently together from platforms throughout the country. Cobden's speeches provided persuasive arguments; Bright concentrated upon denouncing the privileged political position of the agricultural landlords, which had enabled them to use Parliament to pass the Corn Laws. Although Cobden had taught Bright the high moral and economic case for free trade, Bright tended to speak in narrower terms on behalf of the manufacturers and mill hands, who (he insisted to the latter) shared a common interest in overturning the Corn Laws.

Bright became a member of Parliament for Durham in 1843 and for Manchester in 1847. In 1839 he had married a fellow Quaker, Elizabeth Priestman; but she died of consumption in September 1841, leaving Bright with one daughter. In later life he liked to tell an emotional story of how Cobden visited him after his bereavement and how the two friends made a compact together to crusade against the Corn Laws. Bright's old-age recollections, however, tended to be unconsciously self-inflating, sacrificing accuracy for effect. In reality, he had begun to work closely with Cobden well before his wife's death. He also deeply disliked being opposed, even by Cobden. This was an unfortunate product of his sensitive nature, and he often expressed his disappointment with a brusqueness that hurt the feelings of others.

In 1847 Bright married again; his second wife was Margaret Elizabeth Leatham, another Quaker, two of whose brothers later became Liberal members of Parliament. She, too, took an interest in politics, though Bright did little to encourage this. Certainly, he strongly disapproved discussion of "women's rights" by the females of his family. Four sons and three daughters were born to the Brights, their father adopting a typical Victorian patriarchal attitude, affectionate but dominating. As he grew older, Bright even came to look like an Old Testament patriarch, his striking appearance adding to the effect of his oratory.

During his prime in the 1850s and 1860s, Bright's speeches came to be widely reported, winning admiration even from opponents. He regarded his speaking powers as a gift from God, comparing himself on the platform to a clergyman in his pulpit. In this spirit the greatest of all his oratorical series was delivered against British involvement in the Crimean War. He variously denounced the war as un-Christian, contrary to the principles of international free trade, and harmful to British interests. "The Angel of Death," he said, "has been abroad throughout the land; you may almost hear the beating of his wings." He blamed Lord Palmerston and the aristocracy for deluding the British people; British foreign policy and the expensive network of diplomatic appointments constituted "a gigantic system of outdoor relief for the aristocracy."

Frustration at his failure to stop the war plunged Bright into a severe nervous breakdown (1856–58). His anti-war views also helped to lose him his Manchester seat in

1857, but within a few months he was elected member of Parliament for Birmingham, which he was to represent for the rest of his life. A speech-making campaign for parliamentary reform launched from Birmingham by Bright at the end of 1858 faded out within a few months, but it marked the beginning of the movement toward the great reform agitation of the mid-1860s.

During the second half of 1866 Bright suddenly found himself the hero and chief mouthpiece of the reformers, accepted alike by those who demanded universal suffrage and those who wanted more limited reform. In terms of immediate influence this was the high point of his career. Paradoxically, his position was strengthened by the uncertainty of his own precise preference—he had always left details and close logic to Cobden, who died in 1865. But Bright was well-satisfied with the household franchise introduced by the 1867 Reform Act, which extended the vote to skilled urban artisans but still excluded the town and country labourers. He was impressed by the artisans' intelligence and independence, and he recommended every man who wanted the vote to acquire these qualities. The Brights were benevolent employers, but this same faith in self-help and independence placed Bright at the head of those manufacturers who opposed factory legislation, trade unions, and social reform. This was the negative side of his belief in equality. Its positive side led him strongly to support the North against the slave-owning South during the American Civil War (1861–65) and to press both before and after the Indian Mutiny (1857) for less-authoritarian British rule in India.

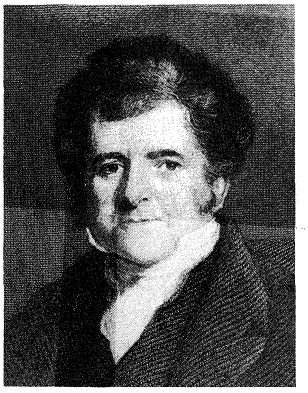
He entered William Gladstone's Cabinet as president of the Board of Trade in 1868, but another breakdown forced his resignation in 1870. Although he served twice more in Gladstone cabinets (1873–74, 1880–82), the rest of his career was but an epilogue. His radicalism no longer seemed dangerous, allowing him during the last 20 years of his life to be widely accepted (as the economist and journalist Walter Bagehot remarked) as "a great institution." He helped to shape Gladstone's Irish land reforms of 1870 and 1881, but his pugnacious streak (always strong, even in the cause of peace) led him in 1886 to reject Gladstone's lead in proposing Irish Home Rule. Bright announced that he was not prepared to see power given to Irish nationalists who had made a mockery of parliamentary government. Bright was greatly admired and venerated in old age, but historians subsequently tended toward a more critical view of his personality and achievement. (D.Re.)

BIBLIOGRAPHY. G.M. Trevelyan, *The Life of John Bright* (1913), is the official life; W. Robertson, *The Life and Times of the Right Hon. John Bright* (1883), is the most voluminous of contemporary accounts. J. Vincent, *The Formation of the Liberal Party 1857–1868* (1966), contains a penetrating analysis; D. Read, *Cobden and Bright: A Victorian Political Partnership* (1967), concentrates upon the personalities and policies of the two men.

Bright, Richard (b. Sept. 28, 1789, Bristol, Gloucestershire, Eng.—d. Dec. 16, 1858, London), British physician who was the first to describe the clinical manifestations of the kidney disorder known as Bright's disease, or nephritis.

Bright graduated in medicine from the University of Edinburgh in 1813. After working in hospitals on the Continent and in London, he became an assistant physician at Guy's Hospital, London, in 1820. He became a full physician there in 1824, and he retired from his post in 1843.

Bright excelled at making meticulous clinical observations and correlating them with careful postmortem examinations. The results of

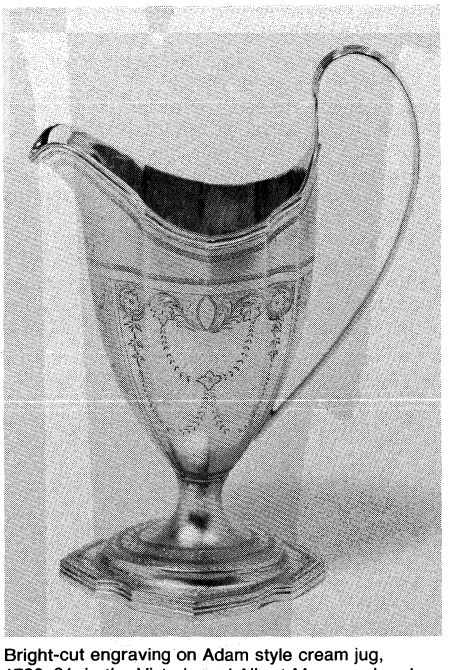


Richard Bright, engraving by H. Cook after a portrait by F.R. Say
BBC Hulton Picture Library

his wide-ranging researches first appeared in *Reports of Medical Cases* (1827), in which he established edema (swelling) and proteinuria (the presence of albumin in the urine) as the primary clinical symptoms of the serious kidney disorder that bears his name. Bright's subsequent papers on renal disease were published in a second volume of reports (1831) and in the first volume of *Guy's Hospital Reports* of 1836.

bright-cut, type of decorative engraving used on metal objects, especially those made of silver. The decorative designs are created by making a series of short cuts into the metal, using a polished engraving tool that causes the exposed surfaces to reflect light and give an impression of brightness.

The technique was most frequently used in England and countries influenced by the work of English silversmiths during the late 18th



Bright-cut engraving on Adam style cream jug, 1790–91; in the Victoria and Albert Museum, London
By courtesy of the Victoria and Albert Museum, London; photograph, A.C. Cooper

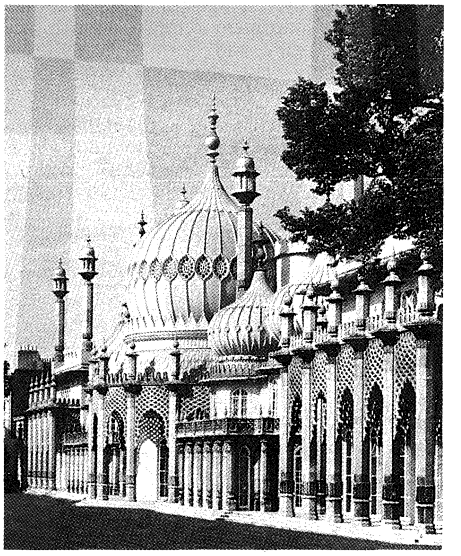
and early 19th centuries. It is sometimes used in diamond settings to make the stones appear larger.

Bright Eyes: *see* La Flesche, Susette.

brightness, in physics, the subjective visual sensation related to the intensity of light emanating from a surface or from a point source (*see* luminous intensity).

Brighton, district (borough), county of East Sussex, England. It is a seaside resort on the English Channel, 51 miles (82 km) south of London. With an area of 22 square miles (58 square km), Brighton spreads over the steep chalk slopes of the South Downs to the north; to the east it is fronted by chalk cliffs; to the west it merges with the residential borough of Hove. Major sea defenses initiated in 1930 line the shore between Black Rock and Saltdean. A marina for boating has been created at Black Rock.

Brighton was for many centuries nothing more than a tiny fishing community. The site's modern significance dates from 1754, when Richard Russell, the author of a treatise on the health benefits of seawater, settled there to put his theories into practice, thereby initiating the vogue of sea bathing. In 1783 the Prince



The Royal Pavilion at Brighton, Eng.
International Photobank

of Wales, later the Prince Regent and then King George IV, made the first of his many visits to Brighton. His powerful patronage of the locality extended almost continuously to 1827 and stamped the town with the distinguished character still reflected in its Regency squares and terraces. His Royal Pavilion, designed in Indian style with fantastic Chinese interior decorations, was built on the Old Steine, where fishing nets were once dried. The pavilion now houses a museum and art gallery, while the Dome, originally the royal stables, is used for concerts and conferences. Maria Fitzherbert, the secret wife of George IV, is buried in St. John's Roman Catholic church. Victorian Brighton grew rapidly with the opening of the railway (1841) connecting it with London.

The old fishing port, with its houses of black flint, includes the Lanes, now known for antique shops. The seaward side of the old port is bounded by the main promenade, which lies between the Palace and West piers. Brighton now has more than 7 miles (11 km) of seafront above its pebbly beach. East of the Palace Pier the first electric railway in Great Britain (1883) carried tourists in open coaches.

The town has the Theatre Royal, a racecourse overlooking the sea from the downs, an aquarium, golf courses, and a sports arena. The municipal airport is at Shoreham-by-Sea. The University of Sussex was founded at nearby Falmer in 1961. Roedean is a well-known public (independent) girls' school. The Royal Sussex County Hospital is the largest of numerous hospitals and sanatoriums in Brighton. The borough has industrial estates, and their highly diversified products range from office machinery to street name plates. Pop. (1985 est.) 143,100.

Bright's disease, also called GLOMERULONEPHRITIS, or NEPHRITIS, inflammation of

the structures in the kidney that produce urine: the glomeruli and the nephrons. The glomeruli are small round clusters of capillaries (microscopic blood vessels) that are surrounded by a double-walled capsule, called Bowman's capsule. Bowman's capsule in turn connects with a long tubule. The capsule and attached tubule are known as a nephron. In cases of glomerulonephritis, the glomeruli, the nephrons, and the tissues between nephrons are all afflicted. Glomerulonephritis may occur only once or may recur. The successive stages of the disease are known as acute, subacute, and chronic.

In acute glomerulonephritis there are severe inflammation, renal insufficiency, swelling, increased blood pressure (hypertension), and severe back pain. Recovery is usually fairly complete after an episode of acute glomerulonephritis, but minor infections may do further damage to the kidneys and bring on the subacute and chronic stages. In the acute form of the disease, the kidneys are swollen, the capsule covering each kidney is taut and stretched, the surface is smooth and gray, and usually there are many small hemorrhages from the capillaries. The whole complex of glomeruli and nephrons swells.

Subacute glomerulonephritis does not necessarily follow acute attacks; if it does develop, however, it has usually been preceded by an acute episode several months or years earlier. The kidney becomes considerably enlarged, the surface is smooth and pale, and the internal tissue is darker than normal. The paleness is due to the restriction of blood flow to the surface portion of the kidney and the high accumulation of fat (lipid) droplets. Bowman's capsules become filled with excess surface (epithelial) cells, red blood cells, and mineral crystals. The nephron tubules begin to degenerate. Because of the breakdown of kidney tissue, a greater amount of blood protein is lost into urine than should normally be released. Red blood cells forced through the constricted glomeruli become crushed, distorted, and fragmented; their loss leads to anemia.

Chronic glomerulonephritis usually follows the other two stages, if the affected person survives long enough, but it has been found in a few individuals who apparently have not had previous kidney disease. In this stage the kidney is reduced mostly to scar tissue. It is small and shrivelled, and the surface is granular. Because the blood cannot be filtered of waste products, abnormal quantities of nitrogenous substances in the blood cause the condition known as uremia. Treatment of all forms of glomerulonephritis is directed toward relief of the symptoms.

Brigid OF SWEDEN, SAINT: *see* Bridget of Sweden, Saint.

Brigit, also called BRIGANTIA (Celtic: High One), in Celtic religion, ancient goddess of the poetic arts, crafts, prophecy, and divination; she was the equivalent of the Roman goddess Minerva (Greek Athena). In Ireland this Brigit was one of three goddesses of the same name, daughters of the Dagda, the great god of that country. Her two sisters were connected with healing and with the craft of the smith. Brigit was worshipped by the semi-sacred poetic class, the *filid,* who also had certain priestly functions.

Brigit was taken over into Christianity as St. Brigit, but she retained her strong pastoral associations. Her feast day was February 1, which was also the date of the pagan festival of Imbolc, the season when the ewes came into milk. St. Brigit had a great establishment at Kildare in Ireland that was probably founded on a pagan sanctuary. Her sacred fire there burned continually; it was tended by a series of 19 nuns and by the saint herself every 20th day. Brigit still plays an important role in modern Scottish folk tradition, where she figures as the midwife of the Virgin Mary. Numerous holy wells are dedicated to her.

Brigantia, patron goddess of the Brigantes of northern Britain, is substantially the same goddess as Brigit. Her connection with water is shown by her invocation in Roman times as "the nymph goddess"; several rivers in Britain and Ireland are named after her.

Brigit OF IRELAND, SAINT, Brigit also spelled BRIDGET; also called BRIDE (b. [according to tradition] Fochart, near Dundalk, County Louth, Ire.—d. *c.* 524–528, Kildare, County Kildare), virgin and abbess of Kildare, one of the patron saints of Ireland.

Little is known of her life but from legend, myth, and folklore. According to these, she was born of a noble father and a slave mother and was sold along with her mother to a Druid, whom she later converted to Christianity. On being set free she returned to her father, who tried to marry her to the King of Ulster; impressed by her piety, the King removed her from parental control. According to the *Liber Hymnorum* (10th century), the Curragh, a plain in Kildare, was granted by the King of Leinster to St. Brigit. At Kildare she founded the first nunnery in Ireland. Their community became a double abbey, for monks and nuns, with the abbess ranking above the abbot. Her friend St. Conleth became, at Brigit's beckoning, bishop of her people. She is said to have been active in founding other communities of nuns. She appears in a wealth of literature, notably the *Book of Lismore,* the *Breviarium Aberdonense,* and *Bethada Náem n-Érenn.* One of the loveliest and most gently profound legends of Brigit is the story of Dara, the blind nun, for the restoration of whose sight Brigit prayed. When the miracle was granted, Dara realized that the clarity of sight blurred God in the eye of the soul, whereupon she asked Brigit to return her to the beauty of darkness. Brigit's feast day is observed as far away as Australia and New Zealand. In early times she was celebrated in parts of Scotland and England converted by Celtic churchmen. The Church of St. Bride's in Fleet Street, London, is dedicated to her.

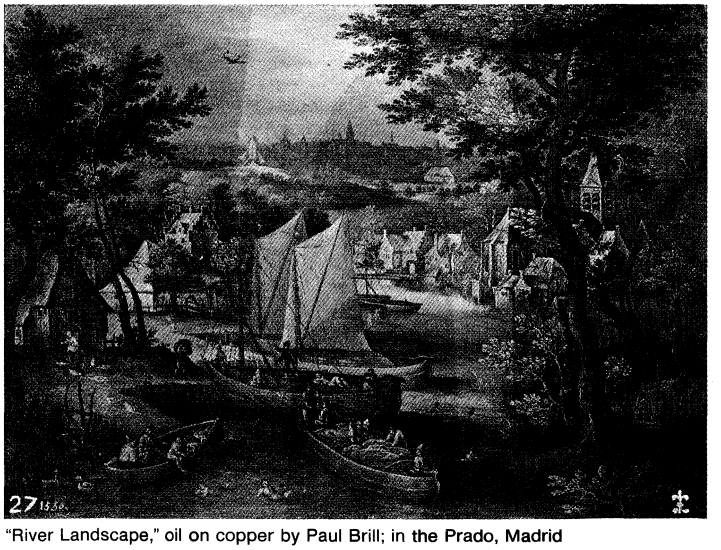
Brigittine (religious order): *see* Bridgettine.

Brikama, town, administrative headquarters of the Western division of The Gambia, on the road from Banjul (formerly Bathurst) to Mansa Konko. An agricultural trade centre (peanuts [groundnuts] and palm oil and kernels) among the Muslim Malinke (Mandingo) and Dyola (Diola or Jola) peoples, it is also the focus for the nation's incipient forest industry (teak and gmelina). There is an ice-making plant and an agricultural college. Pop. (1973) 9,483.

Women carrying gourds in Brikama, The Gambia
World Photo Service—M. Grimoldi

Brilessos, also spelled BRILETTOS (Greece): *see* Pentelicus, Mount.

Brill, Paul, also called PAULUS BRIL (b. 1554, Antwerp—d. Oct. 7, 1626, Rome), Flemish artist who was perhaps the most popular painter of landscapes in Rome in the late 16th and early 17th centuries. His early forest landscapes derive in style partly from Mannerism, but after 1600 he disciplined and simplified his compositions under the influence of the German painter Adam Elsheimer. His latest work was classical in character. Several of his fresco cycles survive in Vatican City and elsewhere as well as numerous individual works on panel and canvas. His brother Mattheus (1550–83) was also an accomplished painter, but he died young, and Paul finished many of Mattheus' uncompleted works.



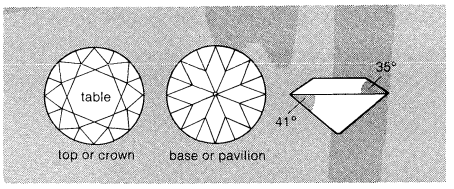
"River Landscape," oil on copper by Paul Brill; in the Prado, Madrid
By courtesy of the Museo del Prado, Madrid

Brillat-Savarin, (Jean-) Anthelme (b. April 1, 1755, Belley, Fr.—d. Feb. 2, 1826, Paris), French lawyer, politician, and author of a celebrated work on gastronomy, *Physiologie du goût* ("The Physiology of Taste").

He followed the family profession of law. A deputy of the third estate at the States-General of 1789, he was forced to flee the country during the Terror and went to Switzerland and the United States. He returned to France in 1796 and became a judge of the court of cassation during Napoleon's consulate. He published several works on law and political economy before his work on gastronomy ap-

peared in 1825, with the full title *Physiologie du goût, ou Méditation de gastronomie transcendante, ouvrage théorique, historique et à l'ordre du jour*, 8 vol. ("The Physiology of Taste, or Meditation on Transcendent Gastronomy, a Work Theoretical, Historical, and Programmed"). The book is less a treatise on cuisine or on culinary arts and more a witty compendium of random chit-chat and precepts, of anecdotes and observations of every kind that might enhance the pleasures of the table—with only an occasional recipe being offered. The book went through several editions in the 19th century and was translated into English in 1925.

brilliant cut, method of facetting a diamond to take best advantage of the optical properties of the stone and produce a finished gem with the maximum fire and brilliancy; it is the



Three views of a brilliant-cut diamond

most popular style of facetting for diamonds. A brilliant-cut stone is round in plan view and has 58 facets, 33 of which are above the girdle (the widest part of the stone) and 25 of which are below. When cut so that the facets of the crown (above the girdle) make an angle of 35° to the plane of the girdle and those of the pavilion (below the girdle) an angle of 41°, the maximum amount of light entering the crown will be reflected back through the crown by the pavilion, and the diamond will possess its maximum brilliance and a high degree of fire.

Introduced by the Venetian gem-cutter Vicenti Peruzzi at the end of the 17th century, the modern brilliant cut evolved slowly until reaching the present form early in the 20th century. It is also used on such stones as ruby, sapphire, emerald, and zircon.

brilliant green, also called EMERALD GREEN, or MALACHITE GREEN G, a triphenylmethane dye of the malachite-green series (*see* malachite green) used in dilute solution as a topical antiseptic. Brilliant green is effective against gram-positive microorganisms. It has also been used to dye silk and wool. It occurs as small, shiny, golden crystals soluble in water or alcohol.

brimstone: *see* sulfur.

Brindisi, Latin BRUNDISIUM, city, capital of Brindisi province, Puglia (Apulia) region, southeastern Italy, on the Adriatic coast between the arms of a Y-shaped sea inlet that admits oceangoing ships, southeast of Bari.

Legend attributes the foundation of the city to Diomedes, the companion of Odysseus; its original Greek name Brentesion (changed by the Romans to Brundisium, meaning "stag's head," from the antler-shaped inner harbour) shows its Illyrian origin. Made a Roman town in 266 BC, it formed, with Tarentum (now Taranto), a base of resistance to the Carthaginian general Hannibal half a century later. The Roman emperor Octavian (Augustus) and Mark Antony were reconciled there in 40 BC, and in 19 BC the poet Virgil died there. Held by a succession of overlords in the early Middle Ages, Brindisi regained importance after conquest by the Normans (1071) and was the embarkation port for many crusaders. Its prosperity continued under the first Angevins (House of Anjou), but it was damaged in the struggles over the succession to the Kingdom of Naples at the end of the 14th century and by an earthquake in 1456. It revived in the 19th century under the Bourbon kings of Naples and the kings of Italy, and its commercial prosperity was further stimulated by the opening of the Suez Canal in 1869. In World War I it was the centre of Italian naval operations in the Adriatic. After the death of Mussolini (July 25, 1943) it was the seat of the Italian government of Pietro Badoglio, who then extricated Italy from the war (September 3).

A Roman column marks the end of the Appian Way, and there are other Roman remains. Although much of the city is modern, there are some medieval buildings including the castle (1227) of the Holy Roman emperor Frederick II; the 11th-century cathedral (rebuilt in 1749); the 11th-century circular baptismal church of S. Giovanni al Sepolcro (now the Civic Museum); and several other churches. Brindisi is the seat of an archbishop and has a provincial museum of archaeology.

Served by the main coastal railway from Ancona to Lecce, with a branch to Taranto, and by an airport 3 mi (5 km) north, Brindisi's excellent port conducts a busy trade with the Middle East and Far East. The city is the main ferry terminal for growing tourist traffic between Italy and Greece. Although it is primarily a commercial centre, Brindisi has food-processing and chemical industries and an oil refinery, and it produces wine. Pop. (1981 prelim.) mun., 88,947.

Brindley, James (b. 1716, Tunstead, near Buxton, Derbyshire, Eng.—d. Sept. 30, 1772, Turnhurst, Staffordshire), pioneer canal builder, who constructed the first English canal of major economic importance.

Beginning as a millwright, in 1752 he designed and built an engine for draining coalpits at Clifton, Lancashire. In 1759 the Duke of Bridgewater hired him to build a 10-mile canal to transport coal from the Duke's mines at Worsley to the textile-manufacturing centre at Manchester. Brindley's solution to the problem included a subterranean channel extending from the barge basin at the head of the canal into the mines, and the Barton

Brindley, engraving by Pierre Condé, early 19th century

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

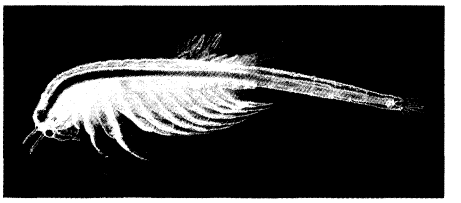
Aqueduct, which carried the canal over the River Irwell.

The success of that canal encouraged similar projects: the Grand Trunk Canal, penetrating the central ridge of England by the Harecastle Tunnel, and the Staffordshire and Worcestershire, the Coventry, the Oxford, the old Birmingham, and the Chesterfield canals, all designed and, with one exception, executed by Brindley. In all, he was responsible for a network of canals totalling about 360 miles. The improvement in communications helped to hasten the Industrial Revolution. Brindley, a self-made engineer, undertook all his works without written calculations or drawings, leaving no records except the works themselves.

brine, salt water, particularly a highly concentrated water solution of common salt (sodium chloride). Natural brines occur underground, in salt lakes, or as seawater and are commercially important sources of common salt and other salts, such as chlorides and sulfates of magnesium and potassium.

Brine is used as a preservative in meat-packing (as in corned beef) and pickling. In refrigeration and cooling systems brines are used as heat-transfer media because of their low freezing temperatures or as vapour-absorption agents because of their low vapour pressure. Brine is also used to quench (cool) steel.

brine shrimp (*Artemia*), any of a genus of small crustaceans of the order Anostraca (sub-



Brine shrimp (*Artemia salina*)

Douglas P. Wilson

class Branchiopoda) inhabiting brine pools and other highly saline inland waters throughout the world. *Artemia salina,* the species that occurs in vast numbers in Great Salt Lake, Utah, is of commercial importance. Young brine shrimp hatched there from dried eggs are used widely as food for fish and other small animals in aquariums. Measuring up to 15 millimetres (0.6 inch) in length, the body of the brine shrimp has a discrete head with a nauplius (larval) eye and stalked compound eyes, a thorax bearing a series of leaflike limbs, and a slender abdomen without appendages. Brine shrimp normally swim in an upside down position by rhythmically beating their legs. They feed primarily on green algae, which they filter from the water with their legs.

Brinell, Johan August (b. Nov. 21, 1849, Bringetofta, Swed.—d. Nov. 17, 1925, Stockholm), Swedish metallurgist who devised the Brinell hardness test, a rapid, nondestructive means of determining the hardness of metals.

In 1875 he began his career as an engineer at the Lesjöfers Ironworks and in 1882 became chief engineer of the Fagersta Ironworks. While at Fagersta he studied the internal composition of steel during cooling and heating and devised his hardness test, which was displayed at the Paris Exhibition of 1900. The test is based on the measurement of the impression left by a small, hardened steel ball after it is pushed into the metal with a given force. With minor variations, his test remains in wide use.

Brink, André Philippus (b. May 29, 1935, Vrede, S.Af.), South African novelist, who wrote in Afrikaans and then translated his work into English, whose novels criticized the South African government.

Brink was educated in South Africa at the University of Potchefstroom and later became head of the department of modern languages at Rhodes University in Grahamstown, S.Af. For several years he was editor of an avant-garde literary magazine, *Sestiger,* which presented the work of a new generation of Afrikaans writers who became known as "the sestigers." Their declared aim was to make "a conscious effort to broaden the rather too parochial limits of Afrikaner fiction"—in essence this meant an examination of the political system in a way that rapidly antagonized the traditional Afrikaner reader.

Brink's novel *Lobola vir die Lewe* (1962; "The Price of Living") won the Dutch Reina Prinsen Geerligs Prize. His *Die Ambassadeur* (1963; *File on a Diplomat,* 1967) drew upon his experience while living in Paris, but his later work focussed on South Africa. His

novels presented increasingly bleak and bitter evidence of the disintegration of human values that occurs under apartheid. Such views inevitably brought him into conflict with the government. *Kennis van die aand* (1973; *Looking on Darkness*, 1974), *Gerugte van Reën* (1978; *Rumours of Rain*, 1978), and *A Dry White Season* (1980) were well received abroad but were banned in South Africa, being designated pornographic, blasphemous, and Communistic.

Brink, Bernhard ten (b. Jan. 12, 1841, Amsterdam—d. Jan. 29, 1892, Strassburg, Ger.), scholar whose research stimulated a revival of British and German study of Geoffrey Chaucer's works.

He became professor of modern languages at the University of Marburg (1870) and from 1873 was professor of English at the University of Strassburg. Besides his critical editions of the *Prologue* to the *Canterbury Tales* and the *Compleynte to Pité,* he published *Chaucer: Studien zur Geschichte seiner Entwicklung und zur Chronologie seiner Schriften* (1870; "Chaucer: Studies in the History of His Development and on the Chronology of His Writings") and *Chaucers Sprache und Verskunst* (1884; *The Language and Metre of*

Bernhard ten Brink
Archiv fur Kunst und Geschichte, West Berlin

Chaucer, 1901). His *Beowulf-Untersuchungen* (1888; "Beowulf Researches") was an important contribution to Anglo-Saxon studies. His best known work, *Geschichte der englischen Literatur,* 2 vol. (1877–93; *History of English Literature,* 1883–93), covered that subject through the period immediately preceding the Elizabethan Age.

Brinkman, Johannes Andreas (b. March 22, 1902, Rotterdam—d. May 6, 1949, Rotterdam), Dutch architect particularly noted for his role in the design of the van Nelle tobacco factory, Rotterdam, one of the most architecturally important industrial buildings of the 1920s and one of the finest examples of modern architecture in The Netherlands.

Brinkman attended the Delft Technical University and in 1925 joined the architect Lodewijk Cornelis van der Vlugt. That firm, with the participation of Mart Stam, designed the van Nelle factory (1928–30), whose unbroken expanses of windows convey a strong feeling of lightness and transparency. The architectural firm, in association with W. van Tijen, also designed the Bergpolder apartment building in Rotterdam (1933–34), an outstanding example of modern apartment design. In 1937, after van der Vlugt's death, Brinkman worked with J.H. van den Broek.

Brinon, Fernand de (b. Aug. 26, 1885, Libourne, near Bordeaux, Fr.—d. April 15, 1947, Montrouge), French journalist and politician who became a leading advocate of collaboration with Nazi Germany through the Vichy regime during World War II.

Trained in law and political science, Brinon joined the *Journal des Débats* (1909) and was its editor in chief from 1920 to 1932. After creditable service in World War I, he became an ardent advocate of a reconciliation between France and Germany. In 1939 he became political editor of *L'Information.* He was the first French journalist to interview Hitler

Brinon, 1940
H. Roger-Viollet

and became a leading member of the Comité France-Allemagne and the Cercle du Grand Pavois, influential political–business organizations.

In November 1940 Brinon was appointed Vichy representative to German-occupied French territories and later (April 1942) a secretary of state. When the Pétain–Laval government was deported from Vichy and refused further collaboration with the Germans (August–September 1944), Brinon headed a "government commission" with its seat at Belfort. After that futile effort, he fled to Germany, was captured by the Allies, and was executed as a collaborator in 1947. A posthumous edition of his *Mémoires,* based on his personal papers, appeared in 1949. Other books by Brinon include *En Guerre: Impressions d'un témoin* (1915; "At War: Impressions of a Witness") and a pro-Nazi piece called *France-Allemagne, 1918–1934* (1934).

Brinvilliers, Marie-Madeleine-Marguérite d'Aubray, marquise de (marchioness of) (b. *c.* 1630—d. July 16, 1676, Paris), notorious French poisoner.

The daughter of Antoine Dreux d'Aubray, civil lieutenant of Paris, she married an army officer, Antoine Gobelin de Brinvilliers, in 1651. Attractive and pleasure-loving, she became the mistress of a friend of her husband, J.-B. Godin de Sainte-Croix. On her father's intervention, Sainte-Croix was sent to the Bastille in 1663. On his release he plotted with his mistress to take revenge on her father by poisoning him. With the assistance of one of the king's apothecaries, he obtained poisons that she tested on patients in hospitals. Eventually she poisoned her father (1666) and then her two brothers (1670), but an attempt on her husband failed. After Sainte-Croix's death

The Marquise de Brinvilliers, detail from a drawing by an unknown artist, 17th century
H. Roger-Viollet

(1672) the crimes were discovered. The Marquise escaped but was eventually arrested at Liège and was beheaded in Paris in 1676.

During her interrogation, Madame de Brinvilliers declared: "Half the people of quality are involved in this sort of thing, and I could ruin them if I were to talk." The persons whom she refused to name were those later compromised in a scandal that touched the court of King Louis XIV (*see* Poisons, Affair of the).

Brion, Philippe de Chabot, seigneur de (lord of): *see* Chabot, Philippe de.

Brion, Simon de (pope): *see* Martin IV.

Briosco, Andrea: *see* Riccio, Andrea.

Brisbane, port and capital of Queensland, Australia, and the nation's third largest city. It lies astride the Brisbane River on the southern slopes of the Taylor Range, 12 mi (19 km) above the river's mouth at Moreton Bay. The site, first explored in 1823 by John Oxley, was occupied in 1824 by a penal colony, which had moved from Redcliffe (22 mi northeast). The early name, Edenglassie, was changed to honour Sir Thomas Brisbane, former governor of New South Wales, when the convict settlement was declared a town in 1834. Officially, freemen could not settle within 50 mi of the colony until its penal function was abandoned in 1839, but this ban proved ineffective. A short-lived rivalry for eminence with the town of Cleveland was ended when the latter's wharves burned in 1854, allowing Brisbane to become the leading port. Proclaimed a municipality in 1859, it became the capital of newly independent Queensland that same year. Gazetted a city in 1902, it was joined during the 1920s with South Brisbane to form the City of Greater Brisbane. Its municipal government, headed by a lord mayor,

Queens Park, Brisbane, with the executive building of the Queensland state government (left) and the public library
By courtesy of the Australian Information Service

holds very broad powers. The Brisbane statistical division, including the cities of Ipswich and Redcliffe and portions of six surrounding shires, has close economic and social ties to the city.

Brisbane is the hub of many rail lines and highways, which bring produce from a vast agricultural hinterland stretching west to the Eastern Highlands, the Darling Downs, and beyond. The city's port, which can accommodate ships of 34,000 tons, exports wool, grains, dairy products, meat, sugar, preserved foods, and mineral sands. The metropolitan area, also industrialized with more than half of the state's manufacturing capacity, has heavy and light engineering works, food-processing plants, shipyards, oil refineries, sawmills, and factories producing rubber goods, automobiles, cement, and fertilizer. The city, the halves of which are connected by several bridges and ferries, is the site of the University of Queensland at St. Lucia (1909), Griffith University (1971), Parliament House (1869), the state museum (1855) and art gallery (1895), Anglican and Roman Catholic cathedrals, and many parks and gardens. Water is supplied

from Lake Manchester, the Mount Crosby Weir, and the Somerset Dam. Oil is piped from wells at Moonie (west) and at Roma (northwest), which also supplies natural gas. Pop. (1981) city, 942,836; metropolitan area (statistical division), 1,028,527.

Brisbane, Albert (b. Aug. 22, 1809, Batavia, N.Y., U.S.—d. May 1, 1890, Richmond, Va.), social reformer who introduced and popularized Fourierism in the United States.

Brisbane, the son of wealthy landowners, received his education primarily at the hands of private tutors. At the age of eighteen, he went to Europe in order to study social reform with the great thinkers of his age. Disappointed with Guizot in Paris and Hegel in Berlin, he went on to study Turkish civilization in Constantinople.

Soon after his return to France in 1830, Brisbane discovered the works of Charles Fourier, whose advocacy of separate self-sustaining communities appealed to him. He studied under Fourier in France for two years and then returned to the United States in 1834. It was not until 1839, however, after a period of illness, that Brisbane actively launched his campaign to win converts to Fourierism.

He lectured and launched a Fourier community, and his book *Social Destiny of Man* (1840) attracted widespread attention. Horace Greeley offered Brisbane space in the *New York Tribune* to elucidate the Fourier system—which Brisbane now called Associationism—and Brisbane's columns soon spawned a number of Fourier societies in the United States.

These societies (inciuding Brisbane's own) all failed, and the public lost interest in Associationism. While Brisbane never renounced his belief in Fourierism, he turned to other matters, including study, travel, and his numerous inventions. He was the father of the editor Arthur Brisbane.

Brisbane, Arthur (b. Dec. 12, 1864, Buffalo, N.Y., U.S.—d. Dec. 25, 1936, New York City), U.S. newspaper editor and writer, known as the master of the big, blaring headline and of the atrocity story.

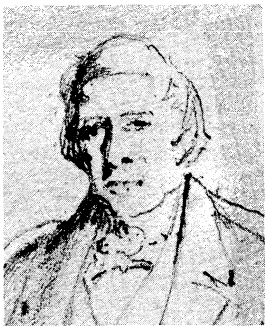
He was the son of Albert Brisbane (1809–90), a social reformer whose ideas he early supported but later repudiated. Returning to

Arthur Brisbane

By courtesy of the Library of Congress, Washington, D.C.

the U.S. in 1883 from studies in Europe, he worked first on Charles A. Dana's New York *Sun* and then on Joseph Pulitzer's New York *World*. In 1897 William Randolph Hearst made him managing editor of *The New York Journal*, and, with his salary tied to circulation rises, Brisbane became the highest paid U.S. newspaper editor of his day. He played a large part in the *Journal's* promotion of the Spanish–American War. His editorial column, "Today," written from 1917 to the day of his death, was widely syndicated, often as a front-page feature.

Brisbane, Sir Thomas Makdougall, BARONET, original name THOMAS BRISBANE (b. July 23, 1773, Brisbane House, near Largs, Ayrshire, Scot.—d. Jan. 27, 1860, Brisbane House), British soldier and astronomical observer for whom the city of Brisbane, Australia, is named. Mainly remembered as a patron of science, he built an astronomical



Sir Thomas Makdougall Brisbane, detail from a sketch by Sir John Watson Gordon

By courtesy of the Scottish National Portrait Gallery, Edinburgh

observatory at Paramatta, Australia, and a combined observatory and magnetic station at Makerstoun, Roxburghshire.

Brisbane entered the army in 1789 and served in Flanders, the West Indies, Canada, and Spain. (His military services were rewarded with a knighthood in 1814.) He first decided to master astronomy in 1795, when a navigational error almost resulted in a shipwreck on his first voyage to the West Indies. In 1821 he was appointed governor of New South Wales, and, although generally a poor administrator, he systematized the administration of the convict system, hiring out convicts to settlers for clearing land. He also reformed the currency and abolished censorship of the press. He established the observatory at Paramatta in 1822 and upon his return to Scotland in 1826 built the observatory at Makerstoun, where he did astronomical work until 1847.

Brisbane was awarded the gold medal of the Royal Astronomical Society in 1828 and was elected president of the Royal Society of Edinburgh in 1833. He was made a baronet in 1836 and attained the rank of general in 1841. His middle name, Makdougall, was his wife's maiden name, which he added to his own in 1826.

Brisbane box (*Tristania conferta*), evergreen tree, of the family Myrtaceae, native to Australia and commonly cultivated in tropical and subtropical regions of North America as a shade tree. It grows to more than 45 metres (about 150 feet) tall, and it has oval or lance-shaped leaves 7–15 centimetres (3–6

Brisbane box (*Tristania conferta*)

Dennite E. Anderson

inches) long and produces small white flowers. The Brisbane box is extremely drought-resistant and the exceptionally strong, durable timber it yields is used commercially in construction and manufacturing.

Brisbane River, river in southeastern Queensland, Australia, rising in the Brisbane–Cooyar ranges and flowing 214 mi (344 km) southeasterly and northeasterly through a farming and dairying region to Moreton Bay. Its chief tributaries are the Stanley and Bremer rivers and Lockyer Creek. It is navigable for steamers below Brisbane (14 mi) and for small craft below Ipswich (50 mi). Ferry service began in 1843 and steamer service in 1846; the first bridge was completed in 1865. The stream was reached in 1823 by three convicts fleeing from Sydney and was explored by Lieut. John Oxley, who captured them. It was named after Sir Thomas Makdougall Brisbane, governor of New South Wales (1821–25).

Brisbane Water, northern arm of Broken Bay, an inlet on the coast of New South Wales, Australia. It was explored by Capt. Arthur Phillip, first governor of New South Wales, in 1788–89 and named North-East Arm; the name subsequently was altered to Brisbane Water to honour Sir Thomas Brisbane, sixth governor of the colony. Because of difficulty of access, development of the region was slow until the completion of a bridge across the Hawkesbury River in 1889. Early activities included the growing of sugarcane and bananas, shell burning (for lime), timbering, and shipbuilding. The area today is largely given to fishing and tourism, and a large proportion of the rapidly growing population commutes daily to Sydney, about 25 mi (40 km) to the south. The Rip bridge (opened 1974) crosses Brisbane Water at its narrowest part, near Woy Woy. Brisbane Water National Park and Bouddi National Park are nearby. The main population centres in the area are Gosford and Woy Woy.

Consult the INDEX *first*

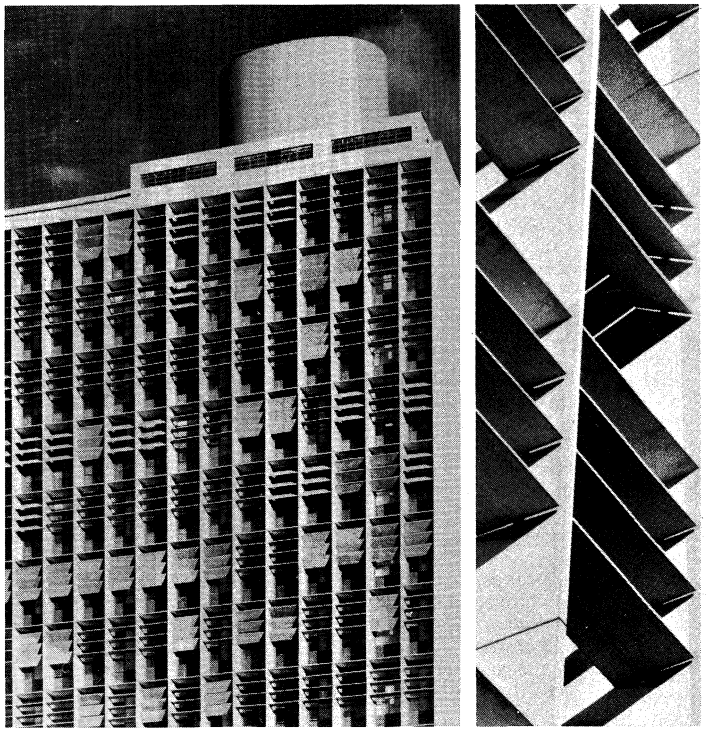
brisé, also called PAS BRISÉ (French: "broken step"), in classical ballet, a small, *battu* ("beaten") step. The quality of a *brisé* should be sharp and brisk.

The basic *brisé* is a travelled *assemblé* that is done with a beat. The dancer brushes the working leg, as in an *assemblé*, to the side and into the air while simultaneously pushing off from the supporting leg, and then beats in front or in back of the supporting leg. The dancer lands on both feet, usually in fifth position *demi-plié* (feet crossed, knees bent). A basic *brisé* can be varied through differences of timing, travelling across the floor, and the position of the beat of the legs.

brise-soleil, sun baffle outside the windows or extending over the entire surface of a building's facade. Many traditional methods exist for reducing the effects of the sun's glare, such as lattices (*shīsh*, or *mushrabīyah*), pierced screens (*qamarīyah*) as used at the Tāj Mahal, or blinds of split bamboo as used in Japan (*sudare*), shades used outside the windows that are similar in effect to venetian blinds.

The French architect Le Corbusier designed a more substantial baffle in 1933. Four years later, as consultant architect to the Brazilian Ministry of Education and Health, he introduced horizontal gear-operated, adjustable baffles for the new multistoried office building in Rio de Janeiro. Subsequently, many other types of sun baffles were developed in South America, Africa, and Asia. They include fixed vertical baffles set beyond a wide, heat-dispersing balcony, and gridlike baffles applied at varied distances over the whole face of a building.

The effect of brise-soleil on the design of buildings in hot-weather countries has been to



Brise-soleil, shown in (left) exterior and (right) close-up view of the Ministry of Education and Health, Rio de Janeiro, designed by Lúcio Costa and Oscar Niemeyer, 1937–43, Le Corbusier, consultant

From *Brazil Builds* by P.L. Goodwin and Kidder Smith

produce an amorphous, outer covering to the facade that conceals the building's actual functions but has potential for creating harmony in street designs by means of its patterned effect. *See also* moucharaby.

Brisson, (Eugène-) Henri (b. July 31, 1835, Bourges, Fr.—d. April 11, 1912, Paris), French statesman who twice served as premier of France (1885, 1898) and was noted for his staunch republicanism and strongly anticlerical views.

After receiving his law degree in Paris, Brisson joined the ranks of the opposition to Napoleon III (ruled 1852–70). He contributed regularly to a number of republican journals, most notably *L'Avenir* (1854–55) and *Le Temps* (1864), of which he was an editor. After serving as deputy mayor of Paris from Sept. 4, 1870, he was elected, on his second attempt, to the National Assembly as a deputy from the capital in February 1871. He represented a Parisian district from 1876 to 1902 and then was elected from the Bouches-du-Rhône *département* from 1902 to 1912.

Brisson, engraving by A. Brun, 1885

By courtesy of the Bibliotheque Nationale, Paris

Brisson was influential in parliamentary circles and served the Republican Union in various offices, including the chairmanship. In the late 1870s he was head of the budget commission. When the Jules Ferry government fell in March 1885, he formed his first Cabinet, which lasted only until Dec. 29, 1885. After service as chairman of the commission that investigated charges of bribery against deputies in the Panama Scandal, he headed a second ministry. Once again it was brief, from June 28 to Oct. 25, 1898, when it fell because his war minister, Gen. Jules Chanoine, defied the Cabinet in expressing his belief in the guilt of Alfred Dreyfus in the Dreyfus affair. In 1900 Brisson was elected president of the Chamber of Deputies (reelected in 1906 and 1912) and gave vigorous support to the movement that achieved a separation of the affairs of church and state.

Brissot (de Warville), Jacques-Pierre (b. Jan. 15, 1754, Chartres, Fr.—d. Oct. 31, 1793, Paris), a leader of the Girondins (*q.v.*; often called Brissotins), a moderate bourgeois faction that opposed the radical-democratic Jacobins during the French Revolution.

The son of an eating-house keeper, he began to work as a clerk in lawyers' offices, first at Chartres, then in Paris. Taking an interest in science, he went to London (February–November 1783), where he published literary articles and founded two scientific periodicals, which failed. Returning to France, he was imprisoned in the Bastille for pamphlets against the Queen and the government but was released in September 1784.

Inspired by the English anti-slavery movement, Brissot founded the Société des Amis des Noirs in February 1788. He left for the United States in May, but when the States General were convened in France he returned and launched a newspaper, *Le Patriote français* (May 1789). Elected to the first municipality of Paris, he took delivery of the keys of the Bastille when it had been stormed.

After Louis XVI's flight to Varennes, Brissot attacked the King's inviolability in a long speech to the Jacobins (July 10, 1791), which contained all the essentials of his future foreign policy. Elected to the Legislative Assembly, he at once concerned himself with foreign affairs, joining the diplomatic committee. He argued that war could only consolidate the Revolution by unmasking its enemies and inaugurating a crusade for universal liberty. Only the Jacobin leader Maximilien Robespierre opposed him, and war was declared on Austria (April 1792). The early defeats suffered by the French, however, gave fresh impulse to the revolutionary movement, which Brissot and his friends had meant to check. Having tried in vain to prevent the suspension of the monarchy, Brissot was denounced by Robespierre in the Paris Commune as a "liberticide" on September 1.

No longer acceptable to Paris, Brissot represented Eure-et-Loir in the National Convention. Expelled from the Jacobins (Oct. 12, 1792) and attacked by the Montagnards (extreme revolutionary faction), he was still influential in the diplomatic committee: his report led to war's being declared on Great Britain and the Dutch (Feb. 1, 1793). On April 3, 1793, Robespierre accused him of being the friend of the traitor Gen. Charles-François Dumouriez and of being chiefly responsible for the war. Brissot replied, denouncing the Jacobins and calling for the dissolution of the municipality of Paris. He was not conspicuous in the struggle between the Girondins and the Montagnards (April–May), but on June 2, 1793, his arrest was decreed with that of his Girondin friends. He fled but was captured at Moulins and taken to Paris. Sentenced by the revolutionary tribunal on the evening of October 30, he was guillotined the next day.

Brissotin (French Revolutionary): *see* Girondins.

bristlecone pine (*Pinus aristata*), a small tree ranging from 5 to 13 metres (15 to 40 feet) in height, belonging to the family Pinaceae (*see* pine). It is native to the Rocky Mountains of the United States, occurring usually at altitudes exceeding 2,600 m (8,000 ft). Bristlecone pines have the longest life-span of any conifer known. A stand of bristlecone pine on Wheeler Peak in eastern Nevada is known to contain several trees over 3,000 years old, and one of them is thought to be about 4,900 years old.

bristlehead, also called VULTURINE PARROT (*Psittrichas fulgidus*), parrot of the forested slopes of northern New Guinea, the sole species constituting the subfamily Psittrichasinae (order Psittaciformes). A short-tailed, crow-sized parrot, nearly 50 centimetres (19.7 inches) in length, it is black with red underparts and gray legs. The forepart of the head lacks feathers and those on the neck are bristlelike; males bear a distinctive red patch behind the eyes. The bristlehead feeds on fruit and soft vegetation. It travels in pairs or small groups, and in flight it glides more often than most parrots. Unlike many other parrots, which climb from branch to branch, the vulturine parrot jumps.

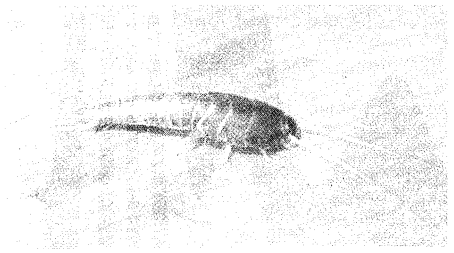
The South American parrot *Gypopsitta vulturina* is also known commonly as the vulturine parrot.

bristlemouth, any of the approximately 60 species of marine fishes that constitute the family Gonostomatidae (order Salmoniformes). Representatives occur in tropical regions of each of the major oceans. Bristlemouths are sometimes called lightfishes because of the luminescent organs present along the sides of the body. They inhabit extreme depths and are often referred to as deep-sea bristlemouths.

One genus, *Cyclothone*, is particularly remarkable because of its abundance in both numbers and biomass. Even though *Cyclothone* species are small (6 centimetres [2½ inches]), many ichthyologists think the genus contains more individuals, and possibly more weight, than any other genus of fishes in the world, including the herrings (genus *Clupea*).

bristletail, any insect of the primitive, wingless order Thysanura of about 350 species. Bristletails are generally 5 to 20 millimetres (0.2 to 0.8 inch) in length when fully grown

and have three slender, bristle-like appendages at the tip of the abdomen. The compound eyes are small, the mouth parts external. Some species have scales covering the body. Young

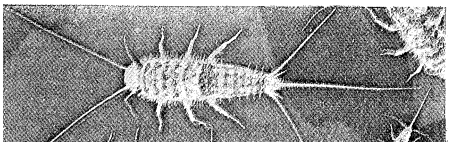


Silverfish (*Lepisma saccharina*)
Alexander B. Klots

bristletails resemble adults except in size. Sexual maturity is attained in two to three years. A bristletail molts as many as 35 times during its life (3 to 5 times per year); the life span of some species may be as long as seven years. Bristletails eat starchy material, often causing excessive damage to books and papers. Bristletail is also the common name for members of the order Microcoryphia, which is now separated from the Thysanura.

The silverfish (*Lepisma saccharina*), a slender, flat, wingless insect with three tail bristles, is so called because it is covered with silvery scales and moves quickly. It normally lives indoors and is worldwide in distribution. Because it eats materials containing high percentages of starch (*e.g.*, paste, book bindings, and wallpaper) it can cause damage to books and fabrics. The antennae and the tail bristles of the silverfish are shorter than the body. Superficially the male resembles the female. Unlike other groups of true insects, which copulate, the silverfish performs courtship movements that end with the male depositing a sperm packet, which the female places in her vagina. The oval, whitish eggs are believed to be inserted into cracks and soil litter. The young, which hatch in several days, are scaleless and have short appendages; they molt every few days, gradually acquiring adult features. The silverfish continues to molt throughout the two or more years of its life, even after reaching sexual maturity. Control is possible with poisonous baits or other insecticides.

The firebrat (*Thermobia domestica*) is typically white in colour with light and dark spots. Its life cycle and habits are similar to those of the silverfish. Its name derives from the



Firebrat (*Thermobia domestica*)
Roman Vishniac

fact that the insect often inhabits warm places such as bakehouses and fireplaces. Chlordane sprays and dusts are used to control firebrat populations.

bristling, also spelled BRISLING, also called SPRAT (*Clupea sprattus*), edible fish belonging to the herring family Clupeidae (order Clupeiformes). Bristlings are silver-coloured marine fishes that form enormous schools in western European waters. They contribute to the worldwide fishing industry. Because they are smaller than Atlantic herrings (*Clupea harengus*), reaching a length of less than 15 centimetres (6 inches), bristlings are particularly valuable for canning as sardines (a term applied to several small fishes of the family Clupeidae). They are eaten fresh, tinned in oil, pickled, or smoked.

Bristol, district (city), county of Avon, England, with an area of 42 sq mi (110 sq km).

The medieval city of Bristol lay at the confluence of the Lower (Bristol) Avon and the Frome, and it was incorporated as a town in 1155. The harbour was created in 1247 by diverting the Frome to the west; at the same time a stone bridge was built at the point of the former confluence. Under Edward III (ruled 1327–77), Bristol was a wool staple (trading town) and imported wool from Ireland, sherry from Spain, and port wine from Portugal in return for the export of woollen cloth. In 1497 John and Sebastian Cabot sailed from Bristol to the New World, and in 1552 the Society of Merchant Venturers was incorporated; its hall, along with a number of other historic buildings, was destroyed by World War II bombing. Bristol was a Royalist stronghold during the English Civil War until it was captured by the Parliamentarians in 1645.

During the later 17th and the 18th centuries, Bristol prospered on the triangular slave trade between West Africa and the West Indian and American plantation colonies. The return trade in Virginian tobacco, Jamaican sugar and molasses, and cocoa from West Africa led to the creation of the "sugar houses" of Bristol and to chocolate manufacture. By the 19th century, the rise of the Lancashire cotton industry, the abolition of the slave trade, together with the limitation on shipping imposed by the Avon Gorge below Clifton, resulted in the loss of much of Bristol's trade to Liverpool. In 1809 tidal waters of the Avon and the Frome were diverted to create a floating, or tideless, harbour with a constant depth of water. The engineer John Loudon McAdam improved Bristol's roads (*c.* 1815) with his technique of laying raised stone surfaces (macadamizing), and the Bristol roads became a model for road improvements throughout Great Britain. Bristol served as the launching point in 1838 for Isambard Kingdom Brunel's "Great Western," the second steamship to cross the Atlantic, and, in 1843, for Brunel's iron-hull ship "Great Britain," which, after a long period of service, was towed from the Falkland Islands back to Bristol in 1970 to be restored. The coming of the railway in 1841, followed by dock extensions at Avonmouth and Portishead, led to a revival of Bristol's trade, notably in meat, tobacco, fruit (bananas), and wine. A suspension bridge across the Avon Gorge, designed by Brunel and completed in 1864, further encouraged traffic. The Royal Portbury Dock has been added to the port complex, and imports include refined petroleum products, animal foodstuffs, and forest products. Exports consist mainly of manufactured goods from the West Midlands, notably automobiles, tractors, and machinery. Local industries include the refining of sugar, cocoa and chocolate making, wine bottling, and the making of fine glass (Bristol "blue"), porcelain, and pottery. Most notable today is aircraft design and construction at Filton, where the British-French Concorde supersonic airliner was built. The construction of the Severn bridge and the completion of the M4 motorway to South Wales greatly enhanced Bristol's position as the West Country metropolis of Severnside.

Bristol is an educational centre. Among its schools are the Bristol Grammar School, the Cathedral School, and Saint Elizabeth's Hospital, all founded in the 16th century; Colston's School (1708); and Clifton College, founded in the residential suburb of Clifton in 1862. The University of Bristol, founded as University College in 1876, was established in 1909.

Notable buildings in Bristol that survived World War II air attack are the cathedral church, once an abbey of St. Augustine, founded in 1142; St. Mark's, or the Lord Mayor's Chapel; the Dominican priory associated with William Penn and the early history of the Society of Friends (Quakers); the Church of St. Mary Redcliffe, for grandeur of proportion and elaboration of design one of the most celebrated parish churches in England; the New Room in Broadmead, the first Methodist chapel in the world and headquarters of that faith's founder, John Wesley, after 1739; Broadmead Baptist Chapel, also associated with the early Nonconformist movement in Bristol; and the Theatre Royal, built in 1766. Pop. (1982 est.) district, 399,600.

Bristol, city, coextensive with the town (township) of Bristol, Hartford County, central Connecticut, U.S., on the Pequabuck River. The

Exhibits in the American Clock and Watch Museum, Bristol, Conn.
By courtesy of the American Clock and Watch Museum; photograph, Mark Sexton

area, part of Farmington or Tunxis Plantation, was settled in 1727 and became known as New Cambridge. Renamed for Bristol, Eng., it was organized as a town in 1785. Bristol Borough (incorporated 1893) was chartered as a city and consolidated with the town in 1911. During the American Revolution Bristol was the centre of considerable Tory activity, and the cave on Chippens Hill was called the "Tory's Den." Bristol became known for clockmaking (begun 1790 by Gideon Roberts), and the American Clock and Watch Museum is located there. Bristol includes Forestville, a manufacturing village. Pop. (1980) city, 57,370; metropolitan area (SMSA), 73,762.

Bristol, borough, Bucks County, southeastern Pennsylvania, U.S., on the Delaware River, just northeast of Philadelphia. It was laid out in 1697 as Buckingham near the site of William Penn's home and was renamed *c.* 1700 for Bristol, Eng. The settlement developed with the establishment (1714) of ferry service to Burlington, N.J., and the construction of the "King's Highway" from Philadelphia to Morrisville. Its Bath Springs made it a popular spa (1775–1822) for Philadelphians. American Revolutionary troops were quartered in Bristol in December 1776; the Old Episcopal Church was used as a stable and the Friends Meeting House became a hospital. Construction of the Delaware Canal (1832) and the Pennsylvania Railroad (1834) brought a short-lived prosperity. Significant industrial growth began in the 1870s with textile mills, and since has expanded to include the manufacture of rugs, metal products, chemicals, and paper. Historic Fallsington is a restoration of colonial buildings. A replica of Penn's home is in Pennsbury Manor State Park, 5 mi (8 km) east. Inc. 1720. Pop. (1980) 10,867.

Bristol, town (township) and seat of Bristol County, Rhode Island, U.S., on a peninsula between Narragansett Bay and Mount Hope Bay, just southeast of Providence. It is connected (south) to Rhode (Aquidneck) Island by Mount Hope Bridge and includes the

villages of Beach Terrace and Bristol. The town was incorporated in 1681 by Plymouth Colony from land acquired in 1676, near the end of King Philip's (Indian) War (1675–76), and was named after Bristol, Eng. Under the jurisdiction of Massachusetts in 1692, it was later annexed (in 1746) to Rhode Island. During the American Revolution it was attacked by the British and partially destroyed on Oct. 7, 1775, and May 25, 1778. Bristol Harbor, an active centre of privateering and the Triangular Trade (rum, molasses, and slaves) in the 18th century, is now used largely by pleasure craft. The town was the site of the Burnside Rifle Company, established in 1853 by Ambrose E. Burnside (a Civil War general and governor of Rhode Island) and later incorporated into the Herreshoff Manufacturing Company. The Herreshoff Boatyard (closed 1945) was the construction site for several of the America's Cup defenders (racing yachts).

Bristol serves as a suburban residential area for Providence. Its industries include the manufacture of aluminum and electrical products, Teflon, plastics, textiles, machinery, and rubber goods. It is the seat of Roger Williams College (1969; formerly a junior college established at Providence in 1948).

Colonial landmarks include: the Joseph Reynolds House, headquarters (1778) of General Lafayette, French supporter of the American Revolution; the Barrock House, used by another French supporter of the Revolutionary War, the Comte de Rochambeau; the Bosworth House, oldest house in Bristol (1680); the fort at the Narrows, dating from King Philip's (Indian) War; the Deputy-Governor Bradford House (*c.* 1760) on Mount Hope; and the Narrows, which has rocks inscribed with Indian characters. American Indian and Eskimo artifacts are displayed at the Haffenreffer Museum of Anthropology (founded 1956). Pop. (1980) 20,128.

Bristol, urban unit on the Virginia (Washington County)–Tennessee (Sullivan County) border, U.S., in an extension of the Shenandoah Valley. Physically, culturally, and economically unified, politically it comprises two separate cities, each with its own government, public schools, utilities, and post office. In 1771 a trading post was built on the site, a former Indian village, to serve westward travellers over the Wilderness Road blazed by Daniel Boone. The town, named for Bristol, Eng., prospered after 1856, when the Norfolk and Western and the Southern railways were linked, thus connecting the Eastern Seaboard and the Mississippi River. The Virginia community, previously called Sapling Grove, was incorporated (1856) as the town of Goodson. Both communities received city charters in 1890 under the name of Bristol. A bitter state boundary dispute raged within the community until finally, in 1903, the line was placed along the centre of State Street, the main thoroughfare.

Manufactures include electronic equipment, metal goods, textiles, and business machines. Bristol is the seat of Bristol College (1895), Virginia Intermont College (1884), and King College (1867). Bristol Caverns, South Holston Dam and Lake, and Steele Creek Park are nearby. Pop. (1980) city (Va.), 19,042; city (Tenn.), 23,986; Johnson City–Kingsport–Bristol metropolitan area (SMSA), 433,638.

Bristol, EARLS OF, titled English nobility of two creations, in the families Digby and Hervey, grouped below chronologically and indicated by the symbol •.

• **Bristol, John Digby, 1st earl of** (b. February 1580—d. Jan. 16, 1653, Paris), English diplomat and moderate Royalist, a leading advocate of conciliation and reform during the events leading to the Civil War (1642–51).

He served as ambassador to Spain for King James I (ruled 1603–25) during most of the period from 1611 to 1624, and in 1622 he was created earl of Bristol.

In 1623 Bristol earned the undying hostility of Prince Charles (later King Charles I) by informing James of the blunders made by Charles and the royal favourite, George Villiers, 1st duke of Buckingham, on a diplomatic mission to the Spanish court. Thus, when Charles ascended the throne, Bristol was removed from the Privy Council. In 1626 Charles imprisoned him to prevent him from

1st Earl of Bristol, engraving by Renold Elstracke

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co., Ltd.

bringing charges against Buckingham. Two years later the House of Lords obtained his release. Returning to his seat in the Lords, he helped obtain passage of the Petition of Right, which condemned arbitrary imprisonment and taxation by the king.

Bristol then retired from public life until 1639, when he reentered politics with the hope of relieving the mounting tensions between Charles and Parliament. Appointed a privy councillor in 1641, he was regarded by the Parliamentarians with particular hatred and distrust and was even subjected to a period of imprisonment in the Tower of London in 1642. Nevertheless, he worked for a negotiated settlement after the outbreak of the Civil War. Upon the collapse of the King's cause in 1646, he was exiled to France, where he spent the rest of his life.

• **Bristol, George Digby, 2nd earl of** (b. before Feb. 22, 1611, Madrid—d. May 20, 1676?, London), English Royalist, an impetuous and erratic statesman who had a checkered career as an adviser to kings Charles I (ruled 1625–49) and Charles II (ruled 1660–85).

The eldest son of John Digby, 1st earl of Bristol, he first became a royal adviser in

2nd Earl of Bristol, detail of an oil painting by Van Dyck, *c.* 1635; in the Dulwich College Picture Gallery, London

By courtesy of the Dulwich College Picture Gallery, London

1641. In 1640 he was elected to the Long Parliament, and in January 1642 he urged the arrest of Charles I's leading Parliamentary opponents; the House of Commons retaliated by impeaching him for alleged treasonable activities (February 1642).

Digby fled to the Continent but returned to England in time to fight in the opening battle of the Civil War (1642–51) between the Royalists and the Parliamentarians. He was made Charles I's secretary of state in 1643, and in 1645 he became lieutenant general of the King's army in the north. When he was defeated at Sherburn, Durham, in October 1645, the Parliamentarians captured his correspondence, which disclosed Charles I's intrigues with foreign powers. Digby escaped to Ireland, then to France; while in France he inherited the earldom of Bristol (1653). Although in 1657 he became secretary of state in the government-in-exile maintained by King Charles II before his restoration, Bristol was forced to resign (1658) after he converted to Roman Catholicism.

Upon the restoration of King Charles II in 1660, Bristol returned to England. In 1663 he was expelled from court for bringing treason charges against the King's chief minister, Edward Hyde, earl of Clarendon, but he was again admitted to royal favour upon Clarendon's fall in 1667. Dorothea Townshend's *George Digby, Second Earl of Bristol* was published in 1924.

• **Bristol, John Hervey, 1st earl of,** also called (1703–14) BARON HERVEY OF ICKWORTH (b. Aug. 27, 1665—d. Jan 20, 1751), the first earl of Bristol in the Hervey line, son of Sir Thomas Hervey (d. 1694) and nephew of John Hervey (1616–79), treasurer to Catherine of Braganza, queen consort of Charles II.

He was educated at Clare Hall, Cambridge, and became member of Parliament for Bury St. Edmunds (March 1694). He was created Baron Hervey of Ickworth in March 1703 and earl of Bristol in October 1714, through the influence of Sarah, duchess of Marlborough, who advertised his support of the Hanoverian succession. By his first marriage he had only one son, Carr, who died unmarried on Nov. 14, 1723, and who is thought by some to have been the father of Horace Walpole (1717–97). His eldest son by his second marriage, John Hervey (1696–1743), gained some renown as a writer and politician (*see* Hervey [of Ickworth], John Hervey, Baron).

Bristol, Clifton and West of England Zoological Society's Gardens: *see* Bristol Zoo.

Bristol Avon (river, England): *see* Avon, Lower.

Bristol Bay, arm of the Bering Sea, indenting for 200 mi (320 km) the southwest coast of Alaska, U.S.; its mouth extends for 270 mi between Cape Newenham (north) and the southwest end of the Alaska Peninsula (south). Its shoreline includes the individually named bays at the mouths of the Togiak, Nushagak, Kvichak, and Ugashik rivers. The shallowness of Bristol Bay limits navigation to small salmon-fishing vessels.

Bristol Channel, inlet of the Atlantic Ocean separating southwestern England from southern Wales. The northern shore borders the South Wales coalfield and is heavily industrialized; the southern shore in the counties of Somerset and Devon is mainly agricultural. At the eastern end of the channel is the estuary of the River Severn. Lundy Island, now the property of the National Trust, lies in the centre of the channel 12 mi (19 km) west of Ilfracombe. Ships using the English port

of Bristol (with the largest municipally owned dock in the United Kingdom) and the Welsh ports of Swansea and Cardiff pass through the channel.

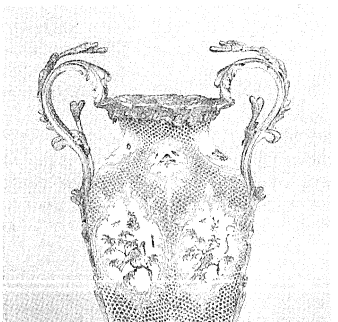
Bristol-Myers Company, American company incorporated in 1933 as a public corporation, having acquired the capital stock of a company dating to 1887. It produces toiletries, cosmetics, household cleaning products, pharmaceuticals, health foods and supplements, and health equipment and prostheses. Headquarters are in New York City.

The original firm, Clinton Pharmaceutical Co., was founded in Clinton, N.Y., in 1887 by William McLaren Bristol, Sr., and John R. Myers. It was incorporated as Bristol-Myers Company on June 9, 1900, and by then had moved from Clinton to Syracuse and then to Brooklyn, N.Y. The company first made drugs for dispensing physicians, but after World War I it concentrated on the laxative Sal Hepatica and other over-the-counter proprietary drugs and entered the field of toiletries, notably with Ipana toothpaste. In 1929 Bristol-Myers was absorbed by a giant holding company, Drug Inc., which, however, dissolved during the Great Depression. In 1933 Bristol-Myers went public.

In 1943 the company returned to making drugs and, over the years, diversified by buying up a number of other companies, including a hair-care and cosmetics firm in 1959; a household-product manufacturer in 1965; and an infant-formula and nutrition company in 1967.

Bristol ware, hard-paste porcelain products of the Coxside porcelain manufactory that were produced between 1768 and 1781.

The Coxside porcelain concern, the first factory to manufacture hard-paste porcelain in England, was started in Plymouth, Eng., in 1768 by William Cookworthy. The plant was moved to Bristol in 1770. At Bristol, Cookworthy continued along previous lines, with such ware as ornamental figures that display much of the lavish, grandiose, or intricate character of Plymouth ware. There were imperfections in the porcelain and, when the firm was taken over in 1774 by Richard Champion, he immediately spent time and money improving the manufacture.



Bristol porcelain vase mounted in ormolu, Richard Champion's factory, c. 1775; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

Champion concentrated on tea and coffee services, flowers being the favoured decoration. More sophisticated ornament, usually Neoclassic rather than the Rococo style used on retail ware, was reserved for commissioned work, which formed a large proportion of Bristol services. German Meissen and French Sèvres wares occasionally served for inspiration. Bristol gilding is unsurpassed. Soft-paste porcelain, usually known as Lund's Bristol, was made at Benjamin Lund's china factory in 1748–52, after which it was taken over by the Worcester Porcelain Company.

Bristol Zoo, formally BRISTOL, CLIFTON AND WEST OF ENGLAND ZOOLOGICAL SOCIETY'S GARDENS, zoological park founded in 1835 in Clifton, Bristol, Eng. Though occupying only 5 hectares (12 acres), the zoo maintains a wide variety of floral plantings, and exhibits nearly 900 animals representing about 300 species. This collection includes a breeding group of black rhinoceroses and one of the largest herds of okapi in captivity.

Bristow, Benjamin Helm (b. June 20, 1832, Elkton, Ky., U.S.—d. June 22, 1896, New York City), lawyer and statesman who, as U.S. secretary of the treasury (1874–76), successfully prosecuted the Whiskey Ring, a group of Western distillers who had evaded payment of federal whiskey taxes.

Bristow

By courtesy of the Library of Congress, Washington, D.C.

Bristow studied law in his father's office and was admitted to the bar in 1853. He served in the Kentucky state Senate (1864–65), pressed for the adoption of the Thirteenth Amendment abolishing slavery, and sought the reelection of President Abraham Lincoln. After the war, as U.S. attorney for the Kentucky district (1866–70), he worked for the protection of blacks against the Ku Klux Klan. In 1870 President Ulysses S. Grant made him the first solicitor general of the United States. Appointed to the treasury post by Grant in 1874, Bristow broke up the Whiskey Ring. Its members fought back by influencing Grant to believe that Bristow was using his office for political gain. He resigned under presidential pressure and returned to the practice of law. At the 1876 Republican convention in Cincinnati, Bristow was a strong contender for the presidential nomination but chose finally to bow out of a deadlock by throwing his support behind Rutherford B. Hayes. He thereafter (from 1878) practiced law in New York City.

Britain, shortened form of Great Britain, island off the western coast of Europe that consists of England, Scotland, and Wales (*qq.v.*). Both forms are often used synonymously with United Kingdom (*q.v.*), which also includes Northern Ireland (*q.v.*) and several offshore islands.

Britain, Battle of (June 1940–April 1941), series of intense raids directed against Great Britain by the German Air Force after the fall of France during World War II. Intended to prepare the way for a German invasion of Britain ("Operation Sea Lion"), the German air attacks were initially directed against British ports and, beginning in August, against installations of the Royal Air Force Fighter Command. In September the Germans began to shift their attention to London and other cities; London was attacked on 57 consecutive nights beginning September 7. The "battle" was essentially stalemated by October, when the invasion was postponed indefinitely, but the air raids continued throughout the winter, with a lull in February 1941 and a final flare-up in March and April. Although the Royal Air Force was greatly outnumbered, it succeeded in blocking the German Air Force through superior tactics, advanced air defenses, including radar, and the penetration of German secret codes.

Britannia Bridge, railroad bridge in northern Wales spanning Menai Strait, between Bangor and Anglesey. It was designed and built by Robert Stephenson, who, with his father, George Stephenson, built the first successful locomotive. Unable to use an arch design because the Admiralty would not allow the strait to be closed to the passage of sailing ships, Stephenson conceived the idea of using a pair of completely enclosed iron tubes, rectangular in section, supported in the centre by a pier built on Britannia Rock. William Fairbairn carried out a series of metallurgical tests, and from 1846 to 1849 the work was executed, the iron tubes being floated into position and lifted by capstan and hydraulic power. The bridge, which carried the London–Holyhead railway across the strait, was severely damaged by fire in 1970. During the repairs, the tubes were replaced by concrete decks—one for the railway, a second for motor traffic—supported by steel arches.

britannia metal, alloy composed approximately of 93 percent tin, 5 percent antimony, and 2 percent copper, used for making various utensils, including teapots, jugs, drinking vessels, candlesticks, and urns, and for official maces. Similar in colour to pewter, britannia metal is harder, stronger, and easier to work than other tin alloys; it can be worked from sheets, like silver, or spun on a lathe. The alloy is first mentioned in 1769, as "Vickers White Metal," but it was during the 19th century that the advantages of britannia metal were appreciated. The alloy was much-used as a base for silver plating. In the 1820s the English firm of Kirkby Smith & Co., Sheffield, Yorkshire, tried to plate britannia metal by fusing it with a sheet of silver. The process proved to be both expensive and unsatisfactory and was soon abandoned. After about 1846, and following the experiments of Elkington & Company, Birmingham, Eng., britannia metal was produced as a base for objects silvered by electrolysis. The good conducting qualities, together with its cheapness and ductility, made the alloy ideal for this purpose. Perhaps the best-known manufacturer of britannia metal is J. Dixon and Sons, Sheffield, whose name, initials, or bugle mark are found on a large number of pieces.

Britannica International Encyclopædia: *see* Buritanika Kokusai Daihyakka-jiten.

British Airways PLC, British air-transport company formed in April 1974 in the fusion of British Overseas Airways Corporation (BOAC, formed in 1939), British European Airways (BEA, formed in 1946), and their associated companies. The company, state-owned from its inception, was privatized in 1987. The airline offers service to cities around the world and carries more passengers on international scheduled flights than any other airline. Its major subsidiaries are British Airways Helicopters, which engages mainly in North Sea oil and gas operations; British Airways Associated Companies, which administers local and regional airlines and hotels; and International Aeradio, which provides telecommunications and other technical services to various airlines and governments. Headquarters are at London's Heathrow Airport.

The airline's history traces to March 31, 1924,

when, with the award of government subsidies, four small postwar companies (Handley Page Transport Ltd., Instone Air Line Ltd., Daimler Airway, and British Marine Air Navigation Co.) merged to form Imperial Airways Ltd., one of the pioneers of intercontinental air routes. Inheriting 1,760 miles (2,830 km) of British and cross-Channel routes, Imperial Airways spanned Europe and Asia as far as India, Malaya, Hong Kong, and Australia and linked imperial territories in Africa as far as South Africa.

Meanwhile, three other airlines (Hillman's Airways Ltd., Spartan Air Lines Ltd., and United Airways Ltd.) had merged in 1935 to form British Airways, to handle domestic and northern European flights. In November 1938, following parliamentary investigations of alleged inefficiencies, the government decided to merge and nationalize Imperial Airways and British Airways. The result was the British Overseas Airways Corporation (BOAC), formally established on Nov. 24, 1939. On Aug. 1, 1946, British European Airways (BEA), formerly a division of BOAC, was split off to become a government corporation in its own right, responsible primarily for British air services in the British Isles and continental Europe.

On May 2, 1952, BOAC introduced the world's first pure-jet scheduled passenger service (from London to Johannesburg) with the de Havilland Comet 1. On Oct. 4, 1958, it began operating the world's first transatlantic jet service (between London and New York City).

Following recommendations of a special committee, Parliament enacted the Civil Aviation Act of 1971, which led in 1974 to the formal dissolution of BOAC and BEA and the vesting of their assets and liabilities in the new British Airways. One of its first achievements was the inauguration (jointly with Air France) of the world's first scheduled supersonic passenger service on Jan. 21, 1976, using the Concorde (the British flying initially from London to Bahrain and, in 1977, to New York City, the French from Paris to Rio de Janeiro).

In early 1987 the British government sold off British Airways to the public by means of a huge stock offering. Later that year the newly privatized company acquired its smaller British rival, British Caledonian Airways, which had routes between Britain and the United States. British Airways remained one of the largest air carriers in the world.

British Amateur Championship, golf tournament held annually in Great Britain for male amateurs with handicaps of 2 or less. A field of 256 players selected by qualifying play is reduced to players who, after 1957, competed for most holes won in a 36-hole final match play round.

In 1885, an Open Amateur Tournament (called open to signify that all countries might enter) was held by the Royal Liverpool Club at Hoylake, but the first official British Amateur Championship was held in 1886. Originally played at St. Andrews, and later at the Hoylake and Prestwick courses, the championship was later played at various other sites. John Ball is the leading eight-time winner (1888, 1890, 1892, 1894, 1899, 1907, 1910, and 1912). Later multiple winners include Joe Carr (1953, 1958, 1960) and Michael Bonallack (1961, 1965, 1968–70).

The British Ladies Amateur Golf Championship, the first women's golf tournament to be established, is held annually in Great Britain for female amateurs with handicaps of eight or less. There are qualifying rounds followed by the final 36 holes, which are decided by match play.

The first championship was held in 1893 at a nine-hole course at the Lytham and St. Anne's Club, Lancashire. In the following year it was held at Littlestone in Kent and has been held at various other courses in Great Britain, including St. Andrew's in Scotland. Lady Margaret Scott, who was the first championship winner, also won in 1894 and 1895. The only other woman to win three years successively was Enid Wilson (1931–33). Cecilia Leitch was champion four times (1914, 1920, 1921, and 1926), as was Joyce Wethered (1922, 1924, 1925, and 1929). *See* Sporting Record: *Golf.*

British and Foreign Bible Society (BFBS), first Bible society in the fullest sense, founded in 1804 at the urging of Thomas Charles and members of the Clapham sect, who proposed the idea to the Religious Tract Society in London. An interdenominational Protestant lay society with international representatives in London, the British and Foreign Bible Society was mainly concerned with making vernacular translations of the Scriptures available to peoples of all races at a price they could afford to pay. It also offered financial assistance to Bible societies in other countries. The BFBS has on occasion divided territory with the American Bible Society.

British Antarctic Territory, a territory of the United Kingdom lying southeast of South America, extending from the Atlantic Ocean on the east to the Pacific Ocean on the west. Triangular in shape, it has an area (mostly ocean) of 2,095,000 square miles (5,425,000 square km), bounded by the South Pole (south), latitude 60° S (north), and by longitudes 20° W (east) and 80° W (west). It includes all land areas south of 60° S and between the aforementioned longitudes, including the South Orkney Islands, the South Shetland Islands, the Antarctic Peninsula and adjacent islands, and mainland Antarctica extending to the South Pole. In area, the land portion of the territory covers about 660,000 square miles (1,700,000 square km). Most of the islands in the territory are glaciated; the Antarctic Peninsula is mountainous, with a snow-covered plateau extending the length of the peninsula, rising from 4,000 feet (1,200 m) in the north to about 7,000 feet (2,000 m) in the south; and the main continental area is covered by permanent ice cap and fringed by floating or grounded ice shelves.

Designated a territory in 1962 by the British government, it consists of the area (excepting South Georgia and the South Sandwich Islands) previously known as the Falkland Islands Dependencies. The territory is administered by a High Commissioner resident in Stanley, Falkland Islands. The population of the territory (usually between 50 and 100) consists of scientists and technicians who maintain the British Antarctic Survey stations. In the summer months, relief personnel and summer field-workers arriving by airplane and ship enlarge the population.

Argentina claims the Antarctic region bounded by latitude 60° S and longitudes 25° W and 74° W; Chile claims the area bounded by latitude 60° S and longitudes 53° W and 90° W. All territorial claims in Antarctica south of 60° S, including the British one that is the basis of the British Antarctic Territory, are in abeyance for the 30-year duration of the Antarctic Treaty, signed in 1959.

British Anti-Lewisite (poison antidote): *see* dimercaprol.

British army, in the United Kingdom, the military force charged with national defense and the fulfillment of international mutual defense commitments. The army of England before the Norman Conquest consisted of the king's household troops (housecarls) and all freemen able to bear arms, who served under the *fyrd* system for two months a year. After 1066 the Normans introduced feudalism and mounted troops (knights) and their auxiliaries, infantry, and military artisans. Mercenaries were employed during the Hundred Years' War (1337–1453) and the Wars of the Roses (1455–85) in combination with the militia. With the Battle of Crécy in 1346, archers became important, the longbow being a major innovation of warfare.

The first English standing army was formed by Oliver Cromwell in 1645 during the Civil War. The New Model Army (*q.v.*) was highly disciplined and well-trained. Associated with the excesses of Cromwell's Commonwealth, however, it was disbanded by Charles II in 1660 except for a household brigade (now the Coldstream Guards). After the Revolution of 1688, the English Bill of Rights (1689) gave Parliament the control of the army that it maintains today.

During the 18th and 19th centuries, as Britain consolidated its colonial empire, the army grew in size and developed as an effective fighting force. The army established standing forces in the colonies and distinguished itself during the Napoleonic Wars (1800–15). Reforms were carried out to improve its organization and efficiency in the late 1800s. Between 1905 and 1912 the Territorial Force (after 1921, Territorial Army) and Special Reserve were established. The army was greatly increased in size by conscription during World War I but was reduced to a minimum with an end to conscription after 1919. In July 1939, however, conscription was again enforced.

Major changes in the British army occurred after 1945. Troops stationed overseas were returned home as the British colonies gained independence, and the military forces were placed in Europe or absorbed into the Home Guard. In 1960 conscription was ended and an all-volunteer army again created. With the introduction of nuclear weapons, the Territorial Army was greatly reduced.

In 1964 the Ministry of Defense was established to administer all the armed forces, and in 1972 all army forces were placed under Headquarters United Kingdom Land Forces. The secretary of state for defense is responsible to the prime minister and the Cabinet. He is advised by the chief of defense staff, who is aided by the three service chiefs.

British Broadcasting Corporation (BBC), publicly financed broadcasting system in Great Britain, operating under royal charter. It held a monopoly on television in Great Britain from its introduction until 1954, and on radio until 1972. Headquarters are in London.

The first initiatives in British radio after World War I were taken by commercial firms that regarded broadcasting primarily as point-to-point communications. The British Broadcasting Company, Ltd., was established in 1922 as a private corporation. Only bona fide manufacturers were permitted to hold shares. In 1925, upon recommendation of a parliamentary committee, the company was liquidated and replaced in 1927 by a public corporation, the British Broadcasting Corporation. Although ultimately answerable to Parliament, the BBC has virtually complete independence in the conduct of its activities. Day-to-day operations come under the control of a board of governors, appointed by the monarch.

The original charter gave the BBC a monopoly covering all phases of broadcasting in Britain. A key figure in the early history of the corporation was John Reith (later Lord Reith), general manager from 1922 and director general from 1927 to 1938. He developed radio broadcasting throughout the British Isles, inaugurated the empire shortwave broadcasting service, and directed the development of the world's first regular high-definition television service in 1936. His concept of public-service broadcasting prevailed in Great Britain

and influenced broadcasting in many other countries.

British television service was interrupted during World War II, but resumed in 1946. The BBC introduced the first regular colour television service in Europe in 1967. It retained its monopoly of television service in Britain until the creation of a commercial channel operated by the Independent Television Authority (later the Independent Broadcasting Authority) in 1954. A second IBA-run commercial channel commenced broadcasting in 1982. The BBC's radio monopoly ended with the government's decision to permit local commercial broadcasts starting in the early 1970s.

The BBC is financed by annual license fees paid by owners of television and radio sets. It offers four radio networks, ranging from popular music to news and information services, and two national television channels. It also broadcasts programs all over the world. Under its charter the BBC may not advertise or broadcast sponsored programs. It is required to refrain from broadcasting any opinion of its own on current affairs and matters of public policy and to be impartial in its treatment of controversy.

British Columbia, westernmost province of Canada, bounded on the west by the Pacific Ocean and the U.S. state of Alaska, on the north by the Yukon and Northwest Territories, on the east by the province of Alberta, and on the south by the northwestern United States. British Columbia stretches 740 mi (1,180 km) from north to south and 640 mi (1,020 km) from east to west at its widest point, covering an area of 365,946 sq mi (947,800 sq km). The provincial capital is Victoria, located in the extreme southwest on the southern tip of Vancouver Island.

The following article summarizes the administrative history, geography, demographic patterns, economy, and culture of modern British Columbia; for additional treatment of its geography and history, *see* MACROPAEDIA: Canada.

At the time of the initial contact with European explorers, Indians in this area numbered about 80,000. The coast was dominated by such peoples as the Coast Salish, Nootka, Kwakiutl, Bella Coola, Tsimshian, and Haida. The rich economy was based on products of the sea and of the huge cedars, and long before the arrival of Europeans there was a highly involved system of trading.

The area that was to become British Columbia was first discovered by Europeans in the late 18th century. Spanish ships came first (in 1774), followed by Captain Cook, who was searching for the Northwest Passage. British and American fur traders were the first to explore the area, and for years the claim to Vancouver Island was in dispute. The island was finally recognized as solely British territory, and in 1849 it was made a crown colony by the imperial government. Orderly settlement of the area was delayed, however, by the governor and by the fur-based Hudson's Bay Company, who felt that settlement would not be in their best interests. The first large immigration occurred with the gold strike of 1858, creating a city out of Ft. Victoria (the western headquarters of the Hudson's Bay Company) and opening the mainland to settlement. The prosperous and dynamic society that resulted was proclaimed the Colony of British Columbia in 1858.

By 1865 the gold rush had subsided, leaving behind a diminished group of permanent settlers as a nucleus for an ongoing society. Improvements in an already fairly well developed transportation and communications network brought the extension of railway lines to Vancouver and the establishment of a steamship line connecting Vancouver with the Orient.

An economic revitalization occurred at the turn of the century with thriving resource industries (timber and mining). After 1918, postwar economic difficulties were blamed on Oriental workers, who became the victims of exclusionist legislation passed in 1923; it was not until the 1940s that Orientals were enfranchised.

A brief recovery was destroyed by the depression of the 1930s, not to be attained again until declaration of war on Germany in 1939. Prosperity continued beyond the war years, and with it came political change. Dissident Conservatives and Liberals formed the Social Credit Party, winning power in 1952 and retaining it until 1972 when the reformist New Democratic Party won the provincial election.

The vast territory of British Columbia lies almost entirely within the great mountain system, or cordillera, that stretches along the western edge of the Americas. Its hundreds of coastal islands—the largest of which are Vancouver Island and Queen Charlotte Islands—offer protection to ships along the coastline. More than half of the land is forested, while another third is barren tundra, snowfields, and glaciers. More than three-quarters of the province is above 3,000 ft (900 m) in altitude, suitable only for grazing. The Peace River region in the far north, outside the cordillera, has the only significant amount of land suitable for large-scale farming. Most of the thousands of lakes are small but are noteworthy for their role in hydroelectric power development and salmon spawning.

British Columbia in the early 1980s was the most urbanized province of Canada and also one of the most racially diverse. People of British descent formed the controlling elite, though there were notable minorities of Chinese, Japanese, Swedes, Norwegians, Italians, and Americans. Due to the influx of large numbers of Europeans after World War II, those of British origin constituted less than half of the province's population by the 1970s.

British Columbia in the early 1980s had a modern and prosperous economy consisting of forest and mineral production in its interior, hydroelectric production from its rivers, and agricultural activity on its plateaus and in its river valleys. Tourism and the shipping trade are also vital to its economy. Vancouver is the largest port of Canada and of western North America, providing shipping facilities for the prairie provinces and the Yukon.

Provincial parliamentary government dates to 1856, but the present system was formed in 1871 when British Columbia joined the Canadian Confederation. The government consists of a legislative assembly, elected to a five-year term by universal adult suffrage; an executive, consisting of the premier, who is leader of the majority party in the assembly and who selects the 18-member executive council from the assembly, and the lieutenant governor, appointed by the Canadian governor general as the monarch's representative; and the judiciary, consisting of the supreme court, appeals court, and county courts, whose judges are appointed by the Canadian governor general, and lower courts, whose judges and officials are appointed by the provincial attorney general.

The British Columbia Overall Medical Services Plan is available to all residents of the province on a voluntary subscription basis at low, uniform rates; and inexpensive hospital care is available through the British Columbia Hospital Insurance Service. Most of the province's population is covered by these plans. Legal aid is available on a limited basis to the poor. The Narcotics Addiction Foundation of British Columbia, located in Vancouver, is attempting to attack a widespread drug problem. Psychotherapy is also offered free of charge.

Public primary and secondary education is free and compulsory through grade 12, and free optional kindergarten is available. There is a special school in Vancouver for the deaf, blind, and mentally retarded. Private, mainly religious schools have about 5 percent of the primary school enrollment and are government subsidized. The schools for the Indian population are provided by the federal government. Vocational schools, the British Columbia Institute of Technology, and community colleges provide post-secondary education, and the University of British Columbia, in Vancouver, offers a wide range of advanced studies; it is supplemented by Simon Fraser University and the University of Victoria. The majority of cultural activities in British Columbia tend to reflect the pioneer background of the province and an economic orientation toward resource industries and the outdoors. Of note are the annual Williams Lake Stampede and the Kelowna Regatta. Cultural activities of larger cities are in a transitional stage between frontier and urban styles. Museum, art galleries, and theatre complexes have been supported through the efforts of local industrialists and distributing agencies. The Vancouver Institute and the Vancouver History Society support scholarly activities. Pop. (1984 est.) 2,851,700.

British Commonwealth Games: *see* Commonwealth Games.

British Commonwealth of Nations: *see* Commonwealth, The.

British Council of Churches, interdenominational cooperative organization formed in 1942 by the Church of England and other British churches. The requirement for membership was the same as that adopted by the World Council of Churches: acceptance of Jesus Christ as God and Saviour.

The council has several departments that carry out cooperative work for the churches in various areas, including youth work and social welfare. It is especially concerned with ecumenical activities and Christian unity.

Membership in the council is made up of most of the Anglican and Protestant churches in the British Isles as well as some interdenominational groups, including the YMCA and YWCA. The Greek Orthodox Church joined the council in 1965. The first president of the council was William Temple, archbishop of Canterbury, and subsequently the presidency was filled by the current archbishop of Canterbury.

British Drama League: *see* British Theatre Association.

British East Africa, territories that were formerly under British control in East Africa, namely Kenya, Uganda, and Zanzibar and Tanganyika (now Tanzania).

British penetration of the area began at Zanzibar in the last quarter of the 19th century. In 1888 the Imperial British East Africa Company established claims to territory in what is now Kenya. In 1890 and 1894 British protectorates were established over the sultanate of Zanzibar and the Kingdom of Buganda (Uganda), respectively, and in 1895 the company's territory in Kenya was transferred to the crown as the East Africa Protectorate (after 1920, the Kenya Colony and the Kenya Protectorate). In 1919 Britain was awarded the former German territory of Tanganyika as a League of Nations mandate.

All of these territories achieved political independence in the 1960s, and Zanzibar united with Tanganyika to form Tanzania in 1964. *See also* East African Community.

British Empire, a worldwide system of dependencies—colonies, protectorates, and other territories—that over a span of some three centuries was brought under the sovereignty of the crown of Great Britain and the administration of the British government. The policy

of granting or recognizing significant degrees of self-government by dependencies, which was favoured by the far-flung nature of the empire, led to the development by the 20th century of the notion of a "British Commonwealth," comprising largely self-governing dependencies that acknowledged an increasingly symbolic British sovereignty. The term was embodied in statute in 1931. Today, the Commonwealth (*q.v.*) includes former elements of the British Empire in a free association of sovereign states.

Great Britain made its first tentative efforts to establish overseas settlements in the 16th century. Maritime expansion, driven by commercial ambitions and by competition with France, accelerated in the 17th century. By 1670 there were British colonies in New England, Virginia, and Maryland and settlements in the Bermudas, Honduras, Antigua, Barbados and Nova Scotia. Jamaica had been conquered, and the Hudson's Bay Company was making a stronghold of Canada. The East India Company began establishing trading posts in India in 1600. The first African settlement (James Island) was made in 1661. Slave trading had begun earlier in Sierra Leone, but it was not made a possession until 1787. The Gold Coast (now Ghana), The Gambia, and Nigeria were later added to Britain's West African possessions.

Several factors made it possible for Britain's influence to remain strong in its far-flung colonies. In particular, the Navigation Acts of 1651 set up a closed economy between Britain and her colonies; all colonial exports had to be shipped on English ships to the British market, and all colonial imports had to come by way of England. British military and naval power, under the leadership of such men as Robert Clive, Eyre Coote, George Rodney, and Horatio Nelson, prevented other European powers from making inroads in the British Empire.

The Treaty of Paris ending the French and Indian War in 1763 left Britain dominant in North America and India. The loss of American colonies in 1783 was compensated by new settlements in Australia in 1788 and the gain of New Zealand by 1840. The Treaty of Amiens (1802) made Trinidad and Ceylon British, and in the Treaty of Paris (1814) France ceded Tobago, Mauritius, St. Lucia, and Malta. Malacca joined the Empire in 1795 and Sir Thomas Raffles acquired Singapore in 1819. Canadian settlements in Alberta, Manitoba, and British Columbia extended British influence to the Pacific, while conquest in India brought in the United Provinces of Agra and Oudh and the Central Provinces, East Bengal, and Assam.

The 19th century marked the full flower of the British Empire. The Colonial Office, inheriting a very loose system of colonial management, adopted policies and methods to achieve more sophisticated control over its widespread territories. In 1877 the British High Commission for the Western Pacific Islands was created. The Indian Empire included Burma, the Punjab, and British Baluchistan, while an "informal empire" operated in China by way of Shanghai. In Africa extension of power to Egypt, The Sudan, Kenya, Uganda, British Somaliland, Zanzibar, Nyasaland, Northern Rhodesia, Southern Rhodesia, Natal, Orange Free State, Transvaal, and Cape Colony realized the idea of an African empire extending "from the Cape to Cairo." It was in South Africa, however, that Britain became entangled in its only major war between the Napoleonic era and World War I, the Boer War of 1899–1902.

Limited self-government was recommended for Canada by Lord Durham in 1839. The idea of "responsible government," whereby some colonies were allowed largely to manage their own affairs under governors appointed by the mother country, spread rapidly. Parts of Australia, New Zealand, Natal, and Cape Colony achieved this status by the end of the 19th century. Confederations of colonies in Canada, Australia, New Zealand, and South Africa obtained such complete control over their affairs that in 1907 they were granted the new status of dominions. Their sovereignty was virtually complete, and they were tied to Britain and one another mainly by a shared allegiance to the crown.

This select group of nations within the Empire, with substantial European populations and long experience of British forms and practices, was often referred to as the British Commonwealth. The demands and stresses of World War I and its aftermath led to a more formal recognition of the special status of the dominions. The British Commonwealth, consisting of the mother country and the effectively sovereign dominions, was recognized by the Statute of Westminster in 1931.

The rest of the empire consisted largely of dependencies whose predominant indigenous populations had no such experience. For them a variety of administrative techniques was tried, ranging from the sophisticated Indian Civil Service, with its largely effective adoption of native practices in civil law and administration, to the very loose and indirect supervision exercised in many African territories, where settlers and commercial interests were left much to themselves while native Africans were segregated into "reserves." Nationalist sentiment developed rapidly in many of these areas after World War I and even more so after World War II, with the result that, beginning with India in 1947, independence was granted them, along with the option of retaining an association with Great Britain and other former dependencies in the Commonwealth of Nations (the adjective "British" was not used officially after 1946). By the 1980s little trace remained of the empire as such, while the Commonwealth had proved to be a remarkably flexible and durable institution.

British Empire, The Most Excellent Order of the, British order of knighthood instituted in 1917 by King George V to reward both civilian and military wartime service, although currently the honour is bestowed for meritorious service to the government in peace as well as for gallantry in wartime. In 1918 a separate military division of the order was created.

The five classes of both civil and military divisions, listed in descending order and conferred on men and women equally, are knight and dame grand cross (G.B.E.), knight and dame commander (K.B.E. or D.B.E., respectively), commander (C.B.E.), officer (O.B.E.), and member (M.B.E.). Conferment of the two highest classes entails admission into knighthood; foreigners can be admitted as "honorary members." Although membership has been limited since 1969, additional appointments can be made by special statutes. Appointments are usually made on the recommendation of the British Minister of Defence and the Secretary of State for Foreign and Commonwealth Affairs.

The officers of the order are prelate (the Lord Bishop of London), king of arms, registrar, secretary, dean (dean of St. Paul's), and gentleman usher of the Purple Rod. The chapel of the order, dedicated in 1960, is in the crypt of St. Paul's Cathedral, London. The insignia bears effigies of King George V and Queen Mary, along with the motto "For God and the Empire."

Associated with this order is the British Empire Medal (B.E.M.) instituted by George V. This award for meritorious service is given to either civilians or military personnel who are not eligible for admission into any of the five classes of the order.

British Empire and Commonwealth Games, also called BRITISH EMPIRE GAMES: *see* Commonwealth Games.

British Expeditionary Force (BEF), any of the British troops sent overseas for service in any place other than India, Egypt, or other virtual dependencies of Great Britain.

After the Crimean War (1853–56), Great Britain relied on its navy to maintain its status as a Great Power and kept its land forces free from any commitment to fighting in Europe. The British reconsidered this policy, however, in response to changes in the European situation between 1890 and 1906—Germany's colonial expansion and the building of a fleet to challenge Great Britain; France's alliance with Russia and reconciliation, in the Entente Cordiale, with Great Britain; and Germany's attempt to check the French in Morocco (First Moroccan Crisis, or Tangier Incident, of 1905).

An army reform of 1908, sponsored by Richard Burdon (later Viscount) Haldane, prescribed that the home-based forces of the regular army, strengthened by the army reserve and even (if necessary) by a special reserve, should be available for emergency dispatch overseas (a territorial force would remain to guard the British Isles).

The BEF sent to France at the outbreak of World War I (1914) sustained heavy losses and was succeeded by numbered British armies. The BEF sent to France early in World War II (1939) was brought back to England when France fell (1940), and the British effort was again continued on other battlefields by numbered armies.

British Imperial System, traditional system of weights and measures used officially in Great Britain until the adoption of the metric system beginning in 1965. The U.S. Customary System of weights and measures is derived from it. British Imperial units are now legally defined in metric terms.

The British Imperial System evolved from the hodgepodge of Roman, customary, and improvised units employed in the Middle Ages. Traditional names such as pound, foot, and gallon were widely used, but the values so designated varied with time and place and from trade to trade. Early royal standards established to enforce uniformity took the name Winchester, after the ancient capital of Britain, where the 10th-century Saxon king Edgar kept a royal bushel measure. Fourteenth-century statutes recorded a yard (perhaps based originally on the King's girth) of three feet, each foot containing 12 inches, each inch equalling the length of three barleycorns. Units of capacity and weight were also specified and persisted with small variation from reign to reign until the 19th century. In the late 15th century, Henry VII reaffirmed the customary Winchester standards for capacity and length and distributed royal standards (physical embodiments of the approved units) throughout the realm. This process was repeated about a century later in the reign of Elizabeth I. In the 16th century the rod (5.5 yards, or 16.5 feet) was once defined as the length of the left feet of 16 men lined up heel to toe as they emerged from church. By the 17th century usage and statute had established the acre, rod, and furlong at their present values (4,840 square yards, 16.5 feet, 660 feet, respectively). The several trade pounds in common use were reduced to just two: the troy pound, primarily for precious metals, and the pound avoirdupois, for other goods sold by weight.

The Weights and Measures Act of 1824 and the Act of 1878 established the British Imperial System on the basis of precise definitions of selected existing units. The 1824 act sanctioned a single imperial gallon to replace the wine, ale, and corn gallons then in general use. The new gallon was defined as equal in

volume to 10 pounds avoirdupois of distilled water weighed at 62° F with the barometer at 30 inches, or 277.274 cubic inches (later corrected to 277.421 cubic inches). The two new basic standard units were the imperial standard yard and the troy pound, which was later restricted to weighing drugs, precious metals, and jewels. A 1963 act abolished such archaic measures as the rod and chaldron (a measure of coal equal to 36 bushels) and redefined the standard yard and pound as 0.9144 metre and 0.45359237 kilogram respectively. The gallon now equals the space occupied by 10 pounds of distilled water of density 0.998859 gram per millilitre against weights of density 8.136 grams per millilitre.

While the British were reforming their weights and measures in the 19th century, the Americans were just adopting units based on those discarded by the act of 1824. The standard U.S. gallon is based on the Queen Anne wine gallon of 231 cubic inches and is about 17 percent smaller than the British imperial gallon. The U.S. bushel of 2,150.42 cubic inches, derived from the Winchester bushel abandoned in Britain, is approximately 3 percent smaller than the British imperial bushel. In the British system, units of dry and liquid capacity are the same, while in the United States, they differ; the liquid and dry pint in Britain each equal 0.568 cubic decimetre, while the U.S. liquid pint is 0.473 cubic decimetre, and the U.S. dry pint is 0.551 cubic decimetre. British and American units of linear measure and weight are essentially the same. Notable exceptions are the British stone of 14 pounds, which is not used in the United States, and a divergence in definition of the hundredweight (100 pounds in the U.S., 112 in Britain) that yields two tons, the short U.S. ton of 2,000 pounds and the long British ton of 2,240 pounds. In 1959 major English-speaking nations adopted common metric definitions of the inch (2.54 centimetres), the yard (0.9144 metre), and the pound (0.45359237 kilogram).

British/US system (foot-pound-second, fps)

length

1 statute mile (mi)	=	5,280	ft	=	1,760	yd	=	320 rods	=	8 furlongs		
1 nautical mile (n mi)	=	6,076	ft	=	1.151	mi						
1 furlong	=	660	ft	=	220	yd	=	40 rods	=	1/8 mi		
1 chain (Gunter's)	=	66	ft	=	22	yd	=	100 links	=	4 rods		
1 rod	=	16.5	ft	=	5.5	yd	=	25 links				
1 fathom	=	6	ft	=	72	in						
1 yard (yd)	=	3	ft	=	36	in						
1 foot (ft)	=	12	in									
1 link (Gunter's)	=	0.66	ft	=	7.92	in						
1 hand	=	4	in									
1 inch (in)	=	1	in									
1 mil	=	0.001	in									

area

1 sq mi	=	640 acres	=	102,400 sq rods	=	3,097,600 sq yd	= 27,878,400 sq ft
1 acre	=	10 sq chains	=	160 sq rods	=	4,840 sq yd	= 43,560 sq ft
1 sq ft	=	144 sq in			=	1/9 sq yd	= 144 sq in

volume

1 cu ft	=	1/27 cu yd	=	12 fbm	=	1,728 cu in
1 cu in	=	1/46,656 cu yd	=	1/1,728 cu ft		
1 acre-foot	=	43,560 cu ft	=	1,613 cu yd		
1 board-foot (fbm)	=	144 cu in	=	1/12 cu ft	=	1 super foot (lumber)
1 cord (US)	=	128 cu ft				

capacity

1 cu ft	=	7.481 gal (US)	=	6.229 gal (Br)

liquid measure (US)

1 barrel, oil	=	42	gal (US)	=	34.97	gal (Br)				
1 gallon (gal)	=	0.833	gal (Br)	=	4	qt	=	231.00 cu in	=	128 fl oz
1 quart (qt)	=	1/4	gal	=	2	pt	=	57.75 cu in	=	32 fl oz
1 pint (pt)	=	1/8	gal	=	1/2	qt	=	28.88 cu in	=	16 fl oz
1 gill (gi)	=	1/32	gal	=	1/4	pt	=	7.22 cu in	=	4 fl oz
1 fluid ounce (fl oz)	=	1/128	gal	=	1/16	pt	=	1.80 cu in		

dry measure (US)

1 bushel (bu)	=	0.97	bu (Br)	=	4	pk	=	2,150.4 cu in	=	1.24 cu ft
1 peck (pk)	=	1/4	bu	=	8	qt	=	537.6 cu in	=	0.31 cu ft
1 quart (qt)	=	1/32	bu	=	2	pt	=	67.2 cu in	=	1/8 pk
1 pint (pt)	=	1/64	bu	=	1/2	qt	=	33.6 cu in		

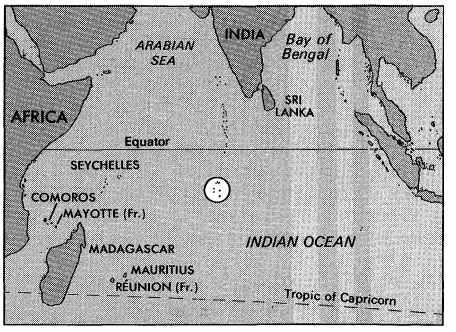
liquid and dry measure (Br)

1 bu	=	1.03 bu (US)	=	8 gal	=	4 pk	=	2,219.36 cu in	=	1.284 cu ft
1 pk	=	0.25 bu	=	2 gal	=	8 qt	=	554.84 cu in		
1 gal	=	1.20 gal (US)	=	4 qt			=	277.42 cu in		
1 qt	=	0.30 gal	=	2 pt	=	1/8 pk	=	69.36 cu in		
1 pt	=	4.80 gi (US)	=	4 gi			=	34.68 cu in	=	20 fl oz
1 gi	=	1.20 gi					=	8.67 cu in	=	5 fl oz
1 fl oz	=	0.96 fl oz (US)					=	1.73 cu in		

weight

1 short ton (sh t) (US)	=	0.89 long tons	=	2,000	lb	=	20 sh cwt*
1 long ton (Br)	=	1.12 short tons	=	2,240	lb	=	22.4 sh cwt*
1 short cwt* (US)	=	0.05 short tons	=	100	lb		
1 long cwt* (Br)	=	0.05 long tons	=	112	lb		
1 stone (person)	=	0.14 sh cwt	=	14	lb		
1 pound (lb)	=	0.07 stone (Br)					
1 ounce avdpt (oz)	=	437.50 grains	=	1/16	lb	=	0.911 oz troy
1 ounce troy (oz troy)	=	480.00 grains	=	1/12	lb	=	1.097 oz
1 grain			=	0.0023 oz		=	0.0021 oz troy

*cwt = hundredweight. †avdp = avoirdupois.



British Indian Ocean Territory

British Indian Ocean Territory, colony of the United Kingdom in the central Indian Ocean, established Nov. 8, 1965, by the amalgamation of the Aldabra Islands (*q.v.*) and the Farquhar and Desroches islands (all purchased from the Seychelles) with the Chagos Archipelago (formerly a dependent of Mauritius). On June 28/29, 1976, the islands purchased from the Seychelles were returned to the newly independent Republic of Seychelles. After that date the colony comprised only the islands of the Chagos Archipelago, including Diego Garcia (*q.v.*; area 23 sq mi [60 sq km] covering some 21,000 sq mi [54,000 sq km] of ocean). Administrative headquarters were at Victoria, Seychelles, during 1965–76 and after 1976 were at the Foreign and Commonwealth Office, London.

A brief discussion of the administrative status of the British Indian Ocean Territory follows. For a discussion of the colony's geography and history, *see* MACROPAEDIA: Indian Ocean Islands.

The colony was created (despite the opposition of the Organization for African Unity and Mauritian demands for the return of the Chagos Archipelago) to allow the establishment of defense and communications facilities in the Indian Ocean by the governments of Britain and the United States. To that end, the existing population of copra-plantation workers was expelled (some 1,200 persons were relocated, mainly in Mauritius, during 1965–73), and a major British–U.S. defense facility was built on Diego Garcia, the southernmost island of the Chagos Archipelago. Expansion of these facilities during the late 1970s was opposed by neighbouring states, who viewed the base as compromising the nonmilitarized status of the Indian Ocean region. There is no permanent civilian population.

British Isles, group of islands off the western coast of Europe. The group consists of two main islands, Great Britain and Ireland, and numerous smaller islands. *See* United Kingdom; England; Scotland; Wales; Ireland; Northern Ireland.

British Leyland Limited: *see* BL Public Limited Company.

British Library, national library of Great Britain, formed by the British Library Act (1972) and organized by July 1, 1973. It consists of the former British Museum library, National Central Library, National Lending Library for Science and Technology, and the British National Bibliography. The library's reference division includes more than 10,000,000 printed books, 120,000 manuscripts, 100,000 seals, more than 3,000 papyri, and other materials. The lending division has about 4,500,000 volumes, 55,000 current periodicals, and 3,500,000 documents on microfilm.

The British Museum library was founded in 1753 on the basis of collections of Sir Hans Sloane. At the same time manuscripts, rich in Anglo-Saxon and Latin codices, of Edward and Robert Harley, earls of Oxford, and Sir Robert Cotton were acquired. In 1757 George II presented to the library the Royal Library of the kings of England (from Edward IV to George II), which brought with it the right of a free copy of all books entered at Stationers'

Hall. The second royal library, that of George III, was purchased from George IV in 1823.

The British Museum library collection included a rich series of charters (including those of the Anglo-Saxon kings), codices, psalters, and other papers ranging from the 3rd century BC to modern times. The Department of Oriental Printed Books and Manuscripts included the library of C.J. Rich, the Chambers collection of Sanskrit manuscripts, and an exceptional library of Hebrew manuscripts.

The National Central Library was founded in 1916 as the Central Library for Students. It was the national centre for interlibrary lending within the British Isles and between Britain and other countries. The National Lending Library for Science and Technology (founded 1961) was administered by the Department of Education and Science. Its books and periodicals usually were available only to organizations and other libraries in the United Kingdom. The British National Bibliography was founded in 1950; it publishes the national catalog of British publishing, of the same name.

British Museum, Great Britain's national collection of archaeology and ethnography, located in the Bloomsbury district of London. The museum and library originated in 1753 when the art collection and library of Sir Hans Sloane (1660–1753) were acquired by the government. Established by an act of Parliament, the museum and library were opened to the public in 1759 and housed in Montagu House; the present building was designed in the Neoclassical style by Sir Robert Smirke and was built (1823–52) on the site of Montagu House.

The museum has among its holdings collections of ancient and medieval artifacts and art. The ethnographical collections are displayed at the Museum of Mankind, elsewhere in London. In 1973 the library of the British Museum was joined with several other significant holdings to create the British Library (*q.v.*).

British Museum (Natural History), byname NATURAL HISTORY MUSEUM, in London, scientific institution with national and international responsibilities for taxonomic and associated research using its collection of natural-history specimens and extensive libraries. It supports biological and geological research generally, and it also functions as an educational centre through the displays in its exhibition galleries.

The museum was formerly an integral part of the British Museum, originating in 1753 when the government acquired the collections of Sir Hans Sloane (1660–1753). In 1881, under the superintendency of Richard Owen (1804–92), the natural-history collections were moved (1881–85) from Bloomsbury to a building in South Kensington designed especially for them by Alfred Waterhouse, and where they are now kept. Not until an act of Parliament in 1963, however, did the Natural History Museum gain its own board of trustees and become fully independent of the British Museum.

The collections consist of animals and plants—both extant and extinct—meteorites, and the rocks and minerals that make up the Earth's crust. The department of mineralogy has about 180,000 specimens, and those of botany, paleontology, zoology, and entomology number in the many millions. Each department has its own library of books, journals, and original manuscripts. There is also a general library.

In 1975 the museum's education and exhibition activities were brought together to form a new Department of Public Services. Subsequently the museum developed new educational displays on the physical processes of life and the relationships between species. Major galleries deal also with human biology, ecology and food chains, man's place in evolution, and the origin of species.

British North America Act, the act of Parliament of the United Kingdom by which in 1867 three British colonies in North America—Nova Scotia, New Brunswick, and Canada—were united as "one Dominion under the name of Canada" and by which provision was made that the other colonies and territories of British North America might be admitted. It also divided the province of Canada into the provinces of Quebec and Ontario and provided them with constitutions. The act served as Canada's "constitution" until 1982 and was used as the basis of Canada's Constitution Act of 1982, by which the British Parliament's authority was transferred to the independent Canadian Parliament.

The British North America Act conferred on the new dominion a constitution "similar in principle to that of the United Kingdom." The executive government was vested in Queen Victoria and her successors. These two provisions meant that Canada would have parliamentary and cabinet government. The legislature was to consist of a Senate, its members appointed for life from the regions of Canada, and a House of Commons elected from the provinces on the principle of representation by population. The act provided that criminal law should be federal, and civil law provincial. The federal government was to appoint all senior judges, the provinces to administer the laws and maintain the courts. The act also authorized establishment of a Supreme Court of Canada.

The allocation of powers between the federal and provincial governments was done by sections 91 and 92 of the act. By the former, the federal legislature was given power to legislate for "the peace, order and good government of Canada," and "for greater certainty" 29 subjects of exclusive federal jurisdiction are listed. The act also gave the federal government the right to disallow any provincial act within two years of its passage. The provinces might levy direct taxation only, while the dominion might use any mode of taxation. The act thus provided for a union in which the federal government had general and overriding powers, while the provinces had particular and restricted ones.

The course of judicial interpretation in the Judicial Committee of the imperial Privy Council nevertheless transformed the character of the federal constitution under the act by greatly reducing the powers of the federal government and correspondingly increasing those of the provinces. The act provided no process of amendment. Amendments were made by the imperial Parliament in London at the request of the Parliament of Canada.

British Open, one of the world's major men's golf tournaments, held annually (with a few exceptions) since 1860 at different courses in the British Isles. It is open to professional and amateur contestants (hence the name). Since 1892 the Open has been 72 holes of stroke play (the player with the lowest number of strokes is the winner). Eligibility for the tournament is determined by a qualifying round, with a few players exempted on the basis of past performance. *See* Sporting Record: *Golf: Individual events.*

British Petroleum Company PLC, The (BP), British petrochemical corporation registered on April 14, 1909, as the Anglo-Persian Oil Company, Ltd.; it was renamed the Anglo-Iranian Oil Company, Ltd., in 1935 and changed its name to the British Petroleum Company Limited in 1954. The current name was adopted in 1982. The company's headquarters are in London.

The Anglo-Persian Oil Company was formed in 1909 to take over and finance an oil-field concession granted in 1901 by the Persian government to an English investor, William Knox D'Arcy. The first successful oil wells were drilled at Masjed Soleymān, and crude oil was piped to a refinery built at Abadan, from which the first cargo of oil was exported in March 1912. Other Iranian fields and refineries were built, and by 1938, Abadan had the largest single refinery in the world. The concession was revised in 1933, briefly suspended in 1951–53, and renewed in 1953 in a consortium with other oil companies.

Effective Jan. 1, 1955, British Petroleum became a holding company, and its subsidiaries and associated companies (some 650 in all) today engage in the exploration, production, refining, transportation, and distribution of oil and natural gas and in the manufacture of chemicals, plastics, synthetic fibres, and animal-feed products. In 1914 the British government became the company's principal stockholder and over the years was usually the largest single stockholder. Beginning in 1977 the British government reduced its ownership of BP by selling shares to the public, and in the late 1980s the government turned over BP entirely to private ownership by selling its remaining shares of the company. This cleared the way for BP to fully acquire Britoil PLC, an independent oil company that produced oil from the North Sea fields.

Over the years BP developed oil fields and built refineries in several more countries. It now has major interests in Alaska's Prudhoe Bay and in the United Kingdom sector of the North Sea, where, in 1965, BP made the first commercial discovery of natural gas and, in 1970, the first discovery of a major oil field. Beginning in 1970, BP merged its assets in the United States with those of the Standard Oil Company (Ohio), in which BP acquired a controlling interest. In 1987 BP acquired the rest of the Standard Oil Company for almost $8,000,000,000, thus reinforcing its position as one of the world's largest oil companies.

British Railways, byname BRITRAIL, the national railway system of Great Britain, created by the Transport Act of 1947, which inaugurated public ownership of the railroads. The first railroad built in Great Britain was the Stockton and Darlington, opened in 1825. It used a steam locomotive built by George Stephenson and was practical only for hauling mineral trains. The Liverpool and Manchester Railway, which opened in 1830, was the first modern railroad. It was a public carrier of both passengers and freight. By 1870 Britain had about 13,500 miles (21,700 km) of railroad. At their greatest extent in 1914, there were about 20,000 miles (32,000 km) of track, run by 120 competing companies. Steam locomotives began to be replaced by diesels in the 1950s, and in the 1960s by electrification.

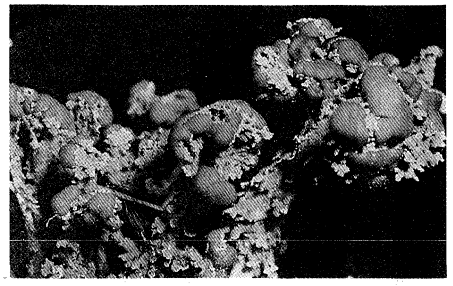
The railroads were taken over by the British Transport Commission in 1948. A 1962 law established the British Railways Board to manage the railroads. The board set out to nationalize the system, emphasizing mass movement over major trunk lines and the abandonment of many other services. It divided the system into five regions, each managed by a board responsible for most operations in its region. In 1980 the government sold majority control of all nonrail activities of the railroad.

Between 1963 and 1975 the board shortened its routes from 17,500 miles to 11,000 and cut personnel from about 475,000 to about 250,000. It undertook track reconstruction, installed long, continuously welded rails, and introduced new signaling systems. A computerized freight service was introduced in 1975, through which a central computer in London monitors the movements of 216,000 freight cars. In 1966–67 the west-coast line from London to Birmingham, Manchester, and Liver-

pool was electrified, and in the early 1970s electrification was extended to Glasgow.

A major effort was made to attract passengers by emphasizing speed and comfort. A High Speed Train (Inter-City 125), that could run at speeds of up to 125 mph, cut travel time between London and Glasgow from seven hours to five.

British soldiers (*Cladonia cristatella*), species of lichen with erect, hollow branches that end in distinctive red fruiting bodies from which



British soldiers (*Cladonia cristatella*)
Grant Haist

the popular name is derived. It is greener and redder in early spring than at other times. It occurs on the ground or on dead wood and is a good plant for terrariums.

British Solomon Islands Protectorate (Pacific Ocean): *see* Solomon Islands.

British South Africa Company, mercantile company, based in London, that was incorporated in 1889 under a royal charter at the instigation of Cecil Rhodes, with the object of acquiring and exercising commercial and administrative rights in south central Africa. The Charter gave the company rights to maintain or distribute vast territory; the company was also authorized to make treaties, establish a police force, and set up banking firms. The charter was initially granted for 25 years, and it was extended for a 10-year period in 1915.

By 1900 the company was administering both Southern Rhodesia (now Zimbabwe) and Northern Rhodesia (now Zambia) and by various means had acquired substantial land and mineral rights. Company rule ended in Southern Rhodesia in 1923, when the white settlers were granted responsible government, and in Northern Rhodesia in 1924, when the Colonial Office assumed control. The company retained its commercial assets, however, including mineral rights and railways that the Southern Rhodesian government acquired in 1933 and 1947, respectively. Its mineral rights in Northern Rhodesia became a valuable source of revenue following the development of the copper-mining industry in that territory between World Wars I and II; the company, which paid no dividend prior to 1924, had derived an estimated £70,000,000 in royalties on copper by 1964. On the eve of Zambia's independence the company was forced, by the threat of expropriation, to assign its mineral rights to the local government for £4,000,000, half of which was provided by the British government. The company merged with two other companies to form Charter Consolidated, Ltd., in 1965.

British Steel Corporation, British government-owned corporation established by the Iron and Steel Act of March 22, 1967. On July 28, the corporation, through nationalization, assumed ownership of 14 major steel companies in the United Kingdom: Colvilles Limited; Consett Iron Company Limited; Dorman, Long & Co., Limited; English Steel Corporation Limited; G.K.N. Steel Company Limited; John Summers & Sons Limited; The Lancashire Steel Corporation Limited; The Park Gate Iron and Steel Company, Limited; Richard Thomas & Baldwins Limited; Round Oak Steel Works Limited; South Durham Steel and Iron Company Limited; The Steel Company of Wales Limited; Stewarts and Lloyds, Limited; and The United Steel Companies Limited. These companies commanded some 200 wholly or partly owned subsidiaries in the United Kingdom and overseas in Australia, New Zealand, Canada, Africa, South Asia, and South America. The headquarters of British Steel are in London.

The first efforts to centralize the British iron and steel industry occurred during the Great Depression, in the creation (1934) of the British Iron and Steel Federation (BISF), an association of major firms that negotiated both with the government and with rival foreign cartels and firms on issues of pricing, tariffs, quotas, and other policies. During World War II, the staff of BISF became almost wholly the staff of Iron and Steel Control, a division of the Ministry of Supply established to direct wartime production.

At war's end a Labour government returned to office, pledged to the nationalization of the steel industry. In 1949 a nationalization act was passed, creating the Iron and Steel Corporation of Great Britain, but little real change in the industry had resulted by the time that the Conservatives returned to power in 1951 and, two years later, denationalized the steel industry. The 1953 act did, however, establish an Iron and Steel Board to supervise, though not dominate, a privately owned industry still associated in the BISF.

Finally, with the Labourites again in power, a second nationalization was imposed in 1967 under the Iron and Steel Act. The BISF was abolished, and the public British Steel Corporation was established. Another Iron and Steel Act, of 1969, dissolved the old constituent companies and rearranged the corporation into six divisions for general steels, special steels, strip mills, tubes, constructional engineering, and chemicals. These divisions were later reorganized into a more complex system of Manufacturing Divisions (geographical), Product Units (types of products), and Profit Centres (types of products and services).

British Theatre Association, formerly (until 1973), BRITISH DRAMA LEAGUE, organization created in 1919 for the encouragement of the art of the theatre, both for its own sake and as a means of intelligent recreation among all classes of the community. Its founder, Geoffrey Whitworth, was its first secretary and later became its first director and chairman of the council. From its inception, the work of the association has been mainly among amateur groups, helping them by advice, information, tuition, and the loan of books to improve their standards of production. Most groups borrow acting copies of every play they perform from the association. Its library, started with a gift of books from Annie Horniman, is now one of the principal theatrical collections of the world. The journal *Drama* was founded in July 1919.

The association's activities, however, are not limited to amateurs; its members have urged the establishment of a national theatre policy adequate to the needs of the people; the establishment of drama departments at the universities; a place for drama in the school curriculum; and the abolition of entertainment duty in respect to live entertainment.

The main outlines of the association's work are established through annual conferences, of which the first was held at Stratford-upon-Avon, Warwickshire, in 1919; and the annual national festivals of community drama, first organized in 1927.

Its headquarters are in London. One-third of its members are individuals and the rest organizations, including amateur societies, professional repertory companies, the British Broadcasting Corporation, and the Independent Broadcasting Authority.

The name of the association was officially changed in 1973.

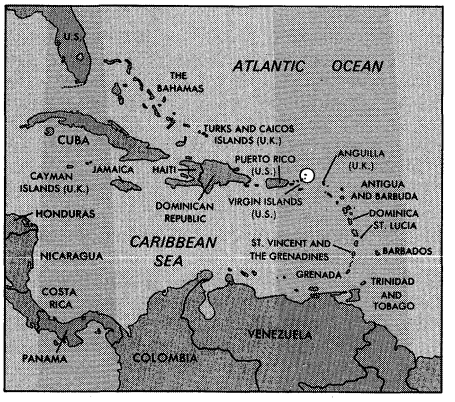
British thermal unit (BTU), a measure of the quantity of heat, defined since 1956 as equal to 1,055 joules, or 252 gram calories. It was defined formerly as the amount of heat required to raise the temperature of one pound of water 1° F. The definition was changed because it was dependent on the initial temperature of the water. Gas utilities frequently use a larger unit, the therm, defined as 100,000 BTU, as a measure of gas consumption.

British Virgin Islands, officially COLONY OF THE VIRGIN ISLANDS, British dependency in the eastern Caribbean Sea, part of an island chain collectively known as the Virgin Islands, which make up the northeastern extremity of the Greater Antilles. Puerto Rico lies about 50 mi (80 km) to the west. The Virgin Islands are divided administratively between the United Kingdom and the United States, the British territory lying to the north and east of the U.S. islands. The British colony consists of four larger islands (Tortola, Anegada, Virgin Gorda, and Jost Van Dyke) and 32 smaller islands and islets. The total area of the colony is 59 sq mi (153 sq km). The chief town and port is Road Town on Tortola (21 sq mi), the largest of the islands. The population in 1984 was estimated to be 13,000.

The article that follows is a summary of significant detail about the British Virgin Islands. For information about regional aspects of the British Virgin Islands, *see* MACROPAEDIA: West Indies.

For current history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the Britannica Book of the Year.

The land. Geologically an extension of the central fault-block mountains of Puerto Rico and composed of folded sedimentary, metamorphic, and igneous rock, the islands present a variety of physical features, including



British Virgin Islands

mountains, lagoons with coral reefs and barrier beaches, and landlocked harbours. Except for Anegada the islands are hilly. The highest point in all the Virgin Islands is Mt. Sage on Tortola, reaching an elevation of 1,781 ft (543 m). The long and narrow Virgin Gorda, with an area of about 8 sq mi, rises to an elevation of about 1,359 ft. Jost Van Dyke is a rugged island only about 3 sq mi in area. Anegada, the northernmost extension of the colony, is a flat coral island surrounded by dangerous reefs. The British Virgin Islands have no rivers. Their subtropical climate is pleasant and healthy for most of the year, a factor in the islands' important tourist industry. Average temperatures range from 71° to 82° F (21.7° to 27.8° C) in winter and from 78° to 88° F (25.5° to 31.1° C) in summer. The average annual rainfall is about 50 in. (1,270

mm), much of it occurring from September to December. Hurricanes are infrequent. Much of the original tropical vegetation has been replaced by secondary scrub growth. The islands have no minerals of commercial value other than sand and gravel.

The people. The great majority of British Virgin Islanders are blacks and mulattoes, the descendants of African slaves. Whites constitute a small minority, although their number grew markedly between 1960 and 1970. Tortola, of all the islands, has by far the largest population, more than 80 percent of the total in 1980. About 20 percent of Tortolans live in Road Town (pop. 2,479 [1980 est.]). The British Virgin Islands, of which about 16 are populated, have a density of about 220 persons per sq mi (85 per sq km). English, the official language and the chief tongue of the people, is often spoken in a Calypso dialect. Religious affiliations are mostly with Protestant denominations, the Methodists being the largest single group. In the early 1980s the birth rate was about 17 per 1,000 population, and the death rate was about 5 per 1,000. The rate of population increase was about 1.2 percent, and the infant mortality rate about 41 per 1,000 live births.

The economy. The main business of the British Virgin Islands is tourism. Having developed rapidly during the 1970s, it provides about 45 percent of the colony's income from external sources. Tourism is also the largest employer in the islands, and its activities stimulate other industries. Agriculture was the backbone of the economy until tourism replaced it in the 1970s. The most important agricultural activity is livestock raising. The main crops in the mid-1970s were bananas, sugarcane, citrus fruits, coconuts, mangoes, and various root crops. Some fruits and vegetables continue to be exported. Fishing in the well-endowed coastal waters is a growing industry, and fresh fish have also become a significant export. Industry is unimportant on the islands, contributing little to the gross domestic product. Among the manufactured products are rum, paint, and building materials. Cottage industries produce woven baskets and various other items that appeal mainly to the tourist trade. The only form of mining is the quarrying of sand and gravel, which is produced in exportable quantities. Most trade is with the United States, the Virgin Islands of the United States, Puerto Rico, and the United Kingdom. The chief imports are building materials, foodstuffs, machinery, motor cars, and beverages. The gross domestic product for 1980 was U.S. $30,000,000, and the per capita income for that year was $2,750. The unit of currency is the U.S. dollar.

The islands are served by more than 60 mi of motorable roads. A bridge connects Tortola on the east to Beef Island, site of the main airport. Direct flights from the Virgin Islands of the United States, Puerto Rico, and the eastern Caribbean are accommodated. Port Purcell near Road Town is the main port.

Administrative and social conditions. The British Virgin Islands are a colony of the United Kingdom. The country is administered under the constitution that came into effect in 1977. The chief executive officer is the governor, who is appointed by the British monarch. Except in the exercise of special responsibilities, the governor is advised by an Executive Council. The Legislative Council consists of a speaker, nine elected members, and the attorney general as an ex officio member. The voting age is 18.

Housing standards on the British Virgin Islands rank well against those of the Caribbean region generally. Dwellings are usually made of concrete or stone. The general health of the population is good. In addition to a 50-bed hospital on Tortola, there are clinics at various locations throughout the colony. The freshwater supply is a problem, and some water must be imported. Literacy is almost 100 percent. School attendance is free and compulsory up to the age of 15. The government maintains primary schools and one comprehensive school, which provides secondary education. There is no higher education, but some students attend the University of the West Indies and other overseas institutions. There is a library at Road Town. Newspapers serving the islands include a weekly and a bimonthly. Baughers Bay in Tortola has a radio station, and television and FM stereo broadcasting are received by cable subscribers.

History. Arawaks, American Indians who initially occupied the Virgin Islands, had been expelled by the warlike Caribs when Columbus arrived at the islands in 1493, naming them Santa Ursula y las Once Mil Virgenes (St. Ursula and the Eleven Thousand Virgins). In 1555 Emperor Charles V of Spain sent an invasion force to claim the islands, and by 1596 most of the Caribs had fled or been killed. The islands were an early haunt for buccaneers and pirates. Dutch buccaneers held Tortola until it was taken over in 1666 by English planters. Tortola was annexed by the British-administered Leeward Islands in 1672. In 1773 the planters were granted civil government with an elected House of Assembly and a partly elected Legislative Council. Economic difficulties arose in the first half of the 19th century, when slavery was abolished. Representative government was eliminated in 1867 and not reinstated until the mid-1900s. In 1872 the islands became politically part of the Colony of the Leeward Islands, retaining that status until the colony was defederated in 1956. Thereafter, the British Virgin Islands became a separate colony. The colony was given a ministerial form of government in 1967, which was continued under the new constitution of 1977.

British West Africa, assortment of widely separated territories in West Africa that were administered by Great Britain during the colonial period. They were Sierra Leone, the Gambia, Nigeria (with the British Cameroons), and the Gold Coast (including Gold Coast crown colony, Ashanti, the Northern Territories, and British Togoland).

Sierra Leone was colonized from England in 1787 by blacks who had formerly been slaves in America. Other groups of blacks followed from Nova Scotia (1792) and Jamaica (1800). They were sponsored and governed by the private Sierra Leone Company until Britain made Sierra Leone a crown colony in 1808. Englishmen founded the colony of Bathurst at the mouth of the Gambia River in 1816. Both colonies served as bases for the British effort to block the slave trade along the coast. Later in the century British rule spread to the interior of Sierra Leone and the Gambia. Both interiors became protectorates governed through indigenous rulers.

The British policy of indirect rule was most clearly formulated by Frederick J.D. Lugard in Nigeria. In the early 1900s, long after Britain annexed Lagos as a crown colony (1861), Lugard conquered the north. Northern Nigeria and Southern Nigeria, established as separate units in 1906, were merged in 1914 under Lugard's direction. His central government comprised an appointed governor, an executive, and a legislative council. Local administration and jurisdiction, however, depended on traditional rulers and traditional institutions. In some cases this meant removing authority from the new class of western-educated Africans and suppressing social change that had already begun. A British resident or district officer served as the liaison between the traditional ruler and the colonial regime. Lugard's system became the model for all of British West Africa.

The Gold Coast (present Ghana) had several parts acquired by Britain at different times. The Gold Coast crown colony, on the Gulf of Guinea coast, was established in 1874 in Fanti and Ga lands near the British coastal trading forts. The mighty Ashanti empire to the north was conquered and made a protectorate in 1900–01. The far north, too, became a protectorate. Sir Gordon Guggisberg, governor from 1919 to 1929, introduced indirect rule by restoring the Ashanti king to his title.

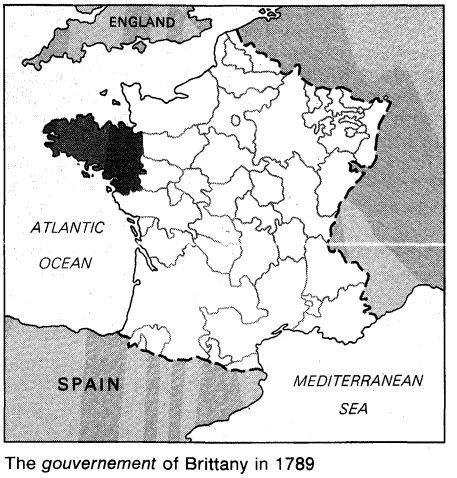
After World War I the former German colonies of Togoland and Kamerun were each divided between Britain and France as League of Nations mandates. British Togoland was administered from the Gold Coast; the British Cameroons, from Nigeria. In 1946 they were redefined as United Nations trusteeships.

British West Africa came to an end in the years around 1960. Western-educated Africans, excluded from power under indirect rule, led the nationalist movements for independence. Ghana (including British Togoland) became independent in 1957. Nigeria followed in 1960, Sierra Leone in 1961, and The Gambia in 1965. The British Cameroons were divided between Nigeria and the Republic of Cameroon.

Britomartis (Cretan: Sweet Maid), Cretan goddess sometimes identified with the Greek Artemis. According to legend, Britomartis was a daughter of Zeus (chief of the gods), and lived in Crete; she was a huntress and a virgin. Minos, king of Crete, fell in love with her and pursued her for nine months until she, in desperation, leaped from a high cliff into the sea. She was caught in fishermen's nets (hence her name Dictynna, from *diktyon,* "net") and hauled to safety. For her chastity she was rewarded by Artemis with immortality. The Greeks also identified her with Aphaea, a primitive local goddess of Aegina whose temple there is famous for its pedimental sculptures.

Briton, one of a people inhabiting Britain before the Anglo-Saxon invasions beginning in the 6th century AD. The majority were probably Cymric Celts, who arrived on the island at an unknown date but perhaps beginning as early as the 7th or 6th century BC; they undoubtedly mixed with aborigines who spoke non-Indo-European languages.

Brittany, French BRETAGNE, Breton BREIZ, planning region (French *région de programme*), encompassing the northwestern French *départements* of Ille-et-Vilaine, Morbihan, Côtes-du-Nord, and Finistère and roughly coextensive with the historic province of Brittany. The capital is Rennes. The region has an area of 10,496 sq mi (27,184 sq km) and is bounded by the *départements* of Manche to the north, Mayenne and Maine-et-Loire to the east, and Loire-Atlantique to the south.



The *gouvernement* of Brittany in 1789

The Bay of Biscay lies to the southwest and the English Channel to the north.

The following article summarizes the political history, geography, demographic patterns, economy, and traditional culture of modern Brittany; for additional treatment of its geography and history, *see* MACROPAEDIA: France.

History. The historical evolution of Brittany has been mainly determined by its loneliness. The region has twice been a shelter for the Celts. The earliest inhabitants of whom there is a record were Celtic tribes, probably intermingled with remnants of the earlier race whose monuments are the menhirs, dolmens, and cromlechs. Conquered by Julius Caesar in 56 BC, inhabitants of the region then known as Armorica took part in the unsuccessful rising against him in 52–51 BC. After the withdrawal of the Romans in the 5th and 6th centuries AD there was a considerable immigration of Celts from Britain and Ireland, including Celtic missionaries who gradually converted the whole country and gave their names to towns and villages (*e.g.,* St. Malo, St. Brieuc, St. Tugdual, and St. Pol-de-Léon). Celtic Brittany was divided into a number of petty lordships, upon which the Merovingians and the first Carolingians tried without great success to impose their authority.

In the 9th century a national hero, Nomenoë, revolted against the tutelage of Charles II of France and conquered Nantes and Rennes, thus giving to Brittany its definitive extension and its complex constitution of both Celtic and Frankish country. The successors of Nomenoë, nominally vassals of the French king but in fact independent, rallied their people against the Norse raiders and drove them away, preventing them from founding on the Loire a new Normandy analogous to that which they had founded on the Seine.

In the 10th century Conan of Rennes became paramount in Brittany, and his son Geoffrey took the title of duke. The line of Conan ended in the 12th century, after many struggles to subdue the Breton feudal lords. These struggles brought the Breton dukes into contact with their neighbours, the dukes of Normandy and the counts of Anjou, and then with the king of England. The Bretons helped William of Normandy to win the Battle of Hastings; but later they had to struggle against him and his successors, who were trying at least to impose their suzerainty on Brittany if not to conquer it. In the 12th century, however, Conan IV, hard pressed by rebellious nobles, sought the help of Henry II of England and gave his daughter Constance in marriage to Henry's son Geoffrey, who succeeded to the dukedom.

Brittany would have become a dependency of the Angevin (Plantagenet) empire if Geoffrey's heir, Arthur I, had not been murdered by the English king John and if Arthur's sister, Alix, had not been given in marriage to a Capetian prince, Peter of Dreux (Pierre Mauclerc), by Philip II Augustus of France. A line of French dukes ruled at Rennes until the death (1341) of John III, who did not leave an heir.

France and England again contested for Brittany on the occasion of the civil war between the partisans of two indirect heirs: John of Montfort, supported by the English, and Charles of Blois, nephew of Philip VI of France. The defeat and death of Charles at Auray (1364) secured the dukedom for the House of Montfort. The dukes of the Montfort dynasty (John IV, John V, and Peter II) tried to secure Brittany's neutrality between France and England during the Hundred Years' War, conscious of the duchy's intermediary geographic position. The constable earl of Richmond, however, rendered great services to the French crown against the English before succeeding his nephew, Peter II, in the dukedom as Arthur III in 1457. He was succeeded in 1458 by another nephew of his, Francis II, who died in 1488, leaving his daughter Anne as heiress of Brittany.

Brittany was definitively joined to the crown of France through Anne's successive marriages, with Charles VIII and then to Louis XII. Her daughter Claude became the queen of Francis I of France, under whom the treaty of 1532 was concluded, binding Brittany to France but containing guarantees of its local liberties. Until the Revolution this provincial autonomy survived, local patriotism opposing Bourbon attempts at centralization. The mass of the people had remained unaffected by the Reformation. During the religious wars, Brittany was the scene of much fighting against the Huguenots, and there were many Spanish garrisons.

Apart from some short-lived troubles in the early years of Louis XIII's reign, the province then generally had a long period of peace. At the beginning of the French Revolution, in November 1789, the movement of "federation" was born in Brittany, in reaction against the aristocratic system of the provincial *parlements;* but from 1792 to 1799 the Chouans of Brittany struggled against the antireligious campaign of the First Republic. From the end of the 19th century opinion slowly and unequally evolved toward conservative republicanism. In the late 20th century, bands of separatists engaged in occasional demonstrations and rare acts of violence (paralleling separatist movements all around the globe), but the mass of Bretons seemed content with their French allegiance.

Geography. Brittany belongs to the ancient uplands of the Massif Armoricain and is lowlying, the mean altitude being 341 ft (104 m). The mountains of Arrée lie to the north and reach an altitude of 1,260 ft. Erosion has carved out sharp *abers,* or gorges, in the north, and the coastline is deeply indented. An oceanic climate prevails.

Demographic patterns. Decline in the French share of north Atlantic fisheries and the rural depopulation seen elsewhere in France at the beginning of the 20th century led to a decline in the population of Brittany of more than 11 percent between 1911 and 1946, but it has subsequently increased at a rate above the national average. The growth of industries and the service sector has accounted for much of the increase. Demographic recovery has been uneven, favouring the coastal areas over the hinterland. Emigration has depleted the rural population, whose birthrate lags behind the national average.

Economy. Emigration from the countryside has resulted in the consolidation of many farms. Animal husbandry predominates and has displaced the traditional cultivation of cereals, although the cultivation of fodder crops is on the increase. Pigs and chickens are raised in feedlots for meat that is exported to other French regions. Brittany is a leading producer of milk. Fishing continues to be a major industry, and the region accounts for approximately two-fifths of total French landings.

Industries must import energy and raw materials, and, thus, they remain underdeveloped. Pleumeur-Bodou in Côtes-du-Nord is a major space telecommunications centre and has encouraged the development of related industries in Brest and Rennes. Tourism is an important industry and centres on the coastal cities and towns.

Traditional culture. Bretons combine enterprise and traditionalism. Many have distinguished themselves as seafarers, and Brittany long provided the French navy with the greater part of its crews. The Catholic faith is widespread in Brittany and appears particularly in the pilgrimages or *pardons* at Locronan, Josselin, and Ste. Anne d'Auray. Brittany moreover has preserved its old social structure better than other provinces; in the country, families are large and respectful of paternal authority, and the rural nobility still exercises influence.

The Breton language is commonly spoken in parts of Morbihan, Finistère, and Côtes-du-Nord (*see* Breton language), and from the mid-19th century there has been a considerable literary revival (*see* Breton literature). Pop. (1982) 2,707,886.

Britten, (Edward) Benjamin, BARON BRITTEN OF ALDEBURGH (b. Nov. 22, 1913, Lowestoft, Suffolk, Eng.—d. Dec. 4, 1976, Aldeburgh, Suffolk), leading British composer of the mid-20th century, whose operas are considered the finest English operas since Purcell, and an outstanding pianist and conductor.

Britten, 1960
Camera Press

Britten composed as a child and at the age of 12 began several years of study under the respected composer and influential teacher Frank Bridge. He later studied under John Ireland and Arthur Benjamin at the Royal College of Music in London and while there composed the set of choral variations, *A Boy Was Born* (1933; revised, 1958). He then worked as a composer for the radio, theatre, and cinema, coming into close contact with the poet W.H. Auden. In 1937 his *Variations on a Theme of Frank Bridge,* for string orchestra, won him international acclaim.

From 1939 to 1942 he was in the U.S., where his first work for the stage, the operetta *Paul Bunyan* (1941; libretto by Auden), was performed. A commission by the Koussevitzky Foundation led to the composition of his opera *Peter Grimes* (1945; libretto by M. Slater after George Crabbe's poem *The Borough*), which placed Britten in the forefront of 20th-century composers of opera. Later operas include *The Rape of Lucretia* (1946); the comic *Albert Herring* (1947); *Billy Budd* (1951; after Herman Melville); *Gloriana* (1953; written for the coronation of Queen Elizabeth II); *The Turn of the Screw* (1954; after Henry James); *A Midsummer Night's Dream* (1960); *Owen Wingrave* (television, 1971); and *Death in Venice* (1973; after Thomas Mann).

With the church parable *Curlew River* (1964) his conception of musical theatre took a new direction, combining influences from the Japanese Nō theatre and English medieval religious drama. Two others, *The Burning Fiery Furnace* (1966) and *The Prodigal Son* (1968), followed. An earlier church pageant opera, *Noye's Fludde* (1958), made use of one of the medieval Chester miracle plays. *The Rape of Lucretia* marked the inception of the English Opera Group, with Britten as artistic director, composer, and conductor. This undertaking gave rise to the Aldeburgh Festival (founded 1947), which became one of the most important English music festivals and the centre of Britten's musical activities.

Preeminent among Britten's nontheatrical music are his song cycles. Among those that established his stature as a songwriter are (for voice and piano) *Seven Sonnets of Michelangelo* (1940; written for the tenor Peter Pears, his lifelong friend and artistic partner) and *The Holy Sonnets of John Donne* (1945). Britten's largest choral work is the *War Requiem*

(1962) for choir and orchestra, based on the Latin requiem mass text and the poems of Wilfred Owen, who was killed in World War I. Other choral works include the *Hymn to St. Cecilia* (1942; text by Auden), *Ceremony of Carols* (1942), *Rejoice in the Lamb* (1943), *St. Nicolas* (1948), *Spring Symphony* (1949), and *Voices for Today* (1965; written for the 20th anniversary of the United Nations).

Among his principal instrumental works are the *Simple Symphony* for strings (1925); three string quartets (1941, 1945, and 1976); concerti for piano and for violin; *The Young Person's Guide to the Orchestra* (1945); and *Symphony in D Major for Cello and Orchestra* (1963), written for the Russian cellist Mstislav Rostropovich.

Britten was created Companion of Honour in 1953 and was awarded the Order of Merit in 1965. In June 1976 he was created a life peer, the first musician or composer to be elevated to the peerage.

brittle mica, any member of a group of silicate minerals related to clintonite (*q.v.*).

brittle star, also called SERPENT STAR, any of the 2,000 living species of marine invertebrates comprising the class Ophiuroidea (phylum Echinodermata). Their long, thin arms—usually five and often forked and spiny—are

Brittle star (*Ophiocoma imbricatus*)
Allan Power—Bruce Coleman Ltd.

distinctly set off from the small disk-shaped body. The arms readily break off but soon regrow—*i.e.,* are regenerated.

The mouth, on the underside of the body, has five teeth; an anus is lacking; and the tube feet serve mainly as sense organs for detecting light and odour. The animal feeds by extending one or more arms into the water or over the mud, the other arms serving as anchors. Ophiuroids, although mainly scavengers and plankton feeders, sometimes trap sizeable animals. They are capable of moving jerkily but usually cling to the sea floor or to sponges or cnidarians (*e.g.,* coral).

Brittle stars occupy many marine habitats, often at great depths. The most widespread species is the long-armed brittle star (*Amphiopholis squamata*), a grayish or bluish species that is strongly luminescent. Two of the best known littoral species are the green brittle star (*Ophioderma brevispina*), found from Massachusetts to Brazil and the common European brittle star (*Ophiothrix fragilis*).

Brittle stars with many-branched, much-coiled arms are called basket stars. Most live in deep waters.

Britton, Elizabeth Gertrude Knight, *née* KNIGHT (b. June 9, 1858, New York City—d. Feb. 25, 1934, Bronx, New York City), U.S. botanist known for lasting contributions to the study of mosses.

After graduating in 1875 from Normal (later Hunter) College in New York, she began teaching there in the training and botany departments. Her first scientific paper, on albinism in plants, was published in 1883, and that year she began the studies on mosses that made her widely known. Britton eventually published over 300 scientific articles. She married Nathaniel L. Britton, a botany instructor at Columbia College, in 1885.

Britton is credited with the first suggestion that New York have a great botanical garden, and subsequently became honorary curator of mosses at the New York Botanical Garden (incorporated in 1891). She also founded the Sullivant Moss Society in 1898, which later (1949) became the American Bryological Society.

In her later life Britton grew concerned with wildflower conservation and was a founder of the Wild Flower Preservation Society of America in 1902. Her work with that organization contributed to legislation that protected endangered native plants and also resulted in the protection of wild American holly from use as a Christmas decoration.

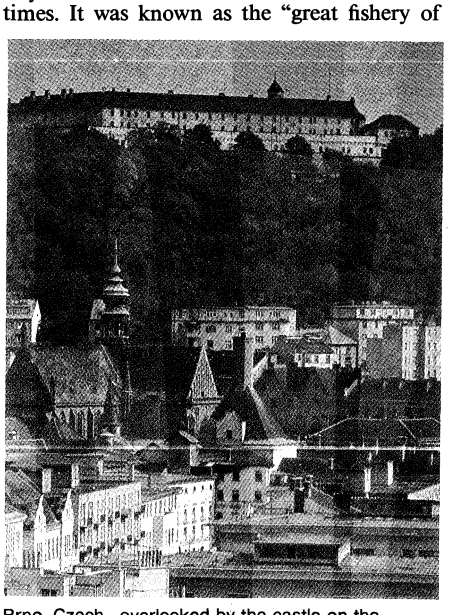
Briusov, Valery Yakovlevich: *see* Bryusov, Valery Yakovlevich.

Brive-la-Gaillarde, town, Corrèze *département,* Limousin region, south central France, on the Corrèze River west of the Massif Central, south of Limoges. Rock caves nearby show evidence of prehistoric occupation, and later inhabitants left great stone monuments. The town originated as the Roman Briva Curretiae (Corrèze Bridge). In the Middle Ages it was the capital of lower Limousin. St. Anthony of Padua founded a monastery here in 1226. The curious Romanesque church of Saint-Martin is an example of 12th-century Limousin art. Some medieval houses, notably La Labenche, survive.

Brive lies in a fertile area where three former provinces (Limousin, Périgord, Quercy) met. It benefitted from its position at the crossing of the main north–south (Paris–Toulouse) and east–west (Bordeaux–Geneva) rail and road routes. The Brive basin is well sheltered from climatic extremes, and thus an agrarian and industrial economy prevails. Grain, fruit, paper, and pork are major products, and there is light and heavy industry. Brive is an important agricultural market centre. Pop. (1982) 50,898.

Brixen (Italy): *see* Bressanone.

Brixham, locality, Torbay district, county of Devon, England, on the south side of Tor Bay. Much of Brixham was built in Victorian times. It was known as the "great fishery of the west," for Brixham fishermen developed the technique of trawling. Nearby is Windmill Hill Cave, occupied from prehistoric until Roman times. Pop. (latest census) 10,721.



Brno, Czech., overlooked by the castle on the Špilberk
Elliott Erwitt—Magnum

Brno, German BRÜNN, capital of Jihomoravský *kraj* (Southern Moravia region), Czechoslovakia, on the eastern foothills of the Bohemian–Moravian Highlands (Českomoravská vysočina), at the confluence of the Svratka and Svitava rivers. It is the second largest city of Czechoslovakia and the traditional capital of Moravia. North of Brno is the Moravian Karst, a region famous for its caves, grottoes, and gorges.

There is archaeological evidence that the city's environs were inhabited in prehistoric times. Traces of Neanderthal man were found in a nearby cave called Svédův stůl (Swedish Table) and a camping ground of the Cro-Magnon mammoth hunters (30,000 BC) was discovered at Dolní Věstonice, on the edge of the Pavlovské vrchy (Pavlov Hills), 20 mi (30 km) south. Also in the locality are traces of Celts and other tribes and many Slav settlements from the 5th and 6th centuries. The name Brno comes from the Celtic *brynn* ("hill town").

German colonization, beginning in the 13th century, stimulated growth of the community, which became an incorporated city in 1243. In the 14th century, the margraves of Moravia acquired and for long kept control of Brno, which, dominated by the fortress on the Špilberk, withstood several sieges: in 1428 by the Hussites (religious reformers); in 1464 by George of Poděbrady, the Bohemian leader; and in 1645 by the Swedes, under Lennart Torstenson. Later, during the Silesian War of the Austrian Succession (1740–45), it was invaded again. It was occupied by the French in 1805, before Napoleon's triumph over the combined Austrian and Russian armies at Slavkov (Austerlitz), 7 mi southeast of Brno.

The Špilberk fortress was turned into a political prison and military hospital under the Habsburgs. In 1832 the Italian poet Silvio Pellico revealed in his book *Le mie prigioni* ("My Prisons") the horrors of the Špilberk dungeons, where at that time the Carbonari group of Italian patriots was imprisoned by the Austrians.

Gregor Mendel, the monk-geneticist, worked on his theory of heredity (1865) in the monastery at Brno, and the city was the lifetime home of the composer Leoš Janáček.

Despite the ravages of war, many fine old buildings have survived, including the churches of St. Thomas and St. James and the Gothic church of the Augustinian monastery. The old town, with narrow streets, is enclosed by a belt of boulevards, beyond which are several modern housing projects.

The inhabitants, predominantly German prior to World War II, are now mainly Czech. Brno has developed as an educational (Purkyně University, 1919) and industrial centre, famed for its international trade fairs. Manufactures include textiles and metallurgical products. A famous gun, the ZB (later manufactured in Enfield, England, as the Bren gun), was developed at Brno. Pop. (1983 est.) 378,722.

Broach (India): *see* Bharūch.

broaching machine, tool for finishing surfaces by drawing or pushing a cutter called a broach entirely over and past the surface. A broach has a series of cutting teeth arranged in a row or rows, graduated in height from the teeth that cut first to those that cut last. Since the total depth of cut is distributed over all the teeth, each tooth removes only a few thousandths of an inch. Broaching is particularly

suitable for internal surfaces such as holes and internal gears, but it can also shape external gears and flat surfaces. Broaching machines are usually hydraulically operated.

Broad Church, middle-of-the-road movement that emerged as one of the three parties in the Church of England during the second half of the 16th century. The Broad Church represented "broad" views and eschewed narrow expressions of doctrine as practiced by Anglo-Catholics (later High Churchmen) on one hand and anti-Roman Evangelicals (Low Churchmen) on the other. Broad Churchmen in the 19th century were liberal figures in the Anglican Church with decidedly intellectual, rather than political, interests. At the turn of the century they were leaders of the Modernist movement, which demanded "a modern creed for modern man." Broad Churchmen brought to the United States the British Christian Socialism that transformed the socially conservative Episcopal Church into a leading exponent of the Social Gospel.

broad-horned antelope: *see* bongo.

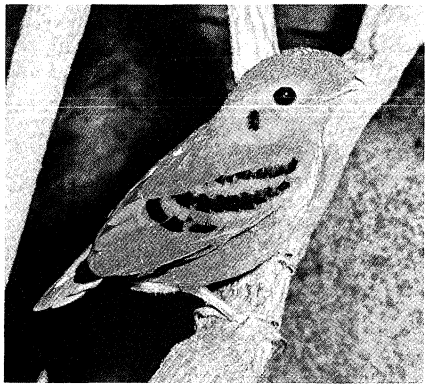
broad jump (sport): *see* long jump.

Broad River, river in North Carolina and South Carolina, U.S., rising on the eastern slope of the Blue Ridge Mountains and flowing southeast into South Carolina, then south through a segment of the Sumter National Forest to Columbia, where, after a course of about 220 mi (350 km), it joins the Saluda River to form the Congaree River. The river is dammed for hydroelectric power near Lake Lure town, N.C., and at Parr Shoals, S.C.

broad-shouldered water strider (insect): *see* smaller water strider.

broadbill, family name EURYLAIMIDAE, any of 14 species of Old World tropical birds constituting the suborder Eurylaimi, order Passeriformes. Broadbills differ from all other passerines (perching birds) in the arrangement of the leg muscles that bend the toes.

Broadbills are chunky birds, 12.5 to 28 centimetres (5 to 11 inches) long, with a short, wide bill having bristles or wattles at the base. They live in forests or swamps, but many visit gardens. All have loud voices—some whistle, others croak—and several produce sounds



Lesser green broadbill (*Calyptomena viridis*)
Kenneth W. Fink from Root Resources—EB Inc.

by wing whirring or bill snapping. Broadbills make hanging nests, usually over water, with a porched side entrance near the top.

Most species live in Malaysia, but some range to India and the Philippines; two genera are isolated in Africa. The Asian species are mainly green or blue; most African types are brownish or grayish, marked with reddish hues or black. Typical of the main group of broadbills, which are sociable and noisy insect eaters, is the 25-cm (10-in.) long-tailed broadbill (*Psarisomus dalhousiae*), which ranges from the Himalayas to Borneo. It has a green body, black-and-yellow head, and a graduated blue tail. A minor group of quiet, solitary fruit eaters is represented by the 15-cm (6-in.) lesser green broadbill (*Calyptomena viridis*), of Malaysia; it is green, with a stubby tail and a puff of feathers over its bill.

broadcasting, electronic transmission of radio and television signals designed for public consumption. It does not include private or military transmissions intended for specific receivers. Generally speaking, broadcast systems deliver a wide range of educational, informational, and entertainment programming to a large audience.

A brief treatment of broadcasting follows. For full treatment, *see* MACROPAEDIA: Broadcasting.

After Guglielmo Marconi's pioneering wireless broadcast of Morse code across the Atlantic Ocean in 1901, experiments in practical radio communication were vigorously pursued on both sides of the Atlantic. Radiobroadcasting was first undertaken in the United States by amateur enthusiasts, one of whom aired the first known program on Christmas Eve of 1906. This transmission was typical of the noncommercial nature of early broadcasts. The rapid development of technology increased public demand for equipment and programming, and the first commercial station, KDKA of Pittsburgh, became operational in November 1920; by November 1922 there were 564 licensed radio-broadcasters in the United States.

Rapid expansion, however, brought problems. The establishment of the first broadcasting network, in 1926, made radio into a national industry. Profits from advertising revenues and equipment sales turned the broadcasting systems into a powerful economic force. Because the industry was essentially unregulated, monopolistic practices evolved, with receiver manufacturers establishing favourable business relations with certain broadcasting companies. The federal government responded with the Radio Act of 1927, which clearly delineated the rights of both consumers and producers and created the Federal Communications Commission to oversee broadcast operations.

The 1930s and 1940s were the "golden era of radio." As broadcasters learned how to utilize the medium, new types of drama, light entertainment, and documentary programming were developed; traditional art forms (especially stage drama and music) were also transmitted with success.

During this time, regular television broadcasting began in several countries, including Germany (1935), Britain (1936), and the United States (1941). World War II severely restricted the growth of the new industry, but after the war it developed rapidly, especially in the United States. Television stations often began as subsidiaries of existing radio networks, with shared administrative and creative policies, but the new service swiftly superseded the older medium in importance to become the most powerful and pervasive mode of communication in the industrialized nations of the world. Colour-television broadcasts were inaugurated in 1954, but the widespread use of colour sets did not begin until a decade later. The development of satellite transmission of live television, videotape and videodisc machines, and subscription-television systems has vastly expanded the entertainment choices available in private homes.

Radio and television systems can generally be categorized by two criteria: the legal and commercial status of administration and ownership, and the nature and intent of the programming offered to the audience. All broadcasting organizations are to some degree subject to government control, but state-operated systems are directly controlled through government agencies or departments. They often serve as conduits for official information and programming, as is the case in the Soviet Union. Public corporations, on the other hand, are licensed, chartered, and financed by government grants and public subscription but exercise complete control over administrative and creative policy. The British Broadcasting Corporation (BBC) is generally acknowledged as a prototype in this area.

Radiotelevisione Italiana is an example of a partnership between government and private enterprise. The Italian government owns the largest share of its stock but exercises no direct control over editorial decisions. The system is instead managed by a nonpartisan committee, with input from private stockholders. Operating revenue is generated by both advertising sales and government stipend. Privately owned and operated systems predominate in the United States, and there are equivalent companies worldwide. Almost all these systems are commercial in structure and derive profit from the sale of advertising time to sponsors.

Publicly franchised corporations are usually sensitive to audience taste and, freed from commercial considerations, are able to provide programming of a challenging or controversial nature. Commercial broadcasters, however, must attract a large audience to ensure the success of their advertising promotions, and they are quick to cancel or alter programs that do not generate a wide appeal. Most avoid material that is challenging or of limited interest, and concentrate instead on programs that have the broadest appeal, such as adventure, drama, comedy, and sports.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Broadland, district, county of Norfolk, England, north and east of Norwich. It has an area of 213 sq mi (552 sq km) and takes its name from The Broads (*q.v.*), which contribute to its distinctive aquatic landscape. Most of the district, however, is rich arable land, even the alluvial valley floor having long been embanked and drained. The tourist industry operates from Wroxham; Blickling Hall, a National Trust property, and many fine churches also attract tourists. Pop. (1982 est.) 98,100.

Broads, The, system of inland waterways in the county of Norfolk, England, consisting of shallow lakes formed by the broadening of the Rivers Bure and Yare, which connect many of the waterways. The individual Broads vary in size from mere pools to the 296-ac (120-ha) expanse of Hickling. Of some 40 Broads, only 16, with a total area of less than 1,000 ac, are available for public navigation, the rest being inaccessible or too shallow and remaining a sanctuary for wildlife.

The Broads are flooded peat diggings excavated in the Middle Ages when the sea level was appreciably lower than it is today. With their fringing marshes (fens) they support rare species of birds, plants, and insects. Although the fens still provide reed and sedge for thatching, the main use of The Broads is for recreation (sailing, fishing, bird-watching), and they are alive with vacationers in summer.

broadside ballad, form of popular verse printed on broadsides (large sheets printed on one side). Broadside ballads appeared shortly after the invention of printing in the 15th century and were hawked in streets, fairs, and marketplaces of Europe into the 19th century. Typical broadsides included hack-written topical ballads on recent crimes, executions, or disasters. Many ballads passed into the oral tradition from broadside origins. Although older texts were often "beautified" by the ad-

dition of flowery, sentimental, or moralizing language, broadsides also preserved versions of traditional ballads that might otherwise have disappeared from popular tradition. *See also* good-night.

Broadstairs and Saint Peter's, parish (town), Thanet district, county of Kent, England. The parish lies east of Canterbury, on the east coast of the Isle of Thanet. Hengist and Horsa, brothers who were legendary leaders of the first Anglo-Saxons in Britain, landed nearby in the 5th century. Kingsgate, previously St. Bartholomew's Gate, commemorates the landing of Charles II in 1683 on his way from London to Dover. In the 1840s the town was frequented by Charles Dickens, and tablets mark the houses associated with him, notably Bleak House, atop a cliff near the pier. Pop. (1981) 23,447.

Broadway, parish, Wychavon district, county of Hereford and Worcester, England, at the foot of the Cotswolds escarpment, which is crowned by the Beacon Tower built in 1797. The village of Broadway is much frequented by tourists attracted by its Tudor and Jacobean houses built of Cotswold stone. Notable

Cotswold stone houses along High Street, Broadway, Hereford and Worcester
J. Allan Cash—EB Inc.

buildings include the Norman church, a 14th-century abbot's grange (once housing the abbots of nearby Evesham), the gatehouse of Broadway Court, and the 17th-century Lygon Arms hostelry. Pop. (1981) 2,403.

Broadway, New York City thoroughfare that traverses the length of Manhattan, and near the middle of which are clustered the theatres that have long made it the foremost showcase of commercial stage entertainment in the United States; the term Broadway was at one time virtually synonymous with American theatrical activity.

Broadway gained its name as the axis of an important theatre district in the mid-19th century, attracting impresarios with its central location and fashionable reputation. The number, size, and magnificence of the Broadway theatres grew with New York City's prosperity and power, until, in the 1890s, the brilliantly lighted street became known as "The Great White Way."

Impelled by growing U.S. wealth and cultural aspirations and unrivaled by other forms of popular entertainment, theatrical activity on Broadway soared to its peak in the late 1920s, a high point from which it has suffered a continuous decline. Broadway's theatres, numbering about 20 at the turn of the century, reached an all-time high of 80 in 1925; by 1980, only 40 remained (few of which were located on Broadway itself; rather, they were just east or west of Broadway, generally between 41st and 53rd streets). The record season of 1927–28 saw 280 new productions open on Broadway; there are considerably fewer in recent decades. *See also* Off-Broadway.

Broadwood, John (b. Oct. 1732, Cockburnspath, Berwickshire, Scot.—d. 1812, London), British maker of harpsichords and pianos and founder of the oldest existing firm of piano manufacturers.

Broadwood, a cabinetmaker, was working for the prominent Swiss-born harpsichord maker Burkat Shudi (Burkhardt Tschudi) in London in 1761. He married Shudi's daughter in 1769 and the following year became his partner, an association that lasted until Shudi's death in 1773. Thereafter, Broadwood worked with his brother-in-law, taking over the business entirely in 1782. His son James Shudi Broadwood (1772–1851) became a partner in 1795, and the firm remains under direction of the same family.

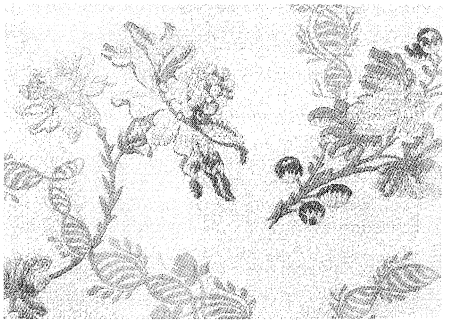
John Broadwood's first piano (1773) was a square instrument modeled after those of Johann Zumpe, a German-born pianoforte maker who worked for a time with Shudi and who built the first square pianos. By 1780 Broadwood was making square pianos after an original design. The first known Broadwood grand piano dates from 1781. His grand pianos used added damper and soft pedals resembling those on modern grands. Among many later improvements and patents is the divided bridge (1788), which allows bass and treble strings to affect the soundboard independently; this arrangement became the model for most later grand pianos.

Other members of the Broadwood family were active musically, particularly Lucy Broadwood (1858–1929), who collected and published English folk songs.

Broca, Paul (b. June 28, 1824, Sainte-Foy-la-Grande, Fr.—d. July 9, 1880, Paris), surgeon who was closely associated with the development of modern physical anthropology in France and whose study of brain lesions contributed significantly to understanding the origins of aphasia, the loss or impairment of the ability to form or articulate words. He founded the anthropology laboratory at the École des Hautes Études, Paris (1858), and the Société d'Anthropologie de Paris (1859).

Much of Broca's research concerned the comparative study of the craniums of the races of mankind. He used original techniques and methods to study the form, structure, and topography of the brain and sections of prehistoric craniums. In 1861 he announced his discovery of the seats of articulate speech in the left frontal region of the brain, since known as the convolution of Broca. Thus, he also furnished the first anatomical proof of the localization of brain function. Founder of the *Revue d'anthropologie* (1872), he established the École d'Anthropologie, Paris (1876), and became its director. His writings include *Mémoires d'anthropologie,* 5 vol. (1871–78; "Memoirs of Anthropology").

brocade, in textiles, woven fabric having a raised floral or figured design that is intro-



Detail of handwoven Italian silk brocaded on silk with floral motif, c. 1730–50
By courtesy of Scalamandre, New York City

duced during the weaving process, usually by means of a Jacquard attachment. The design, appearing only on the fabric face, is usually made in a satin or twill weave.

The background may be twill, satin, or plain weave. The rich, fairly heavy fabric is frequently used for evening dresses, draperies, and upholstery.

broccoli (*Brassica oleracea,* Italica group), form of cabbage (*q.v.*) of the mustard family (Brassicaceae). Broccoli is a fast-growing, upright, branched, annual plant, 600–900 millimetres (24–35 inches) tall that bears dense

Broccoli (*Brassica oleracea* variety *italica*)
G.R. Roberts

green clusters of flower buds at the ends of the central axis and the branches. In Great Britain the term broccoli refers to the cauliflower (*q.v.; Brassica oleracea,* Botrytis group). Native to the eastern Mediterranean and Asia Minor, sprouting broccoli was cultivated in Italy in ancient Roman times and was introduced into England about 1720 and to America probably in colonial times. It thrives in moderate to cool climates and is propagated by seeds, either sown directly in the field or in plant beds to produce transplants. Broccoli reaches harvest in 60 to 150 days, depending upon the variety and the weather. The flavour of broccoli resembles that of cabbage but is somewhat milder.

Fresh broccoli should be dark green in colour, with firm stalks and compact bud clusters; as a vegetable it is served raw or cooked.

Broch, Hermann (b. Nov. 1, 1886, Vienna—d. May 30, 1951, New Haven, Conn., U.S.), German writer who achieved international recognition for his "multidimensional novels," in which he used innovative literary techniques to present a wide range of human experience.

At the age of 29 Broch renounced his inheritance by selling his family's textile mill and returning to the University of Vienna in order to pursue studies in physics, mathematics, and philosophy. His first major work was the trilogy *Die Schlafwandler* (1931–32; *The Sleepwalkers*), which traces the disintegration of European society between 1888 and 1913, depicting the triumph of the realist over the romanticist and the anarchist. Paralleling the historical process, the novel moves from a subtle parody of 19th-century realism through expressionism to a juxtaposition of many different forms, including poetry, drama, narrative, and essay.

Between 1934 and 1936 Broch worked on *Der Versucher* (1953; "The Seducer"), which exemplifies his theory of mass hysteria in the portrayal of a Hitlerian stranger's domination of a mountain village.

In 1935 Broch spent five months in a Nazi prison. His release was obtained through the international efforts of friends and fellow artists, including James Joyce. In 1940 he emigrated to the United States, where he was less widely known than in Europe.

One of Broch's later works is *Der Tod des Virgil* (1945; *The Death of Virgil,* 1945), which presents the last 18 hours of Virgil's life, in which he reflects on his times, an age of transition that Broch considered similar to his own. Broch later turned from literature to devote himself to political theory and attempts to aid European refugees.

His other works include *Die unbekannte*

Grösse (1933; *The Unknown Quantity*), *Die Schuldlosen* (1950; "The Innocents"), and numerous essays, letters, and reviews.

brochantite, a copper sulfate mineral, its chemical formula being $Cu_4SO_4(OH)_6$. It is ordinarily found in association with malachite, azurite, and other copper minerals in the oxidized zone of copper deposits, particularly in arid regions. Occurrences include Gumeshevsk, U.S.S.R.; Nassau, E.Ger.; Rio Tinto, Spain; Krísuvík, Ice.; and the southwestern United States. It is abundant in Arizona and Chile. For detailed physical properties, *see* sulfate mineral (table).

Brock, Sir Isaac (b. Oct. 6, 1769, St. Peter Port, Guernsey, Channel Islands—d. Oct. 13, 1812, Queenston, Upper Canada), British soldier and administrator in Canada, popularly known as the "Hero of Upper Canada" during the War of 1812 against the United States.

Sir Isaac Brock, detail of a watercolour by an unknown artist

By courtesy of the Public Archives of Canada

Brock entered the British Army as an ensign in 1785. He was made lieutenant colonel of the 49th Regiment in 1797, and in 1802 he was sent to Canada, where he was promoted to colonel in 1805 and major general in 1811. In 1810 he had assumed command over all troops in Upper Canada (now in Ontario), and he later took over the civil administration of the province as provisional lieutenant governor. In 1812, with the outbreak of war between Britain and the United States, he energetically undertook the defense of Upper Canada against invasion and organized the militia. On Aug. 15, 1812, with British and Indian troops, against great odds, he took Detroit from American forces; for this achievement he was awarded a knighthood of the Order of the Bath. On October 13 his troops again defeated American forces at the Battle of Queenston Heights on the Niagara frontier, but during the battle he was mortally wounded.

Brock, Sir Thomas (b. March 1, 1847, Worcester, Worcestershire, Eng.—d. Aug. 22, 1922, London), English sculptor best-known for the imperial memorial to Queen Victoria now in front of Buckingham Palace, London.

In all, Brock executed seven statues of Victoria and her portrait design on the coinage of 1897. Among his portrait sculptures are those of British statesman William Gladstone (1902) and the American poet Henry Wadsworth Longfellow (1884), both in Westminster Abbey. His statue of Captain James Cook (1914) stands in the Mall in London. He was knighted in 1911.

Brockdorff-Rantzau, Ulrich, Graf von (count of) (b. May 29, 1869, Schleswig-Holstein, Prussia [now in W.Ger.]—d. Sept. 8, 1928, Berlin), German foreign minister at the time of the Treaty of Versailles and one of the architects of German–Soviet understanding in the 1920s.

As German minister in Copenhagen (1912–18) he supported the Danish policy of neutrality during World War I and was able to maintain German–Danish trade. At the Conference of Paris in 1919 he argued in vain for better conditions of peace for Germany. Unable to dissuade his government from ratifying the Treaty of Versailles, he resigned his post as foreign minister in June 1919. In 1922 he became ambassador to the Soviet Union, where he and Soviet statesman Georgy V. Chicherin worked to consolidate the German–Soviet rapprochement inaugurated by the Treaty of Rapallo. The German–Soviet Treaty of Berlin (April 1926) counterbalanced the Locarno Pact of 1925, which had seemed to link Germany too closely with the Western powers.

Brocken, also spelled BLOCKSBERG, highest point (3,747 feet [1,142 m]) of the Harz Mountains, lying 8 miles (13 km) west-southwest of Wernigerode, East Germany. A huge, granite-strewn dome, the peak commands magnificent views in all directions, and a mountain railway (12 miles [19 km] long) reaches the summit. When the sun is low, shadows cast from the peak become magnified, and seemingly gigantic silhouettes are cast on the upper surfaces of low-lying clouds or fog below the mountain. This effect is known as the Brocken spectre, or Brocken bow, and is given a mystical significance in the mountain's folklore. Long after the introduction of Christianity, traditional rites continued to be enacted there annually on Walpurgis Night, or Witches' Sabbath (April 30). The peak is represented in a famous scene in Goethe's drama *Faust*.

Brocken bow, also called ANTICORONA, GLORY, BROCKEN SPECTRE, or MOUNTAIN SPECTRE, the apparently enormously magnified shadow of an observer cast, when the Sun is low, upon the upper surfaces of clouds that are below the mountain upon which he stands. The apparent magnification of size of the shadow is an optical illusion that occurs when the observer judges his shadow on relatively nearby clouds to be at the same distance as faraway land objects seen through gaps in the clouds. The phenomenon is often observed on mountain peaks but is recorded in literature with special reference to the Brocken, a peak in the Harz Mountains in Germany where the Brocken bow sometimes produces spectacular effects. The observer's shadow is often surrounded by coloured bands or rings that are the result of the diffraction of sunlight by water droplets in the cloud. The phenomenon of rainbowlike bands around a shadow on a cloud is also commonly observed from airplanes flying in sunlight above a cloud layer.

Brockes, Barthold Heinrich (b. Sept. 22, 1680, Hamburg—d. Jan. 16, 1747, Ritzebüttel, Hanover [now in W.Ger.]), poet whose works were among the most popular and influential expressions of the early Enlightenment in Germany.

The scion of a wealthy patrician family, he traveled widely before becoming a merchant in his hometown. In 1720 he was appointed a member of the Hamburg senate, and in 1735 he became a magistrate in Ritzebüttel. Influenced by the 18th-century English poets James Thomson and Alexander Pope, whose works he translated, he wrote nature poetry, such as *Irdisches Vergnügen in Gott* (1721–48; "Earthly Pleasure in God"), in which natural phenomena are described minutely and seen as aspects of God's perfectly ordered universe. One of the first modern German poets to treat nature as a principal subject, he was the forerunner of the new poetic attitude toward nature in German literature that culminated in the works of Heinrich von Kleist (1777–1811) and Albrecht von Haller (1708–77).

brocket (*Mazama*), any of several small deer, family Cervidae (order Artiodactyla), found from Mexico to South America. Timid browsers, brockets inhabit wooded areas and generally live alone or in pairs. There are about four species, among them the brown brocket (*M. gouazoubira*) and the red brocket (*M. americana*). Brockets are stout-bodied deer with arched backs and short tails, standing 43–69 cm (17–27 inches) high at the shoulder. The shade of the brown coat depends on the species. Males have short, unbranched antlers.

The term brocket is also used to designate a two-year-old male red deer (*Cervus elaphus*).

Brockhaus Enzyklopädie, German encyclopaedia published in Wiesbaden, W.Ger., and generally regarded as the model for the development of many encyclopaedias in other languages. Its entries are considered exemplars of the short, information-filled article.

The first edition was published (1796–1808) as *Konversations-Lexikon* by Friedrich Arnold Brockhaus, a 19th-century leader in the encyclopaedia field, who advocated inclusion of the latest material, the simplification of complicated treatments, and the use of highly specific entries. His philosophy was to make easily accessible to school children and to the lay reader readily learned information on all kinds of subjects. Since its origin, *Brockhaus* has maintained an emphasis on popular knowledge and information and an insistence on high-quality illustrations, used lavishly throughout.

Brockhaus' name did not appear in the encyclopaedia's title until the publication of the 15th edition as *Der grosse Brockhaus* (20 volumes and supplement, 1928–35). The 16th edition (1952–63), with 12 volumes, 2 supplementary volumes, and an atlas, reinforced the work's status as a reliable reference set covering an extremely wide range of topics with short articles. A completely revised and reset 17th edition, *Brockhaus Enzyklopädie,* with 21 volumes and 4 supplementary volumes, appeared from 1966 to 1981. Volumes of a revised and reset 18th edition began to be published in 1986.

Brockton, city, Plymouth County, southeastern Massachusetts, U.S. It lies 20 miles (32 km) south of Boston. The lands now occupied by the city were sold by the Indians in 1649 to Myles Standish and John Alden and became part of the Plymouth Colony. The original farming community was part of the town of Bridgewater until 1821 and was called North Bridgewater until renamed for Brockton, Ont., in 1874. Shoe manufacturing began there as early as 1750, and by 1865, with the development of the McKay sewing machine (enabling the stitching of the uppers and soles of shoes) and the demand created by the Civil War, Brockton became a major boot-producing centre. The city's diversified manufactures (in addition to footwear) now include clothing, electronic equipment, machine tools, plastics, and printed materials. The city, which was one of the first to adopt electric street lighting (1884), also pioneered in operating electric-powered streetcars and introduced a widely copied municipal system of inland sewage disposal in 1893. It is the seat of Massasoit Community College (1966). Inc. 1881. Pop. (1986 est.) city, 96,461; metropolitan area (MSA), 187,700.

Brockville, city, seat (1792) of the united counties of Leeds and Grenville, southeastern Ontario, Canada. It lies along the St. Lawrence River, opposite Morristown, N.Y. Founded in about 1790, the settlement was variously known as Elizabethtown, Williamstown, and Charlestown until after the War of 1812, when it was renamed in honour of Major General Sir Isaac Brock. The city is a summer resort and a starting point for boat trips on the St. Lawrence Seaway and through the Thousand Islands. There has been light-industrial development in the area. Inc. village, 1832; town, 1859; city, 1962. Pop. (1981) 19,896.

Brod, Max (b. May 27, 1884, Prague—d. Dec. 20, 1968, Tel Aviv, Israel), Czech-born, German-language novelist and essayist known primarily as the friend of Franz Kafka and as the editor of his major works, which were published after Kafka's death.

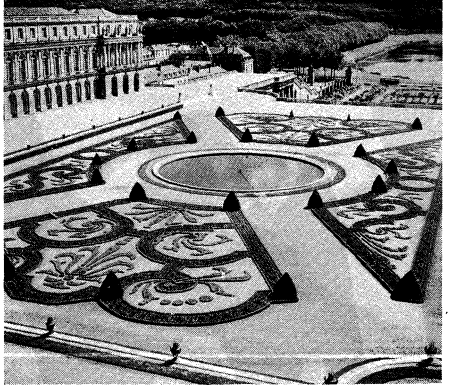
Brod studied law at the University of Prague, and in 1902 he met and befriended Kafka. Brod later worked as a minor government official and as a drama critic. He was an active Zionist from 1912, and he went to Palestine in 1939, fleeing the Nazi invasion of Czechoslovakia. He subsequently worked as a drama adviser to the Habima theatre company in Tel Aviv.

Brod and Kafka remained lifelong friends. The latter had instructed Brod to destroy his unpublished manuscripts after his death, but Brod defied the wishes of his late friend and instead edited and published the materials in the 1930s. Brod's own numerous novels, blending fantasy, mysticism, and eroticism, are written in a direct style. His most famous work is a historical novel, *Tycho Brahes Weg zu Gott* (1916; *The Redemption of Tycho Brahe*). Other novels, such as *Die Frau, nach der man sich sehnt* (1927; *Three Loves*) and *Zauberreich der Liebe* (1928; "The Magic Realm of Love"), deal sensitively with the problems of love. His *Franz Kafka, eine Biographie* (1937; *Franz Kafka: A Biography*), presents a highly developed, personal point of view. Brod also edited Kafka's diaries (1948–49) and letters (1954 and 1958).

Among Brod's other works are collections of essays, *Heidentum, Christentum, Judentum* (1921; *Paganism, Christianity, Judaism: A Confession*) and *Diesseits und Jenseits,* 2 vol. (1946–47; "On This Side and on the Other Side"), which attempt to define a modern Zionist's intellectual position.

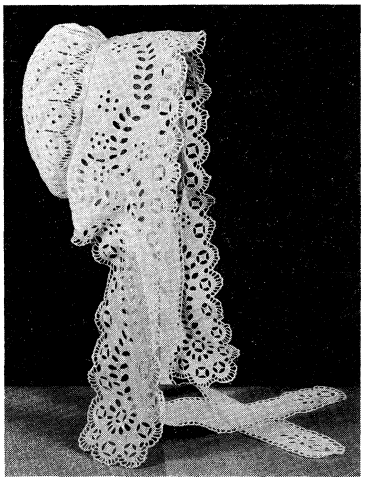
broderie, also called PARTERRE DE BRODERIE (French: "parterre of embroidery"), type of parterre garden evolved in France in the late 16th century by Étienne Dupérac and characterized by the division of paths and beds to form an embroidery-like pattern. The patterns were flowing ribbons of form (generally of formalized foliate design) rather than the angular shapes typical of other types of parterre; and the various beds into which the parterre was divided by paths were coordinated in a single symmetrical design.

The great masters of the *parterre de broderie* were the French gardeners Claude Mollet, André Le Nôtre (*q.v.*), and Alexandre-Jean-Baptiste Le Blond (*q.v.*). The finest examples were in gardens such as at Hampton Court in England and Versailles in France. With other artificial elaborations the *parterre de broderie* went out of fashion in the 18th century when the natural-appearing, or English, garden became fashionable.



Parterre de broderie, Versailles, Fr.
Jean Roubier

broderie anglaise (French: "English embroidery"), form of whitework embroidery in which round or oval holes are pierced in the material (such as cotton), and the cut edges then overcast; these holes, or eyelets, are grouped in a prearranged pattern that is further delineated by means of simple embroidery stitches on the surrounding material. The technique originated in 16th-century Europe and was not confined to England as its name would imply. In the 19th century it was much used on nightwear and underclothing, transfers being used to rough out the design. Present-day *broderie anglaise* is generally done by machine.



Bonnet decorated with *broderie anglaise,* English, first half of the 19th century; in the Victoria and Albert Museum, London
By courtesy of the Victoria and Albert Museum, London

Brodsky, Joseph, original Russian name IOSIP ALEKSANDROVICH BRODSKY (b. May 24, 1940, Leningrad), Russian-born poet who was awarded the Nobel Prize for Literature in 1987 for his important lyric and elegiac poems.

Brodsky left school at age 15 and thereafter began to write poetry while working at a wide variety of jobs. He began to earn a reputation in the Leningrad literary scene, but his independent spirit and his irregular work record led to his being charged with "social parasitism" by the Soviet authorities, who sentenced him in 1964 to five years of hard labour. The sentence was commuted in 1965 after prominent Soviet literary figures protested it. Exiled from the Soviet Union in 1972, Brodsky lived thereafter in the United States, becoming a naturalized U.S. citizen in 1977. He was a poet-in-residence intermittently at the University of Michigan, Ann Arbor, from 1972 to 1980 and was a visiting professor at other schools.

Brodsky's poetry addresses personal themes and treats in a powerful, meditative fashion the universal concerns of life, death, and the meaning of existence. His earlier works, written in Russian, include *Stikhotvoreniya i poemy* (1965; "Verses and Poems") and *Ostanovka v pustyne* (1970; "A Halt in the Wasteland"); these and other works were translated by George L. Kline in *Selected Poems* (1973), which includes the notable "Elegy for John Donne." His more important works, in Russian and English, include the poetry collections *A Part of Speech* (1980) and *History of the Twentieth Century* (1986) and the essays collected in *Less Than One* (1986).

Broek, J(ohannes) H(endrik) van den (b. Oct. 4, 1898, Rotterdam), Dutch architect who, with Jacob B. Bakema, was particularly associated with the post-World War II reconstruction of Rotterdam.

He graduated from Delft Technical University in 1924 and began his architectural practice in 1927 in Rotterdam. In 1937 he formed a partnership with Johannes Andreas Brinkman, and in 1948 he formed a partnership with Jacob B. Bakema. A notable early project was the Lijnbaan Shopping Centre, Rotterdam (1953). Other projects of the 1950s included department stores in Rotterdam, school buildings in Brielle (1948–57) and Rotterdam (1958), churches at Schiedam (1957) and Nagele (1959), a large housing development at Hengelo (1957–59), and The Netherlands Pavilion at the Brussels World's Fair (1958). His later projects include buildings for Delft Technical High School (1965) and the civic centre at Marl, W.Ger. (1960–67).

Brofeldt, Johannes (Finnish fiction writer): *see* Aho, Juhani.

'Brog-mi (b. 992, Tibet—d. 1072), Tibetan monk and eccentric mystic.

He studied for one year in Nepal and for eight years at Vikramashila (Bihār, India). Coming under the influence of Atīśa, an Indian Buddhist who arrived in Tibet in about 1042, 'Brog-mi took a leading part in the revival of Tibetan Buddhism. He founded a new and powerful order known as Sa-skya-pa. In 1073 his disciple Dkon-mchog rgyal-po established the great Sa-skya monastery.

Brøgger, Waldemar Christofer (b. Nov. 10, 1851, Christiania, now Oslo—d. Feb. 17, 1940, Oslo), Norwegian geologist and mineralogist whose research on Permian igneous rocks (from 225,000,000 to 280,000,000 years old) of the Oslo district greatly advanced petrologic (rock-formation) theory.

In 1881 he became professor of mineralogy and geology at the University of Stockholm, where he set up an outstanding mineralogical institute. Nine years later he became professor at the University of Oslo, a post he held until 1917. There he studied Permian rocks and carried out pioneering work on the theory of magmatic differentiation (the separation of molten magma into heterogeneous rocks). His work revealed much about the mineralogy of the rocks of southern Norway and the Oslo region. His studies of glacial deposits revealed a great deal about the former distribution of land ice in southern Norway. Brøgger was a member of the Norwegian Parliament (1900–06) and served as rector of the University of Oslo.

Broglie, DUKES OF, titled French nobility descended from a Piedmontese family of the 17th century, grouped below chronologically and indicated by the symbol •.

• **Broglie, François-Marie, 1er duc de** (1st duke of) (b. Jan. 11, 1671—d. May 22, 1745), general and marshal of France during the reigns of Louis XIV and Louis XV.

He served continuously in the War of the Spanish Succession and again in Italy in 1733–35, being made marshal of France in 1734. In 1742, during the War of the Austrian Succession, he was appointed to command the French army in Germany, but he had always been the "man of small means," safe, cautious, and lacking in daring. His only success was in the action of Sahay in Bohemia on May 24–25, 1742, for which he was created duc de Broglie in the following June.

• **Broglie, Victor-François, 2e duc de** (2nd duke of) (b. Oct. 19, 1718—d. March 30, 1814, Münster, Westphalia), marshal of France under Louis XV and Louis XVI, who became one of the émigrés during the French Revolution.

He served with his father, the first duke, in Italy and took part, during the War of the Austrian Succession, in the storming of Prague (1741) and in the campaigns on the Rhine (1744–45) and in the Netherlands

(1747). During the Seven Years' War, his victory over Ferdinand of Brunswick at Bergen (near Frankfurt) in 1759 won him the rank of marshal of France from Louis XV and that of prince of the Holy Roman Empire from the emperor Francis I. Early in July 1789, Louis XVI put him in command of the troops gathered around Versailles with a view to checking the disorders that were to develop into the Revolution and made him minister of war. This attempt was short-lived, and within a few days Broglie had to emigrate.

• Broglie, (Achille-Charles-Léonce-) Victor, 3e duc de (3rd duke of) (b. Nov. 28, 1785, Paris—d. Jan. 25, 1870, Paris), French politician, diplomat, and, from 1835 to 1836, prime minister, who throughout his life campaigned against reactionary forces.

Taken into the imperial council of state as *auditeur* in 1809, Broglie was sent by Napoleon on diplomatic missions to various countries as attaché. In June 1814, under the First Restoration, he was included in Louis XVIII's Chamber of Peers. There, after the Hundred Days, he distinguished himself by his courageous defense of Marshal Ney, for whose acquittal he, alone of all the peers, both spoke and voted.

In politics under Louis XVIII and Charles X, Broglie identified himself with the Doctrinaires, a small but active group that advocated constitutional monarchy and was in charge of drafting the liberal press law adopted during Louis XVIII's reign. In 1826 Broglie attacked the bills on primogeniture designed to prevent equal distribution of property among descendants.

After the July Revolution of 1830, the duc de Broglie was minister of education for a few months and later took office as minister for foreign affairs. His main efforts were directed toward establishing closer relations between France and Great Britain. He retired from office in April 1834. The following March he became prime minister and in this capacity passed strong measures against seditious activities. Resigning the prime ministership in February 1836, he held himself aloof from politics until 1848, though in May 1847 he was ambassador to London.

The Revolution of 1848 greatly disturbed the duc de Broglie because it represented for him the destruction of the principles of parliamentary rule. Elected deputy for Eure in May 1849 and as a member of the conservative group known as the "Burgraves," he did his best to stem the tide of socialism and to avert the reaction in favour of autocracy. After the coup d'état of Dec. 3, 1851, he was one of the bitterest enemies of Napoleon III's regime. From 1855 he was a member of the Académie Française. The last 20 years of his life were devoted chiefly to philosophical and literary pursuits. His writings include *Vues sur le gouvernement de la France* (1861), *Écrits et discours,* 3 vol. (1863), *Le Libre Échange et l'impôt* (1879; "Free Trade and Taxation"), and *Souvenirs,* 4 vol. (1885–88).

• Broglie, (Jacques-Victor-) Albert, 4e duc de (4th duke of) (b. June 13, 1821, Paris—d. Jan. 19, 1901, Paris), French statesman and man of letters who served twice as head of the government during the early crucial years of the Third French Republic but failed to prepare the way for the return of a king.

After a brief diplomatic career at Madrid and Rome, Broglie withdrew from public life at the Revolution of 1848. He had already published a translation of the religious system of Leibniz (1846). He contributed to the *Revue des Deux Mondes* and to the Orleanist and clerical organ *Le Correspondant.* He was elected to the Académie Française in 1862, while his work *L'Église et l'empire romain au IVe siècle,* 6 vol. (1856–66), was still incomplete.

In February 1871 the duc de Broglie was elected to the National Assembly as deputy for Eure. A few days later he was appointed ambassador to London. In March 1872, because of heavy criticism of his negotiations of trade and commercial treaties between Great Britain and France, he resigned his foreign post and took his seat in the National Assembly, where he became a leading spirit of the conservative campaign against Adolphe Thiers, then president of the republic.

On the replacement of Thiers by the conservative Marshal Mac-Mahon, the Duc became president of the council, or premier, and minister for foreign affairs (May 1873) and later of the interior (November 26). His ministry was marked by an extreme conservatism that provoked the bitter hatred of republicans. He also alienated the Legitimists by his friendly relations with the Bonapartists and the Bonapartists by an attempt to effect a compromise between the rival claimants to the monarchy. The Cabinet fell on May 18, 1874.

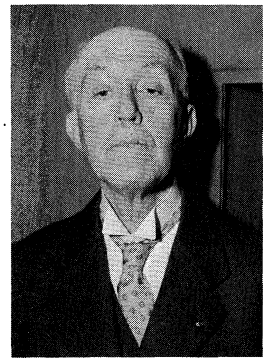
Three years later (May 16, 1877) Broglie was entrusted by Mac-Mahon with the formation of a new Cabinet, but this proved unable to earn a vote of confidence from the new republican majority in the Chamber. Forced to resign (November 20), he was not reelected in 1885 and abandoned politics for historical work. His *Mémoires,* 2 vol., were published in 1938–41.

• Broglie, (Louis-César-Victor-) Maurice, 6e duc de (6th duke of) (b. April 27, 1875, Paris—d. July 14, 1960, Neuilly, Fr.), French physicist who made many contributions to the study of X rays.

After graduating from the École Navale (Naval School), he served as a naval officer for nine years. He turned to the physical sciences about 1904 and founded his own well-equipped laboratory at the family mansion in Paris, where he and other physicists collaborated in experimentation, especially relating to atomic structure. He improved the accuracy of X-ray spectrography by introducing the rotating crystal method and used X-ray techniques to measure the forces binding various groups of electrons to the atomic nucleus. He was elected to the Académie Française in 1934 and became a foreign member of Britain's Royal Society in 1946. From 1942 to 1946 he was a professor at the Collège de France. On his death without direct heirs, the ducal title passed to his brother, Louis.

• Broglie, Louis-Victor (-Pierre-Raymond), 7e duc de (7th duke of) (b. Aug. 15, 1892, Dieppe, Fr.—d. March 19, 1987, Paris), French physicist best known for his research on quantum theory and for his discovery of the wave nature of electrons. He was awarded the 1929 Nobel Prize for Physics.

Early life. Broglie was the second son of a member of the French nobility. From the Broglie family, whose name is taken from a small town in Normandy, have come high-ranking soldiers, politicians, and diplomats since the 17th century. In choosing science as a profession, Louis de Broglie broke with family tradition, as had his brother Maurice (from whom, after his death, Louis inherited the title of duc). Maurice, who was also a physicist and made notable contributions to the experimental study of the atomic nucleus, kept a well-equipped laboratory in the family mansion in Paris. Louis occasionally joined his brother in his work, but it was the purely conceptual side of physics that attracted him. He described himself as "having much more the state of mind of a pure theoretician than that of an experimenter or engineer, loving especially the general and philosophical view. . . ." He was brought into one of his few contacts with the technical aspects of physics during World War I, when he saw army service in a radio station in the Eiffel Tower.



Louis-Victor Broglie, 1958
AP/Wide World Photos

Broglie's interest in what he called the "mysteries" of atomic physics—namely, unsolved conceptual problems of the science—was aroused when he learned from his brother about the work of the German physicists Max Planck and Albert Einstein, but the decision to take up the profession of physicist was long in coming. He began at 18 to study theoretical physics at the Sorbonne, but he was also earning his degree in history (1909), thus moving along the family path toward a career in the diplomatic service. After a period of severe conflict, he declined the research project in French history that he had been assigned and chose for his doctoral thesis a subject in physics.

Theory of electron waves. In this thesis (1924) Broglie developed his revolutionary theory of electron waves, which he had published earlier in scientific journals. The notion that matter on the atomic scale might have the properties of a wave was rooted in a proposal Albert Einstein had made 20 years before. Einstein had suggested that light of short wavelengths might under some conditions be observed to behave as if it were composed of particles, an idea that was confirmed in 1923. The dual nature of light, however, was just beginning to gain scientific acceptance when Broglie extended the idea of such a duality to matter.

Broglie's proposal answered a question that had been raised by calculations of the motion of electrons within the atom. Experiments had indicated that the electron must move around a nucleus and that, for reasons then obscure, there are restrictions on its motion. Broglie's idea of an electron with the properties of a wave offered an explanation of the restricted motion. A wave confined within boundaries imposed by the nuclear charge would be restricted in shape and, thus, in motion, for any wave shape that did not fit within the atomic boundaries would interfere with itself and be canceled out. In 1923, when Broglie put forward this idea, there was no experimental evidence whatsoever that the electron, the corpuscular properties of which were well established by experiment, might under some conditions behave as if it were radiant energy. Broglie's suggestion, his one major contribution to physics, thus constituted a triumph of intuition.

The first publications of Broglie's idea of "matter waves" had drawn little attention from other physicists, but a copy of his doctoral thesis chanced to reach Albert Einstein, whose response was enthusiastic. Einstein stressed the importance of Broglie's work both explicitly and by building further on it. In this way the Austrian physicist Erwin Schrödinger learned of the hypothetical waves, and on the basis of the idea, he constructed a mathematical system, wave mechanics, that has become an essential tool of physics. Not until 1927, however, did Clinton Davisson and Lester Germer in the United States and George Thomson in

Scotland find the first experimental evidence of the electron's wave nature.

Later career and writings. After receiving his doctorate, Broglie remained at the Sorbonne, becoming in 1928 professor of theoretical physics at the newly founded Henri Poincaré Institute, where he taught until his retirement in 1962. He also acted, after 1945, as an adviser to the French Atomic Energy Commissariat.

In addition to winning the Nobel Prize for Physics, Broglie received, in 1952, the Kalinga Prize, awarded by the United Nations Economic and Social Council, in recognition of his writings on science for the general public. He was a foreign member of the British Royal Society, a member of the French Academy of Sciences, and, like several of his forebears, a member of the Académie Française.

Broglie's keen interest in the philosophical implications of modern physics found expression in addresses, articles, and books. The central question for him was whether the statistical considerations that are fundamental to atomic physics reflect an ignorance of underlying causes or whether they express all that there is to be known; the latter would be the case if, as some believe, the act of measuring affects, and is inseparable from, what is measured. For about three decades after his work of 1923, Broglie held the view that underlying causes could not be delineated in a final sense, but, with the passing of time, he returned to his earlier belief that the statistical theories hide "a completely determined and ascertainable reality behind variables which elude our experimental techniques." (B.L.C.)

BIBLIOGRAPHY. Some of the popular writings of Broglie have been translated into English: *Matter and Light: The New Physics* (1939); *The Revolution in Physics* (1953); *Physics and Microphysics* (1960); and *New Perspectives in Physics* (1962). An account of his work may be found in Barbara Lovett Cline, *The Questioners: Physicists and the Quantum Theory* (1965).

broiling, cooking by exposing food to direct radiant heat, either on a grill over live coals or below a gas burner or electric coil. Broiling differs from roasting and baking in that the food is turned during the process so as to cook one side at a time. Temperatures are higher for broiling than for roasting; the broil indicator of a household range is typically set around 550° F (288° C), whereas larger commercial appliances broil between 700° and 1,000° F (371° and 538° C).

Fish, fowl, and most red meats are suitable for broiling. Steaks, popularly broiled over coals, can also be broiled in skillets or in the oven set on a seasoned wooden plank. In preparation of the entrée known as the London broil, or London mixed grill, flank steaks and other meats are garnished with vinegar, oil, and minced garlic before being placed on a rack and oven-broiled.

Broken Bay, inlet of the Tasman Sea (Pacific Ocean), indenting east-central New South Wales, Australia. It receives the Hawkesbury and Pittwater rivers, and its 3-mile-(5-kilometre-) wide entrance, flanked by Hawke, or Box, Head (north) and Barranjoey Head (south), leads to an interior broken into three small inlets: Pittwater (south), Cowan Creek (central), and Brisbane Water. Visited in 1770 by Captain James Cook, who logged it as "some broken land like a bay," it was more fully explored in 1789 by Governor Arthur Phillip. Its shores now form a popular resort and outer suburban area for Sydney (15 miles [24 km] south). The principal towns along it are Gosford and Woy Woy. The Ku-Ring-Gai Chase National Park extends along the Pittwater, and Cowan Creek and Lion Island are at the bay's mouth.

Lion Island, at the mouth of Broken Bay, New South Wales

Picturepoint, London

Broken Glass, Night of (Germany): *see* Kristallnacht.

Broken Hill, mining city, west-central New South Wales, Australia. It lies on the eastern flank of the Main Barrier Range, 30 miles (50 km) east of the South Australian border. Known as the Silver City, it is situated on one of the world's richest deposits of silver, lead, and zinc ores. The site, in a hot and subarid region, was first visited in 1844 by Charles Sturt, who named the humpbacked range Broken Hill. The settlement was founded after the discovery of lead and silver there in 1883. Mining operations were developed by the Broken Hill Proprietary Company, Ltd. (BHP), formed in 1885 (the company is now Australia's largest industrial enterprise, although it withdrew from Broken Hill in 1939). Declared a municipality in 1888, Broken Hill was made a city in 1907. The Barrier Industrial Council, an amalgamation of labour unions formed in 1925, exerts considerable control over the city's civic affairs.

The mining field is one of Australia's greatest mineral assets, by the late 20th century having produced a huge quantity of ore (Australia is the world's largest exporter of lead, and most of its recorded production of lead has come from Broken Hill). Crude ore is milled in the city; lead concentrates are then shipped to Port Pirie (South Australia) for refining. Zinc concentrates for smelting and refining are sent by railway to Cockle Creek or Port Pirie or are exported to Tasmania. Both concentrates are a source of sulfur for the manufacture of sulfuric acid. The city is also the centre of the West Darling pastoral area. Broken Hill's commercial relations are principally with South Australia, because a rail connection was completed to Adelaide, 340 miles (550 km) southwest, in 1887, and there was no such link to Sydney (570 miles [915 km] east) until 1927.

Broken Hill is a modern city with a university college associated with the University of New South Wales, hospitals, shops, and hotels. It is the base for a Royal Flying Doctor Service and a school of the air (which conducts school lessons via radio for outback children). Broken Hill is linked by air and rail to most major Australian cities and is at the junction of the Silver City and Barrier highways. Water is pumped from as far away as the Darling River (70 miles [110 km] east), and the city is actively developing a regeneration area around itself to halt the threat of drift sand coming from land once used for mining. The Menindee Lakes on the Darling form a 40,000-acre (16,000-hectare) recreation area. Pop. (1983 est.) 27,400.

Broken Hill (Zambia): *see* Kabwe.

Broken Hill man: *see* Kabwe man.

Broken Hill Proprietary Company Limited (BHP), largest corporation in Australia, registered in Victoria on Aug. 13, 1885, and engaged today primarily in the production of steel, minerals, and oil and gas. Current headquarters are in Melbourne. The company took its name from Broken Hill (*q.v.*), a city along a range in New South Wales where a rich silver, lead, and zinc lode was discovered in 1883.

In the late 1880s and '90s, Broken Hill had the richest silver mine in the world, and, though the returns on various minerals gradually decreased, BHP's mines there did not close until 1939. In 1900 BHP began its transition to steel, opening iron mines near Spencer Gulf in that year, later experimenting with smelting, and finally in 1915 opening the giant Newcastle Iron and Steel Works in New South Wales. Other collieries and steelworks (such as at Port Kembla, Whyalla, and Kwinana) were developed or purchased over the years so that BHP became—and remains—the enterprise responsible for virtually all the iron and steel production in Australia. To transport the coal, limestone, iron, dolomite, manganese, and other elements of steelmaking, as well as the finished products, BHP operates a huge private fleet, one of the world's largest.

BHP's search for petroleum and gas began in 1954, but active drilling and production began only after 1964, the year that BHP entered into formal collaboration with Esso Exploration Australia, Inc., a subsidiary of Exxon (then called Standard Oil of New Jersey). BHP also has subsidiaries engaged in various other activities, such as wire production, shipbuilding, equipment manufacture, and the production of cement, bricks, and related materials. In 1983 the company acquired a controlling interest in Utah International Inc., a major producer of metallurgical coal in Australia, with holdings in copper, iron ore, and steam coal in various countries.

Almost all BHP industrial sites are in Australia, with only a few sites in New Zealand, New Guinea, Malaysia, Indonesia, and the Philippines.

broken wind (animal disorder): *see* heaves.

Brokopondo, town, central Suriname. The town is located along the Suriname River between the hydroelectric Pheda Dam to the north and the Afobaka Dam to the south. Aluminum is produced from bauxite in Brokopondo, using power from the dams. The town has an airstrip.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

'Brom-ston (b. 1008—d. 1064), Tibetan Buddhist, member of the school of the 11th-century reformer Atīśa. He translated much of the Buddhist sacred literature, including Tantra texts, into classic Tibetan and possibly (*c.* 1060) made the definitive arrangement of the *Kanjur* and *Tanjur,* the two basic Tibetan collections of Buddhist principles.

Bromberg (Poland): *see* Bydgoszcz.

Brome, Richard (d. *c.* 1652), English dramatist generally deemed the most considerable of the minor Jacobean playwrights.

He was originally Ben Jonson's servant and probably acted as his secretary. The relationship developed into friendship, and knowledge of Brome's personal character is chiefly drawn from Jonson's sonnet to "my old faithful servant and by his continued virtue my loving friend . . . Mr. Richard Brome," prefixed to Brome's *Northern Lasse* (published 1632).

Brome was a conscientious and able craftsman, continuing the Elizabethan dramatic tradition until the theatres were closed by order of Parliament in 1642. Filled with pictures of contemporary London and its life, his comedies are of historical value and interest.

The Northern Lasse (produced 1629?) made

Brome's reputation as a dramatist and was the most popular of his plays; although *A Joviall Crew* (acted 1641, published 1652) is consid-

Richard Brome, engraving by Thomas Cross the Elder

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

ered to be his best work. There are 15 of his comedies extant; two volumes of his plays were edited by Alexander Brome (no relation) in 1653 and 1659.

bromegrass, any of the approximately 100 annual and perennial species of weeds and forage grasses in the genus *Bromus* (family Poaceae), found in temperate and cool climates. These grasses have flat, thin leaves and open, spreading flower clusters that are erect or drooping. Most are 30 to 100 centimetres (12 to 40 inches) tall. More than 40 species are found in the United States; about half are native grasses.

Rescue grass (*B. catharticus*), a winter annual introduced from South America into the United States as a forage and pasture grass, and smooth brome (*B. inermis*), a perennial native to Eurasia and introduced into the northern United States as a forage plant and soil binder, are the economically important bromegrasses. The common weed chess (*B. secalinus*), sometimes known as cheat, is found along roadsides and in grain fields. Downy brome or cheatgrass (*B. tectorum*), ripgut grass

Bromegrass (*Bromus*)

Charles Hannum—EB Inc.

(*B. diandrus*), and foxtail brome (*B. rubens*) are dangerous to grazing animals; spines on the spikelets or bracts puncture the animals' eyes, mouths, and intestines, leading to infection and possible death.

Bromeliaceae, the pineapple family of flowering plants (order Bromeliales), containing three subfamilies, about 50 genera, and more than 2,000 species all but one native to tropical America and the West Indies.

A brief treatment of Bromeliaceae follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

Many are short-stemmed epiphytes (plants that grow upon tree branches). The stiff, strap-shaped leaves, usually borne in rosettes, often are edged with spines or are coloured near the base. Many species bear flowers in a long spike, with coloured bracts (leaflike structures) below the flowers or along the spike. The fruit is fleshy in most genera, but a few produce dry pods.

Spanish moss (*q.v.; Tillandsia usneoides*), used as packing material, and the edible fruit of the pineapple (*q.v.; Ananas comosus*) are the major economic products of the family. The pinguin (*Bromelia pinguin*), a red-flowered plant with sword-shaped leaves about 1.2

Pinguin (*Bromelia pinguin*)

Earl L. Kubis from Root Resources—EB Inc.

to 1.8 metres (4 to 6 feet) high, is useful as a hedge plant. Some species are cultivated indoors as ornamentals for their colourful flowers and foliage, such as *Aechmea, Billbergia, Cryptanthus, Dyckia, Guzmania, Hechtia, Neoglaziovia, Neoregelia, Nidularium, Puya, Tillandsia,* and *Vriesea* (*qq.v.*). The leaves of some species of *Aechmea, Ananas, Bromelia, Neoglaziovia,* and *Puya* contain fibres that are made into rope, fabric, and netting. Many genera, such as *Androlepis*, are often displayed in conservatories.

Bromeliales, order of flowering plants, containing a single family, Bromeliaceae, with about 2,000 species of primarily tropical plants. *See* Bromeliaceae.

Bromfield, Louis (b. Dec. 27, 1896, Mansfield, Ohio, U.S.—d. March 18, 1956, Columbus, Ohio), U.S. novelist, essayist, and professional farmer.

The son of a farmer, Bromfield studied agriculture briefly at Cornell University in Ithaca, N.Y., before undertaking the study of journalism at Columbia University. Decorated for his service in the French Army, which he joined at the outbreak of World War I, Bromfield was later awarded an honorary B.A. from Columbia for his distinguished war service. Bromfield served as critic for *Musical America;* as music, theatre, and art critic for the *Bookman;* and as one of the original staff members of *Time* magazine. After marrying in 1923, he moved to a village north of Paris, where he concentrated on his writing. During these expatriate years, he produced his most highly acclaimed novels, including *The Green Bay Tree* (1924), *Possession* (1925), and *Early Autumn* (1926), for which he was awarded the 1926 Pulitzer Prize. Although written in France, these works, along with his best novel, *A Good Woman* (1927), all focussed on life in the U.S.

With the onset of World War II, Bromfield returned to the United States to live and work on his newly acquired farm, Malabar, near Lucas, Ohio. There he continued with his writing, producing *Wild is the River* (1941), *Until the Day Break* (1942), *Mrs. Parkington* (1943), and *What Became of Anna Bolton* (1944). Little of his later work attained the depth or quality of the novels he wrote in France.

bromine (Br), chemical element, deep-red fuming liquid, member of the halogen elements, or Group VIIa of the periodic table. A rare element, bromine is found in nature dispersed throughout the Earth's crust only in compounds, as soluble and insoluble bromides. Some enrichment occurs in ocean water (65 parts per million by weight), in the Dead Sea (approximately 2.7 percent), in some thermal springs, and in rare, insoluble silver bromide minerals. The chief commercial source of bromine is ocean water, from which the element is extracted by means of chemical replacement (oxidation) by chlorine. Antoine-Jérôme Balard in France, first isolated bromine from bitterns (saline liquors) left after the evaporation of Mediterranean Sea water and recognized it as an element in 1826. Bromine thereafter was manufactured as a by-product from bitterns left after the crystallization of the main salt products.

Elemental bromine ordinarily is converted into compounds by the producer. Most of the bromine produced after 1928 and into the late 1970s was used in the manufacture of ethylene dibromide, a liquid added to leaded antiknock gasolines to remove the lead from engine cylinders during combustion. The compound is also used to destroy nematodes and other pests in soil. Bromine also is used in making various dyes and the compounds acetylene tetrabromide and bromoform (used as gauge liquids because of their high specific gravity). Bromides of potassium, sodium, calcium, strontium, lithium, and ammonium have been used widely in medical practice because of their sedative action. Silver bromide (AgBr), an important component of photographic film, is, in common with silver chloride and iodide, light sensitive. Traces of potassium bromate ($KBrO_3$) are added to wheat flour to improve baking characteristics. Other bromine compounds of significance include hydrogen bromide (HBr), a colourless gas used as a reducing agent and a catalyst in organic reactions. A solution of the gas in water is called hydrobromic acid, a strong acid that resembles hydrochloric acid in its activity toward metals or their oxides and hydroxides.

Bromine has a pungent odour and is irritating to the skin, eyes, and respiratory system. Exposure to concentrated bromine vapour, even for a short time, may be fatal. Molecules of the liquid and vapour have two atoms (Br_2) over a wide range of temperatures. The vapour is amber in colour, and the solid is almost black. A saturated solution of bromine in water is orange-red and on cooling yields a red crystalline hydrate (a clathrate, in which bromine molecules are trapped in cagelike spaces within the network of water molecules). Bromine is a strong oxidizing agent, so that it combines violently with certain elements, such as phosphorus, aluminum, and potassium, giving off light. In the presence of moisture, bromine attacks many metals to form bromides. The most stable oxidation state of the element is −1, in which bromine

occurs naturally, but oxidation states of +1 (hypobromite, BrO^-), +3 (bromite, BrO_2^-), +5 (bromate, BrO_3^-), and +7 (perbromate, BrO_4^-) are known. Bromine can be introduced into most organic molecules and can be displaced by other groups more readily than can chlorine. An organic bromo compound resembles the corresponding chloro derivative but is usually more dense, less volatile, less combustible, and less stable. Natural bromine is a mixture of two stable isotopes: bromine-79 (50.54 percent) and bromine-81 (49.46 percent). Of the 17 known radioactive isotopes of the element, bromine-77 has the longest half-life (57 hours).

atomic number	35
atomic weight	79.909
melting point	−7.2° C (19° F)
boiling point	59° C (138° F)
specific gravity	3.12 (20° C)
oxidation states	−1, +1, +3, +5, +7
electronic config.	2-8-18-7 or $(Ar)3d^{10}4s^24p^5$

Bromley, outer borough of Greater London, having an area of 59 sq mi (153 sq km). The borough is largely residential, the suburban development having spread rapidly as a result of its good rail access (since 1860) to central London. It benefits from the preserve of open commons at Hayes and Chislehurst and from parkland at Pett's Wood. The old Kent market town of Bromley has become an important shopping and entertainment centre and has many large office blocks, and light industry along the Cray Valley.

The borough has had a charter since 862. The bishops of Rochester were lords of the manor and resided at Bromley Palace until 1845. Wickham Court (Tudor) is another notable historic building. In the northwestern corner of the borough the Crystal Palace, built of glass for the London Exposition of 1851 in Hyde Park, was re-erected in 1854 on Norwood Heights, overlooking London from the south. It was destroyed by fire in 1936, but the grounds now contain the National Recreation Centre. Chislehurst is known for its "caves," which are in fact 19th-century chalk mines. They were used as air raid shelters during World War II. Pop. (1982 est.) 297,900.

bromomethane: *see* methyl bromide.

Bromsgrove, district, county of Hereford and Worcester, England. Until 1974 it was in the former Worcestershire. The district has an area of 85 sq mi (220 sq km). The town of Bromsgrove has surviving half-timbered houses, including the Hop Pole Inn (1572). Parts of the grammar school were built in 1533, and there are several Georgian houses on High Street. There is a weekly cattle and produce market, and industries include wrought ironwork, forging, button making, nail making, and railway repairs. Between Birmingham and Worcester the district is primarily residential, but agriculture plays an important part. Villages include Catshill, Bournheath, Marlbrook, Blackwell, Barnt Green, and Rubery. Pop. (1981 prelim.) town, 43,673; (1982 est.) district, 88,300.

Bromsulphalein test, also called BSP TEST, or SULFOBROMOPHTHALEIN CLEARANCE TEST, laboratory method for the assessment of liver function. A measured amount of BSP, a synthetic dye that is normally almost entirely removed from the circulation by the liver and excreted into the bile, is injected intravenously; 30–45 minutes later, a sample of blood is drawn from the vein, and the BSP concentration is determined. Normally, 96 percent or more of the injected dye is cleared from the circulation in 30–45 minutes. Abnormal retention of BSP in the blood is usually indicative of impaired liver function but may also be attributed to such conditions as changes in liver blood flow caused by congestive heart failure or a blood clot in the portal vein or from obstruction to bile flow (cholestasis).

bronc-riding: *see* bareback bronc-riding; saddle bronc-riding.

bronchiectasis, an abnormal expansion of the bronchial tubes in the lungs as a result of inflammation and obstruction. Usually the disorder occurs as the result of a preexisting lung disease.

Obstruction of the bronchi can result from tumours, mucus plugs, foreign objects (*e.g.*, coins, food, candy), or abscesses. The obstruction, in turn, may lead to accumulation and stagnation of secretions and infections and loss of tone in the bronchial walls. Short-term infections, such as measles, whooping cough, pneumonia, or influenza, cannot by themselves cause bronchiectasis, but they can cause ulcers or weak spots in the bronchial walls. Chronic infections cause continued inflammation of the bronchial walls. The elastic and muscle fibres tend to degenerate in these circumstances, and this degeneration allows the dilatation of the bronchi. Inflammation can also cause a physiological block, in which paralysis of the bronchial walls prevents the removal of secretions from the tubes by peristaltic action. Once dilatation occurs, secretions tend to accumulate, and infection spreads and intensifies.

Clinically, the disease is manifested by the presence of infective agents and by an overabundance of mucous secretions. Coughing may produce a thick purulent discharge from the passageways. In severe cases, the sputum discharge may be heavy and may have a strong offensive odour. Generally the infection produces fatigue and growth retardation in children. Breathing may become laboured, and the skin acquires a bluish tint. Complications that can arise from bronchiectasis are recurrent pneumonia, lung abscesses, and bleeding and spitting of blood. Chronic bronchiectasis may cause clubbing of the toes and fingers. The diagnosis is generally made by X-ray examinations.

Treatment involves determining which segments of the lungs are afflicted and then draining them two or three times daily. Even after improvement has occurred, drainage is continued for a lengthy period. Antibiotics are administered for a limited time to destroy the infective organisms. If only one lung is diseased, surgical removal of the affected segments can be performed. With control of infection, life expectancy is normal in moderately involved cases.

bronchitis, inflammation of the bronchial walls as a result of infection or irritation. The bronchi are air passageways branching through the lungs. The thin mucous layer that coats the bronchial wall serves to trap dust, soot, and bacteria suspended in the inspired air; the cilia—hairlike motile projections from cells in the lining—act as agents in pushing the debris out of the bronchial tube to the mouth.

The major causative factor of bronchitis is cigarette smoke; dust and other air pollutants contribute to its prevalence. The disease is about four times more common in men than in women, and there is evidence that early childhood environments, especially when there have been excessive colds, other respiratory diseases, poor medical attention, or poor eating habits, play a role in the occurrence of bronchitis later in life.

The acute form of bronchitis, often part of an acute viral infection, causes coughing, mucus in the lungs, sputum discharge, breathlessness, and wheezing. This is a relatively simple condition that usually does not cause significant tissue damage.

Chronic bronchitis is most frequently the result of some preexisting abnormal condition, most commonly bronchial changes due to the inhalation of irritant material. Chronic heart disease produces congestion of blood in the lungs that obstructs or collapses the air sacs, or alveoli, and the bronchi by exerting pressure upon them. Infections of the sinus cavities provide a reservoir of available germs, which can continually reinfect the lungs. Stretching of the bronchial walls, in the condition known as bronchiectasis, can be precipitated by bronchial obstructions such as calcium stones, foreign objects, and tumours. Damaged bronchi are ideal sites for harbouring infections, accumulation of excess fluids, and mucous secretions. Cigarette smoke impairs ciliary activity and causes increased growth of the mucous glands lining the airway. All of these conditions are the primary causes of bronchitis; infections are a secondary result of these disorders.

The disease is self-perpetuating: a physical lung disorder leads to infection and inflammation; the inflammation produces changes in the bronchial walls; these changes enhance the probability of new infections; and new infections cause further tissue destruction. The combination of increased mucus, fewer cilia, and irregularities in the bronchial wall inhibits the removal of mucus, and the wall's protective mechanisms are ineffective. The inner surface of the wall is gradually replaced by fibrous scar tissue; once the functioning cells in the bronchial walls are destroyed, there is no evidence of their regeneration.

In chronic bronchitis there is constant coughing. Large volumes of mucus may be discharged as sputum, the discharge becomes thick and purulent, breathing may become difficult, and small bloodstaining of the sputum may occur. The exchange of oxygen and carbon dioxide may be compromised. Treatment includes control of the infection, drainage of fluids, cessation of smoking, and removal of the affected person from the occupational hazards when possible.

bronco (horse): *see* cayuse.

Brong-Ahafo Region, administrative unit of Ghana, West Africa, stretching from the Ivory Coast border (west) to the Volta Region, its chief boundary (north and east) being the Black Volta and Volta rivers. Created in 1959 from the original Ashanti Region, it has an area of 15,273 sq mi (39,557 sq km) and three main physical divisions: (1) in the centre, a westward continuation of the Kwahu Plateau, rising to 2,000 ft (600 m), with headwaters of the Tano River and Volta tributaries; (2) south of this divide, a dissected peneplain averaging 1,000 ft in elevation; and (3) a fairly steep descent northward from the plateau to a sandstone plain mostly below 500 ft. Near Bui, resistant rocks along the Black Volta cause rapids with hydropower potential. South of Wenchi the annual rainfall generally exceeds 50 in. (1,270 mm), falling on moist, semideciduous forest; to the north the rain is lighter, and thin sandy soils, exposed to dry harmattan winds from the interior and to periodic drought, support savanna woodland.

The forested southwestern section, especially around Sunyani, is economically the best developed. Timber and cocoa production are significant. The cultivation of swamp rice and coffee is increasing in marginal areas, but prospects for food crops are limited by remoteness and lack of communications. The dry season (November to March) in the northern savanna permits only selected crops, chiefly yams, corn (maize), and cassava; much of this section is uninhabited because of the tsetse fly and poor soil. Agricultural settlements throughout Brong-Ahafo are usually small, with 500–1,000 inhabitants, and are concentrated along the main roads, still the principal means of transportation despite the advent of the railroad. The regional capital is Sunyani (*q.v.*), and other administrative headquarters are at Gawso, Wenchi, and Atebubu. Pop. (1980 est.) 1,038,809.

Brongniart, Adolphe-Théodore (b. Jan. 14, 1801, Paris—d. Feb. 18, 1876, Paris), French botanist whose classification of fossil plants, which drew surprisingly accurate relations between extinct and existing forms prior to Charles Darwin's principles of organic evolution, earned him distinction as the founder of modern paleobotany. Brongniart is also known for his valuable contributions to angiosperm (flowering plant) morphology, especially for his account of pollen development and pollen tube formation (1827).

In 1831 Brongniart became an assistant to the botanist René Desfontaines at the Muséum National d'Histoire Naturelle, Paris, and two years later succeeded his teacher to the museum chair that he held for the rest of his life. He began publication in 1822 of a series of papers dealing with the classification and distribution of fossil plants. By 1828, when he wrote the *Prodrome d'une histoire des végétaux fossiles,* followed by his *Histoire des végétaux fossiles,* 2 vol. (1828–37), he had developed an orderly system of fossil plant classification that distinguished four successive groups of dominant plant forms, from the appearance of the first land plants to the present. Despite his belief in a fundamental fixity of species, his division of existing plant life into six classes approached modern phytogeny.

Unfortunately, Brongniart had abandoned this system by 1843, when he classified the museum's collections according to his modified version of the Swiss botanist Pyrame de Candolle's taxonomy. Nevertheless, innovations introduced by Brongniart at that time, such as the treatment of gymnosperms as a distinct group and a distinction made between the fertilized egg and the seed, proved valuable to later attempts at plant classification, especially the widely adopted taxonomy of the German botanists August Eichler and Adolf Engler.

Brongniart, Alexandre (b. Feb. 5, 1770, Paris—d. Oct. 7, 1847, Paris), French mineralogist, geologist, and naturalist, who first arranged the geologic formations of the Tertiary Period (from 2,500,000 to 65,000,000 years ago) in chronological order and described them.

Alexandre Brongniart, plaster medallion by David d'Angers
H. Roger-Viollet

Appointed professor of natural history (1797) at the École Centrale des Quatre-Nations, Paris, he became director of the Sèvres Porcelain Factory (1800–47). He worked to improve the art of enamelling in France, and made Sèvres the leading such factory in Europe.

Among Brongniart's early papers is the "Essai d'une classification naturelle des reptiles" (1800; "Essay on the Classification of Reptiles"), in which he divided the class Reptilia into four orders: Batrachia (now a separate class, Amphibia), Chelonia, Ophidia, and Sauria. He made the first systematic study of trilobites, an extinct group of arthropods that became important in determining the chronology of Paleozoic strata (from 225,000,000 to 570,000,000 years ago).

In 1804 he began a study of fossil-bearing strata in the Paris Basin with the French naturalist Georges Cuvier. Summarizing this study in his *Essai sur la géographie minéralogique des environs de Paris, avec une carte géognostique et des coupes de terrain* (1811; "Essay on the Mineralogical Geography of the Environs of Paris, with a Geological Map and Profiles of the Terrain"), Brongniart helped introduce the principle of geologic dating by the identification of distinctive fossils found in each stratum and noted that the Paris formations had been created under alternate freshwater and saltwater conditions.

As professor of mineralogy (1822–47) at the Museum of Natural History, Paris, he turned his attention to ceramic technology; his last major work was *Traité des arts céramiques* (1844; "Treatise on the Ceramic Arts").

Broniewski, Władysław (b. Dec. 17, 1897, Płock, Kingdom of Poland—d. Feb. 10, 1962, Warsaw), Polish poet of exceptional emotional power and impact.

The son of a country squire, he joined the anti-tsarist Polish legions under Józef Piłsudski in April 1915; but in 1917, after the Russian Revolution, he was interned by the Germans for his refusal to serve in a Polish force under their command. When Poland's independence was restored, he enlisted in the new national army and fought the Russian Communists in the Russo-Polish War of 1919–20. Later he began to write revolutionary poems espousing the cause of the working class. His first volume, *Wiatraki* (1925; "The Windmills"), was followed by *Dymy nad miastem* (1927; "Smoke over the City") and *Komuna Paryska* (1929; "Paris Commune"). Upon the outbreak of World War II and the Soviet occupation of Lwów, he was sent to a forced-labour camp in the northern Soviet Union. Liberated in the summer of 1941, he joined the Polish Army under Gen. Władysław Anders, which in 1943 was moved to the Middle East. He spent the remaining war years in Jerusalem, where he published *Bagnet na broń* (1943; "Bayonet On"). In 1945 he arrived in London, where he wrote *Drzewo rozpaczające* ("The Despairing Tree"). He then decided to return to Poland, where he was acclaimed by the Communists as a prodigal son. New collections of verse followed, including *Słowo o Stalinie* (1950; "The Word on Stalin"), written under party pressure characteristic of the era.

Bronowski, Jacob (b. Jan. 18, 1908, Poland—d. Aug. 22, 1974, East Hampton, N.Y., U.S.), Polish-born British mathematician and man of letters who eloquently presented the case for the humanistic aspects of science.

While he was still a child his family emigrated to Germany and then to England, where he became a naturalized British subject. He won a scholarship to Cambridge University, where he studied mathematics. He not only achieved high honours in mathematics but also received critical acclaim for his poetry and prose. After receiving his Ph.D. (1933) from Cambridge, he taught mathematics (1934–42) at the University College of Hull. During World War II Bronowski pioneered in a field now known as operational research and worked to increase the effectiveness of Allied bombing. After the war he headed the projects division of UNESCO (1948) and then served as the director of Britain's National Coal Board (1950–63), where he was considered an expert on smokeless fuels.

When Bronowski, on a scientific mission to Japan to study the effects of the atomic bombings (1945), saw firsthand the ruins of Nagasaki, he gave up military research. From that time on he concentrated on the ethical as well as the technological aspects of science, and he shifted his attention from mathematics to the life sciences, the study of human nature, and the evolution of culture.

Among his books are *The Common Sense of Science* (1951) and the highly praised *Science and Human Values* (1956; rev. ed. 1965), which expressed the credo for a new humanism. These books, an examination of science for the layperson, presented Bronowski's views that science needs an ethos in order to function. In *The Identity of Man* (1965) he sought to present a unifying philosophy of human nature. He also wrote *William Blake, 1757–1827: A Man Without a Mask* (1943), revised as *William Blake and the Age of Revolution* (1965), and four radio plays, one of which, *The Face of Violence,* won the Italia Prize (1951) for European drama.

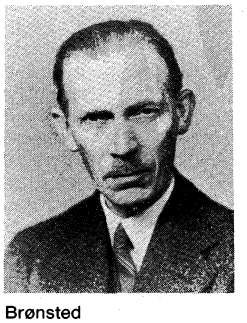
From 1964 until his death Bronowski was a resident fellow of the Salk Institute of Biological Sciences (San Diego, Calif.). His last major project was the authorship and narration of the BBC television series *The Ascent of Man* (1973), a luminous account of science, art, and philosophy in human history.

Bronsart von Schellendorf, Paul (b. Jan. 25, 1832, Danzig [Polish Gdańsk], Prussia—d. June 23, 1891, near Braunsberg, Prussia), soldier, military writer, and minister of war who helped reform the Prussian army of the 1880s.

Entering the army in 1849, Bronsart became a protégé of the Prussian chief of the general staff, Helmuth von Moltke, held high staff appointments during the Franco-Prussian War (1870–71), and conducted the preliminary negotiations for the French surrender at Sedan. A royalist officer firmly convinced that parliament should not interfere in military matters, he served as minister of war from 1883 to 1889 and worked for the modernization of the army and the replacement of the single-shot rifle with a magazine weapon. His most important work, *Der Dienst des Generalstabes im Frieden und im Kriege* (1875) was officially issued to the British army as *The Duties of the General Staff* (1905).

Bronsart von Schellendorf, detail of an engraving after a photograph by W. Höffert
By courtesy of the Staatsbibliothek, West Berlin

Brønsted, Johannes Nicolaus (b. Feb. 22, 1879, Varde, Den.—d. Dec. 17, 1947, Copenhagen), Danish physical chemist known for a widely applicable acid–base concept identical to that of Thomas Martin Lowry of England. Though both men introduced their defini-



Brønsted
By courtesy of the Royal Danish Embassy; photograph, Elfelt, Copenhagen

tions simultaneously (1923), they did so independently of each other. Brønsted was also an authority on the catalytic properties and strengths of acids and bases. His chief interest was thermodynamic studies, but he also did important work with electrolyte solutions.

The son of a civil engineer, Brønsted received his degree in chemical engineering (1899) and his doctorate in chemistry from the University of Copenhagen in 1908, when he also became a professor of physical and inorganic chemistry. He retained this position throughout his lifetime.

Brønsted was a visiting professor at Yale in 1929, and he became a fellow of the Royal Society in 1935. His firm opposition to Nazism during World War II won him election to the Danish Parliament (1947), but illness prevented him from taking his seat.

Brønsted–Lowry theory, also called PROTON THEORY OF ACIDS AND BASES, a theory, introduced independently in 1923 by the Danish chemist Johannes Nicolaus Brønsted and the English chemist Thomas Martin Lowry, stating that any compound that can transfer a proton to any other compound is an acid, and the compound that accepts the proton is a base. A proton is a nuclear particle with a unit positive electrical charge; it is represented by the symbol H^+ because it constitutes the nucleus of a hydrogen atom.

According to the Brønsted–Lowry scheme a substance can function as an acid only in the presence of a base; similarly, a substance can function as a base only in the presence of an acid. Furthermore, when an acidic substance loses a proton, it forms a base, called the conjugate base of an acid, and when a basic substance gains a proton, it forms an acid called the conjugate acid of a base. Thus, the reaction between an acidic substance, such as hydrochloric acid, and a basic substance, such as ammonia, may be represented by the equation:

$$HCl + NH_3 \rightleftharpoons NH_4^+ + Cl^-$$

In the equation the ammonium ion (NH_4^+) is the acid conjugate to the base ammonia, and the chloride ion (Cl^-) is the base conjugate to hydrochloric acid.

The Brønsted–Lowry theory enlarges the number of compounds considered to be acids and bases to include not only the neutral molecules (*e.g.,* sulfuric, nitric, and acetic acids, and the alkali metal hydroxides) but also certain atoms and molecules with positive and negative electrical charges (cations and anions). The ammonium ion, the hydronium ion, and some hydrated metal cations are considered acids. The acetate, phosphate, carbonate, sulfide, and halogen ions are considered bases.

Bronstein, Lev Davidovich (Russian leader): *see* Trotsky, Leon.

Bronte, town, Catania province, eastern Sicily, Italy, at the western foot of Mt. Etna, northwest of Catania city. It is an agricultural centre noted for pistachio nuts. The Church of the Annunciation dates from the 17th century. The dukedom of Bronte was bestowed on the British naval hero Lord Nelson by Ferdinand IV in 1799; the ducal seat is at nearby Castello di Maniace. Pop. (1981 est.) mun., 21,935.

Brontë, Anne, pseudonym ACTON BELL (b. Jan. 17, 1820, Thornton, Yorkshire, Eng.—d. May 28, 1849, Scarborough, Yorkshire), English poet and novelist, author of *Agnes Grey* (1847) and *The Tenant of Wildfell Hall* (1848), generally considered less brilliant than the novels of her two sisters, Charlotte and Emily Brontë.

The youngest of six children of Patrick and Marie Brontë, Anne was taught in the family's Haworth home, chiefly by her sister Charlotte. She took a position as governess briefly in

Anne Brontë, watercolour by Charlotte Brontë, 1834
By courtesy of the Bronte Society

1839 and then again for four years, 1841–45, with the Robinsons, the family of a clergyman, at Thorpe Green, near Boroughbridge, Yorkshire. There her irresponsible brother, Patrick Branwell, a drunkard and opium addict, joined her in 1845, intending to serve as a tutor. Anne returned home soon after but was followed shortly by her brother, who had been dismissed, charged with making love to his employer's wife.

In 1846 Anne contributed 21 poems to *Poems by Currer, Ellis and Acton Bell,* a joint work with her sisters Charlotte and Emily. Her first novel, *Agnes Grey,* was published together with Emily's *Wuthering Heights* in three volumes in December 1847. The reception to these volumes, associated in the public mind with the immense popularity of Charlotte's *Jane Eyre* (October 1847), led to quick publication of Anne's second novel, *The Tenant of Wildfell Hall,* published in three volumes in June 1848; it sold well. She fell ill with tuberculosis toward the end of the year and died the following May.

Anne is commonly described as gentle and pious. In chaste and shapely verse she examines her thoughts and feelings in the light of moral and religious truth. Her novel *Agnes Grey,* probably begun at Thorpe Green, records with limpidity and some humour the life of a governess. George Moore called it "simple and beautiful as a muslin dress." *The Tenant of Wildfell Hall* presents an unsoftened picture of a young man's debauchery and degradation and sets against it her Arminian belief, opposed to Calvinist predestination, that no soul shall be ultimately lost. Her outspokenness raised some scandal, and Charlotte deplored the subject as morbid and out of keeping with her sister's nature, but the vigorous writing indicates that Anne found in it not only a moral obligation but also an opportunity of artistic development.

BIBLIOGRAPHY. The chief works focussing on Anne Brontë herself are Ada Harrison and Derek Stanford, *Anne Brontë: Her Life and Work* (1959), and Winifred Gerin, *Anne Brontë* (1959).

Brontë, Charlotte, married name MRS. ARTHUR BELL NICHOLLS, pseudonym CURRER BELL (b. April 21, 1816, Thornton, Yorkshire, Eng.—d. March 31, 1855, Haworth, Yorkshire), English novelist, noted for *Jane Eyre* (1847), a strong narrative of a woman in conflict with her natural desires and social condition. The novel gave new truthfulness to Victorian fiction. She later wrote *Shirley* (1849) and *Villette* (1853).

Life. Her father was Patrick Brontë (1777–1861), an Anglican clergyman. Irish-born, he had changed his name from the more commonplace Brunty. After serving in several parishes, he moved with his wife, Maria Branwell Brontë, and their six small children to Haworth amid the Yorkshire moors in 1820, having been awarded a rectorship there. Soon after, Mrs. Brontë and the two eldest children (Maria and Elizabeth) died, leaving the father to care for the remaining three girls—Charlotte, Emily, and Anne—and a boy, Patrick Branwell. Their upbringing was aided by an aunt, Elizabeth Branwell, who left her native Cornwall and took up residence with the family at Haworth.

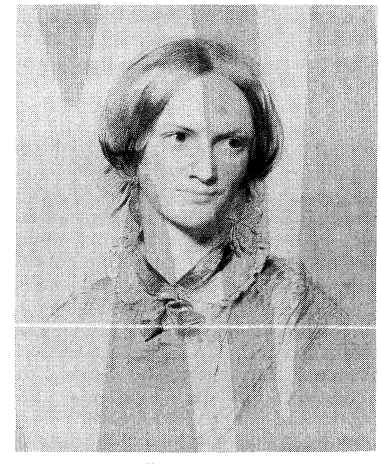
In 1824 Charlotte and Emily, together with their elder sisters before their deaths, attended Clergy Daughters' School at Cowan Bridge, near Kirkby Lonsdale, Lancashire. The fees were low, the food unattractive, and the discipline harsh. Charlotte condemned the school (perhaps exaggeratedly) long years afterward in *Jane Eyre,* under the thin disguise of Lowood; and the principal, the Rev. William Carus Wilson, has been accepted as the counterpart of Mr. Naomi Brocklehurst in the novel.

Charlotte and Emily returned home in June 1825, and for more than five years the Brontë children learned and played there, writing and telling romantic tales for one another and inventing imaginative games played out at home or on the desolate moors.

In 1831 Charlotte was sent to Miss Wooler's school at Roe Head, near Huddersfield, where she stayed a year and made some lasting friendships; her correspondence with one of her friends, Ellen Nussey, continued until her death, and has provided much of the current knowledge of her life. In 1832 she came home to teach her sisters but in 1835 returned to Roe Head as a teacher. She wished to improve her family's position, and this was the only outlet that was offered to her unsatisfied energies. Branwell, moreover, was to start on his career as an artist, and it became necessary to supplement the family resources. The work, with its inevitable restrictions, was uncongenial to Charlotte. She fell into ill health and melancholia and in the summer of 1838 terminated her engagement.

In 1839 Charlotte declined a proposal from the Rev. Henry Nussey, her friend's brother, and some months later one from another young clergyman. At the same time Charlotte's ambition to make the practical best of her talents and the need to pay Branwell's debts urged her to spend some months as governess with the Whites at Upperwood House, Rawdon. Branwell's talents for writing and painting, his good classical scholarship, and his social charm had engendered high hopes for him; but he was fundamentally unstable, weak willed, and intemperate. He went from job to job and took refuge in alcohol and opium.

Meanwhile his sisters had planned to open a school together, which their aunt had agreed



Charlotte Brontë, chalk drawing by George Richmond, 1850; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

to finance, and in February 1842 Charlotte and Emily went to Brussels as pupils to improve their qualifications in French and acquire some German. The talent displayed by both brought them to the notice of Constantin Héger, a fine teacher and a man of unusual perception. Charlotte was basically happy, though as a staunch Protestant she despised her Catholic surroundings. After a brief trip home upon the death of her aunt, she returned to Brussels as a pupil-teacher. She stayed there during 1843 but was lonely and depressed. Her friends had left Brussels, and Madame Héger appears to have become jealous of her. The nature of Charlotte's attachment to Héger and the degree to which she understood herself have been much discussed. His was the most interesting mind she had yet met, and he had perceived and evoked her latent talents. His strong and eccentric personality appealed both to her sense of humour and to her affections. She offered him an innocent but ardent devotion, but he tried to repress her emotions. The letters she wrote to him after her return may well be called love letters. When, however, he suggested that they were open to misapprehension, she stopped writing and applied herself, in silence, to disciplining her feelings. However they are interpreted, Charlotte's experiences at Brussels were crucial for her development. She received a strict literary training, became aware of the resources of her own nature, and gathered material that served her, in various shapes, for all her novels.

In 1844 Charlotte atttempted to start a school she had long envisaged in the parsonage itself, as her father's failing sight precluded his being left alone. Prospectuses were issued, but no pupils were attracted to distant Haworth.

In the autumn of 1845 Charlotte came across some poems by Emily, and this led to the publication of a joint volume of *Poems by Currer, Ellis and Acton Bell* (1846); the pseudonyms were assumed to preserve secrecy and avoid the special treatment they believed reviewers accorded to women. The book was issued at their own expense. It received few reviews and only two copies were sold. Nevertheless, a way had opened to them, and they were already trying to place the three novels they had written. Charlotte failed to place *The Professor: A Tale* but had, however, nearly finished *Jane Eyre: An Autobiography,* begun in August 1846 in Manchester where she was staying with her father, who had gone there for an eye operation. When Smith, Elder and Company, declining *The Professor,* declared themselves willing to consider a three-volume novel with more action and excitement in it, she completed and submitted it at once. It was accepted, published less than eight weeks later (on Oct. 16, 1847), and had an immediate success, far greater than that of the books her sisters published the same year.

The months that followed were tragic ones. Branwell died in September 1848, Emily in December, and Anne in May 1849. Charlotte completed *Shirley: A Tale* in the empty parsonage, and it appeared in October. In the following years Charlotte went three times to London as the guest of her publisher, George Smith, and his mother. She met Thackeray and other literary men and women, and sat for her portrait by George Richmond. She went twice to the Lake District, where she stayed in 1851 with Harriet Martineau, the writer, went to Scotland, and visited Mrs. Gaskell in Manchester and entertained her at Haworth. *Villette* came out in January 1853. Meanwhile, in 1851, she had declined a third offer of marriage, this time from James Taylor, a member of Smith, Elder and Company. Her father's curate, Arthur Bell Nicholls (1817–1906), an Irishman, was her fourth suitor. It took some months to win her father's consent, but they were married on June 29, 1854, in Haworth church. They spent their honeymoon in Ireland and then returned to Haworth, where her husband had pledged himself to continue as curate to her father. He did not share his wife's intellectual life, but she was happy to be loved for herself and to take up her duties as his wife. She began another book, *Emma,* of which some pages remain. Her pregnancy, however, was accompanied by exhausting sickness, and she died in 1855. Nicholls stayed in Haworth until Patrick Brontë's death in 1861, when he went back to Ireland.

Assessment. Charlotte's first novel, *The Professor* (published posthumously, 1857), shows her sober reaction from the indulgences of her girlhood. Told in the first person by an English tutor in Brussels, it is based on Charlotte's experiences there, with a reversal of sexes and roles. The necessity of her genius, reinforced by reading her sister's *Wuthering Heights,* modified this restrictive self-discipline; and, though there is plenty of satire and dry, direct phrasing in *Jane Eyre,* its success was the fiery conviction with which it presented a thinking, feeling woman, craving for love but able to renounce it at the call of impassioned self-respect and moral conviction. There are melodramatic naivetés in the story of the love of a governess for her Byronic employer, and Charlotte's elevated rhetorical passages do not much appeal to modern taste, but she maintains her hold on the reader. The novel is subtitled *An Autobiography* and is written in the first person; but, except in Jane's impressions of Lowood, the autobiography is not Charlotte's. Personal experience is fused with suggestions from widely different sources, and the Cinderella theme may well come from Samuel Richardson's *Pamela.* The action is carefully motivated, and apparently episodic sections, like the return to Gateshead Hall, are seen to be necessary to the full expression of Jane's character and the working out of the threefold moral theme of love, independence, and forgiveness.

Charlotte intended *Shirley* to be "real, cool and solid," avoided melodrama and coincidences, and widened her scope. Setting aside Maria Edgworth and Scott as national novelists, *Shirley* is the first regional novel in English, full of shrewdly depicted local material—Yorkshire characters, church and chapel, the cloth workers and machine breakers of her father's early manhood, and a sturdy but rather embittered feminism.

In *Villette* she recurred to the Brussels setting and the first-person narrative, disused in *Shirley;* the characters and incidents are largely variants of the people and life at the Pension Héger. Against this background she set the ardent heart, deprived of its object, contrasted with the woman happily fulfilled in love.

The influence of Charlotte's novels was much more immediate than that of *Wuthering Heights,* which was described for many years as without posterity. Charlotte's combination of romance and satiric realism had been the mode of nearly all the women novelists for a century. Her fruitful innovations were the presentation of a tale through the sensibility of a child or young woman—in which Dickens followed her; her lyricism—in which the genius of romantic poetry entered the novel; and the picture of love from a woman's standpoint—with which she unwittingly startled a section of Victorian opinion. The two sides of her nature were never fully harmonized, and this results in what Virginia Woolf called the "jerking of the planes." Her special mastery lies in her intense participation in her story and its transmission to readers.

BIBLIOGRAPHY. E.C. Gaskell, *The Life of Charlotte Brontë,* 2 vol. (1857, many later editions), raised controversy and was modified in the third edition. It is indispensable. See Margaret Lane, *The Brontë Story: A Reconsideration of Mrs. Gaskell's Life of Charlotte Brontë* (1953, reprinted 1971). The Haworth edition, *The Life and Works of Charlotte Brontë and Her Sisters,* 7 vol. (1899–1900), was edited by C.K. Shorter and H. Ward, who had access to material in the hands of Nicholls and published all of Charlotte's available letters in C.K. Shorter, *The Brontës: Life and Letters,* 2 vol. (1908). The first supplement, however, was provided by T. Wemyss Reid in *Charlotte Brontë: A Monograph* (1877). During the 20th century a formidable body of biographical and critical investigation and assessment appeared, including May Sinclair, *The Three Brontës* (1912); E. Dimnet, *Les Soeurs Brontë* (1910; *The Brontë Sisters,* 1927); Laura L. Hinkley, *The Brontës, Charlotte and Emily* (1945); Phyllis E. Bentley, *The Brontës* (1947) and *The Brontë Sisters* (1950); Laurence and E.M. Hanson, *The Four Brontës* (1949); Inga Stina Ewbank, *Their Proper Sphere: A Study of the Brontë Sisters As Early-Victorian Female Novelists* (1966); Ada Harrison and Derek Stanford, *Charlotte Brontë* (1967); and W.A. Craik, *The Brontë Novels* (1968).

Brontë, Emily (Jane), pseudonym ELLIS BELL (b. July 30, 1818, Thornton, Yorkshire, Eng.—d. Dec. 19, 1848, Haworth, Yorkshire), English novelist and poet, who produced but one novel, *Wuthering Heights* (1847), a highly imaginative novel of passion and hate set on the Yorkshire moors. Emily was perhaps the greatest of the three Brontë sisters, but the record of her life is extremely meagre, for she was silent and reserved and left no correspondence of interest; and her single novel darkens rather than solves the mystery of her spiritual existence.

Emily Brontë, oil painting by Branwell Brontë, 1833; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Life. Her father, Patrick Brontë (1777–1861), an Irishman, was educated at St. John's College, Cambridge, taking a degree in 1806, and six years later married Maria Branwell from Penzance, Cornwall. He held a number of curacies: Hartshead-cum-Clifton, Yorkshire, was the birthplace of his elder daughters, Maria and Elizabeth, and nearby Thornton was the birthplace of Charlotte, Patrick Branwell, Emily, and Anne. In 1820 the father became rector of Haworth, where he remained for the rest of his life.

After the death of their mother in 1821, the children were left very much to themselves in the bleak moorland rectory. Most of their time was spent in reading and in composition. The children were educated, during their early life, at home, except for a single year that Maria, Elizabeth, Charlotte, and Emily spent at the Clergy Daughters' School at Cowan Bridge in Lancashire. In 1835, when Charlotte secured a teaching position at Miss Wooler's school at Roe Head, Emily accompanied her as a pupil but suffered from homesickness and remained

only three months. In 1838 Emily spent six exhausting months as a teacher in Miss Patchett's school at Law Hill, near Halifax, and then resigned.

To keep the family together at home, Charlotte planned to keep a school for girls at Haworth. In February 1842 she and Emily went to Brussels to learn foreign languages and school management at the Pension Héger. Although Emily pined for home and for the wild moorlands, it seems clear that in Brussels, reserved as she was, she was better appreciated than Charlotte. Her passionate nature was more easily understood than Charlotte's decorous temperament. In October, however, when her aunt died, Emily returned permanently to Haworth.

In 1845 Charlotte came across some poems by Emily, and this led to the discovery that all three sisters had written verse. A year later they published jointly a volume of verse, *Poems by Currer, Ellis and Acton Bell,* the initials of these pseudonyms being those of the sisters; it contained 21 of Emily's poems, and a consensus of later criticism has accepted the fact that Emily's verse alone reveals true poetic genius. The venture cost the sisters about £50 in all, and only two copies were sold.

By midsummer of 1847 Emily's *Wuthering Heights* and Anne's *Agnes Grey* had been accepted for joint publication by J. Cautley Newby of London, but publication of the three volumes was delayed until the appearance of their sister's *Jane Eyre,* which was immediately and hugely successful. *Wuthering Heights,* when published in December 1847, did not fare well; critics were hostile, calling it too savage, too animal-like, and clumsy in construction. Only later did it come to be considered one of the finest novels in the English language.

Soon after the publication of her novel, Emily's health began to fail rapidly. She had been ill for some time, but now her breathing became difficult, and she suffered great pain. She died of tuberculosis in December 1848.

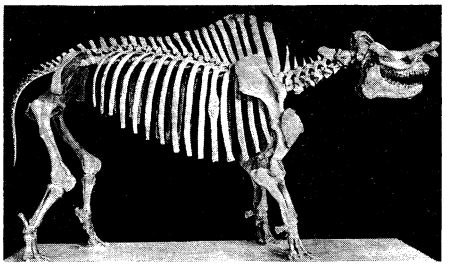
Assessment. Emily Brontë's work on *Wuthering Heights* cannot be dated, and she may well have spent a long time on this intense, solidly imagined novel. It is distinguished from other novels of the period by its dramatic and poetic presentation, its abstention from all comment by the author, and its unusual structure. It recounts in the retrospective narrative of an onlooker, which in turn includes shorter narratives, the impact of the waif Heathcliff on the two families of Earnshaw and Linton in a remote Yorkshire district at the end of the 18th century. Embittered by abuse and by the marriage of Cathy Earnshaw—who shares his stormy nature and whom he loves—to the gentle and prosperous Edgar Linton, Heathcliff plans a revenge on both families, extending into the second generation. Cathy's death in childbirth fails to set him free from his love–hate relationship with her, and the obsessive haunting persists until his death; the marriage of the surviving heirs of Earnshaw and Linton restores peace.

Sharing her sisters' dry humour and Charlotte's violent imagination, Emily diverges from them in making no use of the events of her own life and showing no preoccupation with a spinster's state or a governess's position. Working, like them, within a confined scene and with a small group of characters, she constructs an action, based on profound and primitive energies of love and hate, which proceeds logically and economically, making no use of such coincidences as Charlotte relies on, requiring no rich romantic similes or rhetorical patterns, and confining the superb dialogue to what is immediately relevant to the subject. The sombre power of the book and the elements of brutality in the characters affronted some 19th-century opinion. Its supposed masculine quality was adduced to support the claim, based on the memories of her brother Branwell's friends long after his death, that he was author or part author of it. While it is not possible to clear up all the minor puzzles, neither the external nor the internal evidence offered is substantial enough to weigh against Charlotte's plain statement that Emily was the author.

BIBLIOGRAPHY. The first biography of Emily by A.M.F. Robinson, *Emily Brontë* (1883), to which Ellen Nussey contributed information but did not approve the conclusions, was followed by Romer Wilson, *All Alone: The Life and Private History of Emily Jane Brontë* (1928); Muriel Spark and Derek Stanford, *Emily Brontë: Her Life and Work* (1953); Jacques Blondel, *Emily Brontë* (1955); John Hewish, *Emily Brontë* (1969); and Ada Harrison and Derek Stanford, *Emily Brontë* (1971). Also useful is Irene Cooper Willis, *The Authorship of Wuthering Heights* (1936).

Brontosaurus (dinosaur): *see* Apatosaurus.

Brontotherium, extinct genus of large, hoofed, herbivorous mammals found as fossils in early Oligocene deposits of North America (the Oligocene Epoch began about 38,000,000 years ago and lasted about 12,000,000 years). *Brontotherium* is representative of the titanotheres, large perissodactyls that share a common ancestry with the horse; indeed, the titanotheres probably were derived from a form very similar to the dawn horse (*Hyracotherium*). *Brontotherium* stood at least 2.5 metres (about 8 feet) high at the shoulder. Although the skull was massive and long, the brain was small; *Brontotherium* probably had limited intelligence. There was a pair of large horns at the front of the skull, united at their base but split toward their apex. The teeth were large but primitive; it is probable that *Brontotherium* could eat only soft vegetation. It is also probable that with the spread of grasslands the titanotheres were unable to deal with the large amounts of grit that had to be chewed and became extinct because they had the wrong kind of tooth construction.



Brontotherium, restored skeleton
By courtesy of the American Museum of Natural History, New York

Bronx, the, one of the five boroughs of New York City, southeastern New York, U.S., coextensive with Bronx County (area 41 sq mi [106 sq km], formed 1912); it is separated from Manhattan by the Harlem River and bordered by Westchester County (north), the Hudson River (west), the East River (south), and Long Island Sound (east). The Bronx, the only mainland borough, is connected to Manhattan by a dozen bridges and railroad tunnels and to Queens by the Triborough, Bronx–Whitestone, and Throgs Neck bridges. The site was called Keskeskeck by the Indians who sold it in 1639 to the Dutch West India Company. In 1641 Jonas Bronck, a Scandinavian, purchased 500 ac (200 ha). Shortly thereafter religious dissenters and New England settlers moved there early, trespassing on Dutch territory. The borough was a part of Westchester County until 1898, when it was incorporated in the city of New York.

Although primarily residential, much of its waterfront (more than 80 mi [130 km]) is used for shipping, warehouses, and industry (textiles, foods, machinery, and paper products). Educational institutions include Fordham University (1841), Manhattan College (1853), a division of the City University of New York, a division of New York University (1831), and the Albert Einstein College of Medicine of Yeshiva University. Bronx Park, the New York Zoological Gardens, Yankee Stadium (home of the New York Yankees baseball team), and the house where Edgar Allan Poe wrote "Ulalume" and "Annabel Lee" are in the borough. Pop. (1970) 1,471,701; (1980) 1,169,115.

Bronx Zoo, in full NEW YORK ZOOLOGICAL PARK, New York City, one of the finest zoological collections in the world. When it opened in 1899 the 98-ha (252-ac) grounds, in the northwestern area of New York City's northern borough of the Bronx, included several spacious enclosures for large herds. Conservation of threatened species such as the Père David's deer, the European bison, and the okapi continues to be a major objective of the zoo.

In 1941 the Bronx Zoo opened the African Plains, a 1.6-ha moated area featuring large groups of animals in natural surroundings. An extensive renovation project in the 1960s created more natural habitat settings and introduced the world's first major exhibit of nocturnal animals in a specially designed building called the World of Darkness. The World of Birds, completed in 1972, is a huge, landscaped, indoor free-flight exhibit. Other recent developments include the Rare Animal Range, exhibiting almost extinct species in their natural settings; a completely renovated Children's Zoo; and Wild Asia, a geographical gathering of Asian mammals and birds in large enclosures on a 16-ha (40-ac) section of the zoo grounds. Wild Asia can be viewed from a 3-km (2-mi) monorail system.

The Bronx Zoo supports much research, both on its grounds and in various parts of the world. It also oversees the Wildlife Survival Center on St. Catherine's Island, Georgia. The findings of studies supported by the zoo are published in its popular *Animal Kingdom* as well as in a number of technical journals. The zoo, managed by the New York Zoological Society, is financed by the society and the city. Its collection embraces more than 3,200 specimens of about 600 species.

bronze, alloy of copper and tin of exceptional importance and historical interest. It was made as early as 3000 BC, though its use in artifacts did not become common until much later. Homer in the *Iliad* relates how Hephaestus, the Greek god of fire, threw copper, tin, silver, and gold into his furnace to make the shield of Achilles. Proportions of copper and tin varied widely (from 67 percent to 95 percent copper in surviving artifacts), but by the Middle Ages certain proportions were known to give certain effects. An alloy described in an 11th-century Greek manuscript in the library of St. Mark's, Venice, cites a proportion of one pound copper to two ounces of tin (8 to 1), approximately that used for bronze gunmetal in later times.

Besides being harder than copper, bronze is more fusible (that is, more readily melted) and so easier to cast; it is also harder than pure iron and, in varying alloys, suitable to such applications as gun barrels and machinery bearings. The historical substitution of iron for bronze in tools and weapons was the result of iron's abundance compared to copper and tin rather than any inherent advantages of iron.

Bell metal, characterized by its sonorous quality when struck, is a bronze with a high tin content, from one part in four to one in seven. Statuary bronze may have as little as one part in 10 of tin, sometimes with an admixture of zinc and lead. Zinc increases hardness, and small amounts are usually present in bearing metals. Bronze is also improved in

quality and strength by the addition of a small amount of phosphorus; phosphor bronze may contain 1 or 2 percent phosphorus in the ingot and a mere trace after casting, but its strength is nonetheless enhanced for such applications as pump plungers, valves, and bushings. Also useful in mechanical engineering are manganese bronzes, in which there may be little or even no tin but considerable amounts of zinc and manganese.

Besides its use in weapons and tools, bronze has also been widely used in coinage; most "copper" coins are actually bronze, typically with about 4 percent tin and 1 percent zinc. *See also* Babbitt's metal; gunmetal.

Bronze Age, third phase in the development of humanity's material culture, following the Paleolithic and Neolithic ages; also, the first period in which metal was used. The date at which the age began varied with regions; in Greece, for instance, the Bronze Age began before 3000 BC, whereas in China it did not start until *c.* 1800 BC.

The beginning of the period is sometimes called the Chalcolithic (Copper–Stone) Age, referring to the initial use of pure copper (along with its predecessor toolmaking material, stone). Scarce at first, copper was initially used only for small or precious objects. Its use was known in east Anatolia by 6500 BC, and it soon became widespread. By the middle of the 4th millennium, a rapidly developing copper metallurgy, with cast tools and weapons, was a factor leading to urbanization in Mesopotamia. By 3000 the use of copper was well-known in the Middle East, had extended westward into the Mediterranean area, and was beginning to infiltrate the Neolithic cultures of Europe.

This early copper phase is commonly thought of as part of the Bronze Age, though true bronze, an alloy of copper and tin, was used only rarely at first. During the 2nd millennium the use of true bronze greatly increased; the tin deposits at Cornwall, Eng., were much used and were responsible for a considerable part of the large production of bronze objects at that time. From about 1000 BC, however, the greater availability and use of another metal, iron, brought the Bronze Age to an end, and the Iron Age began.

bronze diabetes: *see* hemochromatosis.

bronze work, implements and artwork made of bronze, which is an alloy of copper, tin, and, occasionally, small amounts of lead and other metals. Bronze first came into use before 3000 BC but was rare until extensive trade in tin developed following the discovery of large tin deposits, such as those in Great Britain. Until the development of iron in about 1000 BC, bronze was used widely in weapons, armour, tools, and other implements. Even in modern times, bronze is still used for certain kinds of machine parts. Bronze is not as malleable as copper or silver, nor is it readily forged or chased. Its unique casting properties, however, have assured its continued preeminence in cast sculpture.

As molten bronze solidifies, it expands, assuring the faithful reproduction of every detail in the mold. As the solidified bronze cools further, it contracts slightly, easing removal of the sculpture from the mold. Bronze sculpture is often esteemed for the natural patina that forms over time as the surface of the bronze tarnishes. The thin, uniform patina of green and blue copper compounds confers not only aesthetic qualities but also a measure of protection to the underlying metal. In the Middle Ages, bronze found extensive uses in churches and cathedrals, both for bronze doors and for bronze vessels, candlesticks, reliquaries, and other liturgical implements. Bronze also was used in households for basins and ewers, candlesticks and chandeliers, and fittings for furniture as late as the 19th century. Bronze work was often decorated, by such techniques as engraving, inlaying, enameling, and gilding.

bronzing, coating an object of wood, plaster, clay, or other substance to give it colour and lustre like bronze. Dutch metal, an alloy of 80 percent copper and 20 percent zinc, is frequently used for bronzing. The metal is prepared as a thin foil and then powdered. This powder may be applied directly to objects that have been sized with a spirit lacquer or gold size, or the powder may be combined with spirit lacquer thinned with amyl acetate and the mixture painted on with a brush.

Various shades of colour may be obtained chemically. The natural gold colour of the alloy can be heightened by applying spirit lacquer coloured with dragon's blood, a resin obtained from plants. A true-bronze appearance may be imparted by treatment with a solution of arsenious acid in hydrochloric acid. An antique bronze finish may be imparted by treatment with a water solution of copper nitrate, ammonium chloride, and calcium chloride. A pale-gold colour is obtained by application of nitric acid. These colours may be preserved by a finishing coat of clear spirit lacquer.

Gun barrels can be bronzed by treatment with a strong solution of antimony trichloride.

Bronzino, Il, original name AGNOLO, or AGNIOLO, DI COSIMO (b. Nov. 17, 1503, Monticelli, Duchy of Milan—d. Nov. 23, 1572, Florence), Florentine painter whose polished and elegant portraits are outstanding examples of the Mannerist style. These works are the classic embodiments of the courtly ideal under the Medici dukes of the mid-16th century; they influenced the development of European court portraiture for the next century.

"Portrait of a Young Man" (possibly Guidobaldo II, duke of Urbino), oil painting by Il Bronzino; in the Metropolitan Museum of Art, New York City

The Metropolitan Museum of Art, New York City, bequest of Mrs. H.O. Havemeyer, 1929, the H.O. Havemeyer Collection (29.100.16), copyright © 1981 by the Metropolitan Museum of Art

Bronzino was greatly influenced by the work of his teacher, the Florentine painter Jacopo da Pontormo. Bronzino adapted his master's eccentric, expressive style (early Mannerism) to create a brilliant, precisely linear style of his own that was also partly influenced by Michelangelo and the late works of Raphael. Bronzino served as the court painter to Cosimo I, duke of Florence, from 1539 until his death. His portraits, such as "Portrait of Eleanor of Toledo with Her Son Giovanni" (Uffizi, Florence), are preeminent examples of Mannerist portraiture: emotionally inexpressive, reserved, and noncommittal, yet arrestingly elegant and decorative. Bronzino's great technical proficiency and his stylized rounding of sinuous anatomical forms are also notable. He also painted sacred and allegorical works of distinction, such as "The Allegory of Luxury," or "Venus, Cupid, Folly, and Time" (*c.* 1546; National Gallery, London), which reveals his love of complex symbolism, contrived poses, and clear, brilliant colours.

brooch, ornamental pin, usually with a clasp to attach it to a garment. Brooches developed from the Roman clasp, or fibula (*q.v.*), similar to a safety pin, in regions that had been part of the Roman Empire. In the severe climate of northern Europe, the brooch became the characteristic ornament because it routinely functioned as a fastening for a heavy cloak or tunic.

Brooches have been made in many different shapes. A long brooch that resembled the fibula was made throughout Europe from the Black Sea to Britain, differing in ornamentation and design in each region. The brooch characteristic of the Franks was a rosette, or circular brooch, generally decorated with filigree. At first the Scandinavians developed brooches based on the fibula, but after about 550 their brooches became more individualized. Their "tortoise" (7th to early 11th century), trefoil (9th–11th century), and circular brooches are generally decorated with symmetrical designs of considerable beauty. Continental gold filigree and complex cloisonné work were introduced into England by the Teutonic tribes. "Saucer" brooches were fairly common, often with rosette designs or zoomorphic patterns. With the introduction of Christianity came forms such as pendant crosses, in which Carolingian and Byzantine influence is evident. The penannular brooch, in the form of a ring with a small break in the circumference, was characteristic of Irish production; generally of great size and probably worn on the shoulder with the pin pointing upward, it was richly decorated with interlaced patterns. The finest example is the Tara brooch (*q.v.*), which is now in the National Museum of Ireland, Dublin.

Throughout the Middle Ages the brooch continued to be widely used, often in the form of a ring in which the pin is held in position by the pull of the fabric through which it passes. As improvements came about in jewelry-making techniques, brooches became more varied. They could be combined with cameos, for example, and set with precious gems cut in new techniques, and they could be made in the form of birds, flowers, leaves, crescents, stars, bows, and the like. With the expansion of wealth in the 19th century and the creation of a market for vast quantities of inexpensive jewelry, brooches became a popular commercial form.

brooding, in zoology, pattern of behaviour of certain egg-laying animals, especially birds, marked by cessation of egg laying and readiness to sit on and incubate eggs. Incubation (*q.v.*) itself is the process of maintaining uniform heat and humidity of the developing eggs, usually accomplished by one or both parents sitting on the eggs at all times. Many birds develop a brood patch—an area of bare, featherless skin on the underbody—in preparation for incubation and brooding. A network of blood vessels in the skin of the brood patch raises the temperature locally. After the hatch, the parent birds brood their young, keeping them warm by spreading the feathers out, umbrella-like, so the young can maintain contact with the skin of the adult. In domestic fowl the term "broody hen" refers both to a sitting (incubating) bird and, later, to the same hen brooding her chicks.

Among invertebrates, some sea anemones (*e.g., Epiactis*) develop brood pouches on the body wall, wherein the embryos develop. Newly hatched whip scorpions (*Mastigoproctus*) remain in and around their mother's abdominal brood chamber until at least their first molt.

Brook, Peter (Stephen Paul) (b. March 21, 1925, London), English producer-director of Shakespeare's plays whose daring productions of other dramatists contributed significantly to the development of the 20th century's avant-garde stage.

Attaining at an early age the status of one of the foremost British directors, he introduced the plays of Jean Cocteau and Jean-Paul Sartre (including *Vicious Circle* and *Men Without Shadows*) to England. After serving as director of the Royal Opera House, Covent Garden, London (1947–50), he returned to drama and directed, in the 1950s and early '60s, Shakespearean productions of *Measure for Measure, Titus Andronicus, The Winter's Tale,* and *King Lear* (1962; Royal Shakespeare Company). Influenced by the tenets of the Theatre of Cruelty proposed by Antonin Artaud, he produced Jean Genet's work *The Screens* and, ultimately in 1964, Peter Weiss's sensational play commonly called *Marat/Sade,* whose unconventional style and staging shocked the theatre world and won him international fame. In 1968 he produced Seneca's *Oedipus* and published *The Empty Space,* which put forth his ideas on theatre. Believing that the director is, above all, a play's chief creative force, he adopted some of the innovative techniques advocated by the experimental Polish director Jerzy Grotowski and the U.S. director Julian Beck, founder of the Living Theatre. Later major productions include *Timon of Athens* (Paris, 1974), *Ubu Roi* (Paris, 1977), and *Antony and Cleopatra* (Stratford, London, 1979). From 1971 he worked with the International Centre of Theatre Research, which he founded. Associated with Britain's Royal Shakespeare Theatre from 1962, Brook served as a producer and codirector.

Articles are alphabetized word by word, not letter by letter

Brook Farm, formally THE BROOK FARM INSTITUTE OF AGRICULTURE AND EDUCATION, short-lived utopian experiment in communal living (1841–47). The farm itself was located in West Roxbury, Mass., near Boston. It was organized and virtually directed by George Ripley, a former Unitarian minister, editor of *The Dial* (a critical literary monthly), and a leader in the Transcendental Club, an informal gathering of intellectuals of the Boston area. He was aided by his wife, Sophia Dana Ripley, a woman of wide culture and academic experience.

According to the articles of agreement, Brook Farm was to combine the thinker and the worker, to guarantee the greatest mental freedom, and to prepare a society of liberal, cultivated persons, whose relations with each other would permit a more wholesome and simpler life than could be led amid the pressure of competitive institutions.

The project was financed by the sale of stock, a purchaser of one share automatically becoming a member of the institute, which was governed by a board of directors. The profits, if any, were divided into a number of shares corresponding to the total number of man-days of labour, every member entitled to one share for each day's labour performed. Among the original shareholders were Charles A. Dana and Nathaniel Hawthorne, who served together as the first directors of agriculture. Ralph Waldo Emerson, Bronson Alcott, Margaret Fuller, Elizabeth Peabody, Theodore Parker, and Orestes A. Brownson were among its interested visitors.

Brook Farm attracted not only intellectuals—though teachers were always in preponderance among the 70 or 80 members—but farmers and craftsmen as well. It paid $1 a day for work (physical or mental) to men and women and provided housing, clothing, and food at approximately actual cost to all members and their dependents. For four years the commune published *The Harbinger,* a weekly magazine devoted to social and political problems, to which James Russell Lowell, John Greenleaf Whittier, and Horace Greeley occasionally contributed.

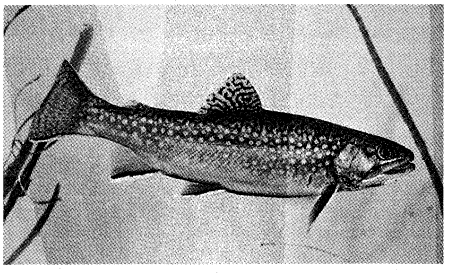
Brook Farm was noted particularly for the modern educational theory of its excellent school, which sought to establish "perfect freedom of relations between students and teaching body." Discipline at the school was never punitive; rather, it consisted of a gentle attempt to instill in the student a sense of personal responsibility and to communicate a passion for intellectual work. There were no prescribed study hours, and each student was required to give a few hours a day to manual labour. There was an infant school, a primary school, and a college preparatory course covering six years. Although communal living proved to have disadvantages (Hawthorne found that he was unable to write there and left after six months), for a while it seemed that the ideal of the founders would be realized. Within three years the community—or "Phalanx," as it was called after 1844, when Brook Farm adopted some of the theories of the French Socialist Charles Fourier—had added four houses, workrooms, and dormitories. It then put all available funds into the construction of a large central building to be known as the Phalanstery, which burned to the ground as its completion was being celebrated. Though the colony struggled on for a while, the enterprise gradually failed; the land and buildings were sold in 1849. Ripley worked as the literary critic on Greeley's *New York Tribune* until his death in 1880.

Brook Farm was one of many experiments in communal living that took place in the United States during the first half of the 19th century; it is better known than most and has a secure place in U.S. social history because of the distinguished literary figures and intellectual leaders associated with it. Hawthorne's *Blithedale Romance* (1852) is a fictional treatment of some aspects of the Brook Farm setting.

Brook Island (Pacific Ocean): *see* Jarvis Island.

brook moss: *see* water moss.

brook trout, also called SPECKLED TROUT, or SQUARETAIL (*Salvelinus fontinalis*), popular freshwater game fish, a variety of char, regarded for its flavour and its fighting qualities when hooked. The brook trout belongs to the salmon family, Salmonidae. A native of the northeastern United States and Canada,



Brook trout (*Salvelinus fontinalis*)
Treat Davidson—The National Audubon Society Collection/Photo Researchers

it has been transplanted to many parts of the world. It lives in cold, clean fresh water and is recognized by dark, wormlike markings on the back, red and whitish spots on the body, and white on the leading edge of the lower fins and lower tail-fin lobe. It may weigh up to about three kilograms (six pounds). Some individuals migrate to large lakes or the sea and grow much larger and more silvery.

Brooke RAJ (1841–1946), dynasty of British rajas that ruled Sarawak (now a state in Malaysia) on the island of Borneo for a century.

Sir James Brooke (b. April 29, 1803, Secrore, near Benares, India—d. June 11, 1868, Burrator, Devon, Eng.) first visited the Eastern Archipelago on an unsuccessful trading trip in 1834, after an early career that included military service with the British East India Company and participation in the first Anglo-Burmese war (1825). Intent on furthering European settlement in the East, he purchased and fitted out an armed schooner with the fortune left to him by his father, and sailed again for the Indies in 1838. At Singapore (founded 20 years earlier by Sir Stamford Raffles), Brooke learned that Pengiran Muda Hassim, chief minister of the sultanate of Brunei, was engaged in war with several rebel Iban (Sea Dayak) tribes in neighbouring Sarawak, nominally under Brunei control. The rebellion was crushed with Brooke's aid, and as a reward for his services the title of raja of Sarawak was conferred upon him in 1841, confirmed in perpetuity by the sultan of Brunei in 1846. For the next 17 years Brooke and a handful of English assistants made expeditions into the interior of Sarawak, partially suppressed the prevalence of headhunting, and established a secure government. He was knighted in 1848. Returning to England in 1863, he left the government of Sarawak in the hands of a nephew, who, on the death of Sir James in 1868, succeeded him.

Sir Charles Anthony Johnson Brooke (b. June 3, 1829, Berrow, Somerset, Eng.—d. May 17, 1917, Cirencester, Gloucestershire), who adopted the surname Brooke, became the second raja. The government of Charles Brooke has been described as a benevolent autocracy. Charles himself had spent much of his life among the Iban people of Sarawak, knew their language, and respected their beliefs and customs. He made extensive use of down-river Malay chiefs as administrators, and encouraged selective immigration of Chinese agriculturalists, while the dominant indigenous group, the Ibans, were employed in military service. In general, social and economic changes were limited in impact, shielding the inhabitants from both the benefits and the hardships of Western-style development. He was knighted in 1888. The second raja was succeeded upon his death by his eldest son, Charles.

Sir Charles Vyner de Windt Brooke (b. Sept. 26, 1874, London—d. May 9, 1963, London) was the third and last "white raja" (1917–46). He joined the Sarawak administration in 1897. After World War I, a boom in rubber and oil drew Sarawak further into the world economy, and for that and other reasons the state embarked on gradual modernization of its institutions. Public services were developed, a Sarawak penal code modelled on that of British India was introduced in 1924, and there was some extension of educational opportunity. Brooke was knighted in 1927. In September 1941, on the centenary of Brooke rule, the third raja proclaimed a constitution designed to establish self-government for Sarawak, but shortly afterward the state fell to the Japanese. When World War II was over, Vyner Brooke decided that Sarawak should be ceded to Great Britain, and, after a bitter family feud, he formally terminated Brooke rule on July 1, 1946.

Brooke, Alan Francis: *see* Alanbrooke (of Brookeborough), Alan Francis Brooke, 1st Viscount.

Brooke, Edward (b. Oct. 26, 1919, Washington, D.C.), American lawyer and legislator, the first black to be popularly elected to the U.S. Senate.

Brooke earned his undergraduate degree at

Howard University (Washington, D.C.) in 1941 and served as an infantry officer during World War II. After being discharged, he earned two law degrees at Boston University, where he was editor of the law review.

Brooke began practicing law in 1948 and became a successful Boston attorney. He met with defeat, however, when he ran in 1950 and again in 1952 for a seat in the Massachusetts legislature. His 1960 bid to become the Massachusetts secretary of state also ended in defeat. From 1961 to 1962 he served as chairman of the Boston Finance Commission, seeking evidence of corruption in city politics.

In 1962 Brooke, a Republican, was elected attorney general of Massachusetts. A vigorous prosecutor of official corruption, he was re-elected in 1964 by a large margin, despite the success of Democrats that year.

In 1966 Brooke ran for a seat in the U.S. Senate and won by nearly half a million votes. He established a reputation as a soft-spoken moderate on civil rights and a leader of the progressive wing of his party. In 1972 he was overwhelmingly reelected, even as Massachusetts supported Democrat George McGovern in the presidential contest.

In 1978, however, beset by personal problems including a divorce and accusations of financial misdeeds, Brooke lost his bid for a third term. In 1979 he became chairman of the National Low-Income Housing Coalition.

Brooke, Fulke Greville, 1st Baron (Elizabethan writer): *see* Greville, Fulke.

Brooke, Henry (b. *c.* 1703, County Cavan, Ire.—d. Oct. 10, 1783, Dublin), Irish novelist and dramatist, best known for *The Fool of Quality,* one of the outstanding English examples of the novel of sensibility—a novel in which the characters demonstrate a heightened emotional response to events around

Henry Brooke, engraving by C. Pye after a drawing by J. Thurston from a portrait by the subject's nephew Henry Brooke

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

them. After attending Trinity College, Dublin, Brooke went to London in 1724 to study law. There he became friendly with Alexander Pope; he had already met Jonathan Swift in Ireland.

In 1739 Brooke wrote a celebrated drama, *Gustavus Vasa, the Deliverer of His Country,* performance of which was forbidden because of the supposition that Sir Robert Walpole, the prime minister, was depicted in the part of the villain. Brooke returned to Ireland, and the play was printed and later performed in Dublin as *The Patriot.*

Brooke's novel, *The Fool of Quality* (1765–70), is a rambling and digressive narrative centred on the education of an ideal nobleman. Its moral message recommended it to John Wesley, a founder of Methodism, who edited an abridged version in 1780, and, later, to the clergyman-author Charles Kingsley, who published it with an enthusiastic biographical preface in 1859.

Brooke, Rupert (b. Aug. 3, 1887, Rugby, Warwickshire, Eng.—d. April 23, 1915, Skyros, Greece), English poet, a wellborn, gifted,

Rupert Brooke, posthumous portrait drawing by J.H. Thomas; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

handsome youth whose early death in World War I contributed to his idealized image in the interwar period. His best known work is the sonnet sequence *1914.*

At school at Rugby, where his father was a master, Brooke distinguished himself as a cricket and football player as well as a scholar. At King's College, Cambridge, where he matriculated in 1906, he was prominent in the Fabian (Socialist) Society and attracted innumerable friends. He studied in Germany and travelled in Italy, but his favourite pastime was rambling in the countryside around the village of Grantchester, which he celebrated in a charming and wildly irrational panegyric, "The Old Vicarage, Grantchester" (1912). In 1911 his *Poems* were published. He spent a year (1913–14) wandering in the U.S., Canada, and the South Seas. With the outbreak of the war he received a commission in the Royal Navy. After taking part in a disastrous expedition to Antwerp that ended in a harrowing retreat, he sailed for the Dardanelles, which he never reached. He died of septicemia on a hospital ship off Skyros and was buried in an olive grove on that island.

Brooke's wartime sonnets, *1914* (1915), brought him immediate fame. They express an idealism in the face of death that is in strong contrast to the later poetry of trench warfare. One of his most popular sonnets, "The Soldier," begins with the familiar lines:

> If I should die, think only this of me:
> That there's some corner in a foreign field
> That is for ever England.

John Lehmann's *The Strange Destiny of Rupert Brooke,* a biography, was published in 1981.

Brookfield, village, Cook County, northwestern Illinois, U.S., on Salt Creek. A western residential suburb southwest of Chicago, it was founded in 1892 by Samuel Eberly Gross, a land promoter, and originally called Grossdale. It was renamed in 1905. Its major attraction is the Chicago Zoological Park, popularly known as Brookfield Zoo. Inc. 1893. Pop. (1980) 19,395.

Brookfield Zoo, formally CHICAGO ZOOLOGICAL PARK, zoo opened in 1934, known for its extensive use of open-air, unbarred enclosures. Located in Brookfield, Ill., a suburb southwest of Chicago, the zoo, owned by the Forest Preserve District of Cook County, is operated by the Chicago Zoological Society.

The 83-ha (204-ac) zoo has Italian provincial buildings and formal malls. Special attractions are the inland porpoise show, a children's zoo, and Tropic World, a vast enclosed exhibit of mixed species from the three main rainforests of the world—African, Asian, and South American. Well-known residents were the three giant pandas, Su-lin, Mei-mei, and Mei-lan, shown from 1937 to 1953. Brookfield has had exceptional success in breeding Dall sheep, okapis, and polar bears—and it has collections of hoofed stock, kangaroos, and baboons and other African primates. The zoo has approximately 2,300 specimens of more than 500 species.

Brookings, city, seat of Brookings County, eastern South Dakota, U.S., in the Big Sioux River Valley. Founded in 1879 and named for Judge W.W. Brookings, it evolved as the centre of a diversified agricultural area, noted especially for hybrid corn and seeds. A progressive farm economy has been sustained by the agricultural and horticultural schools of South Dakota State University, which was established in Brookings in 1881 and is the state's only land-grant school. A collection of pioneer-life paintings by Harvey Dunn is exhibited at the South Dakota Memorial Art Center. Inc. 1883. Pop. (1980) 14,951.

Brookings, Robert S(omers) (b. Jan. 22, 1850, Cecil County, Md., U.S.—d. Nov. 15, 1932, Washington, D.C.), U.S. businessman and philanthropist who helped establish the Brookings Institution (*q.v.*) at Washington, D.C.

Brookings entered a St. Louis, Mo., woodenware company at the age of 17. Four years later he and his brother opened their own woodenware firm and during the next 25 years extended their interests into real estate and the lumbering and transportation industries.

Following his retirement in 1896, Brookings devoted his time to the development of Washington University in St. Louis. As president of the university corporation (1897–1928) he helped relocate the school, induced wealthy St. Louis citizens to contribute money for buildings and endowments, and helped raise the medical school to a position of academic excellence. He was one of the original trustees of the Carnegie Endowment for International Peace and during World War I served as chairman of the price-fixing committee of the War Industries Board. After the war he became the first board chairman of the Institute for Government Research and helped found the Institute of Economics and the Brookings Graduate School of Economics and Government. In 1927 these three organizations were merged and named the Brookings Institution in his honour.

Brookings Institution, research institute, not for profit, founded in Washington, D.C., in 1927 by the merchant, manufacturer, and philanthropist Robert S. Brookings (*q.v.*) and devoted to public service through research and education in the social sciences, particularly in economics, government, and foreign policy. It was formed by the amalgamation of the Institute for Government Research (founded 1916), the Institute of Economics (1922), and the Robert Brookings Graduate School of Economics and Government (1924). Its chief publications are the *Brookings Bulletin* (quarterly), *Brookings Papers on Economic Activity* (three times a year), and *Reprint Series* (irregular).

brookite, one of three minerals composed of titanium dioxide (TiO_2) (*see also* rutile; anatase). It typically occurs as brown, metallic crystals in veins in gneiss and schist; it is also found in placer deposits and, less commonly, in zones of contact metamorphism. It is widespread in veins in the Alps; in Fronolen, north Wales, it forms crystals on crevice walls in diabase. Brookite forms crystals that belong to the orthorhombic system. For detailed physical properties, *see* oxide mineral (table).

Brookline, urban town (township), an exclave of Norfolk County, eastern Massachusetts,

U.S., between Suffolk and Middlesex counties and almost surrounded by Boston. Settled in 1638 as part of Boston, it was called Muddy

The birthplace of Pres. John F. Kennedy, Brookline, Mass.
D. Hanley—Photo Researchers

River until organized as a town of Suffolk County in 1705. Named for a small brook that formed the line of Judge Samuel Sewall's tract, it was an early market-gardening area and administratively became part of Norfolk County in 1793. It includes Brookline Village, Cottage Farms, Longwood, Beaconsfield, and part of Chestnut Hill and has long been a suburban residential area with some light industries, including furniture making, printing, and publishing. Brookline is the birthplace of Pres. John F. Kennedy; the house (83 Beals Street) in which he was born was designated a national historical site in 1969. The town is the seat of Hebrew (1921) and Hellenic (1937; Greek Orthodox) colleges. Pop. (1982 est.) 54,205.

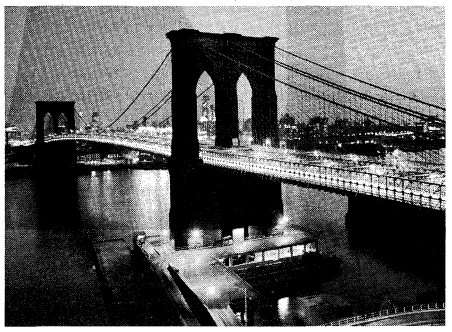
Brooklyn, one of the five boroughs of New York City (*q.v.*), southwestern Long Island, southeastern New York, U.S., coextensive with Kings County (area 71 sq mi [184 sq km]). It is separated from Manhattan by the East River and is bordered by the Upper and Lower New York bays (west), the Atlantic Ocean (south), and the borough of Queens (north and east). Brooklyn is connected to Manhattan by three bridges (one of which is the Brooklyn Bridge), one vehicular tunnel, and several rapid transit tubes; to Queens and Long Island by parkways; and to Staten Island by the 4,260-ft (1,298-m) Verrazano-Narrows Bridge (completed 1964).

The first settlement (1636) in the area by Dutch farmers was soon followed by other settlements—Flatlands, Wallabout, the Ferry, Gravesend, and in 1645 Breuckelen, also spelled Breucklyn, Breuckland, Brucklyn, Broucklyn, Brookland, and Brookline; the present spelling became fixed about the close of the 18th century. Later settlements included New Utrecht (1650), Flatbush (1651; first called Medwoud, Midwout, or Midwood), Bushwick, and Williamsburg (1660). The Revolutionary Battle of Long Island was fought there on Aug. 27, 1776, with remnants of the American army retreating to Brooklyn Heights overlooking the East River. In 1816 the most populous section of Brooklyn was incorporated as a village and in 1834 as a city. In 1855 Williamsburg and Bushwick were annexed; other communities were absorbed until the city of Brooklyn became conterminous with Kings County (created 1683). Brooklyn became a borough of New York City on Jan. 1, 1898.

Brooklyn is both residential and industrial and also handles a vast amount of oceangoing traffic. It is a western terminus of the Long Island Rail Road. There are many educational institutions, including Pratt Institute (1887), Polytechnic Institute of New York (1854), and branches of the City University of New York, the State University of New York, and Long Island University. Several colonial churches (including Plymouth Church of the Pilgrims, where Henry Ward Beecher preached), Coney Island (*q.v.*), the Brooklyn Botanic Garden and Arboretum (*q.v.*), the Brooklyn Museum, and the Brooklyn Children's Museum are in the borough. Famed native sons include composer George Gershwin, lyricist Ira Gershwin, and writers Arthur Miller and Norman Mailer. Pop. (1970) 2,602,012; (1980) 2,230,936.

Brooklyn Botanic Garden and Arboretum, botanical garden founded in 1911 in Brooklyn, N.Y., municipally owned and privately operated (by the Brooklyn Institute of Arts and Sciences); it maintains an extensive and widely emulated program of public education. The 20-ha (50-ac) area in Brooklyn is augmented by a 90-ha field station in nearby Westchester County. Among the more than 12,000 plant forms in the botanical garden are special rose, cactus, and orchid collections, a bonsai exhibit, a fragrant garden for the blind, a Shakespeare garden, and a wild-flower garden. The garden publishes a quarterly, *Plants and Gardens.*

Brooklyn Bridge, suspension bridge spanning the East River from Brooklyn to Manhattan Island, New York City. A brilliant feat of 19th-century engineering, the Brooklyn Bridge was the first bridge to use steel for cable wire; during its construction explosives were used inside a pneumatic caisson for the first time. The masterwork of John Augustus Roebling,



Brooklyn Bridge at night from the Manhattan side
A. Devaney

the Brooklyn Bridge was built (1869–83) in the face of immense difficulties. Roebling died as a result of an accident at the outset, and his son, Washington Roebling, taking over as chief engineer, suffered a crippling attack of caisson disease (the bends) during the founding of the New York pier (1872). Confined to his apartment in Columbia Heights (Brooklyn), he continued to direct operations, observing with field glasses and sending messages to the site by his wife, Emily Warren Roebling. A compressed-air blast that wrecked a pneumatic caisson slowed the work, as did a severe fire that smoldered for weeks in another caisson, a cable that parted from its anchorage on the Manhattan side and crashed into the river, and the fraud perpetrated by a steel-wire contractor that necessitated the replacement of tons of cable.

The Brooklyn Bridge's 1,595-foot (486-metre) main span was the longest in the world until the completion of the Firth of Forth cantilever bridge in 1890. Its deck, supported by four cables, carries both automobile and pedestrian traffic. A distinctive feature is the broad promenade above the roadway, which John Roebling accurately predicted "in a crowded commercial city will be of incalculable value."

Brooklyn Children's Museum, educational institution in Brooklyn, N.Y., established in 1899 as the world's first children's museum. The museum was originally a part of the Brooklyn Institute of Arts and Sciences, founded in 1823. In 1977 the Children's Museum opened in a building in Crown Heights, Brooklyn, after nearly seven decades of operation in two Victorian mansions. The museum's more than 50,000 cultural artifacts and natural history specimens combine with a system of permanent exhibits to advance its educational purposes. It is strong in cultural history, natural history, and technology.

Brooklyn Museum, museum in Brooklyn, N.Y., that pioneered in public education in art and community participation and service. The first section of the museum was opened in 1896. It added wings and special facilities over the years, and in 1923 it became the first museum in the United States to exhibit African cast-metal and other objects as art, not ethnological artifacts. The first period room installation was opened in 1929. Twelve Assyrian alabaster reliefs were added to the museum's collections in 1955. The Egyptian and classical collection covered five millennia of Egyptian art by the early 1980s. Examples of the diversity of topics covered in special exhibits include Cubism, black American art, women's art, and Haitian art.

Brooks, town, southern Alberta, Canada, on the Trans-Canada Highway, 116 mi (187 km) southeast of Calgary. It originated in the late 19th century as a Canadian Pacific Railway flag stop for cattle shipping and was named for N.E. Brooks, a division railroad engineer. In the surrounding area, ranching and the production of natural gas are important; wheat and alfalfa have been grown since 1914, when the railway built an irrigation dam at Bassano on the nearby Bow River. Brooks Aqueduct, 2 mi long, carries water across the valley.

Brooks is the site of a provincial horticultural research centre. Kinbrook Island Provincial Park (95 ac [38 ha]), noted for bird life, on Lake Newell is just to the south; Dinosaur Provincial Park (21,817 ac [8,829 ha] is 30 mi northeast. Inc. 1911. Pop. (1981) 9,421.

Brooks, Cleanth (b. Oct. 16, 1906, Murray, Ky., U.S.), American teacher and critic whose work was important in establishing the New Criticism, which stressed close reading and structural analysis of literature.

Educated at Vanderbilt, Nashville, Tenn., and Tulane, New Orleans, universities, Brooks was a Rhodes scholar (Exeter College, Oxford) before he began teaching at Louisiana State University, Baton Rouge, in 1932. From 1935 to 1942, with the poet and critic Robert Penn Warren, he edited *The Southern Review,* a journal that advanced the New Criticism, as did Brooks's critical works, *Modern Poetry and the Tradition* (1939) and *The Well Wrought Urn* (1947). Authoritative college textbooks by Brooks, with others, also reinforced the popularity of the New Criticism: *Understanding Poetry* (1938) and *Understanding Fiction* (1943) cowritten with Warren, and *Understanding Drama* (1945) with Robert Heilman.

Brooks taught at Yale University from 1947 and was also a Library of Congress fellow (1951–62) and cultural attaché at the U.S. embassy in London (1964–66). Brooks's later works included *Literary Criticism: A Short History* (1957) and *William Faulkner: The Yoknapatawpha Country* (1963; both cowritten with William K. Wimsatt, Jr.), and *William Faulkner: Toward Yoknapatawpha and Beyond* (1978). *A Shaping Joy: Studies in the Writer's Craft* (1972) contains collected writings and lectures of the 1960s.

Brooks, Gwendolyn (Elizabeth) (b. June 7, 1917, Topeka, Kan., U.S.), American poet whose works deal with the everyday life of urban blacks. She was the first black poet to win the Pulitzer Prize, and in 1969 she was named the poet laureate of Illinois.

Brooks graduated from Wilson Junior College in 1936. Her early verses appeared in the *Chicago Defender,* a newspaper written pri-

marily for the black community of Chicago. Her first published collection, *A Street in Bronzeville* (1945), reveals her talent for making the ordinary life of her neighbours extraordinary. *Annie Allen* (1949), for which she won the Pulitzer Prize, is a loosely connected series of poems related to a black girl's growing up in Chicago. The same theme was used for Brooks's novel *Maud Martha* (1953).

The Bean Eaters (1960) contains some of her best verse. Her *Selected Poems* (1963) was followed in 1968 by *In the Mecca,* half of which is a long narrative poem about people in the Mecca, a vast, fortress-like apartment building erected on the South Side of Chicago in 1891 that had long since deteriorated into a slum. The second half of the book contains individual poems, among which the more noteworthy are "Boy Breaking Glass" and "Malcolm X." Brooks also wrote a book for children, *Bronzeville Boys and Girls* (1956). The autobiographical *Report from Part One* (1972) was an assemblage of personal memoirs, interviews, and letters. Later works include *Primer for Blacks* (1980), *Young Poets' Primer* (1981), and *To Disembark* (1981).

Brooks, Louise (b. Nov. 14, 1906, Cherryvale, Kan., U.S.—d. Aug. 8, 1985, Rochester, N.Y.), American motion-picture actress, noted for her effortless incarnation of corrupt sensuality in silent-picture roles during the 1920s.

The daughter of a lawyer, Brooks began dancing while a teenager and appeared in Florenz Ziegfeld's *Follies* on Broadway in 1925. She made her film debut that same year, soon rising to leading roles in such Hollywood films as Howard Hawks's *A Girl in Every Port* (1928) and William Wellman's *Beggars of Life* (1928). Her performances attracted the attention of the German director G.W. Pabst, who cast her as the amoral, self-destructive temptress Lulu in *Die Büchse der Pandora* (1928; *Pandora's Box*). Brooks's haunting performance in this film and as the 16-year-old girl who is seduced and prostituted in Pabst's *Tagebuch einer Verlorenen* (1929; *The Diary of a Lost Girl*) marked the summit of her career. Her innocent eroticism, along with her pale, beautiful features and bobbed brunette hair made her both a film icon and a symbol of the disdainful flapper of the 1920s.

Brooks returned to the United States in 1930, but her intellectual independence and outspokenness repeatedly brought her into conflict with studio executives there. After appearing in small roles in several Hollywood films during the 1930s, she permanently abandoned the cinema in 1938. During the 1950s she wrote a number of astute articles on motion pictures. Brooks was rescued from obscurity in the early 1980s when her classic performances in Pabst's films won belated critical acclaim. Her literate and intelligent collection of autobiographical essays, *Lulu in Hollywood,* was published in 1982.

Brooks, Phillips (b. Dec. 13, 1835, Boston—d. Jan. 23, 1893, Boston), American Episcopal clergyman who won an international reputation for his sermons during his 22-year ministry at Trinity Church in Boston.

Brooks graduated from Harvard University in 1855 and taught briefly before going to Philadelphia (1859) to become minister of the Church of the Advent and, three years later, of Holy Trinity Church. In 1868 he wrote his famous Christmas hymn "O Little Town of Bethlehem" for the Holy Trinity Sunday School, and the following year he became rector at Trinity Church. In 1891 Brooks was consecrated bishop of Massachusetts, but he died after a brief episcopate of 15 months.

Endowed with a commanding stature, a compelling personality, and great eloquence, Brooks was by far the most attractive and

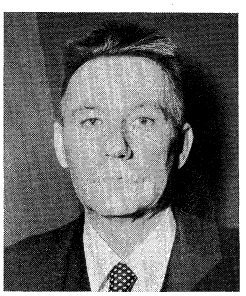
Phillips Brooks, 1893
By courtesy of the Library of Congress, Washington, D.C.

widely loved preacher of his day. His natural vigour coupled with an innate gentleness and cheerfulness gave to his preaching a quality of winsomeness and serenity that was tremendously appealing to the large congregations that gathered to hear him. He was a Broad Churchman who preached the Gospel with both intellectual clarity and nondogmatic power, always refusing to be drawn into controversy or intolerant opinions.

Brooks, Van Wyck (b. Feb. 16, 1886, Plainfield, N.J., U.S.—d. May 2, 1963, Bridgewater, Conn.), American critic, biographer, and literary historian, whose "Finders and Makers" series traces U.S. literary history in rich biographical detail from 1800 to 1915.

Brooks grew up in the wealthy suburb of Plainfield. Graduating from Harvard in 1907, Brooks went to England, where, while working as a journalist, he published his first book, *The Wine of the Puritans* (1908), in which he blamed the Puritan heritage for America's cultural shortcomings. He explored this theme more thoroughly in his first major work, *America's Coming-of-Age* (1915), which made a strong impact with its thesis that the Puritan duality that separated spiritual and money matters had resulted in a corresponding split in contemporary American culture between "highbrow" and "lowbrow" publics, neither of which was helpful to the writer.

Brooks's book *The Ordeal of Mark Twain* (1920; rev. ed., 1933) was a psychological study attempting to show that Twain had crippled himself emotionally and curtailed his genius by repressing his natural artistic bent for the sake of his Calvinist upbringing. In *The Pilgrimage of Henry James* (1925) Brooks took a stand against expatriation, arguing that James's later writing was convoluted and inferior because of his too-long separation from his native land. Brooks suffered a mental breakdown from 1927 to 1931. *The Life of Emerson* (1932), largely written before his collapse, was edited by his friend Lewis Mumford. In Emerson, Brooks found an American



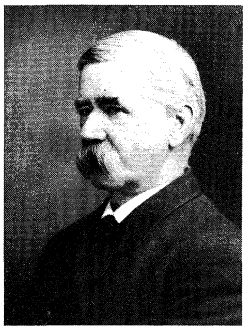
Van Wyck Brooks, 1947
AP/Wide World Photos

writer who had successfully bridged the gap between art and life.

The "Finders and Makers" series began with *The Flowering of New England, 1815–1865* (1936), followed by *New England: Indian Summer, 1865–1915* (1940), *The World of Washington Irving* (1944), *The Times of Melville and Whitman* (1947), and *The Confident Years: 1885–1915* (1952). Criticized by some for seeking in this series a mainstream, essentially middlebrow, cultural tradition free from contradictions and conflicts, Brooks wrote *The Writer in America* (1953) to justify his position.

Brooks, William Keith (b. March 25, 1848, Cleveland—d. Nov. 12, 1908, Lake Roland, Md., U.S.), American zoologist known for his research on the anatomy and embryology of marine animals, especially the tunicates, crustaceans (*e.g.,* crayfish), and mollusks (notably the oyster). In his acceptance of evolution, he remained in the tradition of 19th-century descriptive morphology; but, through his more able students, he influenced the transition to an experimental, causal approach to 20th-century biology, particularly in cytology, genetics, and embryology.

A student of Louis and Alexander Agassiz at Harvard University, where he received a doctorate in 1875, Brooks advocated the study of marine organisms in their natural habitats



William Brooks
By courtesy of the Johns Hopkins University, Baltimore, Md.

and was one of the first morphologists to accept Charles Darwin's evolutionary concepts. From 1876 he taught at Johns Hopkins University, Baltimore, where he became head of the biology department in 1894. He founded the Chesapeake Zoological Laboratory (1878) and, as Commissioner to the General Assembly of Maryland, championed the conservation of the Chesapeake Bay oyster. Among his more important works are *The Oyster* (1891), a monograph on "The Genus Salpa" (1893), and *The Foundations of Zoology* (1899).

Brooks Range, northernmost extension of the Rocky Mountains in northern Alaska, U.S. It is separated from the Alaska Range (south) and the Mackenzie Mountains (southeast) by the lowlands of the Yukon and Porcupine river systems. The range extends about 600 mi (1,000 km) in a west–east direction across Alaska, from the Chukchi Sea to the Yukon (Canadian) border, and reaches widths of 80 mi. Its peaks average 3,000 ft (900 m) in the west to 9,000 ft in the centre and east; Mt. Isto (9,058 ft), near the Canadian border, is the highest point. The range serves as a watershed between the Yukon River drainage and that of the Arctic Ocean. Anaktuvuk Pass (2,200 ft), near its centre, is the principal means of access from the Yukon lowlands. The British and Richardson mountains, extending about 250 mi southeast to the Peel River of Canada, are sometimes considered part of the range. Named for the geologist Alfred H. Brooks, the entire mountain group is within the Arctic Circle and is devoid of trees, being north of the timberline. Huge reserves of oil were discovered at Prudhoe Bay at its northern base, and the range is crossed at Atigun Pass by the trans-Alaskan pipeline en route to the Valdez terminal in southern Alaska.

broom, any of several shrubs or small trees of the genus *Cytisus,* of the pea family (Faba-

ceae), native to temperate regions of Europe and western Asia. They are also cultivated in other regions chiefly for their attractive flowers. The compound leaves have three leaflets. The yellow, purple, or white flowers are solitary or in small clusters. The fruit is a flat pod. A common almost leafless species is *C. scoparius,* a shrub with bright-yellow flowers; it is often grown for erosion control in warm climates. When ripe, its pods burst, scattering

Broom (*Cytisus beanii*)
Valerie Finnis

the seeds. Butcher's broom, *Ruscus aculeatus,* is a shrub of the lily family (Liliaceae) with small whitish flowers and red berries.

broom moss, common species of the wind-blown moss (*q.v.*) group.

broomcorn, a variety of upright grass of the species *Sorghum vulgare,* or *S. bicolor* variety *technicum,* belonging to the family Gramineae (sometimes Poaceae) and cultivated for their stiff stems. The seeds of broomcorn are borne on the ends of long straight branches. When harvested and dried, these stiff bristles are processed and bound to form broom heads and brushes. *S. vulgare* is grown in the Great Plains of North America. Broomcorn is also the common name of *Panicum miliaceum,* a type of millet (*q.v.*).

Broome, town and port, northern Western Australia, on the north shore of Roebuck Bay (an inlet of the Indian Ocean). This part of the coast was explored in 1688 and 1699 by the English adventurer and buccaneer William Dampier, whose report on the barren conditions discouraged later settlement. It was not until the discovery of pearl-oyster beds offshore in 1883 that the site was settled and named after Sir Frederick Napier Broome, governor (1883–91). It became the centre of a prosperous pearling trade, which declined in the 1930s and collapsed with the advent of plastics in the 1950s. There remains some fishing for immature oysters to supply cultured pearl farms at Kure Bay, 250 mi (400 km) northeast. Situated on the Great Northern Highway to Perth (1,392 mi southwest), Broome now serves the cattle-grazing Kimberley district. The town's meatworks ships its output from a 2,700-ft (825-m) jetty, built to overcome the difficulties presented by a 30-ft tidal range. Offshore drilling for oil and natural gas is an important local industry. The terminus of a submarine cable from Java (1889), Broome was attacked by the Japanese during World War II. Pop. (1981) 3,666.

Broome, William (b. May 3, 1689, Haslington, Cheshire, Eng.—d. Nov. 16, 1745, Bath, Somerset), British scholar and poet, best known as a collaborator with Alexander Pope and Elijah Fenton in a project to translate Homer's *Odyssey,* of which Broome translated books 2, 6, 8, 11, 12, 16, 18, and 23. He

Broome, engraving by J.-M. Delattre after a portrait by D. Heins, 18th century
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

seems to have undertaken the work mainly to add lustre to his reputation, but when he found that little fame came his way because of it, he began to complain of underpayment. In fact Pope was more generous than originally had been supposed. Broome also made translations from the Greek of Anacreon, and his own *Poems on Several Occasions* was published in 1727.

broomrape, any member of about 140 species of the genus *Orobanche* and its family (Orobanchaceae), which contains 14 genera (including *Boschniakia*) and about 180 species in all. All are parasitic herbs, with little green tissue (*i.e.,* they have little chlorophyll and do not produce their food photosynthetically to any great extent), which draw nourishment from the roots of other plants by means of small suckers.

The broomrape family, which occurs in the Northern Hemisphere, is characterized by the

Broomrape (*Boschniakia*)
Charlie Ott—Photo Researchers

nongreen colour of the plants, irregularly shaped flowers, scales in place of leaves, and one-chambered capsules that contain numerous minute seeds. The plants may be yellowish, brownish, purplish, or white.

Broonzy, Big Bill, byname of WILLIAM LEE CONLEY BROONZY (b. June 26, 1893, Scott, Miss., U.S.—d. Aug. 14, 1958, Chicago), American blues singer and guitarist who represented a tradition of itinerant folk blues.

Broonzy grew up in Arkansas. He served in the army (1918–19) and moved to Chicago in 1920, where six years later he made his recording debut as guitar accompanist to Negro blues singers. Later he became a singer himself and by 1940 was recognized as one of the best-selling blues recording artists. His New York City concert debut was made at Carnegie Hall in 1938. In 1951 he visited Europe and soon became popular across the Continent. At the height of his popularity in 1957, his vocal effectiveness was reduced by a lung operation, and he died the following year of cancer. Many students of the blues have found his work almost as fascinating for its sociological as for its strictly musical content. His mother, who was born a slave, died in 1957 at the age of 102, having survived to see Broonzy become a world-famous figure. His autobiography, *Big Bill Blues,* appeared in 1955.

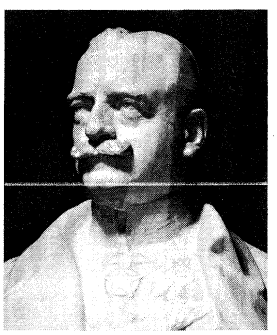
Brophy, Brigid (Antonia) (b. June 12, 1929, London), English writer whose satiric, witty novels explore the psychology of sex. She also wrote plays and nonfiction that reflect her interests in psychoanalysis, art, opera, and sexual liberation.

The daughter of the novelist John Brophy, she began writing at an early age. Her first novel, *Hackenfeller's Ape,* was published in 1953. With her husband, the art historian Michael Levey, and the author and literary critic Charles Osborne, Brophy wrote the controversial *Fifty Works of English and American Literature We Could Do Without* (1967), which attacked many eminent literary figures and criticized such works as *Hamlet* and *Huckleberry Finn.* Her other nonfiction includes critical portraits—such as *Mozart the Dramatist* (1964) and *Black and White: A Portrait of Aubrey Beardsley* (1968)—and a well-received collection of selected journalism, *Don't Never Forget* (1966).

The two great influences on Brophy's work were Sigmund Freud and George Bernard Shaw, whom she called the "two mainstays of the 20th century." Her nonfiction treatise *Black Ship to Hell* (1962), which examines human destructive and self-destructive instincts, owes much to her study of psychoanalysis. *Flesh* (1962), *In Transit* (1969), *Pussy Owl: Superbeast* (1976) and other novels portray the subtleties of modern relationships.

Broqueville, Charles, comte de (count of) (b. Dec. 4, 1860, Postel, near Mol, Belg.—d. Sept. 5, 1940, Brussels), statesman who headed the Belgian government-in-exile during World War I.

Broqueville was prime minister in 1911 and again in 1912. Minister of war also from 1912 to August 1917, he was responsible for the Belgian mobilization on the eve of war in 1914. He resigned the premiership in December 1917 when it became known that, without informing his Cabinet, he had taken part in a negotiation for a separate peace with Austria-Hungary. He subsequently held various ministerial appointments and finally was again prime minister from October 1932 until November 1934, at the head of a Catholic–Liberal coalition.



Broqueville, marble bust by Jacques Marin, 1920; in the Chambre des Représentants, Brussels
© A.C.L., Brussels

Brorson, Hans Adolf (b. June 20, 1694, Randerup, Den.—d. June 3, 1764, Ribe), Danish Pietist clergyman, the outstanding writer of hymns of his day, and translator of German Pietist hymns into Danish.

In 1732, while a pastor, he started publishing hymns for his congregation in southern Jutland. His main work, *Troens rare klenodie* (1739; "The Rare Jewel of Faith"), contained

Brorson, engraving by M. Bernigeroth
By courtesy of the Royal Danish Embassy, London

many translations and 82 original hymns. This work had seven editions during Brorson's lifetime. In 1741 he was elected bishop of Ribe, where he remained for the rest of his life. A second series of hymns, *Svanesang* (1765; "Swan Song"), was published after his death.

Broschi, Carlo: *see* Farinelli.

Brosse, Salomon de (b. 1571, Verneuil, Fr.—d. Dec. 9, 1626, Paris), most influential French architect of the early 17th century, whose works paved the way for the mature classical style of the generation that followed him.

The career of de Brosse, a Protestant, was made possible by Henry IV's promulgation in 1598 of the Edict of Nantes, guaranteeing religious toleration. The de Brosse family subsequently moved to Paris where Salomon quickly achieved success. As architect to the queen, Marie de Médicis, from 1608, he prepared designs for the Palais du Luxembourg (built *c.* 1620–27). This work and two châteaus—Coulommiers (1613) and especially Blérancourt (completed prior to 1619)—strongly influenced later architects, particularly François Mansart, who worked under de Brosse at Coulommiers.

His two most important public works were the renovation of the Grande-salle of the Palais de Justice at Paris and construction of the Palais du Parlement of Brittany at Rennes. In 1623 he rebuilt the Protestant Temple at Charenton, but his most influential church design is the novel facade for Saint-Gervais (1616), where the three principal classical orders are superimposed.

De Brosse's importance as a designer lay in his attention to mass rather than to surface decoration. This concern, the realization of an Italian Renaissance ideal, led to a new simplicity and monumentality in French architecture.

Brotherhood of Theologians (Eastern Orthodoxy): *see* Zoe.

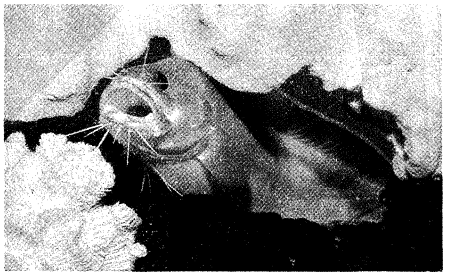
Brothers of the Sword, Order of the, Latin FRATRES MILITIAE CHRISTI, German SCHWERTBRÜDERORDEN, byname KNIGHTS OF THE SWORD, LIVONIAN ORDER, or LIVONIAN KNIGHTS, organization of crusading knights that began the successful conquest and Christianization of Livonia (most of modern Latvia and Estonia) between 1202 and 1237.

After German merchants from Lübeck and Bremen acquired commercial interests in the lands around the mouth of the Dvina River (mid-12th century), German missionaries entered the region. In 1202 the third bishop of Livonia, Albert von Buxhoevden, founded the Order of the Brothers of the Sword, with the Pope's permission, as a permanent military body in Livonia to protect the church's conquests and to forcibly convert the native pagan tribes to Christianity.

Consecrated by the Pope in 1204, the order adopted the rules of the Knights Templar; the order's knights (called Knights of the Sword because their white cloaks were decorated with red crosses and swords) were required to be of noble birth and to take vows of obedience, poverty, and celibacy. They dwelled in district castles, each of which was ruled by its own council and a military chief, who was chosen by the order's grand master. The grand master, who served for life, was selected by the knights' general assembly, which also elected the order's other officials at its annual sessions. In addition to knights, the order's membership included soldiers, artisans, and clerics.

By 1206 the order had firmly established itself as the dominant power in the land of the Livs, the Finno-Ugrian people dwelling near the mouths of the Dvina and Gauja rivers, and by 1217 it had conquered not only the neighbouring Latvian tribes north of the Dvina but also southern Estonia. It then began the conquest of the lands south of the Dvina but encountered strong resistance from their inhabitants, the Curonians (Kurs) and the Semigallians. In September 1236 while the order's army, heavily burdened with booty, was returning through Semigallia from a raid in Lithuanian Samogitia, a combined force of Semigallians and Samogitians inflicted a disastrous defeat upon them (Battle of Saule), killing the grand master, Volquin, and effectively destroying the knights' military might. The order, which had been reprimanded by both the Holy Roman emperor and the Pope for indiscriminately using brutal tactics against converts as well as heathens and which appeared by this time to be more concerned with establishing its own feudal domain than with gathering converts for the church, was then forced by the Pope to disband and reorganize as a branch (1237) of the Teutonic Knights, whose main base was in Prussia and whose grand master thenceforth appointed the provincial master (*Landmeister*) of Livonia. The Livonian Knights continued the conquest of Livonia and ruled the region as an autonomous order again from 1525. Livonia, however, was divided and the order dissolved in 1561.

brotula, also called BROTULID, any of about 200 to 220 species of marine fishes placed by some authorities with the cusk eels in the family Ophidiidae, and separated by others as the family Brotulidae. Brotulas are primarily



Brotula (*Brotula*)
Tom McHugh, Steinhart Aquarium—Photo Researchers

deep-sea fishes, although some inhabit shallow waters and a few (*Lucifuga, Stygicola*) live in freshwater caves of tropical America.

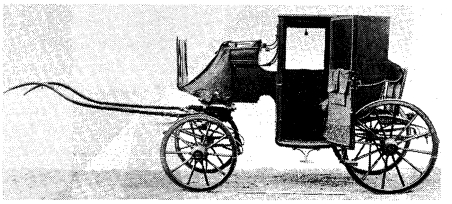
Brotulas are elongated fishes with pointed tails and a single long fin composed of the dorsal, anal, and tail fins. They range in size from a few centimetres to a maximum of about 90 centimetres (3 feet). Some have functional eyes, but others, including the cave and deep-sea species, are nearly to completely blind. Little is known about most brotulas; some lay eggs, and others bear living young. The deep-sea members of the family, taken at depths of up to about 7,300 metres (24,000 feet), comprise one of the most abundant groups of fish living at those levels.

Broudy, Harry S(amuel) (b. July 27, 1905, Filipowa, Pol.), Polish-born U.S. educational philosopher, best known as a spokesman for the classical Realist viewpoint of education.

Broudy emigrated to the United States from Poland as a small boy. He attended the Massachusetts Institute of Technology, Boston University (B.A., 1929), and Harvard (M.A., 1933; Ph.D., 1935). After receiving his doctorate in philosophy, Broudy was a supervisor for the Massachusetts Department of Education. From 1937 to 1957 he taught the philosophy and psychology of education at two Massachusetts state teachers colleges, and from 1957 to his retirement in 1974 he was professor of the philosophy of education at the University of Illinois in Urbana-Champaign.

He was the editor of *Educational Forum* (1964–72) and also was author or co-author of several books: *Building a Philosophy of Education* (1954), *Psychology for General Education* (1956), *Philosophy of Education* (1967), *The Real World of the Public Schools* (1972), and *Enlightened Cherishing* (1972).

brougham, four-wheeled, one-horse carriage. As originally designed (*c.* 1838) by Henry (later Baron) Brougham, a former lord chancellor of England, it had a low coupé body,



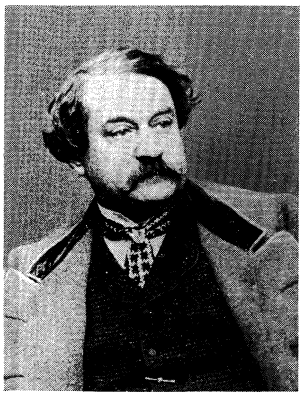
Brougham, 1838; in the Science Museum, London
By courtesy of the Science Museum, London, Crown copyright reserved

appearing as if the front were cut away, that enclosed one forward-facing seat for two passengers; a coachman's seat was attached to the front, where a third passenger could also ride.

There were many variations on this design, such as the country brougham and depot brougham, and many broughams were later converted into hacks called growlers. One style of carriage had a folding child's seat inside, facing backward, but such a vehicle was called a coupé. Another was slightly longer, having a full-framed seat inside the front of the body, and was called a clarence. In the United States both the coupé and the clarence were also known as extension-front broughams.

Brougham, John (b. May 9, 1814, Dublin—d. June 7, 1880, New York City), Irish-born U.S. author of more than 75 popular 19th-century plays, he was also a theatre manager and an actor who excelled in comic eccentric roles.

As a youth Brougham planned to study surgery, but he went to London where a chance acquaintance led to his acting debut (July 1830) playing six parts in *Tom and Jerry* at the Tottenham Street Theatre. A year later he wrote his first play, a burlesque. Then came a number of other works, including the popular *London Assurance* on which he collaborated with the Irish-U.S. playwright Dion Boucicault. In 1840 he became manager of the Lyceum Theatre, writing *Life in the Clouds, Love's Livery, Enthusiasm, Tom Thumb the Second,* and collaborating with Mark Lemon on *The Demon Gift.* In 1842 he went to the

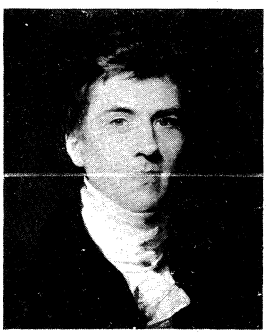


John Brougham
BBC Hulton Picture Library

United States, managing theatres in New York City and writing a number of comedies and dramas until 1860, when a trip to London led to a five-year stay. In 1865 he returned to the United States, where he continued to write, act, and manage theatres until his death. His last stage appearance was on Oct. 25, 1879, in Boucicault's *Rescued.*

Brougham and Vaux, Henry Peter Brougham, 1st Baron (b. Sept. 19, 1778, Edinburgh—d. May 7, 1868, Cannes, Fr.), lawyer, British Whig Party politician, reformer, and lord chancellor of England (1830–34); he was also a noted orator, wit, man of fashion, and an eccentric. Before and during his tenure as lord chancellor he sponsored numerous major legal reforms, and he took the lead in creating (1825–28) the University of London, the first English nondenominational institution of higher learning.

Educated at the University of Edinburgh, he practiced at the Scots bar (from 1800) and helped to found *The Edinburgh Review* (1802). In his early political activities and in his book *Colonial Policy of European Powers* (1803), he attacked the slave trade and eventually became associated with the left wing of the Whig Party. Apprehensive of his strong individualism, however, party leaders waited until 1810 before procuring his election to the House of Commons. Called to the English bar in 1808, Brougham served as legal adviser to Princess (afterward Queen) Caroline, whom he and Thomas Denman (later lord chief justice) successfully defended in an annulment action initiated in 1820 by her husband, King George IV. He sponsored the Public Education Bill of 1820; continued to make antislavery speeches; advocated parliamentary reform; and delivered a now-famous address (Feb. 7, 1828) that gave direction to the reform of English civil procedure later in the 19th century. During the 1820s he helped to found not only the University of London but also the Society for the Diffusion of Useful Knowledge, intended to make good books available at low prices to the working class.



Henry Brougham, detail of an oil painting by Sir Thomas Lawrence; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

Created a baron, Brougham held the Cabinet office of lord chancellor from Nov. 22, 1830, to Nov. 11, 1834, under two prime ministers, the 2nd Earl Grey and the 2nd Viscount Melbourne. He was largely responsible for the establishment of the central criminal court in London and the judicial committee of the Privy Council. He greatly speeded equity proceedings, inspired later legislation for a county court system, and was a leader in forcing the parliamentary Reform Act of 1832 through the House of Lords. In the 1840s he urged the repeal of the Corn Laws (import duties on grain). During the 1848 upheaval in France, he tried without success to obtain French citizenship and a seat in the National Assembly.

Brougham spent much of the last 30 years of his life at Cannes, on the French Mediterranean. The brougham, the first four-wheeled carriage intended to be drawn by only one horse, was designed by him. Among his biographies is *Henry Brougham* (1957), by Frances Richmond Hawes.

Broughton, Jack, byname of JOHN BROUGHTON (b. *c.* 1704—d. Jan. 8, 1789, London), third heavyweight boxing champion of England, formulator of the first set of boxing rules, and inventor of mufflers, the precursors of modern boxing gloves.

Originally a longshoreman, Broughton gained recognition as champion at an uncertain date after defeating Tom Pipes and Bill Gretting. He secured the patronage of William Augustus, duke of Cumberland (suppressor of the Jacobite Rebellion in 1745–46), who lost interest in him after his defeat by Jack Slack, April 10, 1750. Broughton taught boxing and operated a boxing arena in Hanway Street, London, from 1742 until his death. The rules of pugilism that he prepared in 1743 remained in effect until their supersession by the London Prize Ring Rules in 1838.

Broughton (de Gyfford), John Cam Hobhouse, Baron, also called (1831–51) SIR JOHN CAM HOBHOUSE, 2ND BARONET (b. June 27, 1786, Redland, Gloucestershire, Eng.—d. June 3, 1869, London), British politician and literary personage known as the alleged coiner of the phrase "His Majesty's Opposition" (implying the continued loyalty of a major party

Broughton de Gyfford, engraving by J. Thomson after a drawing by A. Wivell, 1821
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

when out of power) and as a close friend of Lord Byron. On his advice, Byron's memoirs were destroyed (after the poet's death in 1824) by their owner, the publisher John Murray.

Hobhouse and Byron, who had become acquainted at Trinity College, Cambridge, travelled together in Europe in 1809–10 and in 1816–17. In the 1820s he shared Byron's enthusiasm for Greek independence from Ottoman Turkey. Imprisoned (1819–20) for his pamphlet attacking the unreformed House of Commons, he was then (1820) elected to that body. In 1825 he secured the prohibition of night labour by children in factories. After the enactment of major parliamentary reform in 1832, Hobhouse (2nd baronet from 1831) became increasingly conservative.

Hobhouse served as secretary at war (1832–33), chief secretary for Ireland (1833), first commissioner for woods and forests (1834), and president of the Board of Control for India (1835–41, 1846–52). While heading the India Board, he supported the anti-Russian policy of the foreign secretary, Lord Palmerston. In 1851 he was created a baron, a title that became extinct upon his death; his baronetcy descended to a nephew. His *Recollections of a Long Life,* privately printed in 1865, was published, 6 vol. (1909–11) by his daughter Charlotte, Baroness Dorchester.

Broun, Heywood (Campbell) (b. Dec. 7, 1888, Brooklyn, N.Y., U.S.—d. Dec. 18, 1939, Stamford, Conn.), U.S. journalist noted for liberal social and political opinions. He attended Harvard University from 1906 to 1910 but did not graduate. He began his professional career writing baseball stories in the sports section of the New York *Morning Telegraph,* moving to the *Tribune* in 1912 as sports writer; eventually he became the paper's drama critic. While at the *Tribune* he started his famous column "It Seems To Me," taking the column with him when he moved to the *World* in 1921, where he stayed till 1928. He left the *World* in 1928, following a conflict with his publisher over his defense of two alleged murderers, Sacco and Vanzetti; he returned to the paper briefly the following year but was again fired over an article he wrote for *The Nation* in which the *World* was called "pseudo-liberal." When the *World* merged with *The Telegram* in 1931, he became a writer for the new paper till 1939, when he again changed employers because of political differences with his publisher. He joined the staff of the *Post* that year, staying till his death. He wrote a column in *The New Republic,* "Shoot the Works," from 1935 till his death.

Interested and active in labour and political problems, Broun ran unsuccessfully for Congress in 1930 on the Socialist ticket. He established the American Newspaper Guild, which he served as president until his death.

Broussais, François-Joseph-Victor (b. Dec. 17, 1772, Saint-Malo, Fr.—d. Nov. 17, 1838, Paris), French physician whose advocacy of bleeding, leech treatments, and fasting dominated Parisian medical practice early in the 19th century.

Following publication of *L'Examen des doctrines médicales* (1816; "The Examination of Medical Doctrines"), Broussais' system of "physiological medicine" rapidly became the most popular medical philosophy around Paris. His doctrine insisted that all disease originates as an irritation of the gastrointestinal tract that passes to other organs "sympathetically." Broussais is one of history's most notorious "bleeders." His methods fell into

Broussais, detail of a lithograph by François-Séraphin Delpech after a portrait by Nicolas-Eustache Maurin
Harlingue—H. Roger-Viollet

disfavour, however, when his treatment of victims of the 1832 Paris cholera epidemic ended disastrously.

Brouwer, Adriaen, Brouwer also spelled BRAUWER (b. 1605/06, Oudenaarde, Flanders—d. January 1638, Antwerp), Flemish genre painter who influenced artists in both Flanders and Holland.

Brouwer went to study under Frans Hals in Haarlem about 1621, gained a high reputation in Holland, and returned to the South Netherlands in 1631. There he was arrested and imprisoned by the Spaniards as a spy until September 1633. He then settled in Antwerp. Except for a handful of landscapes, apparently from his last years, all of Brouwer's pictures are of subjects drawn from common life—showing peasants smoking, drinking, or brawling in taverns; quack surgeons operating on grimacing patients; and so on. Most of the pictures are small and painted on panel. The coarseness of his subjects contrasts with the delicacy of his style, which in its mature stage shows an unusual mastery of tonal values.

"Peasants Brawling over a Game of Cards," oil painting by Adriaen Brouwer; in the Gemäldegalerie, Dresden, E.Ger.
By courtesy of the Deutsche Fotothek, Dresden

Brouwer, Dirk (b. Sept. 1, 1902, Rotterdam—d. Jan. 31, 1966, New Haven, Conn., U.S.), Dutch-born U.S. astronomer and geophysicist known for his achievements in celestial mechanics, especially for his pioneering application of high-speed digital computers.

After leaving the University of Leiden, Brouwer served as a faculty member at Yale University from 1928 until his death, becoming both professor of astronomy and director of the Yale Observatory in 1941. At Yale he first studied changes in the Earth's rotation, later tackling orbital problems. Along with W.J. Eckert, he developed a method of calculating orbit corrections (1937) that has been widely accepted, and, with Eckert and G.M. Clemence (1951), Brouwer was the first to use a computer to calculate planetary positions accurately. Among his other notable contributions, Brouwer formulated the term ephemeris time to describe time measurement unaffected by variation in the rate of the Earth's rotation.

Brouwer was elected to the U.S. National Academy of Sciences in 1951, and for his contributions to celestial mechanics he was awarded the Gold Medal of the Royal Astronomical Society in 1955.

Brouwer, L(uitzen) E(gbertus) J(an) (b. Feb. 27, 1881, Overschie, Neth.—d. Dec. 2, 1966, Blaricum), Dutch mathematician who founded mathematical Intuitionism (a doctrine that views the nature of mathematics as mental constructions governed by self-evident laws) and whose work completely transformed topology, the study of the most basic properties of geometric surfaces and configurations.

Brouwer taught at the University of Amsterdam from 1909 to 1951. He did most of his important work in topology between 1909 and 1913. In connection with his studies (begun in 1907) of the work of the German mathematician David Hilbert, he discovered the plane translation theorem, which characterizes topological mappings of the Cartesian plane, and the first of his fixed-point theorems, important in the establishment of some fundamental theorems in branches of mathematics such as differential equations and game theory. In 1911 he revealed his theorems of topological invariance (the unaltering of certain properties of a topological configuration when the configuration undergoes changes by some operation). In addition, he merged the methods developed by the German mathematician Georg Cantor with the methods of analysis situs, an early stage of topology. In view of his remarkable contributions, many mathematicians consider Brouwer the founder of topology.

In his doctoral thesis, *Over de grondslagen der wiskunde* (1907; "On the Foundations of Mathematics"), Brouwer attacked the logical foundations of mathematics and shaped the beginnings of the Intuitionist school. The following year, in *Over de onbetrouwbaarheid der logische principes* ("On the Untrustworthiness of the Logical Principles"), he rejected as invalid the use in mathematical proofs of the principle of the excluded middle (or excluded third). According to this principle, every mathematical statement is either true or false; no other possibility is allowed. In 1918 he published a set theory, the following year a theory of measure, and by 1923 a theory of functions, all developed without using the principle of the excluded middle. He continued his studies until 1954, and, although he did not gain widespread acceptance for his precepts, Intuitionism enjoyed a resurgence of interest after World War II, primarily because of contributions by the U.S. mathematician S.C. Kleene.

Browder, Earl (Russell) (b. May 20, 1891, Wichita, Kan., U.S.—d. June 27, 1973, Princeton, N.J.), U.S. Communist Party leader for almost 25 years, until his split with official party doctrine after World War II.

As a result of his opposition to the entrance of the U.S. into World War I, Browder was imprisoned in 1919–20. He became a member of the U.S. Communist Party in 1921, served as its general secretary from 1930 to 1944, and was the party's candidate for the U.S. presidency in 1936 and 1940. In the latter year he was sentenced to prison for 4 years for passport irregularities but was released after serving 14 months.

In 1944 Browder was removed from his position as party secretary for declaring that capitalism and socialism could peacefully coexist. He was expelled from the Communist Party in 1946 and three years later was named in "treason trials" in Budapest and Prague as originator of the heresy of "Browderism."

Among his many published works are *The People's Front* (1938), *War or Peace with Russia?* (1947), and *Marx and America* (1958).

Brown, Alice Van Vechten (b. June 7, 1862, Hanover, N.H., U.S.—d. Oct. 16, 1949, Middletown, N.J.), art educator known for initiating programs in the teaching of art history in the United States.

Brown studied painting from 1881 to 1885 at the Art Students' League in New York City, intending to become an artist. She turned instead to teaching, becoming assistant director of the Norwich (Conn.) Art School in 1891. There her teaching attracted attention, particularly her use of a laboratory method of art history: students, to sharpen their powers of observation, drew and modelled representations of the art they studied.

In 1897 Brown took a position at Wellesley College (Wellesley, Mass.), where she reorganized its art program and introduced her laboratory method. By 1900 Wellesley was offering the first major course of study in art history in the country. Brown also introduced the first course in museum training (1911) and sponsored the first course ever given in the United States in modern art (1927).

Her writings include, with William Rankin, *A Short History of Italian Painting* (1914).

Brown, Sir Arthur Whitten (b. July 23, 1886, Glasgow—d. Oct. 4, 1948, Swansea, Glamorgan, Wales), British aviator who, with Capt. John W. Alcock, made the first nonstop airplane crossing of the Atlantic.

Brown was trained as an engineer and became a pilot in the Royal Air Force during World War I. As navigator to Alcock, he made the record crossing of the Atlantic in a Vickers-Vimy twin-engined biplane at an average speed of approximately 118 miles (193 kilometres) per hour. Taking off from St. John's, Nfd., at 4:13 PM GMT on June 14, 1919, they landed 16 hours 12 minutes later in a bog near Clifden, County Galway, Ireland. For this feat Alcock and Brown shared the £10,000 prize offered by the London *Daily Mail*, and both were given knighthoods. Brown later returned to engineering and was general manager of the Metropolitan Vickers Company in Swansea. In 1955, G. Wallace published *The Flight of Alcock & Brown.*

Arthur Brown, 1919
BBC Hulton Picture Library

Brown, Capability: *see* Brown, Lancelot.

Brown, Charles Brockden (b. Jan. 17, 1771, Philadelphia—d. Feb. 22, 1810, Philadelphia), writer known as the "father of the American novel." His gothic romances in American settings were the first in a tradition adapted by two of the greatest early American authors, Edgar Allan Poe and Nathaniel Hawthorne. Brown called himself a "story-telling moralist." Although his writings exploit horror and terror, they reflect a thoughtful liberalism.

The son of Quaker parents, Brown was of delicate constitution, and he early devoted himself to study. He was apprenticed to a Philadelphia lawyer in 1787, but he had a strong interest in writing that led him to help found a literary society. In 1793 he gave up the law entirely to pursue a literary career in Philadelphia and New York City.

His first novel, *Wieland* (1798), a minor masterpiece in American fiction, shows the ease with which mental balance is lost when the test of common sense is not applied to strange experiences. The story concerns Theodore Wieland, whose father died by spontaneous combustion apparently for violating a vow to God. The younger Wieland, also a religious enthusiast seeking direct communication with divinity, misguidedly assumes that a ventriloquist's utterances are supernatural in origin; driven insane, he acts upon the prompting of this "inner voice" and murders his wife and children. When apprised of his error, he kills himself. Brown also wrote *Ormond* (1799), *Edgar Huntly* (1799), and *Arthur Mervyn* (1799–1800), as well as a number of less well known novels and a book on the rights of women. Despite this literary output, Brown engaged in trade throughout his life to support his family.

Brown, Earle (b. Dec. 26, 1926, Lunenburg, Mass., U.S.), one of the leading American composers of avant-garde music, best known for his development of graphic notation and the open-form system of composition.

Brown had been trained in engineering and mathematics before he began to study music theory and composition. In 1952 he developed a system of graphic notation, the use of non-traditional notational syllables across a writing surface in such a way that they are analogous to the passage of music through time. In 1953 he further put forth an open-form technique of composition, such that the conductor or performer determines the sequence of a group of musical units. Brown's first open-form composition, *Twenty-five Pages* (1953) for 1–25 performers, has a score of 25 pages that are to be arranged in a sequence chosen by the performer(s). Most of Brown's later work utilizes both graphic notation and open form.

Brown, Ernest William (b. Nov. 29, 1866, Hull, Yorkshire, Eng.—d. July 22, 1938, New Haven, Conn., U.S.), British-born American mathematician and astronomer known for his theory of the motion of the Moon.

Educated at the University of Cambridge in England, Brown began there to study the motion of the Moon by a method devised by G.W. Hill of the United States. Hill had carried the process far enough to show its suitability for solving the problem, and Brown completed the theory. In 1919, after 30 years of work, Brown published his lunar tables, thereby making obsolescent those that had been in use for more than 60 years.

Brown returned to Cambridge almost every summer, but he worked chiefly in the United States. He accepted an appointment at Haverford College, Pennsylvania, in 1891, and was professor of mathematics at Yale University from 1907 until his retirement in 1932.

Brown, Ford Madox (b. April 16, 1821, Calais, Fr.—d. Oct. 6, 1893, London), English painter whose work is associated with that of the Pre-Raphaelite Brotherhood, though he was never a member.

Brown studied art from 1837 to 1839 at Bruges under Albertus Gregorius, and at Antwerp under Baron Gustaf Wappers, from whom he learned a sound technique. His early work is characterized by sombre colour and dramatic feeling suited to the Byronic subjects that he painted in Paris during 1840–43, *e.g.,* "Manfred on the Jungfrau" and "Parisina's Sleep." Already concerned with the accurate representation of natural phenomena, he drew from corpses in University College hospital, London, when painting his "Prisoner of Chillon" (1843). During a visit to Italy in 1845, he met Peter von Cornelius, a member of the former Lukasbund, or Nazarenes. This meeting undoubtedly influenced both his palette and his style. His interest in brilliant, clear colour and neomedievalism first appears in "Wyclif Reading His Translation of the Scriptures to John of Gaunt" (1847). In 1848 Brown briefly accepted Dante Gabriel Rossetti as a pupil, and in 1850 Brown contributed to the Pre-Raphaelites' magazine, *Germ.* Like William Holman Hunt, Brown painted in the open air to obtain naturalistic accuracy.

His most famous picture, "Work" (1852–63), which is a Victorian social document, was first exhibited at a retrospective exhibition held in London (1865), for which he wrote the catalogue. He also worked as a book illustrator with William Morris; produced stained glass, at, among other sites, St. Oswald's, Durham (1864–65); and between 1879 and March 1893 completed a series of 12 murals for the Manchester town hall, depicting scenes from the city's history.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Brown, George (b. Nov. 29, 1818, Edinburgh—d. May. 9, 1880, Toronto), Canadian journalist and politician who was committed to federalism and to weakening the powers of the French Roman Catholic Church in Canada. As proprietor of *The Globe* (Toronto), he wielded considerable political influence in Canada West (Upper Canada, now Ontario), where his newspaper was extremely popular.

Brown emigrated to New York City in 1837, and in 1843 he moved to Toronto, where he began publication of the *Banner,* a newspaper supporting the newly formed Free Church of Scotland. The following year he began to issue *The Globe,* a weekly Reform political journal, which became a daily in 1853. In 1857 he entered the Canadian Parliament as an independent Liberal for Kent County. His attacks against the presumed political power of the Roman Catholic Church won him support in Canada West and unpopularity in Canada East (Lower Canada, now Quebec). The secularization of crown land set aside to maintain a Protestant clergy in Canada (the Clergy Reserves) was largely the result of his campaign to separate church and state, but his attempts to achieve secularization of all Canadian schools failed.

Pressing for proportional representation of Canada West and Canada East in Parliament (the 1840 Act of Union had granted an equal number of representatives to each province), Brown rebuilt the Canada West Liberal Party and briefly held office in 1858 as prime minister. One of the first to advocate a confederation of British North America, he entered a coalition with his personal and political opponent, the Conservative prime minister Sir John Macdonald. Dissatisfied with the terms of a renewed reciprocity treaty with the United States, however, he resigned from the government (December 1865) and never again sat in the House of Commons, though he sought reelection in 1867.

Influential in bringing about Canada's acquisition of the Northwest Territories, Brown entered the Senate in 1873 and helped negotiate a new reciprocity treaty with the United States in 1874. He refused the governorship of Ontario and two offers of knighthood, however, and devoted his energies to *The Globe.* He was fatally shot by one of his discharged employees.

Brown, George Douglas: *see* Douglas, George.

Brown, Hallie Quinn (b. March 10, 1850, Pittsburgh, Pa., U.S.—d. Sept. 16, 1949, Wilberforce, Ohio), American educator and elocutionist who pioneered in the movement for black women's clubs in the United States.

The daughter of former slaves, Brown received a B.S. from Wilberforce University in Ohio in 1873. She subsequently taught on plantations and in the public schools of Mississippi and South Carolina. After graduating from the Chautauqua Lecture School and teaching in Dayton, Ohio, and in Alabama, Brown returned to Wilberforce to teach elocution. At that time she began her extensive travels as an elocutionist and lecturer, speaking in Europe as well as the United States on topics of the life of blacks in America.

Brown helped to form the first British Chautauqua, and in England she lectured on behalf of the British Women's Temperance Association. In the United States, she helped to found the earliest women's clubs for blacks and from 1905 to 1912 served as president of the Ohio State Federation of Colored Women's Clubs. She also helped to found the Colored Women's League of Washington, D.C.—a predecessor of the National Association of Colored Women.

Among her books are *Bits and Odds: A Choice Selection of Recitations* (1880), *First Lessons in Public Speaking* (1920), and *Homespun Heroines and Other Women of Distinction* (1926).

Brown, Harrison (Scott) (b. Sept. 26, 1917, Sheridan, Wyo., U.S.—d. Dec. 8, 1986, Albuquerque, N.M.), American geochemist known for his role in isolating plutonium for its use in the first atomic bombs and for his studies regarding meteorites and the Earth's origin.

Brown studied chemistry, attending the University of California at Berkeley and Johns Hopkins University in Baltimore (Ph.D., 1941). He served (1943–46) on the staff of the Clinton Engineer Works (now Oak Ridge National Laboratory), Oak Ridge, Tenn., where he supervised the production of plutonium for the Manhattan Project. Like Albert Einstein and other scientists who had been instrumental in the development of the atomic bomb, Brown later spoke out against the further development of nuclear weapons. From 1946 to 1951 he was affiliated with the Institute of Nuclear Studies at the University of Chicago, and it was there that he began analyzing trace elements in meteorites. He taught at the California Institute of Technology, Pasadena, from 1951 to 1977 and was elected to the National Academy of Sciences in 1955. He worked at Resource Systems Institute in Honolulu (1977–83) and was editor in chief for the *Bulletin of the Atomic Scientists* from 1985 until his death.

In addition to his work on geochronology and planetary science, Brown was an active campaigner for population control, arms control, and human resources. His books include *Must Destruction Be Our Destiny?* (1946), *The Challenge of Man's Future* (1954), *The Next Hundred Years* (1957; with James Bonner and John Weir), *The Cassiopeia Affair* (1968; with Chloe Zerwick), and *The Human Future Revisited* (1978).

Brown, Helen Hayes (American actress): *see* Hayes, Helen.

Brown, Henry Billings (b. March 2, 1836, South Lee, Mass., U.S.—d. Sept. 4, 1913, Bronxville, N.Y.), associate justice of the United States Supreme Court (1890–1906).

Brown was admitted to the bar in 1860 in Detroit and the following year appointed deputy U.S. marshal there. Two years later he was named assistant U.S. attorney for the eastern district of Michigan. He served in this

capacity until 1868 when, after a brief period as temporary circuit judge, he returned to private practice. By the time of his appointment as judge of the eastern district in 1875, he had become the leading authority on maritime law in the Great Lakes, and had published an important volume of admiralty case reports from the Great Lakes district.

In 1890 Pres. Benjamin Harrison named Brown to the U.S. Supreme Court. Brown's legal attainments and hard work made a major contribution to the Court's backlog of cases at a time when its calendar was four years in arrears and the circuit court of appeals had not yet been created. His most important decision was *Plessy* v. *Ferguson* (1896), which established the legality of segregation so long as facilities were kept "separate but equal." This standard dominated civil rights cases until 1954, when it was overruled by the court in *Brown* v. *Board of Education of Topeka.* Among his other important decisions were a dissent in *Pollock* v. *Farmers Loan & Trust Company,* in which the income tax act of 1894 was struck down, and a controversial opinion concurring in *Downes* v. *Bidwell* (one of the Insular Cases), in which he declared that peoples of annexed territories were not entitled to constitutionally guaranteed rights and privileges.

Brown, Herbert Charles, original name HERBERT BROVARNIK (b. May 22, 1912, London), American chemist whose pioneering work with inorganic and organic boron compounds won him (along with Georg Wittig) the 1979 Nobel Prize for Chemistry.

Brought to the United States in 1914 by his Ukrainian-born parents, Brown grew up in Chicago and graduated from the University of Chicago in 1936. He received his Ph.D. in 1938 and remained at Chicago as an instructor until 1943. He taught at Wayne State University in Detroit from 1943 to 1947 and at Purdue University from 1947, becoming Wetherill Distinguished Professor there in 1959 and emeritus in 1978.

Brown's work with borohydrides led to the development of an important new class of inorganic reagents. His discovery of the organoboranes revealed an array of powerful and versatile reagents for organic synthesis. He was also known for studies of reactions involving so-called carbonium ions or carbo-cations. He was the author of *Hydroboration* (1962) and *Organic Syntheses via Boranes* (1975).

Brown, James (b. May 3, 1933, Augusta, Ga., U.S.), American rhythm and blues vocalist and composer who achieved great popularity from the late 1950s through the 1970s.

Growing up in poverty during the Depression, Brown first sang and danced on street corners for money. He later formed a trio, appearing at small clubs through the South. He gradually evolved a highly personal style, combining elements of the blues and gospel traditions with his own emotionally charged and highly rhythmic delivery, accented by his strong sense of showmanship. He first began recording successfully in 1956 with the hit single "Please, Please, Please." This song was followed by a string of other million-selling singles, including "I Can't Stand Myself," "Papa's Got a Brand New Bag," and "It's a Man's, Man's World," which brought him to a position of unchallenged preeminence in the field of rhythm and blues. Brown played a pioneering role in gaining the attention of white audiences for black popular music. In the 1970s and '80s Brown became increasingly concerned with encouraging young black people to acquire education and to develop pride in their heritage, consciously offering himself as an example of success through determination and hard work.

Brown, Jim, byname of JAMES NATHANIEL BROWN (b. Feb. 17, 1936, St. Simons, Ga., U.S.), outstanding fullback in U.S. professional football who led the National Football League (NFL) in rushing (running with the ball) for eight of his nine seasons.

In high school and at Syracuse University, New York, Brown, excelled in basketball, baseball, track, and lacrosse as well as football, and he was thought to be a potential world heavyweight champion in boxing. From 1957 through 1965 he played for the Cleveland Browns of the NFL, and he led the league in rushing yardage every year except 1962. In each of seven seasons he gained at least 1,000 yards by rushing. He established NFL single-season records by rushing for 1,527 yards in 1958 (12-game schedule) and 1,863 yards in 1963 (14-game schedule). In 1958 and again in 1963, he rushed for 100 or more yards in each of nine games (six consecutively in 1958). On Nov. 24, 1957, he set an NFL record by rushing for 237 yards in a single game, and he equaled that total on Nov. 19, 1961. At the close of his career, he had scored 126 touchdowns, 106 by rushing, had gained a record 12,312 yards in 2,359 rushing attempts for an average of 5.22 yards, and had a record combined yardage (rushing along with pass receptions) of 15,459 yards. Brown's rushing and combined yardage records stood until 1984, when both were surpassed by Walter Payton of the Chicago Bears.

After retiring from football, Brown became a motion-picture actor and a leader of a movement to increase black participation in U.S. business and industry. He appeared in many action and adventure films, among them *The Dirty Dozen* (1967) and *100 Rifles* (1969).

To make the best use of the Britannica, consult the INDEX *first*

Brown, John (b. 1735, Buncle, Berwickshire, Scot.—d. Oct. 17, 1788, London), British propounder of the "excitability" theory of medicine, which classified diseases according to whether they had an over- or an understimulating effect on the body.

Brown studied under the distinguished professor of medicine William Cullen at the University of Edinburgh, but was forced to receive his M.D. from St. Andrews (1779) because of his unpopularity with his colleagues. It was while studying with Cullen that Brown began to develop his theory, which held that all living tissues are "excitable" and postulated that the state of life is dependent on certain internal and external "exciting powers," or stimuli, that operate on it. Brown viewed diseases as states of either decreased or increased excitability, and generally prescribed stimulants for the former condition and sedatives for the latter. His recommended treatments often consisted of wine or laudanum.

In 1780 he published the celebrated exposition of his doctrine, *Elementa Medicinae,* which was appreciated as much for the purity of Brown's Latin as for the practicality of its teachings. It was read with attention and was well received throughout the medical centres of Europe. In the meantime, Brown's detractors in Edinburgh grew, his practice declined, and attendance at his lectures dropped. In debt—he had served time in a debtor's prison—and out of favour in Edinburgh, he moved his family to London, where he died not long after.

Brown's theory was at the height of its popularity in the late 1700s but was finally discredited by the German scientist Hermann von Helmholtz in the early 19th century.

Brown, John (b. May 9, 1800, Torrington, Conn., U.S.—d. Dec. 2, 1859, Charlestown, Va.), militant American Abolitionist whose raid on the federal arsenal at Harpers Ferry, Va., in 1859 made him a martyr to the anti-

John Brown
By courtesy of the Boston Athenaeum

slavery cause and was instrumental in heightening sectional animosities that led to the American Civil War (1861–65).

Moving about restlessly through Ohio, Pennsylvania, Massachusetts, and New York, Brown was barely able to support his large family in any of several vocations at which he tried his hand: tanner, sheep drover, wool merchant, farmer, and land speculator.

Though he was white, in 1849 Brown settled with his family in a black community founded at North Elba, N.Y., on land donated by the New York antislavery philanthropist Gerrit Smith. Long a foe of slavery, Brown became obsessed with the idea of taking overt action to help win justice for enslaved black people. In 1855 he followed five of his sons to the Kansas Territory to assist antislavery forces struggling for control there. With a wagon laden with guns and ammunition, Brown settled in Osawatomie and soon became the leader of antislavery guerrillas in the area.

Brooding over the sack of the town of Lawrence by a mob of slavery sympathizers (May 21, 1856), he concluded that he had a divine mission to take vengeance. Three days later he led a nighttime retaliatory raid on a pro-slavery settlement at Pottawatomie Creek, in which five men were dragged out of their cabins and hacked to death. After this raid, the name of "Old Osawatomie Brown" conjured up a fearful image among local slavery apologists.

In the spring of 1858, Brown convened a meeting of blacks and whites in Chatham, Ont., at which he announced his intention of establishing in the Maryland and Virginia mountains a stronghold for escaping slaves. He proposed, and the convention adopted, a provisional constitution for the people of the United States. He was elected commander in chief of this paper government while gaining the moral and financial support of Gerrit Smith and several prominent Boston Abolitionists.

In the summer of 1859, with an armed band of 16 whites and 5 blacks, Brown set up a headquarters in a rented farmhouse in Maryland, across the Potomac from Harpers Ferry, the site of a federal armoury. On the night of October 16, he quickly took the armoury and rounded up some 60 leading men of the area as hostages. Brown took this desperate action in the hope that escaped slaves would join his rebellion, forming an "army of emancipation" with which to liberate their fellow slaves. Throughout the next day and night he and his men held out against the local militia, but on the following morning he surrendered to a small force of U.S. Marines who had broken in and overpowered him. Brown himself was wounded, and 10 of his followers (including two sons) were killed. He was tried for murder, slave insurrection, and treason against the state and was convicted and hanged.

Although Brown failed to start a general escape movement among slaves, the high moral

tone of his defense helped to immortalize him and to hasten the war that would bring emancipation.

Brown, Sir John (b. Dec. 6, 1816, Sheffield, Yorkshire, Eng.—d. Dec. 27, 1896, Bromley, Kent), British armour-plate manufacturer who developed the use of rolled-steel plates for naval warships.

Brown began as an apprentice to a cutlery firm. In 1848 he invented the conical steel spring buffer for railway cars. In 1856 he established the Atlas ironworks in Sheffield, which produced ordnance forgings, railway bars, steel springs, and axles. Besides supplying iron to the Sheffield steel trade, Brown himself made improvements on the Bessemer process. In 1860 he saw at Toulon the French ship *La Gloire,* which was timber built but was armoured with hammered plate. Deciding that the plates could be rolled instead of hammered, Brown determined to attempt the production of rolled armour plate for the British Navy. Lord Palmerston, the prime minister, visited Sheffield and helped convince the government of the practicability of Brown's scheme, which soon led to orders for armour plate sufficient to protect about three-quarters of the ships of the Royal Navy. He was knighted in 1867.

Brown, Joseph Emerson (b. April 15, 1821, Pickens District, S.C., U.S.—d. Nov. 30, 1894, Atlanta, Ga.), Confederate governor of Georgia during the American Civil War.

Brown grew up in the mountainous region of northern Georgia. His political career began in 1849, when, after having established himself as a lawyer in Canton, Ga., he was elected to the state senate as a Democrat. In 1855 he was elected a circuit judge, a position he was holding when nominated for governor of Georgia in 1857. Brown was elected to four consecutive two-year terms as governor of Georgia (1857–65).

An ardent proslavery, states rights, and, ultimately, secession advocate, he was so ideologically consistent that, with the outbreak of the Civil War, he opposed any interference by the Confederate government in what he deemed the sphere of state sovereignty. He disputed the constitutionality of conscription, the seizure of private property without compensation, and the appointment by Jefferson Davis—rather than himself—of officers to command Georgia enlistees.

At the end of the war, Brown was imprisoned briefly before Pres. Andrew Johnson pardoned him. He then amazed and angered his Georgia constituents by counseling cooperation with the congressional plan for Reconstruction. He was declared a renegade from Southern principles, a belief he reinforced when he switched to the Republican Party and assisted in the implementation of Radical Reconstruction. In 1868 Brown suffered the single electoral loss in his political career when he was defeated for a U.S. Senate seat. Later that same year, he was appointed chief justice of Georgia's Supreme Court. In 1870 he resigned from the court to become president of the Western and Atlantic Company, which operated the state-owned railroad. Through this position and shrewd investments in Atlanta real estate, Brown acquired great wealth.

Despite continuing hostility toward his acquiescence in congressional Reconstruction and toward his seeming opportunism, Brown was elected to the U.S. Senate in 1880. Reelected twice, he served until 1891.

Brown, Joseph Rogers (b. Jan. 26, 1810, Warren, R.I., U.S.—d. July 23, 1876, Isles of Shoals, N.H.), American inventor and manufacturer who made numerous advances in the field of fine measurement and machine-tool production.

After training as a machinist Brown joined his father in a successful clock-making business, which he operated himself from 1841 to 1853. He perfected and produced a highly accurate linear dividing engine in 1850, and in the succeeding two years he developed a vernier caliper reading to thousandths of an inch and also applied vernier methods to the protractor. In 1853 Brown took Lucian Sharpe into partnership; the firm later became the Brown and Sharpe Manufacturing Company. Brown's micrometer caliper, still widely used in industry, appeared in 1867. He also invented a precision gear cutter in 1855 to produce clock gears, a universal milling machine in 1862, and, perhaps his finest innovation, a universal grinding machine (patented in 1877), in which articles were hardened first and then ground, thereby increasing accuracy and eliminating waste.

Brown, Lancelot, byname CAPABILITY BROWN (b. 1715, Kirkharle, Northumberland, Eng.—d. Feb. 6, 1783, London), the foremost English master of garden design, whose works were characterized by their natural, unplanned appearance.

Beginning work as a gardener's boy in Northumberland, in 1742 Brown obtained a post at Stowe, Buckinghamshire, one of the most talked of gardens of the day. His duties included showing the grounds to visitors, thus giving him a chance to make himself known to the nobility who were to be his clients. For some years he worked at Stowe under the broad direction of the landscape architect William Kent. After Kent's death, he set up as a garden designer and by 1753 was the leading "improver of grounds" in England. His first achievement was a lake at Wakefield Lodge for the Duke of Grafton; it was so successful that he was summoned to alter the park of the famous Blenheim Palace at Woodstock. There he created the masterly lakes beside the architect John Vanbrugh's bridge and almost totally erased the earlier geometric plantations. His practice led him into architecture in order to ensure the unity of his designs, and he became a competent architect in the classical mode of the day.

Lancelot Brown, oil painting by Sir Nathaniel Dance; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

The means Brown used were natural: he employed neither carved stone nor architectural shapes but limited himself to turf; mirrors of still water; a few species of trees used singly, in clumps, or in loose belts; and the undulations of the ground. With these he made simple harmonious patterns without obvious symmetry. He likened his own work to the composition of a well-balanced sentence, and some of his contemporaries compared it to poetry; it is rather to abstract painting or to music that it is properly comparable.

Brown's style is often thought of as the antithesis of the style of André Le Nôtre, designer of the splendid formal gardens of Versailles, because Brown made use of the nature of the ground whereas Le Nôtre imposed an architectural pattern on nature. Nevertheless, they had in common an eye for proportion and a noble sense of scale, and both linked their creations with the outside world. Brown's designs were adapted to the society he served, which was totally unlike the authoritarian regime of the 17th-century monarchies. English gentlemen did not maintain courts; they lived privately on their country estates and liked to see their domains from their windows and to ride about them. Brown's nickname arose from his habit of saying that a place had "capabilities." By the time he died, he was rich and honoured and had "improved" a greater acreage of ground than any landscape architect had done before or has done since.

Brown, Michael S(tuart) (b. April 13, 1941, New York City), American molecular geneticist who, along with Joseph L. Goldstein, was awarded the 1985 Nobel Prize for Medicine or Physiology for their elucidation of a key link in the metabolism of cholesterol in the human body.

Brown graduated from the University of Pennsylvania, Philadelphia, in 1962 and received his M.D. from that university's medical school in 1966. He became friends with Goldstein when they were both working as interns at Massachusetts General Hospital in Boston during 1966–68. After conducting research at the National Institutes of Health from 1968 to 1971 he became an assistant professor at the Southwestern Medical School in Dallas, Texas, where he was reunited with his colleague Goldstein.

In Dallas the two men began their collaborative research on the genetic factors that are responsible for high levels of cholesterol in the bloodstream. They compared the cells of normal persons with those of persons having familial hypercholesterolemia, which is an inherited tendency to get abnormally high blood cholesterol levels and, as a result, atherosclerosis and other circulatory ailments. Brown and Goldstein were able to trace a genetic defect in the afflicted persons that resulted in their lacking or being deficient in cell receptors for low-density lipoproteins (LDL), which are the primary cholesterol carrying particles. Their research established that these cell receptors draw the LDL particles into the cells as a prelude to breaking them down, and thus remove them from the bloodstream. The two men also discovered that the cell capture of such lipoproteins inhibits the further production of new LDL receptors by the cells, thus explaining how high-cholesterol diets overwhelm the body's natural capacity for withdrawing cholesterol from the bloodstream.

Brown later collaborated with Goldstein in research to develop new drugs effective in lowering blood cholesterol levels and in researching the basic genetic code behind the LDL receptor. From 1977 he was professor and director of the Center for Genetic Diseases in Dallas.

Brown, Robert (b. Dec. 21, 1773, Montrose, Angus, Scot.—d. June 10, 1858, London), Scottish botanist best known for his description of the natural continuous motion of minute particles in solution, which came to be called Brownian movement. In addition, he recognized the fundamental distinction between the conifers and their allies (gymnosperms) and the flowering plants (angiosperms), recognized and named the nucleus as a constant constituent of living cells in most plants, and improved the natural classification of plants by establishing and defining new families and genera. He also contributed substantially to knowledge of plant morphology, embryology, and geography, in particular by his original work on the flora of Australia.

Brown was the son of a Scottish Episcopalian clergyman. He studied medicine at the universities of Aberdeen and Edinburgh and spent five years in the British Army serving in Ireland as an ensign and assistant sur-

geon (1795–1800). A visit to London in 1798 brought Brown to the notice of Sir Joseph Banks, president of the Royal Society. Banks recommended Brown to the Admiralty for the post of naturalist aboard a ship (the *Investigator*) for a surveying voyage along the northern and southern coasts of Australia under the command of Matthew Flinders.

Robert Brown, detail of a drawing by W. Brockedon, 1849; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Brown sailed with the expedition in July 1801. The *Investigator* reached King George's Sound, Western Australia, an area of great floral richness and diversity, in December 1801. Until June 1803, and while the ship circumnavigated Australia, Brown made extensive plant collections. Returning to England in October 1805, Brown devoted his time to classifying the approximately 3,900 species he had gathered, almost all of which were new to science. The results of his Australian trip were partially published in 1810 as his *Prodromus Florae Novae Hollandiae . . .*, a classic of systematic botany and Brown's major work, in which he laid the foundations for Australian botany while refining the prevailing systems of plant classification. Disappointed by its small sale, however, he published only one volume. Brown's close observation of minute but significant details was also shown in his publication on *Proteaceae,* in which he demonstrated how the study of pollen-grain characters could assist in the classification of plants into new genera. In 1810 Banks appointed Brown as his librarian and in 1820 bequeathed him a life interest in his extensive botanical collection and library. Brown transferred them to the British Museum in 1827, when he became keeper of its newly formed botanical department.

In 1828 he published a pamphlet, *A Brief Account of Microscopical Observations . . .*, in which he recorded that, after having noticed moving particles suspended in the fluid within living pollen grains of *Clarkia pulchella,* he examined both living and dead pollen grains of many other plants and observed a similar motion in the particles of all fresh pollen. Brown's experiments with organic and inorganic substances, reduced to a fine powder and suspended in water, then revealed such motion to be a general property of matter in that state. This phenomenon has long been known as Brownian movement (*q.v.*). In 1831, while dealing with the fertilization of *Orchidaceae* and *Asclepiadaceae,* he noted the existence of a structure within the cells of orchids as well as many other plants that he termed the "nucleus" of the cell. These observations testify to the range and depth of his pioneering microscopical work and his ability to draw far-reaching conclusions from isolated data or selected structures. Brown was elected a fellow of the Royal Society in 1810.

Brown, Robert Hanbury (b. Aug. 31, 1916, Aruvankadu, India), British astronomer and writer noted for his design, development, and use of the intensity interferometer.

Brown graduated from the University of London in 1935. During and after World War II he worked with R.A. Watson-Watt and then E.G. Bowen to develop radar and its uses in aerial combat. In the 1950s he applied his experience with radar to radio astronomy, developing radio-telescope technology at Jodrell Bank Observatory and mapping radio sources in the sky. This work led him to design a radio interferometer capable of resolving radio stars while eliminating atmospheric distortion from the image (1952). With R.Q. Twiss, Brown applied the principles of radio interferometry to measuring the angular size of bright visible stars, thus developing the technique of intensity interferometry. Brown and Twiss set up an intensity interferometer at Narrabri in New South Wales, Australia, for the measuring of hot stars. From 1964 to 1981 Brown was a professor of physics and astronomy at the University of Sydney. His major books include *The Exploration of Space by Radio* (1957; with A.C.B. Lovell), *The Intensity Interferometer* (1974), and *Man and the Stars* (1978).

Brown, Thomas (b. 1663, Shifnal, Shropshire, Eng.—d. June 16, 1704, London), British satirist best known for his reputedly extemporaneous translation of Martial's 33rd epigram beginning "*Non amo te, Sabidi . . .*." Brown entered Christ Church, Oxford, in 1678, but the irregularity of his life there brought him before Dr. John Fell, dean of Christ Church, who agreed to stay Brown's expulsion if he could translate the epigram on the spot. Brown's reply was:

I do not love thee, Dr. Fell,
The reason why I cannot tell;
But this I know, and know full well,
I do not love thee, Dr. Fell.

Brown later left Oxford without taking a degree and settled in London, where his life combined pugnacity in literary argument with a licentious personal life. He translated works from Latin and French and wrote many epigrams, lampoons, and satires. Under the pseudonym of Dudly Tomkinson he wrote three satires upon John Dryden. His prose *Amusements Serious and Comical, Calculated for the Meridian of London* (1700; mod. ed., 1927) presents a vivid picture of the city and its inhabitants as seen by the Grub Street writers. It is of historical rather than literary value.

Brown, Thomas (b. Jan. 9, 1778, Kilmabreck, Kirkcudbright, Scot.—d. April 2, 1820, Brompton, near London), British metaphysician whose work marks a turning point in the history of the common-sense school of philosophy.

Between 1792 and 1803 Brown studied philosophy, law, and medicine at the University of Edinburgh, where he met the philosopher Dugald Stewart and the founders of the *Edinburgh Review.* After practicing medicine briefly, Brown was deputy lecturer for Stewart (1808–09) and became joint professor of moral philosophy with him in 1810.

From Stewart, who was the chief expositor of the views of Thomas Reid (1710–96), a Scottish philosopher of common sense, Brown accepted many of Reid's arguments that were characteristic of the school. Brown modified some tenets of the school and rejected others, thus standing at the dividing point between two factions. The group led by Brown was oriented toward sense perception and was supported by John Stuart Mill and Alexander Bain; the other group, represented by Sir William Hamilton, sought to introduce the views of various German Idealist philosophers and thereby direct attention away from sensations and toward thought processes.

Brown's writings include *Observations on the Zoonomia of Erasmus Darwin* (1798); *Observations on the Nature and Tendency of the Doctrine of Mr. Hume Concerning the Relation of Cause and Effect* (1804), eight books of verse (collected ed., 4 vol., 1820); and *Lectures on the Philosophy of the Human Mind,* 4 vol. (1820).

Thomas Brown, engraving by W. Walker after a painting by G. Watson, 1806

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Brown, William Hill (b. November 1765, Boston—d. Sept. 2, 1793, Murfreesboro, N.C., U.S.), novelist and dramatist whose anonymously published *Power of Sympathy, or the Triumph of Nature Founded in Truth* (1789) is considered the first American novel. An epistolary novel about tragic, incestuous love, it followed the sentimental style developed by Samuel Richardson; its popularity began a flood of sentimental novels.

The son of the Boston clockmaker who made the timepiece in Old South Church, Boston, Brown wrote the romantic tale "Harriot, or the Domestic Reconciliation" (1789), which was published in the first issue of *Massachusetts Magazine,* and the play *West Point Preserved* (1797), a tragedy about the death of a Revolutionary spy. He also wrote a series of verse fables, a comedy in West Indies style (*Penelope*), essays, and a short second novel about incest and seduction, *Ira and Isabella* (published posthumously, 1807). Brown went south to study law and died shortly thereafter.

brown algae, members of the phylum or division Phaeophyta, comprising about 1,500 species, common in cold waters along continental coasts; freshwater species are rare. The colour of brown algae, which varies from dark brown to olive green, depends upon the proportion of brown pigment (fucoxanthin) to green pigment (chlorophyll). Gas-filled bladders (pneumatocysts) keep photosynthetic parts of the algal thallus floating on or near the surface of the water. Brown algae vary also

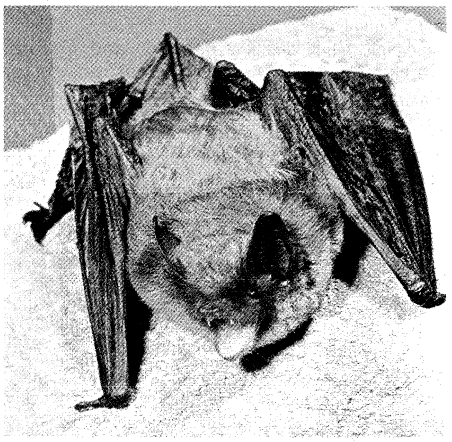
Knotted wrack (*Ascophyllum nodosum*)

William H. Amos—Helen Wohlberg, Inc.

in form and size, from the small filamentous epiphytes (*Ectocarpus*) to complex giant kelps that range in size from 1 to more than 100 metres (3.3 to 330 feet; *Laminaria, Macrocystis, Nerocystis*). Rockweed, another type of brown algae, is found attached to rocky coasts in temperate zones (*Fucus, Ascophyllum*) or floating freely (*Sargassum*). Brown algae multiply by asexual and sexual reproduction; both the motile zoospores and gametes have two unequal flagella. Once a major source of iodine and potash, brown algae are still an important source of algin, a colloidal gel used as a stabilizer in the baking and ice cream industries. Certain species are also used as fertilizer and several are eaten as a vegetable (*kombu*) in the Orient. Brown algae belonging to the order Laminariales are popularly known as kelp (*q.v.*).

brown bat, any of the bats of the genera *Myotis* and *Eptesicus,* of the common bat family, Vespertilionidae. Both genera are widely distributed, being found in almost all parts of the world.

The genus *Myotis* includes almost 70 species, among them the little brown bat (*M. lucifugus*) of North America and the large mouse-eared bat (*M. myotis*) of Europe. Members of the genus are about 3.5–8 centimetres (1 2/5–3 inches) long without the 4–6-cm tail, and they weigh about 5–45 grams (1/6–1 1/2 ounces). Apart from man, they are probably the most widespread of land mammals.



Brown bat (*Myotis volans*)
Roger W. Barbour

About 30 species commonly referred to as big brown bats or serotines are placed in the genus *Eptesicus*. These bats are 3.5–7.5 cm long without the 3.5–5.5-cm tail. They are relatively slow, heavy fliers and are often found in buildings and hollow trees. Representatives include the big brown bat (*E. fuscus*), a common North American species, and the serotine (*E. serotinus*), a stoutly built Eurasian form.

brown bear (*Ursus arctos*), shaggy-haired, characteristically brown bear of the family Ursidae. Numerous races of the species are native to Eurasia and to northwestern North America, where they are usually called grizzlies, or grizzly bears. Many of these animals, such as the more than 80 named forms in North America alone, have been or are considered distinct species by some authorities.

Eurasian brown bears are generally solitary animals, able to run and swim well, usually 120–210 centimetres (48–84 inches) long, and 135–250 kilograms (300–550 pounds) in weight; the exceptionally large Siberian brown bear (*Ursus arctos beringianus*), weighing as much as 360 kg, approximates the North American grizzly bear in size. Eurasian brown bears feed on mammals, fish, vegetable materials, and honey. Coat colour is highly variable, ranging from grayish white through

Brown bear (*Ursus arctos*)
Tierbilder Okapia, Frankfurt am Main

bluish and brownish shades to almost black. Eurasian brown bears are commonly seen in zoos; they can be trained and become quite tractable. Formerly they were frequently trained to move rhythmically to music—the so-called dancing bears of European carnivals and festivals. They originally ranged through much of Europe and Asia; their range and populations are now reduced.

For North American brown bears, including the grizzly bear and the Alaskan brown bears (Kodiak bear and others), *see* grizzly bear. The native American black bear (*see* black bear) occurs in a brown colour phase that is sometimes known as brown bear.

Brown Bomber, The (boxer): *see* Louis, Joe.

brown coal, as defined in the United States and Canada, type of lignite occurring in unconsolidated deposits. In Great Britain the term is used synonymously with lignites in general, and in various continental European countries and Australia, it refers to both lignites and subbituminous coals.

The brown coal mined in North America varies in colour from yellow to dark brown and has a dull or earthy lustre. It often is banded, with layers of concentrated plant matter alternating with those of resinous materials. Thin layers of black lignite may also be present. Many brown coals of lighter colouring have a fibrous structure in which tree roots and other recognizable plant matter are still apparent, indicating little coalification beyond peat.

brown lung, also called BROWN LUNG DISEASE: *see* byssinosis.

brown mica: *see* phlogopite.

brown oak: *see* English oak.

brown pelican (*Pelecanus occidentalis*), pelican species common along the southern U.S. coast. *See* pelican.

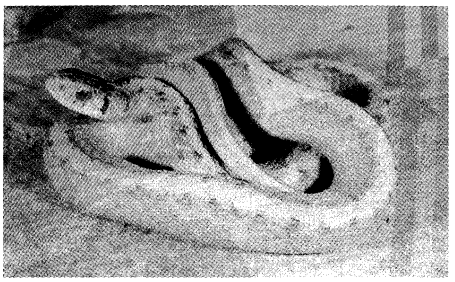
brown recluse, venomous species of brown spider (*q.v.*).

Brown-Séquard, Charles-Édouard (b. April 8, 1817, Port Louis, Mauritius—d. April 1, 1894, Paris), French physiologist and neurologist, a pioneer endocrinologist and neurophysiologist who was among the first to work out the physiology of the spinal cord. His most important discovery was that the adrenal gland is essential for life.

Graduating in medicine at Paris in 1846, Brown-Séquard taught at Harvard University (1864–68), practiced medicine briefly in New York, and succeeded Claude Bernard in 1878 as professor of experimental medicine in the Collège de France. His reputation suffered when, in his old age, he advocated injections of a fluid prepared from the testes of sheep as a means of prolonging life.

brown snake, any of several species named for their usual predominating colour. In New Guinea and eastern Australia it is *Demansia textilis,* a slender, small-headed member of the cobra family, Elapidae—the only egg-laying elapid in the region. The hatchlings are striped, but adults approximate the colour of their surroundings: brown in dry sandy country, dusky greenish in the bush. This snake may be 2.1 metres (7 feet) long. Bad-tempered and highly venomous, it rears up and strikes repeatedly.

New World brown snakes, sometimes called grass snakes, are the two species of the genus *Storeria,* family Colubridae. They are found from eastern Canada to Honduras and are

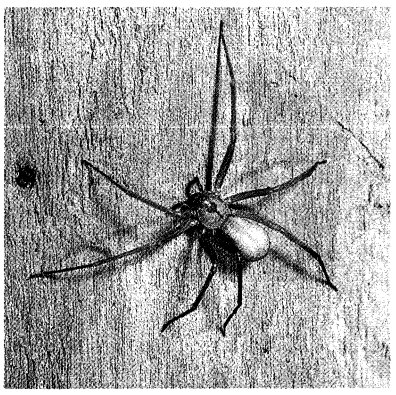


Northern brown snake (*Storeria dekayi*)
D.M. Dennis

small, mostly less than 30 centimetres (12 inches) long, shy, and harmless. The northern brown snake (*S. dekayi*) is the only North American snake to survive in abundance in densely populated regions. The indigo snake (*q.v.*) is called brown snake in tropical America.

brown spider, any member of the family Loxoscelidae (order Araneida). Loxoscelids are light in colour and about 7 millimetres (1/4 inch) long; their six eyes are arranged in two rows. They are most common in the western and southern United States. A few species are venomous to man—including the brown recluse (*Loxosceles reclusa*), which occurs in the United States, and *L. laeta,* of Chile.

L. reclusa, which has extended its range into parts of the northern U.S., has a leg span of about 2.5 centimetres (1 inch) and a dark violin-shaped design on its lighter back. It is



Brown recluse spider (*Loxosceles reclusa*) showing hourglass marking on head region
John H. Gerard—EB Inc.

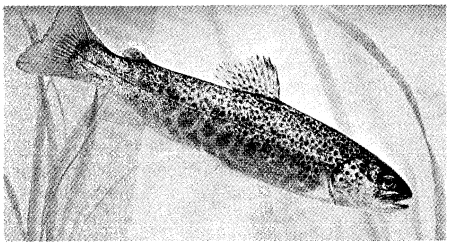
often found under stones or in dark corners inside buildings. The venom of the brown recluse destroys the walls of blood vessels near the site of the bite, sometimes causing a skin ulcer several inches in diameter. The wound, which may require several months to heal, is occasionally fatal.

Brown Swiss, cattle breed native to Switzerland and probably one of the oldest breeds in existence. While these cattle are classified as a dairy breed in the United States, they are often considered a dual-purpose breed elsewhere, as

they are heavier boned and thicker fleshed than the cattle of the other dairy breeds. The colour of the Brown Swiss varies from light brown or gray to dark shades of these colours. Brown Swiss cows are good, persistent milkers, producing milk of average butterfat content as compared with other breeds of dairy cattle.

This breed has found favour in Italy, Austria, Hungary, the United States, Mexico, and the South American countries. Brown Swiss were first introduced into the U.S. in 1869.

brown trout, also called GERMAN BROWN TROUT (*Salmo trutta*), prized and wary European game fish favoured for the table. The brown trout, which includes several varieties such as the Loch Leven trout of Great Britain, is of the family Salmonidae. It has been introduced to many other areas of the world and is recognized by the light-ringed black spots on the brown body. It is widely transplanted because it can thrive in warmer waters than



Brown trout (*Salmo trutta*)

Treat Davidson—The National Audubon Society Collection/Photo Researchers

most trout. It grows to about 3.6 kilograms (8 pounds). Ocean-going individuals, called sea trout, are larger than freshwater forms and provide good sport, as do those that enter large lakes.

Brown University, private coeducational institution of higher learning in Providence, R.I., first chartered in 1764 as Rhode Island College, a Baptist institution for men. The university adopted its present name in 1804. Francis Wayland, president of Brown from 1827 to 1855, broadened the curriculum by expanding electives, adding modern languages, and improving laboratory equipment.

In 1971 the university became coeducational by merging with Pembroke College. Programs include biological sciences, computer and information sciences, engineering, arts, foreign languages, mathematics, letters, physical sciences, psychology, and social sciences. There are special interdisciplinary programs in a number of scientific and cultural subject areas.

Brown v. Board of Education of Topeka, case in which, on May 17, 1954, the U.S. Supreme Court ruled unanimously that racial segregation in public schools violated the Fourteenth Amendment to the Constitution, which says that no state may deny equal protection of the laws to any person within its jurisdiction. The 1954 decision declared that separate educational facilities were inherently unequal. Based on a series of Supreme Court cases argued between 1938 and 1950, *Brown* v. *Board of Education of Topeka* completed the reversal of an earlier Supreme Court ruling (*Plessy* v. *Ferguson,* 1896) that permitted "separate but equal" public facilities. The 1954 decision was limited to the public schools, but it was believed to imply that segregation was not permissible in other public facilities.

brownbul, any of certain bird species of the bulbul family. *See* bulbul.

Browne, Charles Farrar (U.S. humorist): *see* Ward, Artemus.

Browne, E(lliott) Martin (b. Jan. 29, 1900, Zeals, Wiltshire, Eng.—d. April 27, 1980, London), British theatrical director and producer who was a major influence on poetic and religious drama and, for more than 25 years, the director chosen by T.S. Eliot for his plays. It was as director of the religious spectacle called *The Rock* that Browne proposed Eliot as author and helped the poet to make his debut as a dramatist. This led to Eliot's *Murder in the Cathedral* (1935), directed by Browne for the Canterbury Festival, and to Eliot's four modern poetic dramas, in the writing of which he worked in consultation with his director.

During World War II Browne formed the Pilgrim Players and in the postwar years helped to encourage the revival of poetic drama, producing work by such new writers as Christopher Fry at the Mercury Theatre, London. He was for 10 years director of the British Drama League and involved in productions of Shakespeare as well as revivals of medieval mystery plays. He lectured extensively on religious drama in the United States, where, as a young man, he had worked as a professional actor.

Browne, Hablot Knight, pseudonym PHIZ (b. June 15, 1815, Lambeth, near London—d. July 8, 1882, Brighton, East Sussex, Eng.), British artist, preeminent as an interpreter and illustrator of Dickens' characters.

Browne was early apprenticed to the engraver William Finden, in whose studio his only artistic education was obtained. At the age of 19 he abandoned engraving in favour of other artistic work, and a meeting with Dickens two years later determined the form which this would take. Robert Seymour, the original illustrator of *The Pickwick Papers,* had just committed suicide, and the serial publication of the book was in danger from the lack of a capable successor. Browne applied for the post, and the drawings that he submitted were preferred by Dickens to those of a rival applicant—W.M. Thackeray. His pseudonym of "Phiz" was adopted in order to harmonize with Dickens' "Boz,"and it was by his work for Dickens (especially in *Pickwick, David Copperfield, Dombey and Son, Martin Chuzzlewit,* and *Bleak House*) that his reputation was made. He also illustrated the best-known novels of Charles Lever and Harrison Ainsworth in their original editions, and his work was in constant demand by publishers until a stroke of paralysis, in 1867, permanently injured his powers.

Browne, Maximilian Ulysses, Reichsgraf (Imperial Count) (b. Oct. 23, 1705, Basel—d. June 26, 1757, Prague), field marshal, one of Austria's ablest commanders during the War of the Austrian Succession (1740–48) and the Seven Years' War (1756–63), who nevertheless suffered defeat by Frederick II the Great of Prussia.

A Habsburg subject of Irish ancestry, Browne commanded a small garrison in Silesia when,

Reichsgraf Browne, lithograph by Josef Glatz

By courtesy of the Bild-Archiv, Osterreichische Nationalbibliothek, Vienna

in 1740, Frederick II invaded and conquered the province. The Austrians retreated into Bohemia after a skillful delaying action. Later, Browne distinguished himself at Piacenza, in Italy (1746). In 1751 Empress Maria Theresa named him commander in chief in Bohemia, where, at the beginning of the Seven Years' War, he fought Frederick at the indecisive Battle of Lobositz (Oct. 1, 1756). Wounded during the Battle of Prague (May 6, 1757), he died shortly thereafter.

Browne, Robert (b. *c.* 1550—d. October 1633, Northampton, Northamptonshire, Eng.), Puritan Congregationalist church leader, one of the original proponents of the Separatist, or Free Church, movement among Nonconformists that demanded separation from the Church of England and freedom from state control. His Separatist followers became known as Brownists.

Educated at Corpus Christi College, Cambridge, and ordained, he, with Robert Harrison, gathered a Separatist Church at Norwich in 1580. As a consequence of this and other similar activities, he was imprisoned 32 times and in 1582 was exiled. He subsequently returned to England, however, and conformed to the established church. He was the author of a number of books, including *A Treatise of Reformation Without Tarying for Anie* (1582).

Browne, Sir Thomas (b. Oct. 19, 1605, London—d. Oct. 19, 1682, Norwich, Norfolk, Eng.), English physician and author, best known for his book of reflections, *Religio Medici.*

After studying at Winchester and Oxford, Browne probably was an assistant to a doctor near Oxford. After taking his M.D. at Leiden in 1633, he practiced at Shibden Hall near Halifax, in Yorkshire, from 1634, until he was admitted as an M.D. at Oxford; he settled in

Sir Thomas Browne, lead pencil on vellum after R. White; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Norwich in 1637. At Shibden Hall Browne had begun his parallel career as a writer with *Religio Medici,* a journal largely about the mysteries of God, nature, and man, which he himself described as "a private exercise directed to myself." It circulated at first only in manuscript among his friends. In 1642, however, it was printed without his permission in London and so had to be acknowledged, an authorized version being published in 1643. An immediate success in England, the book soon circulated widely in Europe in a Latin translation and was also translated into Dutch and French.

Browne began early to compile notebooks of miscellaneous jottings and, using these as a quarry, he compiled his second and larger work, *Pseudodoxia Epidemica, or, Enquiries into Very many received Tenets, and commonly presumed truths* (1646), often known as *Browne's Vulgar Errors.* In it he tried to correct many popular beliefs and superstitions. In 1658 he published his third book,

two treatises on antiquarian subjects, *Hydriotaphia, Urne-Buriall, or, A Discourse of the Sepulchrall Urnes lately found in Norfolk,* and *The Garden of Cyrus, or the Quincunciall Lozenge, or Net-Work Plantations of the Ancients.* Around the theme of the urns he wove a tissue of solemn reflections on death and the transience of human fame in his most luxuriant style; in *The Garden,* in which he traces the history of horticulture from the garden of Eden to the Persian gardens in the reign of Cyrus, he is especially fascinated by the quincunx. A smaller work of great beauty and subtlety, entitled *A Letter to a Friend, Upon occasion of the Death of his Intimate Friend,* was published posthumously in 1690.

Browne had always been a Royalist, and his fame both as doctor and as writer gained him a knighthood when Charles II visited Norwich in 1671. He seldom left the city but corresponded with such men of learning as John Evelyn, Sir William Dugdale, and John Aubrey. Most of his surviving letters, however, were written to his eldest son, Edward Browne, and these give an intimate picture of his medical practice and his relations with his family. Browne has been criticized for the part he played in 1664 as a witness in the condemnation of two women as witches.

The first edition of Browne's collected works was published in 1686; the standard edition is by Geoffrey Keynes (including letters), 4 vol., 2nd ed. (1964). There is a full *Bibliography* by G. Keynes (2nd ed., 1967). Keynes also edited *Selected Writings* (1969).

Browne, Thomas (Alexander) (Australian novelist): *see* Boldrewood, Rolf.

Browne, William (b. 1591?, Tavistock, Devonshire, Eng.—d. 1645?), English poet, author of *Britannia's Pastorals* (1613–16) and other pastoral and miscellaneous verse.

Browne studied at Oxford and entered the Inner Temple in 1611. Between 1616 and 1621 he lived in France. In 1623 he became tutor to Robert Dormer, the future earl of Carnarvon, accompanying him to Eton and Oxford. His later life appears to have been spent near Dorking, Surrey.

Britannia's Pastorals, modelled on the work of Edmund Spenser, is a long, discursive pastoral narrative interspersed with songs. Devoted to his country, and especially to Devonshire, he attempted to glorify them in pastoral verse of epic dignity.

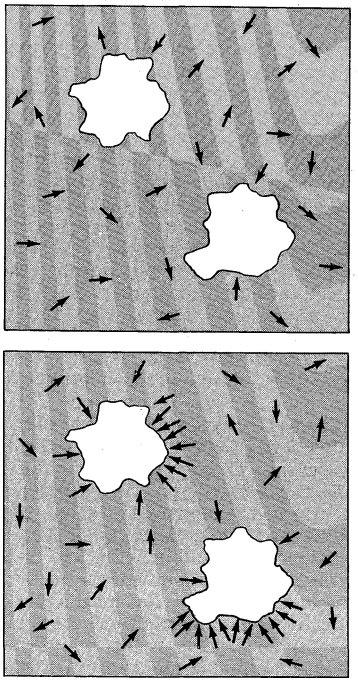
Browne, William George (b. July 25, 1768, London—d. June 1813, Iran), British traveller in Central Africa and the Middle East and the first European to describe Dārfūr, a Muslim sultanate of Bilad as-Sudan, now part of The Sudan.

Browne was forcibly detained in Dārfūr (1793–96), and published his account of the event in *Travels in Africa, Egypt and Syria* (1799, enlarged edition 1806). In 1812 he began a journey from England to the city of Samarkand, now in the Uzbek S.S.R., and was murdered by robbers on the road through Iran from Tabriz to Tehrān.

Brownell, W(illiam) C(rary) (b. Aug. 30, 1851, New York City—d. July 22, 1928, Williamstown, Mass., U.S.), critic who sought to expand the scope of U.S. criticism as Matthew Arnold had for British. After graduating from Amherst College, Amherst, Mass., in 1871, he joined the *New York World,* becoming city editor in a year. After serving on *The Nation* from 1879 to 1881, he became editor and literary adviser to Charles Scribner's Sons, New York publishers, in 1888, remaining there until his death. His first two books, *French Traits* (1889) and *French Art* (1892), established a new and high standard for the U.S. critic, but one that Brownell maintained for himself in his succeeding books: *Victorian Prose Masters* (1901), *American Prose Masters* (1909), *Criticism* (1914), *Standards* (1917), *The Genius of Style* (1924), and *Democratic Distinction in America* (1927).

Brownian movement, any of a variety of physical phenomena in which some quantity is constantly undergoing small, random fluctuations. It was named for the Scottish botanist Robert Brown, who was the first to study such fluctuations (1827).

If a number of particles subject to Brownian movement are present in a given medium and there is no preferred direction for the random oscillations, then over a period of time the particles will tend to be spread evenly throughout the medium. Thus, if A and B are two adjacent regions and, at time t, A contains twice as many particles as B, at that instant the probability of a particle leaving A to enter B is twice as great as the probability that a particle will leave B to enter A. A physical process in which a substance tends to spread steadily from regions of high concentration to regions of lower concentration is called diffusion. Thus, diffusion is a macroscopic manifestation of Brownian motion on the microscopic level. As a consequence, it is possible to study diffusion by simulating the motion of a Brownian particle and computing its average behaviour. A few examples of the countless diffusion processes that are studied in terms of Brownian motion include the diffusion of pollutants through the atmosphere, the diffusion of "holes" (minute regions in which the electrical charge potential is positive) through a semiconductor, and the diffusion of calcium through bone tissue in living organisms.



(Top) Random motion of a Brownian particle; (bottom) random discrepancy between the molecular pressures on different surfaces of the particle that cause motion

From R. Hersh and R. Griego, "Brownian Motion and Potential Theory," copyright © 1969 by Scientific American, Inc.; all rights reserved

By "classical Brownian motion" is meant the random movement of microscopic particles suspended in a liquid or gas. Brown was investigating the fertilization process in *Clarkia pulchella,* a newly discovered species of flower, when he noticed a "rapid oscillatory motion" of the pollen grains suspended in water under the microscope. Other researchers had noticed this phenomenon earlier, but Brown was the first to actually study it. Initially, he believed that such activity was peculiar to the male sexual cells of plants, but then he was startled to observe that pollen of plants dead for over a century showed the same movement, and he called this a "very unexpected fact of seeming vitality being retained by these 'molecules' so long after the death of the plant." Further study revealed that the same motion could be observed not only with particles of other organic substances but even with chips of glass or granite or particles of smoke.

Early explanations attributed the motion to thermal convection currents in the fluid. When observation showed that nearby particles exhibited totally uncorrelated activity, however, this simple explanation was abandoned. By the 1860s, theoretical physicists had become interested in Brownian movement and were searching for a consistent explanation of its various characteristics: a given particle appeared equally likely to move in any direction, further motion seemed totally unrelated to past motion, and the motion never stopped. An experiment (1865) in which a suspension was sealed in glass for a year, showed that the Brownian motion remained unchanged. More systematic investigation in 1889 determined that small particle size and low viscosity of the surrounding fluid resulted in faster motion.

Since higher temperature (*see* Figure) also led to more rapid Brownian motion, in 1877 it was suggested that its cause lay in the "thermal molecular motion in the liquid environment." The idea that molecules of a liquid or gas are constantly in motion, colliding with each other and bouncing back and forth, is a prominent part of the kinetic theory of matter developed in the third quarter of the 19th century by the physicists J.C. Maxwell, L. Boltzmann, and R.J.E. Clausius in explanation of heat phenomena. According to the theory, the temperature of a substance is proportional to the average kinetic energy with which the molecules of the substance are moving or vibrating. It was natural to guess that somehow this motion might be imparted to larger particles that could be observed under the microscope; if true, this would be the first directly observable effect that would corroborate the kinetic theory. This line of reasoning led Albert Einstein in 1905 to produce his quantitative theory of Brownian motion. Similar studies were carried out on Brownian movement, independently and almost at the same time, by M. Smoluchowski, who used methods somewhat different from Einstein's.

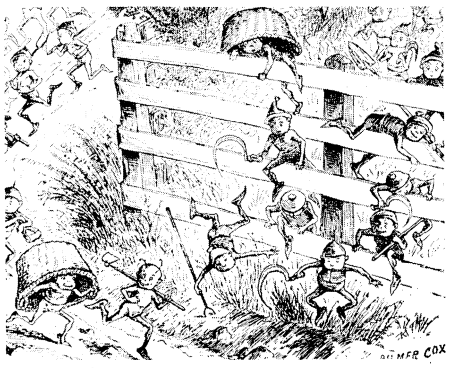
Einstein wrote later that his major aim was to find facts that would guarantee as much as possible the existence of atoms of definite size. In the midst of this work, he discovered that, according to atomistic theory, there would have to be an observable movement of suspended microscopic particles. Einstein did not realize that observations concerning the Brownian motion were already long familiar. Reasoning on the basis of statistical mechanics, he showed that for such a microscopic particle the random difference between the pressure of molecular bombardment on two opposite sides would cause it constantly to wobble back and forth. A smaller particle, a less viscous fluid, and a higher temperature each would increase the amount of motion one could expect to observe. Over a period of time, the particle would tend to drift from its starting point, and on the basis of kinetic theory it is possible to compute the probability (P) of a particle moving a certain distance (x) in any given direction (the total distance it moves will be greater than x) during a certain time interval (t) in a medium whose coefficient of diffusion (D) is known, D being equal to one-half the average of the square of the displacement in the x-direction. This formula for probability "density" allows P to be plotted against x. The graph is the familiar bell-shaped Gaussian "normal" curve that typ-

ically arises when the random variable is the sum of many independent, statistically identical random variables, in this case, the many little pushes that add up to the total motion. The equation for this relationship is

$$P = \frac{e^{-x^2/4Dt}}{2\sqrt{\pi Dt}}.$$

The introduction of the ultramicroscope in 1903 aided quantitative studies by making visible small colloidal particles whose greater activity could be measured more easily. Several important measurements of this kind were made from 1905 to 1911. During this period the French physicist Jean-Baptiste Perrin (*q.v.*) was successful in verifying Einstein's analysis, and for this work he was awarded the Nobel Prize for Physics in 1926. His work established the physical theory of Brownian motion and ended the skepticism about the existence of atoms and molecules as actual physical entities.

brownie, in English and Scottish folklore, a small, industrious fairy or hobgoblin believed to inhabit houses and barns. Rarely seen, he was often heard at night, cleaning and doing housework; he also sometimes mischievously disarranged rooms. He would ride for the



Brownies, detail of an illustration from *The Brownies: Their Book,* written and illustrated by Palmer Cox, 1887

midwife, and in Cornwall he caused swarming bees to settle quickly. Cream or bread and milk might be left for him, but other gifts offended him. If one made him a suit of clothes, he would put it on and then vanish, never to return.

The boggart of Yorkshire and the bogle of Scotland are hostile, mischievous brownies indistinguishable from poltergeists. *See also* puck.

Browning, Elizabeth Barrett, *née* BARRETT (b. March 6, 1806, near Durham, Durham, Eng.—d. June 29, 1861, Florence), English poet whose reputation rests chiefly upon her love poems, *Sonnets from the Portuguese.* Her husband was Robert Browning (*q.v.*)

Elizabeth Barrett Browning, detail of an oil painting by Michele Gordigiani, 1858; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Elizabeth was the eldest child of Edward Barrett Moulton (later Edward Moulton Barrett). Most of her girlhood was spent at a country house within sight of the Malvern Hills, in Worcestershire, where she was extraordinarily happy. At the age of 15, however, she fell seriously ill, probably as the result of a spinal injury, and her health was permanently affected. In 1832 the family moved to Sidmouth, Devon, and in 1836 they moved to London, where, in 1838, they took up residence at 50 Wimpole Street.

In London she contributed to several periodicals, and her first collection, *The Seraphim and Other Poems,* appeared in 1838. For reasons of health, she spent the next three years in Torquay, Devon, but after the death by drowning of her brother, Edward, she developed an almost morbid terror of meeting anyone apart from a small circle of intimates.

Her name, however, was well known in literary circles, and in 1844 her second volume of poetry, *Poems, by E. Barrett Barrett,* was enthusiastically received. In January 1845 she received from the poet Robert Browning a telegram: "I love your verses with all my heart, dear Miss Barrett. I do, as I say, love these books with all my heart—and I love you too." In early summer the two met. Their courtship (whose daily progress is recorded in their letters) was kept a close secret from Elizabeth's despotic father, of whom she stood in some fear. *Sonnets from the Portuguese* (1850) records her reluctance to marry, but their wedding had taken place on Sept. 12, 1846. Her father knew nothing of it, and Elizabeth continued to live at home for a week.

The Brownings then left for Pisa. (When Barrett died in 1856, Elizabeth was still unforgiven.) While in Pisa she wrote "The Runaway Slave at Pilgrim's Point" (Boston, 1848; London, 1849), a protest against slavery in the United States. The couple then settled in Florence, where their only child, Robert Wiedemann Barrett, was born in 1849. In 1851 and in 1855 the couple visited London; during the second visit, Elizabeth completed her most ambitious work, *Aurora Leigh* (1857), a long blank-verse poem telling the complicated and melodramatic love story of a young girl and a misguided philanthropist. This work did not impress most critics, though it was a huge popular success.

During the last years of her life, Mrs. Browning developed an interest in spiritualism and the occult, but her energy and attention were chiefly taken up by an obsession, to a degree that alarmed her closest friends, with Italian politics. *Casa Guidi Windows* (1851) had been a deliberate attempt to win sympathy for the Florentines, and she continued to believe in the integrity of Napoleon III. In *Poems Before Congress* (1860), the poem "A Curse for a Nation" was mistaken for a denunciation of England, whereas it was aimed at U.S. slavery.

In the summer of 1861 Mrs. Browning suffered a severe chill and died.

Browning, John Moses (b. Jan. 21, 1855, Ogden, Utah, U.S.—d. Nov. 26, 1926, Herstal, Belg.), U.S. designer of small arms and automatic weapons, best known for his automatic rifle.

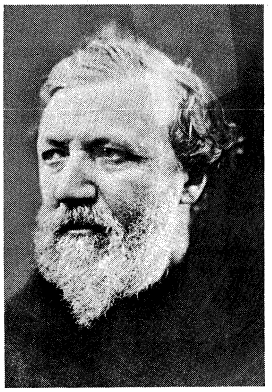
Inventive as a child, Browning made his first gun at the age of 13 in his father's gun shop. In 1879 he patented a single-shot rifle, which he and his brother Matthew sold to the Winchester Repeating Arms Company. His later designs were produced by the Colt, Remington, Stevens, and Winchester arms companies, seldom with his name attached. All of his designs were commercially successful.

The Browning automatic rifle was adopted by the U.S. Army in 1918 and used until the late 1950s. From about 1920 until the 1950s the U.S. armed forces used Browning-designed automatic weapons almost exclusively: .30- and .50-calibre machine guns, in several modifications for air, naval, and land use; the .45-calibre auto-loading pistol; and the 37-millimetre automatic cannon for aircraft.

He designed many types of sporting firearms as well, notably the over-and-under double-barrelled shotgun made in Belgium.

Browning, Robert (b. May 7, 1812, London—d. Dec. 12, 1889, Venice), major English poet of the Victorian age, noted for his mastery of dramatic monologue and psychological portraiture. His most noted work was *The Ring and the Book* (1868–69), the story of a Roman murder trial in 12 books.

Life. The son of a clerk in the Bank of England in London, Browning received only a slight formal education, although his father



Robert Browning, photograph by Julia Margaret Cameron

By courtesy of the Gernsheim Collection, the University of Texas at Austin

gave him a grounding in Greek and Latin. In 1828 he attended classes at the University of London but left after half a session. Apart from a journey to St. Petersburg in 1834 with George de Benkhausen, the Russian consul general, and two short visits to Italy in 1838 and 1844, he lived with his parents in London until 1846, first at Camberwell and after 1840 at Hatcham. During this period (1832–46) he wrote his early long poems and most of his plays.

Browning's first published work, *Pauline: A Fragment of a Confession* (1833, anonymous), although formally a dramatic monologue, embodied many of his own adolescent passions and anxieties. Although it received some favourable comment, it was attacked by John Stuart Mill, who condemned the poet's exposure and exploitation of his own emotions and his "intense and morbid self-consciousness." It was perhaps Mill's critique that determined Browning never to confess his own emotions again in his poetry, but to write objectively. In 1835 he published *Paracelsus* and in 1840 *Sordello,* both poems dealing with men of great ability striving to reconcile the demands of their own personalities with those of the world. *Paracelsus* was well received, but *Sordello,* which made exacting demands on its reader's knowledge, was almost universally declared incomprehensible.

Encouraged by the actor Charles Macready, Browning devoted his main energies for some years to verse drama, a form that he had already adopted for *Strafford* (1837). Between 1841 and 1846, in a series of pamphlets under the general title of *Bells and Pomegranates,* he published seven more plays in verse, including *Pippa Passes* (1841), *A Blot in the 'Scutcheon* (produced in 1843), and *Luria* (1846). These, and all his earlier works except *Strafford,* were printed at his family's expense. Although Browning enjoyed writing for the stage, he was not successful in the theatre, since his strength

lay in depicting, as he had himself observed of *Strafford,* "Action in Character, rather than Character in Action."

By 1845 the first phase of Browning's life was near its end. In that year he met Elizabeth Barrett. In her *Poems* (1844) Barrett had included lines praising Browning, who wrote to thank her (January 1845). In May they met and soon discovered their love for each other. Barrett had, however, been for many years an invalid, confined to her room and thought incurable. Her father, moreover, was a dominant and selfish man, jealously fond of his daughter, who in turn had come to depend on his love. When her doctors ordered her to Italy for her health and her father refused to allow her to go, the lovers, who had been corresponding and meeting regularly, were forced to act. They were married secretly in September 1846; a week later they left for Pisa.

Throughout their married life, although they spent holidays in France and England, their home was in Italy, mainly at Florence, where they had a flat in Casa Guidi. Their income was small, although after the birth of their son, Robert, in 1849 Mrs. Browning's cousin John Kenyon made them an allowance of £100 a year, and on his death in 1856 he left them £11,000.

Browning produced comparatively little poetry during his married life. Apart from a collected edition in 1849 he published only *Christmas-Eve and Easter-Day* (1850), an examination of different attitudes toward Christianity, perhaps having its immediate origin in the death of his mother in 1849; an introductory essay (1852) to some spurious letters of Shelley, Browning's only considerable work in prose and his only piece of critical writing; and *Men and Women* (1855). This was a collection of 51 poems—dramatic lyrics such as "Memorabilia," "Love Among the Ruins," and "A Toccata of Galuppi's"; the great monologues such as "Fra Lippo Lippi," "How It Strikes a Contemporary," and "Bishop Blougram's Apology"; and a very few poems in which implicitly ("By the Fireside") or explicitly ("One Word More") he broke his rule and spoke of himself and of his love for his wife. *Men and Women,* however, had no great sale, and many of the reviews were unfavourable and unhelpful. Disappointed for the first time by the reception of his work, Browning in the following years wrote little, sketching and modelling in clay by day and enjoying the society of his friends at night. At last Mrs. Browning's health, which had been remarkably restored by her life in Italy, began to fail. On June 29, 1861, she died in her husband's arms. In the autumn he returned slowly to London with his young son.

His first task on his return was to prepare his wife's *Last Poems* for the press. At first he avoided company, but gradually he accepted invitations more freely and began to move in society. Another collected edition of his poems was called for in 1863, but *Pauline* was not included. When his next book of poems, *Dramatis Personae* (1864)—including "Abt Vogler," "Rabbi Ben Ezra," "Caliban upon Setebos," and "Mr. Sludge, 'The Medium' "—reached two editions, it was clear that Browning had at last won a measure of popular recognition.

In 1868–69 he published his greatest work, *The Ring and the Book,* based on the proceedings in a murder trial in Rome in 1698. Grand alike in plan and execution, it was at once received with enthusiasm, and Browning was established as one of the most important literary figures of the day. For the rest of his life he was much in demand in London society. He spent his summers with friends in France, Scotland, or Switzerland or, after 1878, in Italy.

The most important works of his last years, when he wrote with great fluency, were the long narrative or dramatic poems, often dealing with contemporary themes, such as *Prince Hohenstiel-Schwangau* (1871), *Fifine at the Fair* (1872), *Red Cotton Night-Cap Country* (1873), *The Inn Album* (1875), and the two series of *Dramatic Idyls* (1879 and 1880). He wrote a number of poems on classical subjects, including *Balaustion's Adventure* (1871) and *Aristophanes' Apology* (1875). In addition to many collections of shorter poems—*Pacchiarotto and How He Worked in Distemper* (1876), *Jocoseria* (1883), *Ferishtah's Fancies* (1884), and *Asolando: Fancies and Facts* (1889)—Browning published toward the end of his life two books of unusually personal origin—*La Saisiaz* (1878), at once an elegy for his friend Anne Egerton-Smith and a meditation on mortality, and *Parleyings with Certain People of Importance in Their Day* (1887), in which he discussed books and ideas that had influenced him since his youth.

While staying in Venice in 1889, Browning caught cold, became seriously ill, and died on December 12. He was buried in Westminster Abbey.

Assessment. Few poets have suffered more than Browning from hostile incomprehension or misplaced admiration, both arising very often from a failure to recognize the predominantly dramatic nature of his work. The bulk of his writing before 1846 was for the theatre; thereafter his major poems showed his increasing mastery of the dramatic monologue. This consists essentially of a narrative spoken by a single character and amplified by his comments on his story and the circumstances in which he is speaking. Browning's fondness for the form has, however, encouraged the two most common misconceptions of the nature of his poetry—that it is deliberately obscure and that its basic "message" is a facile optimism. Neither of these criticisms is groundless; both are incomplete.

Browning is not always difficult. In many poems, especially short lyrics, he achieves effects of obvious felicity. Nevertheless, his superficial difficulties, which prevent an easy understanding of the sense of a passage, are evident enough: his attempts to convey the broken and irregular rhythms of speech make it almost impossible to read the verse quickly; his elliptical syntax sometimes disconcerts and confuses the reader but can be mastered with little effort; certain poems, such as *Sordello* or "Old Pictures in Florence," require a considerable acquaintance with their subjects in order to be understood; and his fondness for putting his monologues into the mouths of charlatans and sophists, such as Mr. Sludge or Napoleon III, obliges the reader to follow a chain of subtle or paradoxical arguments. All these characteristics stand in the way of easy reading.

But even when individual problems of style and technique have been resolved, the poem's interest is seldom exhausted. First, Browning often chooses an unexpected point of view, especially in his monologues, thus forcing the reader to accept an unfamiliar perspective. Second, he is capable of startling changes of focus within a poem. For example, he chooses subjects in themselves insignificant, as in "Fra Lippo Lippi" and "Master Hugues of Saxe-Gotha," and treats through them the eternal themes of poetry. This transition from particular observation to transcendental truth presents much the same challenge to the reader as do the metaphysical poets of the 17th century and much the same excitement. Third, because Browning seldom presents a speaker without irony, there is a constant demand on the reader to appreciate exactly the direction of satiric force in the poem. Even in a melodious poem such as "A Toccata of Galuppi's," the valid position must be distinguished from the false at every turn of the argument, while in the major casuistic monologues, such as "Bishop Blougram's Apology," the shifts of sympathy are subtler still.

It has also been objected that Browning uses his poetry as a vehicle for his philosophy, which is not of itself profound or interesting, being limited to an easy optimism. Against this it may be argued, in the first place, that since Browning seeks to win imaginative rather than speculative conviction it is inadmissible to judge his poetry simply as versified metaphysics. Second, Browning's dramatic monologues must, as he himself insisted, be recognized as the utterances of fictitious persons drawing their strength from their appropriateness in characterizing the speaker, and not as expressions of Browning's own sentiments. Thus his great gallery of imagined characters is to be regarded as an exhaustive catalog of human motives, not as a series of self-portraits. Nevertheless, certain fundamental assumptions are made so regularly that they may be taken to represent Browning's personal beliefs, such as his Christian faith. In matters of human conduct his sympathies are with those who show loving hearts, honest natures, and warmth of feeling; certainly these qualities are never satirized. He is in general on the side of those who commit themselves wholeheartedly to an ideal, even if they fail. By itself this might suggest rather a naive system of values, yet he also, sometimes even in the same poem, shows his understanding of those who have been forced to lower their standards and accept a compromise. Thus, although Browning is far from taking a cynical or pessimistic view of man's nature or destiny, his hopes for the world are not simple and unreasoning.

During his lifetime, critical recognition came rapidly after 1864; and although his books never sold as well as his wife's or Tennyson's, he thereafter acquired a considerable and enthusiastic public. In the 20th century his reputation, along with those of the other great Victorians, declined, and his work did not enjoy a wide reading public, perhaps in part because of increasing skepticism of the values implied in his poetry. He has, however, influenced many modern poets, such as Robert Frost and Ezra Pound, partly through his development of the dramatic monologue, with its emphasis on the psychology of the individual and his stream of consciousness, but even more through his success in writing about the variety of modern life in language that owed nothing to convention.

(Ph.D./Ed.)

MAJOR WORKS. *Poetry and verse drama. Pauline: A Fragment of a Confession* (1833); *Paracelsus* (1835); *Strafford* (1837), historical tragedy; *Sordello* (1840); *Bells and Pomegranates* (eight numbers): no. 1, *Pippa Passes* (1841), a drama; no. 2, *King Victor and King Charles* (1842), a tragedy; no. 3, *Dramatic Lyrics* (1842), including "Waring," "My Last Duchess," and "The Pied Piper of Hamelin"; no. 4, *The Return of the Druses* (1843), a tragedy; no. 5, *A Blot in the 'Scutcheon* (1843), a tragedy; no. 6, *Colombe's Birthday* (1844), a play; no. 7, *Dramatic Romances and Lyrics* (1845), including "Home Thoughts, from Abroad"; and no. 8, *Luria* and *A Soul's Tragedy* (1846); *Christmas-Eve and Easter-Day* (1850); *Men and Women,* 2 vol. (1855), including "Two in the Campagna," "Bishop Blougram's Apology," "Fra Lippo Lippi," and "Love Among the Ruins"; *Dramatis Personae* (1864), including "Abt Vogler," "Rabbi Ben Ezra," "Caliban upon Setebos," and "Mr. Sludge, 'The Medium' "; *The Ring and the Book,* 4 vol. (1868–69); *Balaustion's Adventure* (1871); *Prince Hohenstiel-Schwangau, Saviour of Society* (1871); *Fifine at the Fair* (1872); *Red Cotton Night-Cap Country; or Turf and Towers* (1873); *Aristophanes' Apology* (1875), including a *Transcript from Euripides: Being the Last Adventure of Balaustion; The Inn Album* (1875); *Pacchiarotto and How He Worked in Distemper* (1876), with other poems; *The Agamemnon of Aeschylus* (1877), a translation; *La Saisiaz: The*

Two Poets of Croisic, 1 vol. (1878); *Dramatic Idyls* (1879, first series; 1880, second series); *Jocoseria* (1883); *Ferishtah's Fancies* (1884); *Parleyings with Certain People of Importance in Their Day* (1887); *Asolando: Fancies and Facts* (1889).

BIBLIOGRAPHY. L.N. Broughton, C.S. Northup, and R. Pearsall (comps.), *Robert Browning: A Bibliography, 1830–1950* (1953), is the standard work. Park Honan gives a full descriptive account of Browning studies up to 1966 in chap. 3 of F.E. Faverty (ed.), *The Victorian Poets: A Guide to Research,* 2nd ed. (1968). The Armstrong Browning Library, Baylor University, Waco, Texas, U.S., publishes *The Browning Newsletter.*

Editions. Of the many editions of Browning's works, the most complete is that of Augustine Birrell (1915). A variorum edition edited by R.A. King *et al.* is in progress.

Letters. T.L. Hood (ed.), *Letters of Robert Browning* (1933); R. Curle (ed.), *Robert Browning and Julia Wedgwood* (1937); W.C. Devane and K.L. Knickerbocker (eds.), *New Letters of Robert Browning* (1950); E.C. McAleer (ed.), *Dearest Isa: Robert Browning's Letters to Isabella Blagden* (1951); *Learned Lady: Letters from Robert Browning to Mrs. Thomas FitzGerald, 1876–1889* (1966); P. Landis and R.E. Freeman (eds.), *Letters of the Brownings to George Barrett* (1958); G.R. Hudson (ed.), *Browning to His American Friends* (1965); E. Kintner (ed.), *The Letters of Robert Browning and Elizabeth Barrett Browning, 1845–1846,* 2 vol. (1969).

Biography. W.H. Griffin (completed by H.C. Minchin), *The Life of Robert Browning,* 3rd ed. rev. (1938, reprinted 1966), is the standard biography, now rather dated. M. Ward, *Robert Browning and His World,* 2 vol. (1967–69), is the best modern life.

Criticism. B. Litzinger and D. Smalley (eds.), *Robert Browning: The Critical Heritage* (1970), presents in chronological order the most important reviews and studies of Browning by his contemporaries.

Browning automatic rifle (BAR), automatic rifle produced in the United States starting in 1918 and widely used in other countries as a light machine gun. The BAR is one of a family of weapons named for John M. Browning (1855–1926), a U.S. gun designer. It has been chambered for various ammunition, but most frequently for 7.92-millimetre Mauser and .30-06 Springfield. Nearly 50 inches (127 centimetres) long, it has a 20-round magazine and weighs 19.4 pounds (8.8 kilograms). It can fire up to 650 rounds per minute, but can also fire single shots or bursts of two or three to increase accuracy.

The BAR has been replaced by the Belgian-designed 7.62-mm North Atlantic Treaty Organization (NATO) rifle, which is lighter, shorter, and more effective.

Brownlee, J(ohn) E(dward) (b. Aug. 27, 1884, Port Ryerse, Ont., Can.—d. July 15, 1961, Calgary, Alta.), Canadian politician and premier (1925–34) of the province of Alberta.

Brownlee was admitted to the bar in 1912 and made king's counsel in 1921. After working as general counsel to the United Grain Growers and the United Farmers Party in Alberta, he was appointed the province's attorney general (1921) and shortly thereafter was elected to the legislature in a by-election. He remained in his cabinet post until 1924, then succeeded to the office of premier of Alberta in 1925. During his administration he acquired provincial control of Alberta's resources and sold the local railways to the federal systems. He resigned from office in 1934 and returned to practicing law; he became president and general manager of United Grain Growers, Ltd.

Brownlow, William G(annaway) (b. Aug. 29, 1805, Wythe County, Va., U.S.—d. April 29, 1877, Knoxville, Tenn.), editor of the last pro-Union newspaper in the antebellum South of the United States and governor of Tennessee during the early years of Reconstruction.

As a young child, Brownlow migrated with his family from Virginia to eastern Tennessee. He was orphaned at age 11, grew up with relatives, and had little formal schooling. But he read widely and, in 1826, entered the Methodist ministry.

For the next decade Brownlow was an itinerant preacher. In 1838 he began his long career as a newspaper editor, starting with the *Tennessee Whig* (1838), *Jonesboro Whig and Independent* (1839–49), and *Knoxville Whig* (1849–69 and 1875–77).

An outspoken and unconditional advocate of the Union, Brownlow continued to ridicule secession until Confederate authorities suppressed the *Knoxville Whig* and caused its editor to flee in the fall of 1861. His press and type were destroyed, putting an end to the last pro-Union paper in the South. Confederate Secretary of War Benjamin banished Brownlow to the North, where the former editor regained his health (after having suffered from typhoid), made a successful lecture tour, and wrote a book, *Sketches of the Rise, Progress, and Decline of Secession; With a narrative of Personal Adventure Among the Rebels* (1862).

When eastern Tennessee was brought under the control of federal forces in 1863, Brownlow returned to his home state and aided in restoring civil government there. Then, in 1865, he was elected governor. Determined to punish pro-secessionists, he advocated disenfranchising all who had fought against the Union, and he mobilized 1,600 state guards to crush the newly organized Ku Klux Klan. Despite failing health, he was elected to a second term by a large majority.

Toward the end of his second term as governor, Brownlow was elected to the U.S. Senate. In 1875 he returned to Knoxville, bought back the *Whig* (which he had sold in 1869), and edited the paper until shortly before his death.

Brownshirts (Nazi Germany): *see* SA.

Brownson, Orestes Augustus (b. Sept. 16, 1803, Stockbridge, Vt., U.S.—d. April 17, 1876, Detroit), U.S. writer on theological, philosophical, scientific, and sociological subjects.

Self-educated and originally a Presbyterian, he subsequently became a Universalist minister (1826–31); a Unitarian minister (1832); pastor of his own religious organization, the Society for Christian Union and Progress (1836–42); and, in 1844, a Roman Catholic, which he remained. During the period 1830–70, Brownson wrote on Calvinism, labour and social reform, Transcendentalism, Roman Catholicism, states' rights, democracy, nativism, and emancipation.

Philosophically, he was a moderate follower of the Positivist Auguste Comte and the systematic eclectic Victor Cousin. Before his conversion to Roman Catholicism, he supported the views of the British social reformer Robert Owen. His versatility was expressed in mystical poetry, an interest in philosophy and social amelioration. Typical of his many writings are *The Spirit-Rapper: An Autobiography* (1854); *The Convert* (1857); and *The American Republic* (1865), in which he based government on ethics, declaring the national existence to be a moral and even a theocratic entity, not depending for validity upon the sovereignty of the people.

Brownson published *Brownson's Quarterly Review* (1844–75) as a journal of personal opinion, except for the years 1865–72. After Brownson's death, his son, Henry F. Brownson, collected and published his *Works* (1882–1907) in 20 volumes. In 1955 Alvan S. Ryan issued *The Brownson Reader.* A.M. Schlesinger's *Orestes A. Brownson: A Pilgrim's Progress* appeared in 1939, followed by T. Maynard's *Orestes Brownson: Yankee, Radical, Catholic* in 1943.

Brownsville, city, seat (1848) of Cameron County, extreme southern Texas, U.S., on the Rio Grande opposite Matamoros, Mex., 22 mi (35 km) from the river's mouth. With Harlingen and San Benito it forms an industrial–agribusiness–port complex. On March 28, 1846, Gen. Zachary Taylor placed the U.S. flag on the site (then part of Matamoros) and constructed a fort, later named Ft. Brown, for Maj. Jacob Brown, who died (May 9) defending it from Mexican attack. Taylor's arrival signalled the beginnings of the Mexican War, which began in earnest after the Thornton Skirmish (April 25, 1846). On May 8–9, 1846, the battles of Palo Alto and Resaca de la Palma were fought there. During the Civil War, Brownsville and Matamoros served as ports of call for blockade runners handling guns and ammunition and for Confederate cotton, and on May 12–13, 1865, a Federal force was captured at nearby Palmito Hill by Confederates under Gen. Richard Taylor (a month after the war had ended).

Modern Brownsville began when the first standard-gauge railroad arrived from Kingsville in 1904. The city was the scene of the Brownsville Affair of 1906, in which black soldiers were unjustly accused of murdering a white man and wounding another.

Brownsville's deepwater port (opened 1936), with a 17-mi channel, serves as the southwestern terminus of the Gulf Intracoastal Waterway and handles a range of bulk cargoes, including fuel oil, ores, and grains; it is also the harbour for a large shrimp fleet. Industries include petrochemicals, aircraft repair, and food processing. The city is an international air, highway, and rail focus and is the largest urban centre in the irrigated Lower Rio Grande Valley, which supports cotton, grain, winter vegetables, citrus fruit, and livestock. Brownsville's economy is augmented by tourism, based on the nearby Boca Chica Beach, the Padre Island National Seashore, and gateway facilities to Mexico. The annual pre-Lenten Charro Days festival combines Texan and Mexican culture. The city is the seat of Texas Southmost College (1926), which has surviving buildings of Ft. Brown on its campus. Inc. 1850. Pop. (1980) city, 84,997; metropolitan area (SMSA), 209,680.

Brownsville Affair (1906), racial incident that grew out of tensions between whites in Brownsville, Tex., U.S., and black infantrymen stationed at nearby Ft. Brown. About midnight, Aug. 13–14, 1906, rifle shots on a street in Brownsville killed one white man and wounded another. White commanders at Ft. Brown believed all the black soldiers were in their barracks at the time of the shooting; but the mayor and other whites asserted that they had seen black soldiers on the street firing indiscriminately, and they produced spent shells from army rifles to support their statements. Despite evidence that the shells had been planted as part of a frame-up, investigators accepted the statements of the mayor and the white citizens.

When the black soldiers insisted that they had no knowledge of the shooting, Pres. Theodore Roosevelt ordered 167 black infantrymen discharged without honour because of their conspiracy of silence. His action caused much resentment among blacks and drew some criticism from whites, but a U.S. Senate committee, which investigated the episode in 1907–08, upheld Roosevelt's action.

The Brownsville Affair has ever since been a matter of controversy, and with the rise of the civil rights movement it became a matter of embarrassment to the Army. After the publication in 1970 of John D. Weaver's *The Brownsville Raid,* which argued that the discharged soldiers had been innocent, the Army

conducted a new investigation and, in 1972, reversed the order of 1906.

Brownsville Zoo: *see* Gladys Porter Zoo.

browridge, also called SUPRAORBITAL TORUS, bony ridge over the eye sockets (orbits). Browridges are massive in gorillas and chimpanzees and are also well developed in extinct hominids. They are more prominent in males than in females.

Browridges may have served as buttresses against the stress exerted by jaw muscles or as protection for the eyes. In modern man browridges are greatly reduced.

Broxbourne, district (borough), county of Hertfordshire, England. With an area of 20 sq mi (52 sq km), the district comprises the valley of the River Lea (a tributary of the Thames), which flows from north to south along its eastern boundary, together with the lines of road and railway that follow the west bank of the river and the ribbon of settlement that has grown up along these routes, from Cheshunt and Waltham Cross in the south to Broxbourne and Hoddesdon in the north. Broxbourne town is 17 mi (26 km) north of central London, and the district lies within the capital's commuter belt, but west of the Lea Valley lie extensive areas of park and woodland. The district headquarters are at Cheshunt. Pop. (1982 est.) 79,900.

Broxtowe, district, county of Nottinghamshire, England. With an area of 31 sq mi (81 sq km), the district covers the heavily industrialized western suburbs of the East Midlands city of Nottingham and the valley of the River Trent, while its northern end includes part of the Nottinghamshire coalfield. The district town (seat) is Beeston, southwest of Nottingham. Pop. (1982 est.) 104,300.

Broz, Josip (Yugoslav president): *see* Tito, Josip Broz.

bruang: *see* sun bear.

Bruant, Libéral, Bruant also spelled BRUAND (b. *c.* 1635—d. Nov. 22, 1697, Paris), builder of the Hôtel des Invalides, Paris, a French architect noted for the gravity, dignity, and simplicity of his designs.

Libéral Bruant is the most notable of a family that produced a series of architects active in France from the 16th to the 18th century. He was the son of Sébastien and brother of Jacques, who designed the Hall of the Corporation des Drapiers, the facade of which survives in the Musée Carnavalet. Libéral took the place of his father in 1663 as *architecte du roi* and succeeded him as master of timber works upon Sébastien's death in 1670.

Bruant supplied the overall design for the Salpêtrière (1670), a hospital founded by Cardinal Mazarin, recognized especially for the plan of the chapel, which is separated into units so that the staff and patients might be segregated in the interest of hygiene and yet participate together in the ritual.

The reputation of Bruant rests on his plan for the Invalides (*c.* 1670–77), another hospital intended to house crippled veterans. The double-tiered arcades that bound the inner court are especially fine, having a nearly Roman severity, much like that of an ancient aqueduct. The dome, added by Jules Hardouin-Mansart, was not part of Bruant's design.

Among Bruant's other works was a hall designed at Richmond, Yorkshire, Eng., for the Duke of York, who subsequently became James II. Bruant's own modest home still stands in Paris in the rue de la Perle.

Brubeck, Dave, byname of DAVID WARREN BRUBECK (b. Dec. 6, 1920, Concord, Calif., U.S.), U.S. pianist-composer who brought elements of classical music into jazz.

Brubeck was taught piano by his mother from the age of four and began practicing the cello at nine. He worked as a pianist with local jazz groups from 1933 and studied in music at the College of the Pacific (1941–42), Fresno, Calif., where he formed and led a 12-piece orchestra. He studied composition at Mills College, Oakland, Calif., under the French composer Darius Milhaud and, after serving in the U.S. Army, resumed studies under Arnold Schoenberg, the inventor of the 12-tone system of composition. Of that episode Brubeck is quoted as having said, "We didn't get on well at all."

Dave Brubeck Quartet, with Brubeck at the piano
By courtesy of *down beat* magazine

In 1946 Brubeck formed an experimental octet, followed by a trio in 1949 and a quartet from 1951 to 1967. The quartet, featuring the lilting grace of saxophonist Paul Desmond and, in the 1960s, flirting with what for jazz at that time were abstruse metres (*e.g.*, $\frac{5}{4}$), became the best known jazz unit in the world. In spite of his success with the general public, Brubeck as a pianist was never wholeheartedly accepted as a master by the jazz world. During the 1970s and '80s he toured and recorded, primarily using his sons as personnel. A prolific and original composer, his best known tunes include "The Duke," "In Your Own Sweet Way," "Blue Rondo a la Turk," and "Take Five."

Bruce FAMILY, also spelled BRAOSE, BREAUX, or BRUS, an old Scottish family of Norman descent, to which two kings of Scotland belonged. The name is taken from Bruis (present-day Brix), a Norman castle town between Cherbourg and Valognes.

The family is descended from Robert de Bruce (d. 1094?), a Norman knight who came to England with William I the Conqueror and who was awarded by the gift of many manors, chiefly in Yorkshire, of which Skelton was the principal. His son, the second Robert de Bruce (1078?–1141), received from Scotland's King David I, his comrade at the English court of Henry I, a grant of the lordship of Annandale, in Scotland. Later estranged from David, he renounced his Scottish fief of Annandale, which, however, was restored to his son, the third Robert (fl. 1138–89?).

The family's royal connections began when the fourth Robert (d. before 1191) married Isabel, natural daughter of King William I the Lion, and when their son, the fifth Robert (d. 1245), married Isabel, second daughter of David, earl of Huntingdon, and niece of William I.

The sixth Robert (1210–95), son of the fifth, was one of the 13 claimants to the Scottish throne in 1291. When the English king Edward I decided in favour of John de Balliol, Robert de Bruce resigned Annandale to his son, the seventh Robert (1253–1304), already (by marriage) earl of Carrick. The eighth Robert de Bruce (1274–1329) revived his grandfather's claim and became king of Scotland in 1306 (*see* Robert I *under* Robert [Scotland]). His brother Edward (d. 1318) was killed while fighting to make himself effective king of Ireland. The direct line of the Bruces ended in 1371 with the death of King Robert's son, David II (1324–71; *see* David II *under* David [Scotland]). The crown of Scotland then passed to a grandson of David II (through the female line)—namely, Robert Stewart, who, as Robert I, was the first of the Scottish royal House of Stewart and ancestor of the English House of Stuart.

Bruce, Blanche K(elso) (b. March 1, 1841, Prince Edward County, Va., U.S.—d. March 17, 1898, Washington, D.C.), black senator from Mississippi during the Reconstruction era.

The son of a slave mother and white planter father, Bruce was well educated as a youth. After the Civil War, he moved to Mississippi, where in 1869 he became a supervisor of elections. By 1870 he was an emerging figure in state politics. After serving as sergeant at arms in the state senate, he held the posts of county assessor, sheriff, and member of the Board of Levee Commissioners of the Mississippi River. Through these positions he amassed enough wealth to purchase a plantation in Floreyville, Miss.

In 1874 Mississippi's Republican-dominated state legislature elected Bruce, a Republican, to a seat in the U.S. Senate. He served from 1875 to 1881, advocating just treatment for both blacks and Indians and opposing the policy excluding Chinese immigrants. He sought improvement of navigation on the Mississippi and of relations between the races. Much of his time and energy he devoted to fighting fraud and corruption in federal elections.

Bruce lost his political base in Mississippi with the end of Reconstruction governments in the South. He remained in Washington when, at the conclusion of his Senate term, he was appointed register of the Treasury. He served in that post from 1881 to 1885 and again from 1895 to 1898. He was also recorder of deeds in the District of Columbia (1889–95) and a trustee of Howard University.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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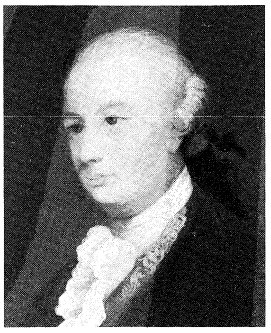
Bruce, James (b. Dec. 14, 1730, Larbert, Stirling, Scot.—d. April 27, 1794, Larbert), explorer who, in the course of daring travels in Ethiopia, reached the headstream of the Blue Nile, then thought to be the Nile's main source. The credibility of his observations, published in *Travels to Discover the Source of the Nile* (1790), was questioned in Britain,

partly because he had first told the French court of his discoveries. Reports by later travelers, however, confirmed the accuracy of his account.

As British consul in Algiers (1763 and afterward), Bruce studied many antiquities of North Africa, recording what he saw in fine drawings. Beginning in 1765 he traveled widely in the Mediterranean region, notably in Syria, and arrived at Alexandria in July 1768. Intent on reaching the source of the Nile, he left Cairo on an arduous journey by way of the Nile, Aswān, the Red Sea, and Mitsiwa (in Ethiopia), eventually reaching the Ethiopian capital of Gondar on Feb. 14, 1770.

Despite serious political unrest in Ethiopia, Bruce continued his expedition and reached



James Bruce, detail from an oil painting by an unknown artist; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Lake Tana, where the Blue Nile rises, on November 14. The journey homeward was one of extreme hardship. He arrived at Marseille in March 1773 and returned to London in 1774. Following retirement to his estate, he began writing in 1780 his vivid account of his travels, considered one of the epics of African adventure literature.

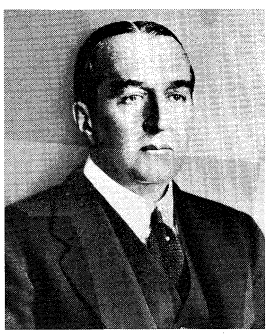
Bruce, James: *see* Elgin, James Bruce, 8th earl of.

Bruce, Robert VIII de: *see* Robert I *under* Robert (Scotland).

Bruce, Thomas: *see* Elgin, Thomas Bruce, 7th earl of.

Bruce (of Melbourne), Stanley Melbourne Bruce, Viscount (b. April 15, 1883, Melbourne—d. Aug. 25, 1967, London), statesman and diplomat, prime minister of Australia from 1923 to 1929, who became that country's leading emissary to Great Britain.

Bruce studied at the University of Cambridge and then practiced law in England. After serving in the British army during World War I, he entered the Australian Parliament in 1918 and was his country's representative to the League of Nations (1921). After serving as federal treasurer from 1921 to 1923, he became prime minister upon the resignation of



Bruce of Melbourne

By courtesy of the Australian Information Service

William Morris Hughes, forming a coalition of the National and Country parties. During his administration, Bruce strove to develop the Australian economy, especially by integrating it with that of Great Britain. He fostered research in public health and applied science. His government was defeated, and he himself lost his seat in a general election in 1929.

As Australia's minister to England in 1932 and Australian high commissioner from 1933 to 1945, Bruce successfully lobbied for the lowering of interest rates for Australia during the Great Depression. As the Australian representative to the British War Cabinet from 1942 to 1945, he opposed British prime minister Winston Churchill in arguing for lenient postwar treatment of Germany. In 1947 Bruce became chairman of the World Food Council and chairman of Britain's Finance Corporation for Industry, which contributed to postwar recovery in Britain.

Awarded a viscountcy in 1947, he was the first Australian to be so honoured. He served as the first chancellor of the Australian National University, Canberra (1952–61), although he lived in England from 1932 until his death. There were no children from his marriage, and the viscountcy lapsed.

Bruce Peninsula, also called SAUGEEN PENINSULA, extension of the Niagara Escarpment, southeastern Ontario, Canada. The peninsula juts northwestward for 60 miles (100 km) into Lake Huron, separating that lake from Georgian Bay. After rising abruptly from its rugged east coast to heights of 200–500 feet (60–150 m) above the lake, the peninsula slopes gradually to its western coast. Although it is poor agriculturally, it is a popular vacation area. Ferry service to Flowerpot Island, a part of Georgian Bay Islands National Park, and to Manitoulin Island is available from Tobermory at the peninsula's tip. Chief towns include Owen Sound and Wiarton.

Bruce Series, division of Precambrian rocks in North America that is well-developed northeast of the Lake Huron region (the Precambrian began about 4,600,000,000 years ago, when the Earth's crust formed, and ended 570,000,000 years ago). The Bruce Series is the lowermost of the three major divisions of the Huronian System; it overlies pre-Huronian schists, underlies rocks of the Cobalt Series, and consists of about 1,500 metres (about 5,000 feet) of quartzites, conglomerates, limestones, and siltstones. The conglomerate that begins the Bruce is separated from pre-Huronian schists by a profound erosional surface representing a time span of unknown duration.

The Bruce sediments were probably deposited by a shallow sea on a locally subsiding, almost flat erosional surface. The upper beds of the Bruce surface are unevenly eroded, and it seems likely that a period of uplift occurred without significant deformation before the deposition of the sediments of the overlying Cobalt Series. The Bruce Series contains significant and valuable deposits of pitchblende and uranite, a source of uranium largely concentrated in the Mississagi Formation, a quartz pebble conglomerate. Controversy surrounds the mode of origin of these ore deposits. Many geologists think that the deposits had a hydrothermal origin. Others feel that the deposits should be classed as sedimentary rocks, and still others think uranium mineralization related to granitic intrusions in the region. Radiometric dating techniques place the age of the Bruce at about 1,620,000,000 years.

brucellosis, also called MALTA FEVER, MEDITERRANEAN FEVER, or UNDULANT FEVER, infectious disease of humans and domestic animals characterized by the insidious onset of fever, chills, sweats, weakness, pains, and aches, all of which usually terminate within three to six months. The disease is named after the British army medical doctor David Bruce, who in 1887 first isolated and identified the causative bacteria from the spleen of a soldier who had died from the infection.

Three main species of *Brucella* are the common cause of human disease, and the organism of each of the species has its major reservoir in domestic animals. The causative organisms are *Brucella melitensis* (goats and sheep), *Brucella suis* (swine), and *Brucella abortus* (cattle). Brucellosis in animals results in severe economic losses to livestock owners. Brucellosis in cattle (which is also known as Bang's disease) may result in abortion, with subsequent loss of stock and lowered milk production; frequently, however, cows carry to term in spite of infection of uterine tissue. In swine, abortion is less common, even in cases in which the tissues of the sow are heavily infected.

Brucellae are highly invasive microbes, causing the disease to spread rapidly from animal to animal. Infection of healthy animals takes place through the ingestion of contaminated food or by direct entrance of the brucellae through abrasions of the skin or through the mucous membrane of the eyes. In swine, infection of the genitalia of the boar can cause the disease to spread throughout the herd. Infected but healthy-appearing cattle, sheep, and goats can excrete considerable numbers of brucellae in their milk for months and, in some instances, for years.

Humans contract brucellosis either directly or indirectly from infected animals. For reasons not clearly understood, children are more resistant than adults to brucellosis. The disease is very rarely transmitted from one human being to another.

There is no dependable or practical form of drug therapy for animal brucellosis. To build up brucellosis-free herds, infected animals must be removed; vaccination of young animals is also a useful measure. Antibiotics are effective in treatment of the human disease in the acute stage. A combination of sulfonamide drug and streptomycin has proved to be successful, and therapy with tetracyclines, such as chlorotetracycline or oxytetracycline, has also given satisfactory results.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Bruch, Max (b. Jan. 6, 1838, Cologne—d. Oct. 2, 1920, Friedensau, near Berlin), German composer remembered chiefly for his virtuoso violin concerti.

At 14 Bruch wrote a symphony and won a scholarship enabling him to study at Cologne. His first opera, *Scherz, List und Rache* (*Jest, Deceit, and Revenge,* text adapted from Goethe), was performed in 1858. He conducted orchestral and choral societies at Koblenz (1865), Sondershausen (1867), Berlin (1878), Liverpool (1880–83), and Breslau (1883–90). From 1891 he conducted a master class at the Berlin Academy of Arts.

Max Bruch, detail of an engraving after a photograph

J.P. Ziolo

Bruch was an unusually ambitious and productive composer. His greatest successes in his own lifetime were his massive works for choir and orchestra—such as *Schön Ellen* (1867; *Beautiful Ellen*) and *Odysseus* (1872). These were favourites with German choral societies during the late 19th century. These works failed to remain in the concert repertoire, possibly because, despite his sound workmanship and effective choral writing, he lacked the depth of conception and originality needed to sustain large works. Bruch's few works that survived him are virtuoso pieces for the violin or cello, notably the three violin concerti, the two Scottish fantasies for violin and orchestra, and the *Kol Nidre* for cello and orchestra. His brilliant first violin concerto in G minor won a permanent place in the violin repertoire.

Bruchsal, city, Baden-Württemberg *Land* (state), southwestern West Germany, on the Saalbach (Saal Stream), just northeast of Karlsruhe. First mentioned in 796 as the site of a Frankish royal villa, it was given to the prince-bishops of Speyer in 1056 and became their residence in 1720. Chartered in 1248, it passed to Baden in 1803. The magnificent Rococo castle (1722–32), one of the most distinguished in Germany, was largely destroyed in World War II. The church of St. Peter (1742–49; by Balthasar Neumann) and the scenic castle park remain. An important communications and industrial centre, Bruchsal has metal and tobacco industries and also manufactures chemicals, paper, and textiles. Pop. (1983 est.) 37,215.

Brucioli, Antonio (b. 1495, Florence—d. 1566, Venice), Italian Humanist whose controversial translation of the Bible led to his being tried three times by the Inquisition on charges of Lutheranism.

After involvement in a plot against Cardinal Giulio de' Medici (later Pope Clement VII) in 1522, Brucioli fled to Lyon. In 1527, after the fall of the Medici, he returned to Florence and wrote against ecclesiastical abuses. Accused of Lutheranism and exiled, he went to Venice, where he translated the Bible into Italian (1532); he followed the Latin versions of the Dutch Renaissance Humanist Erasmus for the New Testament and of the Italian Dominican Hebrew scholar Santes Pagninus for the Old Testament. Brucioli's translation was destined, with some alterations, to become the Bible for Italian Protestants.

The expression of Protestant doctrines in the dedication and in the commentaries (7 vol., 1542–46) led to his call before the Inquisition. After the first prosecution in 1548 he was fined and banished to Ferrara. The second in 1555 ordered him to abjure, subjected him to penitence, and required him to compose a retraction. When he failed to retract, the third prosecution (1558–59) sentenced him to imprisonment.

In addition to his translation of the Bible, Brucioli wrote philosophical dialogues and a translation of the celebrated *Natural History* of Pliny the Elder.

brucite, mineral composed of magnesium hydroxide, $Mg(OH)_2$. It generally forms soft, waxy to glassy, white or pale-green, gray, or blue crystals, plate aggregates, or fibrous masses associated with other magnesium minerals (*e.g.,* magnesite and dolomite); and it commonly is present in serpentine and sometimes in phyllites, crystalline schists, and metamorphosed magnesian limestone. Notable deposits exist at Filipstad, Nordmark, and Jakobsberg, Swed.; the Urals, U.S.S.R.; Teulada, Italy; and Pennsylvania in the United States. For detailed physical properties, *see* oxide mineral (table).

Bruck, also called BRUCK AN DER MUR, town, *Bundesland* Steiermark (federal province of Styria), southeast central Austria, at the junction of the Mur and Mürz rivers north of Graz. First mentioned in 860 as a possession of the archbishops of Salzburg, it was chartered in 1263. The earliest bridge (*Brücke*) on the site, probably from Roman times, gave the town its name. Notable landmarks are the magnificent Gothic Kornmesserhaus ("corn measurer's house"; 1494–1505), fronted by a wrought-iron fountain; the ruins of Landskron castle overlooking the town; and the Gothic parish church. Bruck is a rail junction with important metallurgical (iron, steel, copper), cable, paper, and wood industries. Pop. (1981) 15,086.

Brücke, Die, English THE BRIDGE, organization of Expressionist artists, founded in 1905 in Germany by four architectural students of the Dresden Technical School—Karl Schmidt-Rottluff, who gave the group its name, Fritz Bleyl, Erich Heckel, and Ernst Ludwig Kirchner. In a letter written in 1906 asking Emil Nolde to join, Schmidt-Rottluff explained that "one of the aims of Die Brücke is, as its name implies, to conduct toward it all the revolutionary and fermenting elements." Other members of Die Brücke were Max Pechstein, Otto Müller, the Swiss artist Cuno Amiet, the Finnish Symbolist Akseli Gallén-Kallela, and the Dutch Fauve painter Kees van Dongen.

Paintings and print work by Die Brücke artists encompassed all varieties of subject matter—the human figure, landscape, portraiture, still life—executed in a simplified style that stressed bold outlines and strong colour planes, influenced by Primitivism. Kirchner and Heckel were influenced by African and Pacific island art that they saw in the Dresden ethnological museum; this Primitivism became an important element in Die Brücke style. Manifestations of angst, or anxiety, appear in varying degrees in the works of Die Brücke painters and generally distinguish their art from that of the French Fauvists, who also were indebted to primitive art but who treated form and colour in a more lyrical manner. Die Brücke art was also deeply influenced by the expressive simplifications of late German Gothic woodcuts and by the prints of the Norwegian artist Edvard Munch.

"Dodo and Her Brother," oil painting by Die Brücke artist Ernst Ludwig Kirchner, *c.* 1908; in the Smith College Museum of Art, Northampton, Mass.

By courtesy of the Smith College Museum of Art, Northampton, Mass.

The first Die Brücke exhibition, held in 1906 in the Seifert lamp factory in Dresden, marked the beginning of German Expressionism. From this date until 1913, regular exhibitions were held. (By 1911, however, Die Brücke's activities had shifted to Berlin, where several of the members were living.) The group also enlisted "honorary members" to whom they issued annual reports and gift portfolios of original prints, highly valued collector's items today.

Rifts, which had always taken place among members, increased in the years after 1911; in 1913, provoked by Kirchner's highly subjective accounts of their activities in the *Chronik der Kunstlergemeinschaft Brücke,* the group disbanded.

In addition to painting deeply moving canvases of the struggles and sufferings of humanity, Die Brücke artists contributed enormously to the revival of the woodcut, making it a powerful means of expression in the 20th century.

Brücke, Ernst Wilhelm von (b. June 6, 1819, Berlin—d. Jan. 7, 1892, Vienna), German physiologist who helped to introduce physical and chemical methods into medical research. He was an advocate of animal experimentation. His research included studies on the structure of skeletal muscle, on vision, and on the mechanism of speech. Interested in art, he wrote on the relationship of the physiology of vision to painting.

Brücke, *c.* 1865

Archiv fur Kunst und Geschichte, West Berlin

Brücke was a member of a school of physiologists (including Emil Du Bois-Reymond, Carl Ludwig, and Hermann von Helmholtz) who, about 1847, undertook to develop a new biology rigorously based on physics and chemistry. Although these men did not achieve their goal, they did much to influence the study and practice of medicine. It was largely through Brücke that Freud, who worked in Brücke's physiological laboratory, acquired the mechanistic bias that is seen in his early "Project for a Scientific Psychology."

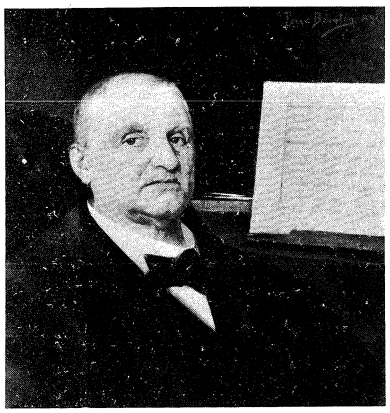
Brücke studied medicine in Berlin and was trained as a physiologist by Johannes Müller. From 1849 to 1891 he was a professor of physiology at the University of Vienna.

Bruckner, (Josef) Anton (b. Sept. 4, 1824, Ansfelden, Austria—d. Oct. 11, 1896, Vienna), Austrian composer best known for his nine symphonies, his three great masses, a requiem, and a *Te Deum.*

Creative influences. Bruckner was born in a small village near Linz in Upper Austria. His musical talent was soon recognized, and in the spring of 1835 he was sent to Hörsching to learn the organ from his godfather. His father's illness brought this interlude to a sudden end, and Bruckner returned to Ansfelden to assist his father in his duties as village schoolmaster and organist. After his father's death in June 1837, Bruckner was accepted as a choirboy by the prior of Sankt Florian abbey near Linz. Here he spent the next three years, receiving a broad general education, with particular emphasis on musical instruction. Following in his father's footsteps, he undertook a teachers' training course in 1840–41, after which he received appointments as an assistant teacher

in Windhaag, 1841–43, Kronstorf, 1843–45, and, finally, once again at Sankt Florian.

Bruckner's second stay at Sankt Florian, from 1845 to 1855, was a critical period in his artistic life. The turning point in the gradual transition from the life of a teacher to that of a musician and composer was probably his appointment—provisionally in 1848, officially in 1851—as organist of Sankt Florian abbey. Nevertheless, during the early 1850s, Bruckner attended a teachers' training course at Linz and went a stage further in 1855 by successfully completing the necessary examination for a high school teacher's certificate. The advice and encouragement of several people, however, convinced Bruckner that his future lay in music. Finally, in 1856, he secured the position of cathedral organist in Linz.



Anton Bruckner, detail of a portrait by Ferry Bératon, 1889; in the Österreichische Nationalbibliothek, Vienna

By courtesy of the Osterreichische Nationalbibliothek, Vienna

A few months earlier, Bruckner had been accepted as a pupil by Simon Sechter, a musician known for his contrapuntal works, and with him, between 1855 and 1861, he pursued an intensive course of counterpoint, undertaken partly by correspondence and partly during his visits to Vienna during holidays. The course culminated in a final examination, the main part of which was a practical examination. An initially skeptical panel of judges, consisting of some of Vienna's most prominent musicians, was left with no doubts of Bruckner's capabilities as both a performer and an improviser.

Bruckner's 12 years in Linz were years of both happiness and disappointment. His happiness lay in his numerous friendships and in his association with the Frohsinn choir, which he conducted in 1860–61 and 1868. He was aware also of an increasing facility in composition, particularly after 1861, when as part of a course in musical form and orchestration he undertook a thorough study of Richard Wagner's opera *Tannhäuser.* This was Bruckner's first acquaintance with the music of the composer before whom in later years he would stand in awe. The Wagnerian example provided a perfect foil to Sechter's contrapuntal training and led to the composition of his first major works—the three great masses, the *Overture in G Minor, Symphony No. 0 in D Minor,* and *Symphony No. 1 in C Minor.* Bruckner's disappointments in the Linz years stemmed largely from his failure to find a suitable marriage partner. His many proposals of marriage were rejected without exception, and his strong religious convictions made it impossible for him to enter into any physical relation outside of marriage.

Opposition and final recognition. In 1867 Sechter died, and Bruckner, having recovered from a nervous breakdown, applied for the vacant position of organist at the *Hofkapelle* in Vienna. His application was rejected, but he was offered a professorship of harmony and counterpoint at the Vienna Conservatory and an unpaid provisional appointment as court organist. Ten more years were to elapse before Bruckner was made a full member of the *Hofkapelle,* and his attempts to secure a lectureship at the University of Vienna were to be unsuccessful until 1875. The latter delay was caused largely by the hostility of the powerful Viennese critic and dean of the university's music faculty, Eduard Hanslick, who was a champion of the German composer Johannes Brahms and antipathetic toward Wagner. For years, Bruckner was quite erroneously branded as a disciple of the latter.

The last 28 years of Bruckner's life were spent in Vienna, devoted to the composition of symphonies 2 to 9, the last of which remained unfinished, the *String Quintet in F Major,* the *Te Deum, Psalm CL, Helgoland,* and several smaller sacred and secular choral works. He rarely moved far from the capital, except for visits to France in 1869 and to England in 1871 to represent Austria as an organ virtuoso. In the 1880s and early 1890s he travelled to various German towns to hear performances of his symphonies and major sacred works. During these years he had to battle against the apathy of the public and the hostility of many critics besides Hanslick. His pupils and others sympathetic to his cause stood by him, however, and he gradually gained recognition. In 1891 the University of Vienna put the official seal on this recognition by conferring on him the honorary degree of doctor of philosophy.

To Bruckner, composition had the significance of a liturgical art, and he brought to it the same zeal that a God-fearing priest might bring to the enactment of the sacred rites. It is precisely this spiritual content that has caused his music to remain a closed book to many people, even when the passage of time has swept away many of the misconceptions about the composer. Bruckner's intense devoutness was an essential component of his personality, for he appears to have felt most acutely that he was an instrument of God. A measure of his greatness lies in the purely altruistic nature of his life and work, undefiled by materialistic values. (A.C.H.)

MAJOR WORKS. *Orchestral works.* Symphonies: *No. 0 in D Minor* (1864, rev. 1869); *No. 1 in C Minor* (first or "Linz" version, 1865–66; second or "Vienna" version, 1890–91); *No. 2 in C Minor* (1871–72, rev. 1875–76, and later); *No. 3 in D Minor* (*Wagner Symphony*), five versions (1873–90); *No. 4 in E flat Major* (*Romantic*), four versions (1874, 1877–78, 1878–80, 1887–88); *No. 5 in B flat Major* (1875–76, rev. 1876–78, and later); *No. 6 in A Major* (1879–81); *No. 7 in E Major* (1881–83, rev. 1885); *No. 8 in C Minor,* three versions (1884–85, 1886–87, 1888–90); *No. 9 in D Minor* (finale in sketch only; first three movements, 1887–94; finale 1894–96).

Chamber music. String Quintet in F Major (1878–79, rev. 1883–84, and later).

Vocal music. Large-scale sacred works: *Short Chorale Mass in C Major,* for contralto, two horns, and organ (*c.* 1842); *Chorale Mass in F Major,* for Maundy Thursday, for unaccompanied four-part chorus (1844); *Requiem in D Minor,* for chorus, orchestra, and organ (1848–49, rev. 1894); *Psalm CXIV,* for five-part chorus and three trombones (1852); *Missa Solemnis in B flat Minor,* for solo voices, chorus, and orchestra (1854); *Mass No. 1 in D Minor,* for soprano, chorus, and orchestra (1864, rev. 1876, and later); *Mass No. 2 in E Minor,* for eight-part chorus and wind instruments (1866, rev. 1876, and later); *Mass No. 3 in F Minor (Grosse Messe), for solo voices, chorus, orchestra, and organ (1867–68, rev. 1876–90); Te Deum,* for soprano solo, chorus, orchestra, and organ (1881, rev. 1883–84); *Psalm CL,* for soprano solo, chorus, orchestra, and organ (1892). Smaller sacred works: *Pange Lingua in C Major,* for four-part chorus (1835, rev. 1891); *Ave Maria,* for four-part chorus and organ (1856); offertory, *Afferentur,* for four-part chorus and trombones (1861); *Pange Lingua,* for chorus in the Phrygian mode (1868); antiphon, *Tota pulchra es,* for tenor, chorus, and organ (1878); *Ecce Sacerdos,* for chorus, three trombones, and organ (1885). Cantatas: Festive cantata, *Preiset den Herrn,* for solo voices, male chorus, brass and woodwind instruments, and timpani (1862); *Germanenzug* (1863), *Das deutsche Lied* (1892), and *Helgoland* (1893), all three for male-voice choir, with brass instruments.

BIBLIOGRAPHY. The main repository of Bruckner's autograph scores, personal papers, and memorabilia is the Music Section of the Austrian National Library in Vienna. Bruckner's letters have been published in two collections, *Gesammelte Briefe,* ed. by M. Auer and ed. by F. Graflinger (both works 1924). The standard biography is A. Gollerich and M. Auer, *Anton Bruckner: Ein Lebens und Schaffensbild,* 4 vol. (1922–37). Other important biographies include those by M. Auer, 6th ed. (1966); F. Blume in *Die Musik in Geschichte und Gegenwart,* vol. 2 (1952); R. Haas (1934); E. Kurth, 2 vol. (1925); L. Nowak (1947, 1964); A. Orel (1925); H.F. Redlich, 2nd ed. (1963); and H.H. Schonzeler (1970).

Brückner, Eduard (b. July 29, 1862, Jena, Saxony—d. May 20, 1927, Vienna), German geographer and climatologist, noted for his studies of the Alps and of Pleistocene glaciation and climatic fluctuations. He was particularly interested in the effect of the ice ages on the surface features of the Earth. The Brückner climatic period, postulated in 1887, was a 35-year period with fluctuations of damp–cold and warm–dry intervals.

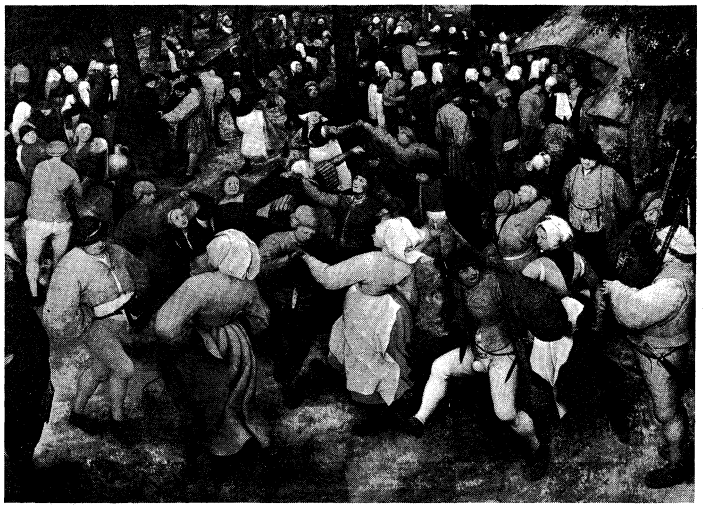
Brückner was a professor at the University of Bern from 1888 until 1904, when he moved to the University of Halle; in 1906 he became a professor at the University of Vienna.

Brudenell, James Thomas: *see* Cardigan, James Thomas Brudenell, 7th earl of.

Bruegel, Pieter, THE ELDER, Bruegel also spelled (until 1559) BRUEGHEL (b. *c.* 1525, probably Breda, Duchy of Brabant—d. Sept. 5/9, 1569, Brussels), the greatest Flemish painter of the 16th century, whose landscapes and vigorous, often witty scenes of peasant life are particularly renowned. Since Bruegel signed and dated many of his works, his artistic evolution can be traced from the early landscapes, in which he shows affinity with the Flemish 16th-century landscape tradition, to his last works, which are Italianate. He exerted a strong influence on painting in the Low Countries, and through his sons Jan and Pieter, known as "Velvet Brueghel" and "Hell Brueghel" respectively, he became the ancestor of a dynasty of painters that survived into the 18th century.

Life. There is but little information about his life. According to Carel van Mander's *Het Schilderboeck* (*Book of Painters*) published in Amsterdam in 1604 (35 years after Bruegel's death), Bruegel was apprenticed to Pieter Coecke van Aelst, a leading Antwerp artist who had located in Brussels. The head of a large workshop, Coecke was a sculptor, architect, and designer of tapestry and stained glass who had travelled in Italy and in Turkey. Although Bruegel's earliest surviving works show no stylistic dependence on Coecke's Italianate art, connections with Coecke's compositions can be detected in later years, particularly after 1563, when Bruegel married Coecke's daughter Mayken. In any case, the apprenticeship with Coecke represented an early contact with a humanistic milieu. Through Coecke Bruegel became linked indirectly to another tradition as well. Coecke's wife, Maria Verhulst Bessemers, was a painter known for her work in watercolour or tempera, a suspension of pigments in egg yolk or a glutinous substance, on linen. The technique was widely practiced in her hometown of Mechelen (Malines) and was later employed by Bruegel. It is also in the works of Mechelen's artists that allegorical and peasant thematic material first

appear. These subjects, unusual in Antwerp, were later treated by Bruegel. In 1551 or 1552, Bruegel set off on the customary northern artist's journey to Italy, probably by way of France. From several extant paintings, drawings, and etchings, it can be deduced that he travelled beyond Naples to Sicily, possibly as far as Palermo, and that in 1553 he lived in Rome for some time where he worked with a celebrated miniaturist, Giulio Clovio, an artist greatly influenced by Michelangelo and later a patron of the young El Greco. The inventory of Clovio's estate shows that he owned a number of paintings and drawings by Bruegel as well as a miniature done by the two artists in collaboration. It was in Rome, in 1553, that Bruegel produced his earliest signed and dated painting, "Landscape with Christ and the Apostles at the Sea of Tiberias." The holy figures in this painting were probably done by Maarten de Vos, a painter from Antwerp then working in Italy.



"The Wedding Dance," oil on panel by Pieter Bruegel, the Elder, 1566; in the Detroit Institute of Arts

By courtesy of the Detroit Institute of Arts

The earliest surviving works, including two drawings with Italian scenery that were sketched on the southward journey and dated 1552, are landscapes. A number of drawings of Alpine regions, produced between 1553 and 1556, indicate the great impact of the mountain experience on this man from the Low Countries. With the possible exception of a drawing of a mountain valley by Leonardo da Vinci, the landscapes produced as a result of this journey are almost without parallel in European art for their rendering of the overpowering grandeur of the high mountains. Very few of the drawings were done on the spot, and several were done after Bruegel's return, at an unknown date, to Antwerp. The vast majority are free compositions, combinations of motifs sketched on the journey through the Alps. Some were intended as designs for engravings commissioned by Hieronymus Cock, an engraver who was Antwerp's foremost publisher of prints.

Bruegel was to work for Cock until his last years, but, from 1556 on, he concentrated, surprisingly enough, on satirical, didactic, and moralizing subjects, often in the fantastic or grotesque manner of Bosch, imitations of whose works were very popular at the time. Other artists were content with a more or less close imitation of Bosch, but Bruegel's inventiveness lifted his designs above mere imitation and he soon found ways to express his ideas in a much different manner. His early fame rested on prints published by Cock after such designs. But the new subject matter and the interest in the human figure did not lead to the abandonment of landscape. Bruegel, in fact, extended his explorations in this field. Side by side with his mountain compositions, he began to draw the woods of the countryside, turned then to Flemish villages, and, in 1562, to townscapes with the towers and gates of Amsterdam (drawings in Musée des Beaux-Arts, Besançon, and Museum of Fine Arts, Boston).

The double interest in landscape and in subjects requiring the representation of human figures also informed, often jointly, the paintings Bruegel produced in increasing number after his return from Italy. All of his paintings, even those in which the landscape appears as the dominant feature, have some narrative content. Conversely, in those that are primarily narrative, the landscape setting often carries part of the meaning. Dated paintings have survived from each year of the period except for 1558 and 1561. Within this decade falls Bruegel's marriage to Mayken Coecke in the church of Notre-Dame de la Chapelle in Brussels in 1563 and his move to that city in which Mayken and her mother were living. His residence recently was restored and turned into a Bruegel museum. There is, however, some doubt as to the correctness of the identification.

In Brussels, Bruegel produced his greatest paintings, but only few designs for engravings, for the connection with Hieronymus Cock may have become less close after Bruegel left Antwerp. Another reason for the concentration on painting may have been his growing success in this field. Among his patrons was Cardinal Antione Perrenot de Granvelle, president of the council of state in the Netherlands, in whose palace in Brussels the sculptor Jacques Jonghelinck had a studio. He and Bruegel had travelled in Italy at the same time, and his brother, a rich Antwerp collector, Niclaes, was Bruegel's greatest patron, having by 1566 acquired 16 of his paintings. Another patron was Abraham Ortelius, who in a memorable obituary called Bruegel the most perfect artist of the century. Most of his paintings were done for collectors.

Bruegel died in 1569 and was buried in Notre-Dame de la Chapelle in Brussels. He was survived by his wife and two sons, Pieter (1564–1638) and Jan (1568–1625), who spelled their name Brueghel, with an "h," as their father did until 1559, when he changed it to Bruegel.

Artistic evolution and affinities. In addition to a great many drawings and engravings by Bruegel, 45 authenticated paintings from a much larger output now lost have been preserved. Of this number, about a third is concentrated in the Vienna Kunsthistorisches Museum, reflecting the keen interest of the Habsburg princes in the 16th and 17th centuries in Bruegel's art.

In his earliest surviving works, Bruegel appears as essentially a landscape artist, indebted to, but transcending, the Flemish 16th-century landscape tradition as well as to Titian and to other Venetian landscape painters. After his return from Italy, he turned to multifigure compositions, representations of crowds of people loosely disposed throughout the picture and usually seen from above. Here, too, antecedents can be found in the art of Hieronymus Bosch and of other painters closer in time to Bruegel.

In 1564 and 1565, under the spell of Italian art and especially of Raphael, he reduced the number of figures drastically, the few being larger and placed closely together in a very narrow space. In 1565, however, he turned again to landscape with the celebrated series known as "Labours of the Months." In the five of these that have survived, he subordinated the figures to the great lines of the landscape. Later on crowds appear again, disposed in densely concentrated groups.

Bruegel's last works often show a striking affinity with Italian art. The diagonal spatial arrangement of the figures in "Peasant Wedding" recalls Venetian compositions. Though transformed into peasants, the figures in such works as "Peasant and Bird Nester" (1568; Kuntshistorisches Museum, Vienna) have something of the grandeur of Michelangelo. In the very last works, two trends appear; on the one hand, a combined monumentalization and extreme simplification of figures and, on the other hand, an exploration of the expressive quality of the various moods conveyed by landscape. The former trend is evident in his "Hunters in the Snow" (1565; Kunthistorisches Museum), one of his winter paintings. The latter is seen in the radiant, sunny atmosphere of "The Magpie on the Gallows" and in the threatening and sombre character of "The Storm at Sea," an unfinished work, probably Bruegel's last painting.

He was no less interested in observing the works of man. Noting every detail with almost scientific exactness, he rendered ships with great accuracy in several paintings and in a series of engravings. A most faithful picture of contemporary building operations is shown in the two paintings of "The Tower of Babel" (one, 1563, Kunsthistorisches Museum; the other, not dated, Museum Boymans-van Beuningen, Rotterdam). The Rotterdam "Tower of Babel" illustrates yet another characteristic of Bruegel's art, an obsessive interest in rendering movement. It was a problem with which he constantly experimented. In the Rotterdam painting, movement is imparted to an inanimate object, the tower seeming to be shown in rotation. Even more strikingly, in "The Magpie on the Gallows," the gallows apparently take part in the peasants' dance shown next to them. The several paintings of peasant dances are obvious examples, and others, less obvious, are the processional representations in "The Way to Calvary" and in "The Conversion of St. Paul." The latter work also conveys the sensation of the movement of figures through the constantly changing terrain of mountainous regions. This sensation had appeared first in the early mountain drawings and, later, in different form, in "The Flight into Egypt" (1563; Count Seilern Collection, London). Toward the end of his life, Bruegel seems to have become fascinated by the problem of the falling figure. His studies reached their apogee in a rendering of successive stages of falling in "The Parable of the Blind." The perfect unity of form, content, and expression marks this painting as a high point in European art.

The subject matter of Bruegel's compositions

covers an impressively wide range. In addition to the landscapes, his repertoire consists of conventional biblical scenes and parables of Christ, mythological subjects as in "Landscape with the Fall of Icarus" (two versions, Musées Royaux des Beaux-Arts and D.M. van Buuren Collection, Brussels), the illustrations of proverbial sayings in "The Netherlands Proverbs" and several other paintings. His allegorical compositions are often of a religious character, as the two engraved series of "The Vices" (1556–57) and "The Virtues" (1559–60), but they included profane social satires as well. The scenes from peasant life are well known, but a number of subjects that are not easy to classify include "The Fight Between Carnival and Lent" and "Children's Games" (1559 and 1560, both Kunsthistorisches Museum) and "Dulle Griet", also known as "Mad Meg" (1562; Musée Mayer van den Bergh, Antwerp).

It has recently been shown how closely many of Bruegel's works mirror the moral and religious ideas of Dirck Coornhert, whose writings on ethics show a rationalistic, commonsense approach. He advocated a Christianity free from the outward ceremonies of the various denominations, Roman Catholic, Calvinist, and Lutheran, which he rejected as irrelevant. In an age of bitter conflicts arising out of religious intolerance, Coornhert pleaded for toleration. Bruegel, of course, castigated human weakness in a more general way, with avarice and greed as the main targets of his criticism that was ingeniously expressed in the engraving "The Battle Between the Money Bags and Strong Boxes." This would have been in keeping with Coornhert's views as well, which permitted taking part outwardly in the old forms of worship and accepting the patronage of Cardinal Granvelle.

MAJOR WORKS. "The Adoration of the Kings" (*c.* 1556; Musées Royaux des Beaux-Arts, Brussels); "The Fight Between Carnival and Lent" (1559; Kunsthistorisches Museum, Vienna); "The Netherlandish Proverbs" (1559; Staatliche Museen Preussischer Kulturbesitz, West Berlin); "The Triumph of Death" (*c.* 1562; Prado, Madrid); "The Suicide of Saul" (1562; Kunsthistorisches Museum); "View of Naples" (*c.* 1562–63; Galleria Doria-Pamphili, Rome); "The Tower of Babel" (1563; Kunsthistorisches Museum); "The Way to Calvary" (1564; Kunsthistorisches Museum); "The Adoration of the Kings" (1564; National Gallery, London); "Labours of the Months" (1565; three in Vienna, one in Prague, and one in New York); "The Massacre of the Innocents" (*c.* 1565–67; Hampton Court, Middlesex, Eng.); "The Wedding Dance" (1566; Detroit Institute of Arts); "The Sermon of St. John the Baptist" (1566; Budapest Museum of Fine Arts); "The Conversion of St. Paul" (1567; Kunsthistorisches Museum); "The Cripples" (1568; Louvre, Paris); "Peasant Wedding" (*c.* 1567; Kunsthistorisches Museum); "The Parable of the Blind" (1568; Museo e Gallerie Nazionali di Capodimonte, Naples); "The Magpie on the Gallows" (1568; Hessiches Landesmuseum, Darmstadt); "The Storm at Sea" (Kunsthistorisches Museum).

BIBLIOGRAPHY. *Bibliographies.* E. Michel, *Bruegel* (1931); *Musée National du Louvre: Catalogue raisonné des peintures flamandes du XV^e^ et du XVI^e^ siècle* (1953); F. Grossmann, "Pieter Bruegel, the Elder," *Encyclopedia of World Art,* vol. 2, col. 632–651 (1960); R.H. Marijnissen, *Bruegel le vieux* (1969; *Bruegel the Elder,* 1969).

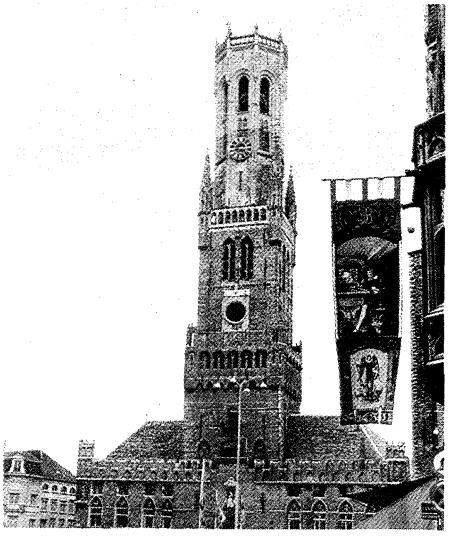
Biographical and critical studies. *G. Gluck, Das grosse Bruegel-Werk* (1951; *The Large Bruegel Book,* 1953), contains the most complete catalog of Bruegel's paintings; F. Grossmann, *Bruegel: The Paintings,* 2nd ed. rev. (1966), a detailed biography including a review of contemporary and later opinions and new interpretations; C.G. Stridbeck, *Bruegelstudien* (1956), an iconographic study concentrating on an examination of Coornhert's philosophy and its relevance for Bruegel; C. de Tolnay, *Pierre Bruegel l'Ancien* (1935), the first biography in which Bruegel's humanistic connections are discussed in detail; *Die Zeichnungen Pieter Bruegels,* 2nd ed. (1952; *The Drawings of Pieter Bruegel the Elder,* 1952), a fundamental, critical study of the drawings, with catalog; L. Munz, *Pieter Bruegel: The Drawings* (1961), a new assessment of Bruegel's drawing technique, catalog differing partly from Tolnay's; H.A. Klein (ed.), *Graphic Worlds of Peter Bruegel the Elder* (1963), the only survey in English of the engravings after Bruegel, useful though not based on original research; J. Grauls, *Volkstaal en volksleven in het werk van Pieter Bruegel* (1957), a detailed study of Netherlandish folklore illustrated by Bruegel; L. Lebeer, *Catalogue raisonné des estampes de Bruegel l'Ancien* (1969), the latest scholarly catalog of the engravings after Bruegel.

Brueghel, Jan, THE ELDER, byname VELVET BRUEGHEL (b. 1568, Brussels—d. Jan. 13, 1625, Antwerp), Flemish painter known for his still lifes of flowers and for his landscapes. He was a son of Pieter Bruegel the Elder and the brother of Pieter Brueghel the Younger. Jan Brueghel worked primarily in Antwerp and was a friend of Peter Paul Rubens, with whom he sometimes collaborated in painting flowers, landscape, and animals in canvases in which Rubens supplied the human figures; an example is the "Adam and Eve in Paradise" (Mauritshuis, The Hague).

Brueghel, Pieter, THE ELDER: *see* Bruegel, Pieter, the Elder.

Bruges (Belgium): *see* Brugge; Ghent and Bruges, history of.

Brugge (Flemish), French BRUGES, capital of West Flanders province, northwestern Belgium, 10 mi (16 km) south of Zeebrugge, its port on the North Sea. Originally a landing place on the Zwijn Estuary, into which the Reie River flowed, it was mentioned in the



Belfry atop the old Market Hall, Brugge, Belg.
By courtesy of Inbel

7th century as the Municipium Brugense (a name derived from a Roman bridge over the Reie). After it was evangelized by St. Eloi, bishop of Noyon-Tournai, the first counts of Flanders built their castle there (9th century) against Norman invaders. By the 13th century the town held a monopoly on English wool, was a leading emporium for the Hanseatic League, and, with the other "members from Flanders" (Ghent and Ypres), virtually governed the entire province. After maintaining its independence despite an attack by France in 1302, it reached its commercial zenith in the 14th century. As the Zwijn Estuary silted up in the 15th century, the city began to decline as a trade centre but remained brilliant and powerful as the court of the dukes of Burgundy (counts of Flanders from 1384) and as the artistic centre of the Flemish school of painting, until the religious and political struggles of the 16th century completed its ruin.

It remained a sleepy medieval town until the construction of the port of Zeebrugge and the cutting of a connecting canal (opened 1907) revived trade and stimulated industry and tourism. It was occupied by the Germans in World Wars I and II; the harbour of Zeebrugge was raided by the British in 1918, and blockships were sunk in the canal to deny the use of the port to German submarines. The construction of a terminal to handle liquefied natural gas from Algeria in the 1980s was expected to revivify the port of Zeebrugge.

As a rail and canal junction, Brugge depends largely on tourism, but a new industrial area in the north produces ships, electronic equipment, dies, yeast, and industrial glass. Spinning, weaving, and lace making are traditional.

Medieval remains include the old Market Hall (13th–15th century), with a famous 47-bell carillon in the belfry, and the Stadhuis (Town Hall; 1376–1420). The Chapel of the Holy Blood (14th–16th centuries) contains the Chapel of St. Basil (1150) and a gold casket reputed to hold a few drops of Christ's blood brought from the Holy Land in 1150. Other notable churches include the Cathedral of St. Salvator (12th–16th centuries); the Church of Notre Dame, containing the tombs of Mary of Burgundy and her father, Charles the Bold; and the Church of Jerusalem (1428), a replica of the Church of the Holy Sepulchre. Notable among many museums with collections of Flemish art and history are the Memling Museum in the 12th-century Hospital of St. John, the Groeninge Museum, and the 15th-century Gruuthuse mansion. The *béguinage* (retreat for secular nuns; 1245) is one of the finest in Belgium. The medieval atmosphere of Brugge lends itself to pageantry; a notable example is the Procession of Holy Blood (on Ascension Day). Pop. (1982) mun., 118,048.

Brugge–Zeebrugge Canal, waterway constructed between 1896 and 1907 to connect Brugge (Bruges) in Belgium with the North Sea, thus restoring to Brugge its ancient status as an ocean port. Measuring 7.5 mi (12 km) in length, the canal has a depth of 24 ft (7 m), minimum width of 65.7 ft (20 m), maximum width of 350 ft (110 m), and one lock.

Brüggen Stage: *see* Pretiglian Glacial Stage.

Brugière, Amable-Guillaume-Prosper, BARON DE BARANTE: *see* Barante, Amable-Guillaume-Prosper Brugière, baron de.

Brugmann, (Friedrich) Karl (b. March 16, 1849, Wiesbaden, Nassau—d. June 29, 1919, Leipzig), German linguist who gained a position of preeminence in comparative Indo-European linguistics during the late 19th and early 20th centuries as a result of his comprehensive and still authoritative research in this field.

As a young man Brugmann sided with the emerging *Junggrammatiker,* or Neogrammarians, who rejected a doctrinaire approach to language science, asserted the inviolability of phonetic laws, and adhered to strict research methodology. His own contribution to establishing the ascendancy of the Neogrammarian position was the publication of a highly original study of nasal sounds (1876). The first volume of *Morphologische Untersuchungen* (1878; "Morphological Investigations"), partly edited by Brugmann, contained his statement of the Neogrammarian views. In 1891 he founded, with Wilhelm Streitberg, the journal *Indogermanische Forschungen* ("Indo-European Researches").

During most of his professional life (1887–1919), Brugmann was professor of Sanskrit and comparative linguistics at the University of Leipzig. An enormously productive researcher, a keenly perceptive original investigator, and a vigorous defender of theoretical principles, he came to be the greatest synthe-

sist among the grammarians of his time. Of his 400 publications, the work on which his fame most securely rests is the two volumes on sounds and forms he prepared for the *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen,* 5 vol. (1886–93; *Outline of the Comparative Grammar of the Indo-Germanic Languages*). The three volumes on syntax were prepared by Berthold Delbrück. A second, greatly enlarged edition was issued between 1897 and 1916. Not only has the *Grundriss* remained probably the most authoritative grammar ever written, but it also stands as one of the great schemes of knowledge concerning the Indo-European languages. Brugmann's ability to control vast masses of exceedingly complex phenomena is evident in all of his work, but nowhere with such clarity as in the *Grundriss.*

Brugnon, Jacques, byname TOTO BRUGNON (b. June 11, 1895, Paris—d. March 20, 1978, Paris), French tennis champion, one of the world's greatest doubles players, who formed a part of the "Four Musketeers" (the others were Jean Borotra, Henri Cochet, and René Lacoste) that proved a major force in world tennis in the 1920s and early 1930s.

Brugnon won the French singles championship in 1921, but he was most famous for his supremacy in doubles. He won four Wimbledon doubles championships (1926, 1928, 1932, 1933), twice with Cachet and twice with Borotra. He won five French doubles championships (1927, 1928, 1930, 1932, 1934), twice with Cochet and three times with Borotra, and in 1928 won the Australian doubles with Borotra. He also won the French mixed doubles (1921–26), playing with the brilliant Suzanne Lenglen. For six years he was captain of the French Davis Cup team (on team, 1921–34); the "Four Musketeers" held the cup from 1927 to 1932.

Brugnon's playing style was distinguished by unorthodox strokes, amazingly quick reflexes, and a rapid, accurate volley. His shy manner fit in well with the ebullience of Borotra, and they formed a popular tennis team, playing together until 1939; Brugnon played for the last time at Wimbledon in 1948. In 1976 Brugnon, with the other "Musketeers," was inducted into the Tennis Hall of Fame.

Brühl, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, near the left bank of the Rhine. It was a stronghold of the electors of Cologne (immediately north) from 1285 onward, and its Baroque Augustusburg Castle (1725), with extensive gardens and a famous staircase by Balthasar Neumann, was their summer residence. After 1945 the castle was often used by the federal government for official functions. A resort for the people of Cologne, the city is also a lignite-mining centre; its other industries include sugar refining and the manufacture of coal briquettes and automobiles. Pop. (1985 est.) 41,252.

Brühl, Heinrich, Graf von (count of) (b. Aug. 13, 1700, Gangloffsömmern, Thuringia—d. Oct. 28, 1763, Dresden, Saxony), prime minister and virtual ruler of electoral Saxony, who unsuccessfully attempted to strengthen the state, the rulers of which were also kings of Poland, by making the Polish crown hereditary and by acquiring a land corridor linking Poland with Saxony.

Rising rapidly under Augustus II the Strong, king of Poland, Brühl held a number of high offices under the elector Frederick Augustus II (Augustus III of Poland). In 1746 he was appointed prime minister, a post until then unknown in Saxony. His wealth and extravagance caused many charges of corruption.

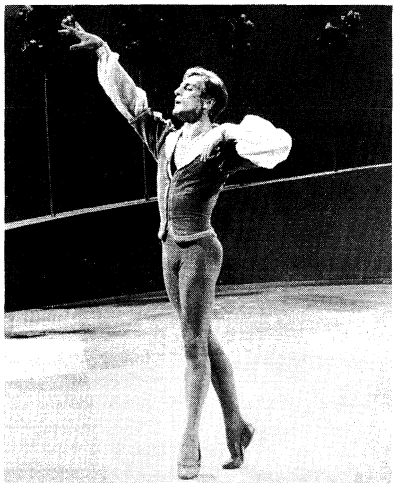
Brühl failed in both his dynastic and territorial ambitions. The first collapsed before the opposition of the Polish aristocracy, and the second involved Saxony in a series of wars that nearly exhausted the state. As his price for agreeing to the Pragmatic Sanction, which provided for the succession to the Austrian throne, he demanded part of Silesia in order to gain the desired land corridor. Failing to obtain this concession, Saxony sided with Prussia against Austria at the onset of the War of the Austrian Succession (1740–48).

Brühl, detail from an engraving by J.J. Baléchou, 1750, after a portrait by Louis Silvestre

Archiv fur Kunst und Geschichte, West Berlin

When Frederick II the Great triumphed and annexed Silesia himself (1742), Brühl realized that his policies could succeed only if Prussia were defeated. Consequently, he tried to reconcile Austria and France, two traditional enemies, initiating a process that resulted in the reversal of alliances (1756) and that set the stage for the Seven Years' War (1756–63), in which Saxony was unsuccessful in its struggle against Prussia. Brühl and his sovereign were forced to flee to Warsaw; both returned to Dresden in 1763.

Bruhn, Erik, original name BELTON EVERS (b. Oct. 3, 1928, Copenhagen—d. April 1, 1986, Toronto), ballet dancer noted for his outstanding classical technique, who appeared principally as a guest artist with North American and European ballet companies.



Bruhn as Romeo, 1967

Fred Fehl

Bruhn entered the training school for the Royal Danish Ballet in 1937, joined the company in 1947, and was promoted to soloist in 1949. To enrich his repertory, he took a leave of absence (1949–58) to dance in the United States with the Ballet Theatre; after relinquishing his permanent membership with the Royal Danish Ballet (1961), Bruhn again danced with the American Ballet Theatre (1955–58; 1960–61; 1968–69), for whom he restaged *La Sylphide* in 1976. He has also performed with such companies as the New York City Ballet, the Royal Ballet, the Australian Ballet, the Royal Swedish Ballet, and the Paris Opéra Ballet.

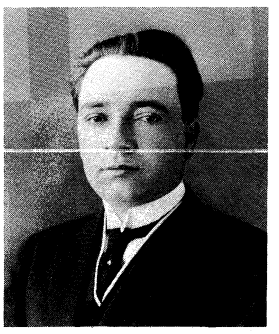
Frequently described as an ideal danseur noble, Bruhn was noted for his exceptionally graceful portrayals in such 19th-century Romantic ballets as *La Sylphide, Giselle,* and *Swan Lake.* He was also praised for his interpretations of Jean in *Miss Julie* and Don José in *Carmen* and for his performances on U.S. television. He choreographed *Concertette* (1953; music by Morton Gould) and *Festa* (1957); staged ballets for the Roman Opera Ballet and the National Ballet of Canada; and in 1967 was appointed director of ballet at the Royal Swedish Opera House, a position he held until 1972. Thereafter he was chiefly associated with Canada's National Ballet, first as an assistant director (1973–81) and then as director (1983 until his death). (Briefly, from 1981 to 1983, he was a choreographer with the American Ballet Theatre). Bruhn was honoured (1963) by the Danish government with the Royal Order of the Dannebrog.

Brûlé, Étienne (b. *c.* 1592, Champigny-sur-Marne, Fr.—d. June 1633, New France), French-born Canadian explorer who emigrated in 1608 and was the first recorded European in what is now the province of Ontario. He is believed to have lived for a year (1610–11) among the Algonkin Indians in order to learn their language. Subsequently, he pioneered the role of interpreter between the French and various tribes, including the Hurons. With the explorer Samuel de Champlain he discovered Lake Ontario (1615) and probably reached Lake Superior (1622). The details of his death remain uncertain, but according to several accounts, he was killed and eaten by the Hurons, his adoptive tribe, whose lore thereafter attributed a prolonged "curse" to his murder.

Brum, Baltasar (b. June 18, 1883, Salto, Uruguay—d. March 31, 1933, Montevideo), statesman noted for his reform of the educational and welfare systems in Uruguay and for his proposal of an American league of nations. His dedication to democracy was so firm that he committed suicide to protest the suspension of the Uruguayan constitution and assumption of dictatorial powers by Pres. Gabriel Terra.

Brum's first major posts were as minister of public education (1913–15) and minister of foreign affairs (1914–15). He served on the commission that revised the Uruguayan constitution (April–June 1917) and was the first president of the country under the new constitution (March 19, 1919–March 19, 1923). He became director of the prominent publication *El Día* (1923–29) and was president of the Council of National Administration (1929–31).

Among Brum's many publications are *La doctrina del arbitraje amplio* (1915; "The Doctrine of Absolute Arbitration"), *La paz de América* (1923; "The Peace of America"), and *Los derechos de la mujer* (1923; "The Rights of Women"). He was responsible for



Brum

By courtesy of the Organization of American States

instituting free and compulsory primary education, for founding public libraries, and for distributing free food to the unemployed and destitute, in addition to enhancing his country's prestige in the field of foreign relations.

Brumaire, Coup of 18–19 (Nov. 9–10, 1799), coup d'état that overthrew the system of government under the Directory in France and substituted the Consulate, making way for the despotism of Napoleon Bonaparte. The event is often viewed as the effective end of the French Revolution.

In the final days of the Directory, Abbé Sieyès and Talleyrand planned the coup with the aid of General Bonaparte, who had arrived in France from the ill-fated Egyptian campaign to be greeted, nevertheless, with triumphal cheers. In Paris on 18 Brumaire, year VIII (Nov. 9, 1799), the legislative Council of Ancients, under Sieyès, voted to have both the Ancients and the lower house, the Council of Five Hundred, meet the next day in the palace at Saint-Cloud, ostensibly in order to render the councils safe from a purported "Jacobin plot" in Paris but in reality in order to put the councils at a convenient site away from the city and under the intimidation of Bonaparte's troops.

The next day, 19 Brumaire, when the councils met at Saint-Cloud, Bonaparte blundered through a speech before the Ancients and later was met by a storm of abuse in the meeting-place of the Five Hundred, whose members, hearing rumours and seeing troops all about, began to perceive the real plot that was brewing. Bonaparte fled the hall, but Sieyès, Lucien Bonaparte, and Joachim Murat retrieved the situation, ultimately by sending in the grenadiers, dissolving the Five Hundred, and forcing the Ancients to decree the end of the Directory (and itself) and the creation of a new consular government headed by First Consul Bonaparte and aided by consuls Sieyès and Roger Duclos. By November 14 Bonaparte was established in the Luxembourg Palace.

Brumel, Valery (Nikolayevich) (b. May 14, 1942, Razvedki, Russian S.F.S.R.), Soviet high jumper who held the world record (1961–71).

Brumel was educated at the Central Institute of Physical Culture (Moscow), graduating in 1967; he was made an honoured master of sport of the U.S.S.R. in 1961 and became a member of the Communist Party in 1964. He set his first world record in 1961 with a jump of 2.23 m (7 ft 4 in.). In 1960, in his first world-class appearance in the Olympic Games at Rome, he won the silver medal, beating John Thomas of the U.S., the then world-record holder. Later jumps breaking his own record culminated in one of 2.28 m. He won the gold medal at the 1964 Olympic Games at Tokyo. In 1965 his right leg was broken in three places in a motorcycle accident. After 27 operations, he resumed training in 1969, and in 1973 he jumped 2.05 m during an indoor meet at Moscow.

Brummell, Beau, byname of GEORGE BRYAN BRUMMELL (b. June 7, 1778, London—d. March 30, 1840, Caen, Fr.), English dandy, famous for his friendship with George, Prince of Wales (regent from 1811 and afterward King George IV). Brummell was deemed the leader of fashion at the beginning of the 19th century.

Brummell's grandfather was a shopkeeper in the parish of St. James, London, who let lodgings to the aristocracy; his father was private secretary to Lord North from 1770 to 1782 and subsequently high sheriff of Berkshire. From his early years Brummell paid great attention to his dress. At Eton, where he was sent to school in 1790 and was extremely popular, he was known as "Buck Brummell," and at Oxford, where he spent a brief period as an undergraduate at Oriel College, he preserved this reputation for fashion and added to it that

Brummell, engraving by John Cooke after a portrait miniature, 1844

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

of a wit. He returned to London, where the Prince of Wales, to whom he had been presented at Eton, gave him a commission in his own regiment (1794). Brummell soon became intimate with his patron, and, in 1798, having then reached the rank of captain, he left the service.

In 1799 he succeeded to a fortune of about £30,000 (a bequest from his father, who had died in 1794). Setting up a bachelor establishment in Mayfair, he became, as a result of the Prince of Wales's friendship and his own good taste in dress, the recognized arbiter of fashion and a frequenter of all society's gatherings. For a time his influence was unchallenged, but eventually gambling and extravagance exhausted his fortune, while his tongue proved too sharp for his royal patron. They quarreled in 1812, and, although Brummell did not immediately lose his place in society, his debts increased so much that on May 16, 1816, he fled to Calais to avoid his creditors. There he struggled on for 14 years, always hopelessly in debt. From 1830 to 1832 he was British consul at Caen. In 1835 he was imprisoned for debt, but his friends once more came to the rescue and provided him with a small income. He soon lost all his interest in dress; his personal appearance was slovenly and dirty, and he began to live fantasies in the past. In 1837, after two attacks of paralysis, shelter was found for him in the charitable asylum of Bon Sauveur, Caen, where he spent his final years.

Brun, Charles Le (French painter): *see* Le Brun, Charles.

Brun, Johan Nordahl (b. March 21, 1745, Byneset, Nor.—d. July 26, 1816, Bergen), poet, dramatist, bishop, and politician who aroused national consciousness in Norway before it became independent of Denmark.

Brun was an indifferent student at the University of Copenhagen but became a pastor in Bergen (1774). He wrote the first Norwegian national anthem, "For Norge, kjæmpers fødeland" (1771; "For Norway, Land of Heroes"), forbidden until independence in 1814. The beginning and high point of his literary career was the drama *Zarine* (1772), which was followed in the same year by another patriotic tragedy, *Einer Tambeskielver.* His primary interest, however, lay in the church. His ambition was satisfied when he became bishop and leading citizen of Bergen in 1804. He became famous as a preacher and is remembered for his many hymns.

Brun, Rudolf (b. *c.* 1300—d. Sept. 17, 1360, Zürich), Swiss politician who became the first burgomaster, and virtual dictator, of Zürich, and whose struggles to maintain personal power ultimately brought the city into the Swiss Confederation (1351).

Although a member of the old Zürich nobility, Brun put himself at the head of a coalition of discontented knights and artisans that in 1336 overthrew the old oligarchical constitution. He drew up a new one, reorganized the governmental machinery of the city, and created the office of burgomaster, to which position he received title for life. Brun's attempts to eliminate all partisans of the old order, however, led to their continued opposition in exile under the patronage of the counts of Rapperswil, a branch of the House of Habsburg. Subsequent hostilities against Rapperswil (1337, 1350) eventually widened into war with Austria (September 1350); and, in seeking support against the Habsburgs, Zürich entered into permanent alliance with the Waldstätten, the forerunner of the Swiss Confederation (May 1, 1351). Brun's attitude toward this attachment, however, was marked by opportunism; and with the close of the Austrian war (1355), he attempted to reestablish the traditional good relations between the Habsburgs and Zürich at the expense of its new confederates. He died a pensioner of the Habsburgs.

Brunca (people): *see* Boruca.

Brundage, Avery (b. Sept. 28, 1887, Detroit—d. May 8, 1975, Garmisch-Partenkirchen, W.Ger.), American sports administrator who from 1952 to 1972 was the controversial and domineering president of the International Olympic Committee (IOC) and did more to set the tone of the modern Olympic Games than any other individual.

Brundage competed in the pentathlon and decathlon at the 1912 Olympics in Stockholm and was the amateur all-round champion of the United States in 1914, 1916, and 1918. In the meantime, he had founded his own construction company and eventually became a multimillionaire. His interest in amateur sports, however, never abated. He served seven years (1928–33, 1935) as president of the Amateur Athletic Union and was president of the U.S. Olympic Association and Committee from 1929 to 1953. In 1936 he was elected to the IOC, serving as vice president (1945–52) and president (1952–72).

Brundage was so convinced of the need to preserve amateur competition in all its purity that he threatened or punished athletes for even relatively minor infractions of his stringent rules. In addition, he created a furor more than once by dismissing highly significant political events as unrelated to Olympic competition. In this spirit he refused to boycott the 1936 Games in Nazi Germany, and he overrode heavy criticism during the 1972 Olympics in Munich when he insisted that the games continue after 11 Israeli athletes were murdered by Palestinian guerrillas.

Brune, Guillaume(-Marie-Anne) (b. March 13, 1763, Brive-la-Gaillarde, Fr.—d. Aug. 2, 1815, Avignon), the only one of Napoleon's marshals associated with the French Revolutionary Reign of Terror. A distinguished cavalry commander, he consolidated his reputation as defender of Holland against the Allies.

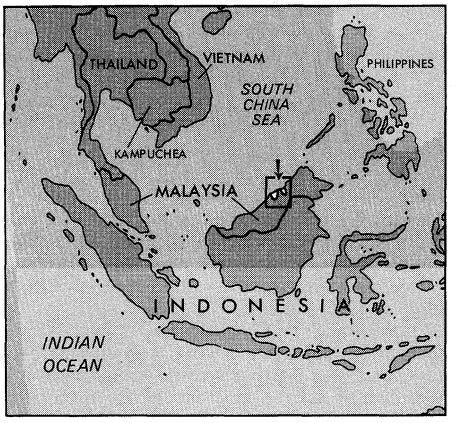
At first dedicated to a literary career, Brune became associated in Paris with the Revolutionary leader Georges Danton, for whom he wrote a pamphlet on military matters. He then became a *commissaire* for purges of the army of the north and later escorted terrorist officials to Bordeaux (where he is credited with trying to restrain the terrorism). The rumour that he was responsible for the murder in 1792 of the Princesse de Lamballe, an intimate companion of Queen Marie-Antoinette, led to his death at the hands of a royalist mob 23 years later.

Under the Directory, Brune served in Paris with Paul Barras and with Napoleon Bonaparte. After three months' service in Italy

(1797), he was made general of division. Barras used him to effect compliance to the French in the Helvetian, Cisalpine, and Batavian republics. Brune defeated the Anglo-Russian Army in Holland at Bergen and at Castricum (September–October 1799). Sent by Napoleon to end the Italian campaign, Brune fought a battle against the Austrians in December 1800. He was made a marshal in 1804. After serving as ambassador to Constantinople and returning to take charge of some coastal defenses, he cleared the Swedes from Stralsund in 1807 but was then abruptly removed from employment, for reasons never divulged. During the Hundred Days (1815), Napoleon sent Brune to defend Provence (which was strongly royalist). When hostilities ended, a mob in Avignon attacked and killed him.

Brunechildis, also spelled BRUNEHAUT (Frankish queen): *see* Brunhild.

Brunei, officially STATE OF BRUNEI, ABODE OF PEACE, Malay NEGARA BRUNEI DARUSSALAM, independent Islāmic sultanate occupying an enclave on the northwestern coast of the island of Borneo, covering an area of 2,226 sq mi (5,765 sq km). The capital is Bandar Seri Begawan (formerly the city of Brunei). Brunei extends about 71 mi (114 km) east to northwest and about 56 mi from north to southwest. It is bordered by the South China



Brunei

Sea on the north and otherwise surrounded by Sarawak (an eastern state of Malaysia), which also juts northward to divide Brunei into two separate portions, the larger on the west. The population in 1985 was 224,000.

A brief treatment of Brunei follows. For full treatment, *see* MACROPAEDIA: East Indies.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. The narrow coastal plain on the northwest stretches 56 mi along a coral sand beach. Brunei's western enclave consists of the valleys of the Belait, Tutong, and Brunei rivers, all of which flow generally northward to the sea. It is mainly hilly, rising more than 1,640 ft (500 m) above sea level. The eastern enclave contains the Temburong river basin, which rises in mountainous country and flows through forested areas to the sea.

The climate is tropical with uniform temperatures (between 76° and 86° F [24° and 30° C]) throughout the year and high humidity (fluctuating between 67 and 97 percent). Annual average rainfall exceeds 100 in. (2,500 mm) in the coastal areas and 150 in. in parts of the interior. Rainfall from November to March comes from the northeast monsoon, and from June to August from the southwest monsoon. More than three-quarters of the country is covered by dense tropical rain forest, characterized by a variety of hardwood species. Along the coast, hardwood casuarinas grow in the sandy soils. Less than 2 percent of the country's land area is arable. The country's animal life is varied and includes lion, tiger, and various monkeys, as well as a variety of birds, lizards, and snakes. In the mid-1980s, Brunei was the fifth largest petroleum producer in East Asia; total reserves were estimated at about 1,470,270,000 bbl (200,400,000 metric tons). Natural gas fields were estimated to contain about 5,134,000,000,000 cu ft (145,000,000,000 cu m).

The people. Brunei's population density is 101 persons per sq mi (39 persons per sq km), but its distribution is very uneven. Most of the people live near the oil fields at Seria and Kuala Belait. The interior is sparsely populated by indigenous peoples who clear areas of the forest for temporary cultivation. During the 1970s the population increased by more than 4 percent annually, but more than a quarter of the total increase (56,500 persons) represented immigration. In the early 1980s the birth rate was 27.9 per 1,000, the death rate 3.3 per 1,000, and the infant mortality 11.5 per 1,000 live births. Brunei's population has a marked excess of males, with a 1982 rate of 114.5 males per 100 females.

Brunei is a mixture of Southeast Asian ethnic groups. About two-thirds of the population is Malay, and one-fifth is Chinese. Other indigenous peoples and Indians are minorities. Almost two-thirds of the people are Muslims; 14 percent are Buddhists, 10 percent Christians, and in the remote interior there are a few animists. In the early 1980s some 80 percent of the population was urban, concentrated mainly in Bandar Seri Begawan, the capital, with about 54,000 persons in 1984; Seria; and Kuala Belait. Rural population occupies mainly the river valleys and coastal areas. The high rates of natural increase and immigration continued into the mid-1980s but were easily outpaced by the increase in oil revenues, allowing the standard of living to rise rapidly.

Economy. Brunei has a developing market economy based on the exploitation of petroleum and natural gas reserves. A relatively small population combined with extremely rapid economic growth during the 1970s has made it one of the world's richest countries in per capita income. The gross national product (GNP) reached U.S. $4,420,000,000 in 1983; GNP per capita was $21,140.

The agricultural sector accounts for approximately 1 percent of the GNP and employs less than 5 percent of the work force. Rubber production, once the main source of earnings, has been generally neglected since the discovery of petroleum and is now of minor importance. About four-fifths of Brunei's food requirements are imported, including its staple, rice. Pepper is cultivated at Labi in Belait district. Other crops—rice, sago, coconut palms, and local fruits—are grown on a small scale. Government plans for agricultural expansion include a cattle breeding project and the development of deep-sea fishing in offshore waters.

Industry (mining and manufacturing) in Brunei accounts for more than three-fourths of the GNP but less than one-tenth of the work force and is dominated by petroleum and natural gas production. Brunei Shell Petroleum, jointly owned by the Royal Dutch Shell Group and the Brunei government, is the only petroleum company in the country, producing approximately 100,000 bbl per day during the mid-1980s. Some of the oil is refined locally at Seria, but most is pumped to Sarawak. The natural gas liquefaction plant at Lumut, the largest in the world, produces about 5,500,000 tons (5,000,000 metric tons) of natural gas a year.

The construction industry was rapidly expanding in the early 1980s as the country prepared for independence from Britain. The government offers sizable tax exemptions on investments in an effort to attract new industry, but the small size of the indigenous work force is a major obstacle to development. Projects in industry and in the infrastructure rely on foreign workers, who comprise about one-third of the total work force. Services and finance account for close to 10 percent of the GNP and employ more than two-fifths of the work force.

There is no personal income tax in Brunei, and the bulk of government revenues are derived from a 30 percent tax on company profits. The largest share of expenditures, which are significantly lower than revenues, is allocated to defense, and most excess revenues are banked rather than invested in development.

Brunei has a substantial trade surplus, largely because of the value of its oil and natural gas exports. Major export markets are Japan, Singapore, Thailand, the United States, and North Korea. Imports, largely food, manufactured goods, machinery, and transport equipment, are chiefly supplied by Singapore, Japan, the United States, and the United Kingdom.

The road system is poorly developed, and rivers remain the main means of transportation in much of the interior. The Royal Brunei Airline, established in 1974, provides international service. A deepwater port opened at Maura in 1973.

Administrative and social conditions. Under its 1959 constitution (many provisions of which have been suspended since 1962), Brunei was a British-protected Islāmic sultanate with executive power vested in the *mentri besar* (chief minister), a Council of Ministers presided over by the sultan, and a Legislative Council elected every five years. Elections were suspended in 1965. Following independence in 1984, the Council of Ministers continued to advise the sultan, and the Legislative Council remained wholly appointive. The judiciary also is responsible to the sultan.

Brunei is a welfare state, and social facilities are well developed. The government provides an extensive pension program. Medical services are provided through several hospitals, outdoor clinics, and traveling dispensaries; a flying medical team serves all villages in the rural areas. Malaria has been practically eradicated. Primary education is universal and free. The language of instruction is Malay, English, or Chinese (Mandarin). Free hostel accommodation and free transport are provided for pupils in remote areas. There are facilities for overseas in-service training of local teachers. Radio and television are under government control, and there are several newspapers in the state.

Cultural life. Cultural activities are encouraged by the Language and Literature Bureau, which publishes quarterly magazines, books for children, and translations from other languages. One of its major publications is a dictionary covering Brunei's local dialects. The Brunei Museum has a library and an Art and Handicraft Centre.

History. Brunei was trading with China during the 6th century, and, through allegiance to the Javanese Majapahit kingdom (13th to 15th centuries), it came under Hindu influence. In the early 15th century, with the decline of the Majapahit kingdom and widespread conversion to Islām, Brunei became an independent sultanate.

When Magellan anchored his ships off Brunei in 1521, Bolkiah, the 5th sultan, controlled almost all of Borneo, its neighbouring islands, and the Sulu Archipelago. By the end of the 16th century, however, the power of Brunei was on the wane because of activities of the Portuguese and the Dutch in the region and because of conquests by the Sulus who later came to control much of the northern coast of Borneo previously possessed by Brunei. In the early 17th century the Dutch established settlements in southern Borneo, and by 1700

the Dutch influence in the East Indies was paramount, althugh soon to be diminished by the growing British presence.

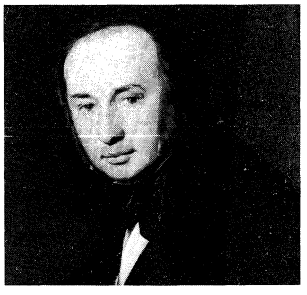
By the 19th century the sultanate of Brunei included only Sarawak, the present-day Brunei, and part of North Borneo (now Sabah). In 1841 a revolt took place against the Sultan of Brunei, which a British soldier, James Brooke, helped to put down. Brooke was then procalimed governor of Sarawak. In 1847 the Sultan of Brunei signed a treaty with Great Britain for the furtherance of commercial relations and the mutual suppression of piracy. In 1877 Brunei's portion of North Borneo was leased to a group of British merchants, with control passing to the British North Borneo Company a few years later. In 1888 Brunei was placed under British protection, and the Sultan agreed that foreign relations of the sultanate should be conducted by the British government. By 1906 the Sultan of Brunei had accepted a British resident, whose counsel was to guide the affairs of state.

Brunei was occupied by the Japanese in 1941 and liberated by the Australians in 1945. The Sultan negotiated a new treaty with the British in 1979, and Brunei achieved full sovereignty and independence on Jan. 1, 1984. It had, by this time, become one of the world's wealthiest nations per capita, owing to its rich resources of petroleum (discovered in 1929) and natural gas (found in 1965). With his wealth, the Sultan built the biggest palace in the world—a $400,000,000 home of 1,788 rooms spread over 50 acres (20 hectares) in the capital city of Bandar Seri Begawan.

Brunei (city, Brunei): *see* Bandar Seri Begawan.

Brunel, Isambard Kingdom (b. April 9, 1806, Portsmouth, Hampshire, Eng.—d. Sept. 15, 1859, Westminster, London), British civil and mechanical engineer of outstanding originality, the designer of the first transatlantic steamer.

The only son of Sir Marc Isambard Brunel, he was appointed resident engineer when work on the Thames Tunnel began, under his father's direction, in 1825. He held the post until 1828, when a sudden inundation seriously injured him and brought the tunnel work to a



Isambard Brunel, detail of an oil painting by J.C. Horsley, 1857; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

standstill that financial problems stretched to seven years. While recuperating, he prepared designs for a suspension bridge over the Avon Gorge, one of which was ultimately adopted in preference to a design by the noted Scottish engineer Thomas Telford.

As engineer at the Bristol Docks, Brunel carried out extensive improvements. He designed the Monkwearmouth Docks in 1831 and, later, similar works at Brentford, Briton Ferry, Milford Haven, and Plymouth. In 1833 he was appointed chief engineer to the Great Western Railway. His introduction of the broad-gauge railway (tracks seven feet apart) provoked the famous "battle of the gauges." The broad gauge made possible high speeds that were a great stimulus to railway progress. In 1844 he introduced a system of pneumatic propulsion on the South Devon Railway, but the experiment was a failure.

Brunel was responsible for building more than 1,000 miles (1,600 kilometres) of railway in the west country, the Midlands, South Wales, and Ireland. He constructed two railway lines in Italy and was an adviser on the construction of the Victorian lines in Australia and the Eastern Bengal Railway, India. His first notable railway works were the Box Tunnel and the Maidenhead Bridge, and his last were the Chepstow and Saltash (Royal Albert) bridges, all in England. The Maidenhead Bridge had the flattest brick arch in the world. His use of a compressed-air caisson to sink the pier foundations for the bridge helped gain acceptance of compressed-air techniques in underwater and underground construction.

Brunel also made outstanding contributions to marine engineering with his three ships, *Great Western* (1837), *Great Britain* (1843), and *Great Eastern* (1858), each the largest in the world at date of launching. The *Great Western,* a wooden paddle vessel, was the first steamship to provide regular transatlantic service. The *Great Britain,* an iron-hull steamship, was the first large vessel driven by a screw propeller. The *Great Eastern* was propelled by both paddles and screw and was the first ship to utilize a double iron hull. Unexcelled in size for 40 years, the *Great Eastern* was not a success as a passenger ship but achieved fame by laying the first successful transatlantic cable.

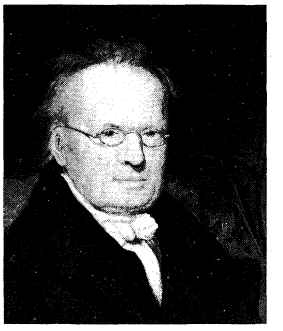
Brunel worked on the improvement of large guns and designed a floating armoured barge that was used for the attack on Kronshtadt during the Crimean War in 1854. He also designed a complete prefabricated hospital building that was shipped in parts to the Crimea in 1855.

Brunel, Sir Marc Isambard (b. April 25, 1769, Hacqueville, Fr.—d. Dec. 12, 1849, London), French-emigré engineer and inventor who solved the historic problem of underwater tunneling.

In 1793, after six years in the French Navy, Brunel returned to France, which was then in the midst of revolution. Within a few months, his royalist sympathies compelled him to leave. He fled to the United States, where he held the post of chief engineer of New York. He built many buildings, improved the defenses of the channel between Staten Island and Long Island, and constructed an arsenal and a cannon foundry. A design of his won the competition for the new capitol to be built in Washington, D.C., but another design was used because of economic considerations.

Brunel perfected a method for making ships' blocks (pulleys) by mechanical means, rather than by hand, and sailed to England in 1799 to lay his plans before the British government. His plans were accepted, and he was placed in charge of installing his machines at Portsmouth dockyard. When completed, the system of 43 machines—run by 10 men—produced blocks superior in quality and consistency to those previously handmade by more than 100 men. Production was also much higher. The Portsmouth installation was one of the earliest examples of completely mechanized production.

A prolific inventor, Brunel designed machines for sawing and bending timber, boot making, stocking knitting, and printing. In 1814 his sawmills at Battersea, London, were nearly destroyed by fire, a disaster that, combined with financial mismanagement by his partners, drove Brunel's enterprise into bankruptcy. After the government refused to accept the output of his army-boot factory when peace was suddenly restored in 1815, Brunel was imprisoned in 1821 for indebt-



Sir Marc Brunel, detail of an oil painting by Samuel Drummond; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

edness. After several months, his friends obtained from the government a grant of £5,000 for his release.

Brunel also practiced as a civil engineer. His designs included the Île de Bourbon suspension bridge and the first floating landing piers at Liverpool. In 1818 he patented the tunneling shield (*q.v.*), a device that made possible tunneling in safety through waterbearing strata.

In 1825 operations began for building the Brunel-designed tunnel under the Thames River between Rotherhithe and Wapping. This scheme, which had no precedent, was completed in 1842, after great physical and financial difficulties and a seven-year hiatus in construction brought about by lack of funds. Brunel had been knighted in 1841 for his engineering feat.

Brunel, Olivier (b. *c.* 1540, Louvain, Brabant—d. 1585, Pechora River, northeastern Russia), Flemish merchant and explorer who established trade between the Low Countries and Russia and explored the northern coast of Russia while searching for a route to China and the East Indies.

The first Flemish navigator of the Arctic Ocean, Brunel sailed beyond Lapland in 1565 in search of a northeast route to China. After establishing a trading post at the mouth of the Northern Dvina River (now Arkhangelsk, U.S.S.R.), he was imprisoned by the Russian government. He was released (1566?) through the intervention of the Stroganovs, a wealthy Russian merchant family, for whom he went to work. As their agent he established regular trade between Russia and the Netherlands (1570). By 1578 the Netherlands' commercial sphere of influence spread over the entire White Sea region, and a Dutch settlement was founded on the present site of Arkhangelsk.

Continuing his search for a northeastern passage, Brunel was the first western European to make an overland trip from Moscow to the Ob River in Siberia, in 1576. He set sail with one ship in 1581 on an Arctic expedition that ended when the ship was wrecked in Pechora Bay after unsuccessfully attempting to sail through the Yugorski Straits into the Kara Sea. In 1584 he made another attempt to find a northeast route but was drowned when his ship capsized in the Pechora River.

Brunelleschi, Filippo (b. 1377, Florence—d. April 15, 1446, Florence), architect and engineer who was one of the pioneers of early Renaissance architecture in Italy. His major work is the dome of the Florence cathedral (1420–36), constructed with the aid of machines Brunelleschi invented expressly for the project. Most of what is known about Brunelleschi's life and career is based on a biography written in the 1480s by an admiring younger contemporary identified as Antonio di Tuccio Manetti.

Early years. Brunelleschi was the second of three sons of Ser Brunellesco di Lippo Lapi, a Florentine notary of some distinction, and

Giuliana Spini. After training as a goldsmith and sculptor, he applied for registration in the Arte della Seta and in 1401 was designated a master. The style of Brunelleschi's sculpture in the four decades between becoming a master and executing the reliefs of the Pazzi Chapel in the 1440s underwent little change. He expressed himself primarily in the style of late Gothic art, creating attenuated figures wrapped in liquid draperies and placed in shallow layers of space. His most direct models have been traced to the late medieval workshops of French 14th-century goldsmiths.

While still in the early phase of his architectural career (probably *c.* 1410–15) Brunelleschi rediscovered the principles of linear-perspective construction known to the Greeks and Romans but buried along with many other aspects of ancient civilization during the Middle Ages. Brunelleschi demonstrated his findings with two painted panels, now lost, depicting Florentine streets and buildings. From Manetti's descriptions it is clear that Brunelleschi had understood the concept of a single vanishing point, toward which all parallel lines drawn on the same plane appear to converge, and the principle of the relationship between distance and the diminution of objects as they appear to recede in space. By using the optical and geometric principles upon which Brunelleschi's

Interior of S. Spirito, Florence, designed by Filippo Brunelleschi, begun 1436
Alinari—Art Resource/EB Inc.

perspective devices were based, the artists of his generation were able to produce works of astonishing realism. On two-dimensional surfaces they were able to create extraordinary illusions of three-dimensional space and tangible objects, so that the work of art appeared to be either an extension of the real world or a mirror of nature.

Solving complex problems of engineering and statics was another facet of Brunelleschi's wide-ranging abilities. While most of his mechanical inventions related to the construction of the dome of Florence cathedral, some of them reached as far afield as theatre production. One of Brunelleschi's most famous machines, probably invented around 1435–40, provided the setting for a liturgical drama celebrating the mystery of the Annunciation in the church of S. Felice in Florence. Suspended from the rafters of the church, the apparatus represented the dome of heaven. It contained complex movable sections and was operated by a hidden windlass.

Architectural career. The machines that Brunelleschi invented for the construction of the soaring dome of the Florence cathedral and its lantern (a structure set on top of the dome to help illuminate the interior) and his scheme for the construction itself represent his greatest feats of technological ingenuity. The cathedral was begun in 1296; during the 14th century the nave was completed and work commenced on the complex octagon of the east end. By 1418 construction reached the stage at which the technical problems of constructing a vault above the enormous dimensions of the octagon had to be solved. These problems had involved previous generations of cathedral architects in bitter disputes. It was Brunelleschi who worked out a successful method to vault the dome, invented the machinery necessary to carry it out, and designed the structure's crowning lantern and its lateral tribunes (semicircular structures). He was named chief architect (*capomaestro*) of the dome project in 1420.

In 1418 the cathedral officials announced a prize for models presenting technical devices for the construction of the dome, designed in the late Gothic period as an eight-sided vault of pointed curvature without exterior buttresses (structures built for additional support). Brunelleschi, along with many others (including his arch-rival Lorenzo Ghiberti) submitted a model. In 1420 a decision was reached in favour of Brunelleschi's model, which demonstrated that the dome could be constructed without the traditional armature, or skeletal framework, by placing the brickwork in herringbone patterns between a framework of stone beams. This construction technique had been evolved by the ancient Romans and had possibly been first observed by Brunelleschi on his supposed trip to Rome (*c.* 1401) with his friend the sculptor Donatello, when both of these giants of early Renaissance art are believed to have studied Classical sculpture and architecture. In 1420 Brunelleschi's dome was begun; in 1436 the completed structure was consecrated, and in the same year his design for its lantern was approved. (The lantern, however, was not completed until after his death.) The imagination and the engineering calculations that led to the successful erection of the dome established Brunelleschi's fame.

Mid-20th-century criticism has modified the earlier approach to Brunelleschi's buildings as the foundations of Renaissance architecture. They are now understood in the context of two worlds—that of the waning Gothic period and also of the incipient Renaissance. Brunelleschi, therefore, is seen as an artist still profoundly dependent on Gothic forms of architecture and construction but with a vision of art and science that was based on the Humanistic concept of the ideal. This is borne out by his first major architectural commission, the Ospedale degli Innocenti (Hospital of the Innocents, or Foundling Hospital). Although the portico of the hospital is composed of many novel features, morphologically it still is related to traditions of Italian Romanesque and late Gothic architecture. The truly revolutionary aspects of the building emanated from Brunelleschi's intuitive sense of the formal principles of the Classical art of antiquity. The Innocenti facade offered a new look in Florentine architecture and a marked contrast to the medieval buildings that preceded it.

By the early 1420s Brunelleschi was the most prominent architect in Florence. At this time the powerful and influential Medici family commissioned him to design the sacristy of S. Lorenzo (known as the Old Sacristy to distinguish it from Michelangelo's "new" 16th-century sacristy in the same church) and the basilica of S. Lorenzo itself. Work was begun in 1421. The sacristy was completed (without its decoration) by 1428. Construction on the basilica was halted at that time but began again in 1441 and lasted into the 1460s. Brunelleschi designed the Old Sacristy (originally intended as a Medici family mausoleum) as a cube vaulted with a hemispherical dome. The structural and decorative units that delineate the architectural surface of the walls of the Old Sacristy and of the basilica proper are of particular elegance and restraint characteristic of Brunelleschi's work at this time.

Around 1429 another wealthy and influential Florentine family, the Pazzi, commissioned Brunelleschi to design a chapel adjacent to the monastic church of Sta. Croce that was intended to be a chapter house (a place of assembly for monks to conduct business). Work probably did not begin before 1442; the building still was not complete in 1457. Modern archaeological investigation has revealed that the porch, famous for the beauty of its design and the elegance of its elaborate ornamentation, is not part of Brunelleschi's original project and that he intended to leave visible the outer curve of the barrel-vaulted sections of the roof, now covered by masonry. Brunelleschi used mathematical modules and geometric formulas for the plan and elevation of the Pazzi Chapel, as he had in S. Lorenzo, but he arranged the space in a more complex and sophisticated manner in the later building. A hemispherical dome covers a central square, which is extended on either side so that the square forms the centre of a rectangle. The minor spatial compartment, opening off a third side of the main square, is a corresponding square apse covered by a dome and containing the altar. The creamy wall surface of the Pazzi Chapel is marked off in geometric patterns by dark gray stone. The clarity, coolness, and elegance for which Brunelleschi's architecture is noted are seen in this work.

Another example of Brunelleschi's experiments with central planning is one of his most enigmatic buildings, Sta. Maria degli Angeli, built for the Camaldolese monastery in Florence. It was begun in 1434 but left incomplete in 1437 (remaining in an unfinished state until the 1930s, when it was completed in a controversial manner). The building was planned as a central octagon with a 16-sided exterior. A chapel opened on each of the eight sides of the interior octagon, terminating in a deeply recessed apse at the end. Eight niches were cut into alternate facets of the exterior walls. Sta. Maria degli Angeli was Brunelleschi's most revolutionary design. It represented a perfectly centralized structure, more formally consistent than the Old Sacristy.

Brunelleschi's church of S. Spirito in Florence was designed either in 1428 or 1434. A basilican church with a centrally planned eastern end, S. Spirito is ringed by semicircular chapels opening off the dome-vaulted side aisles, the transept, and the apse. These chapels accounted for a unique aspect of the design, for the exterior walls of the church were meant to conform to the shape of the chapels in a sequential series of curves. After Brunelleschi died, however, the protruding round chapels were walled over with the flat conventional exterior now visible. Rather than creating its walls as flat surfaces onto which are pressed thin rectilinear members (pilasters), a style perfected in S. Lorenzo and the Pazzi Chapel, Brunelleschi designed S. Spirito with a feeling for its weight, gravity, and plasticity. The building, therefore, can be associated stylistically with Sta. Maria degli Angeli, and also with the four semicircular tribunes above the sacristies of Florence cathedral. Brunelleschi's model for these tribunes was approved in 1439; the first one was completed in 1445, and the remaining three were finished in the 1460s. They are composed of deeply concave semicircular niches crowned with a shell device and separated by thick walls to which have been applied Corinthian half columns with projecting entablatures. In form and in mood, the tribunes were closer to monumental antique architecture than anything constructed in Florence up to that time, and they

foreshadowed the strong profiles and massive grandeur of the buildings of Leon Battista Alberti and Donato Bramante (1444–1514).

Brunelleschi's role as architect of residential buildings is difficult to assess, although Manetti relates that he was summoned from far and wide to design palaces. No documentary evidence exists for the houses and palaces with which biographers and scholars have credited him, the most significant of which (all in Florence) are the Pitti Palace, a rejected plan for the Palazzo Medici–Riccardi, and the Palazzo Bardi–Busini. Each of these palaces contains novel features that are tempting to attribute to Brunelleschi's inventiveness, but definitive proof of his influence or authorship has not been offered.

The manifold architectural abilities of Brunelleschi also are attested to by his military architecture, some of which is partially extant. He is associated with the building and rebuilding of fortifications in Pisa, Rencine, Vicopisano, Staggia, Castellina, Rimini, and Pesaro. In 1430 he was involved in a plan to convert the city of Lucca into an island by building a dam and deflecting the Arno River.

Brunelleschi was active through the early 1440s, and probably continued to be until shortly before his death. He died in Florence and was buried in Florence cathedral.

Private life and assessment. An image of the personality of Brunelleschi can be pieced together from fragments contained in surviving source materials and documents. Although he never married, he was devoted to his adopted son and heir, Andrea di Lazzaro Cavalcanti (known as Il Buggiano), a sculptor, whose career he promoted. Many pieces of church furniture (pulpits, tabernacles, altar tables, lavabos, etc.) attributed to Brunelleschi were in fact designed by Brunelleschi but executed by Il Buggiano. Brunelleschi was an irascible and argumentative man, and he was secretive, believing it imprudent to share his inventions and ideas. These characteristics were consistent with the highly competitive atmosphere of early 15th-century Florence. He not only sustained his bitter rivalry with Ghiberti throughout his lifetime but he also had acrimonious arguments with many other artists, including his friend Donatello. Brunelleschi also wrote sonnets, which seem to have been largely inspired by anger; for his known sonnets were created as public invectives against his enemies.

Above all, Brunelleschi was a practical man. Although he was respected and admired by the greatest Humanists of his generation, his approach to antiquity was not academic or doctrinaire. Using the classicizing elements of Tuscan medieval architecture as the medium through which he approached the venerated classical world, he imparted to his buildings a unique elegance and grace that were uncharacteristic of ancient Roman architecture. Convincing prototypes for his buildings can be discovered in the Byzantine-influenced structures of northeastern Italy, in Tuscan Romanesque and Italian late Gothic architecture, as well as in the ruins of ancient Rome.

(I.Hy./Ed.)

MAJOR WORKS. Ospedale degli Innocenti (Foundling Hospital), Florence (1419-26); Barbadori Chapel, Sta. Felicita, Florence (*c.* 1420); Palazzo di Parte Guelfa, Florence (facade and grand salon, *c.* 1420); dome of Florence cathedral (1420–36); Old Sacristy, S. Lorenzo, Florence (1421–28); basilica of S. Lorenzo, Florence (1421–29, 1441–60s); Sta. Maria degli Angeli, Florence (1434–37, unfinished); lantern of Florence cathedral (1435 ff.); S. Spirito, Florence (1436–80s); tribunes of Florence cathedral (1439 ff.); Pazzi Chapel, Sta. Croce, Florence (1442?–60s).

BIBLIOGRAPHY. Important studies of Brunelleschi and his work are Antonio Manetti, *The Life of Brunelleschi,* ed. by Howard Saalman, trans. by Catherine Enggass (1970; originally published in Italian, 1812); Frank D. Prager and Gustina Scaglia, *Brunelleschi: Studies of His Technology and Inventions* (1970); and Peter Murray, *Architecture of the Renaissance* (1971). Eugenio Battisti, *Filippo Brunelleschi: The Complete Work* (1982), is an illustrated study of his sculpture, architecture, theatrical designs, military engineering projects, and writings.

Bruner, Jerome S(eymour) (b. Oct. 1, 1915, New York City), U.S. psychologist and educator whose work on perception, learning, memory, and other aspects of cognition in young children has, along with the related work of Jean Piaget, influenced the U.S. educational system.

Bruner's father, a watch manufacturer, died when Bruner was 12 years old. Bruner studied at Duke University in Durham, N.C. (B.A., 1937), and then at Harvard, where he received a doctorate in psychology in 1941. After serving as an expert on psychological warfare for the U.S. Army in France during World War II, Bruner returned to Harvard in 1945, becoming professor of psychology there (1952). From 1960 to 1972 he also directed the university's Center for Cognitive Studies. He left Harvard in 1972 to become professor of experimental psychology at Oxford University.

Bruner's studies helped to introduce Piaget's concept of developmental stages of cognition into the classroom. His book *The Process of Education* (1960), translated into many languages, was an influential study of curriculum reform. In it he argued that any subject can be taught to any child at any stage of development, if it is presented in the proper manner. According to Bruner, all children have natural curiosity and a desire to become competent at various learning tasks; when a task as presented to them is too difficult, however, they become bored. A teacher must, therefore, present schoolwork at an appropriate level to challenge the child's current developmental stage. Bruner also conducted studies of perception in children, and he concluded that children's individual values significantly affect their perceptions.

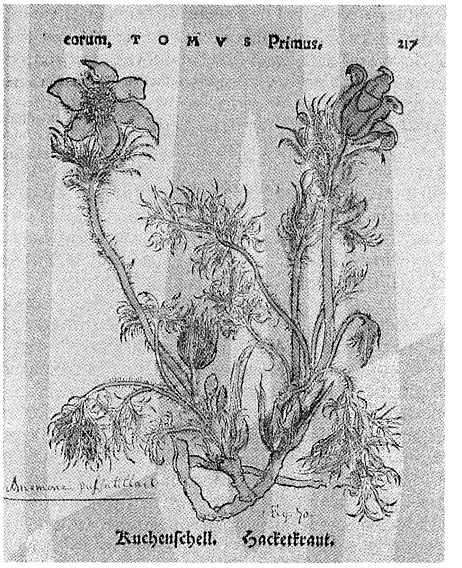
Bruner has published extensively. His major works include *Mandate from the People* (1944), *A Study of Thinking* (with Jacqueline J. Goodnow and George A. Austin, 1956), *On Knowing: Essays for the Left Hand* (1962), *Toward a Theory of Instruction* (1966), *Processes of Cognitive Growth: Infancy* (1968), *The Relevance of Education* (1971), and *Communication as Language* (1982).

Brunet, Jacques-Charles (b. Nov. 2, 1780, Paris—d. Nov. 14, 1867, Paris), compiler of major French bibliographical works.

The son of a bookseller, Brunet acquired a taste for bibliography at an early age and published a supplement to the *Dictionnaire bibliographique de livres rares* (1810; "Dictionary of Rare Books"), brought out a few years earlier. The first edition of Brunet's *Manuel du libraire et de l'amateur de livres* (1810; "Bookseller's and Book Lover's Manual") rapidly became the standard French bibliographical dictionary. Among Brunet's other works are *Nouvelles recherches bibliographiques* (1834; "New Bibliographical Studies") and a study of the early editions of Rabelais.

Brunfels, Otto (b. *c.* 1488, Mainz—d. Nov. 23, 1534, Bern), botanist who was considered by Linnaeus to be one of the founders of modern botany.

Brunfels entered the Carthusian monastery in Strassburg in 1514 as a priest of this austere religious order. He remained there until 1521, when, becoming acquainted with Humanists, he fled the monastery. He then served as a pastor in Steinau for three years and in 1524 opened a school in Strassburg. In 1532 he became town physician in Bern, where he remained until his death. Among his works are



Anemone pulsatilla (modern *Pulsatilla vulgaris*), coloured woodcut by Hans Weiditz in *Herbarium Othonis Brunfelsii tomis tribus,* 3rd edition in Latin of *Herbarum vivae eicones* by Otto Brunfels

By courtesy of the trustees of the British Museum (Natural History)

the two volumes of *Herbarum vivae eicones* (1530–40; "Living Pictures of Herbs"); the text is a collection of old and new commentaries on plants, with little lasting scientific value other than records of medieval properties. The drawings are detailed, accurate, and realistic; this work helped to move botany away from medieval herbalism, with its tradition of folklore, toward its emergence as a modern science. Later botanical illustrators influenced by Brunfels' work strove to achieve greater accuracy.

Brunhild, a beautiful amazon-like princess in ancient Germanic heroic literature, known from Old Norse sources (the *Edda* poems and the *Völsunga saga*) and from the *Nibelungenlied* (*q.v.*) in German. In the Eddic poems in which she appears, she plays the leading role; in the *Nibelungenlied,* because of a shift of emphasis, her prominence is greatly reduced.

Common to both, and no doubt original, is the conception of Brunhild as the central figure of a story in which she vows to marry only a man of the most outstanding qualities and one that can surpass her in strength. One man, Siegfried (*q.v.*), is able to fulfill her conditions, but he woos and wins her not for himself but for another. When Brunhild discovers this deception, she exacts vengeance, which results in the death of Siegfried.

In some of the Norse sources, Brunhild has supernatural qualities and is described as a Valkyrie; it is still a matter of dispute whether these attributes are an accretion or whether their absence from the German version is an omission. Many critics, who doubt their originality in the Norse, seek the source of the poetic figure in the history of the Merovingian kings of the Franks, in which Queen Brunhild plays an important part; the name is also found as an element in place and field names in the region of the Rhine and in northeastern France and Belgium, but this could have resulted from the popularity of the literary figure.

Brunhild, also spelled BRUNHILDA, BRUNHILDE, or BRUNICHILDIS, French BRUNEHAUT (b. *c.* 534—d. 613, Renève, Burgundy), queen of the Frankish kingdom of Austrasia, daughter of the Visigothic king Athanagild, and one of the most forceful figures of the Merovingian Age.

In 567 Brunhild married Sigebert I, king of Austrasia, changing her religion from Arianism to Catholicism. In the same year

her sister Galswintha married Sigebert's half brother Chilperic I, king of the western part of the Frankish territory, but in 567 or 568, at the instigation of his concubine Fredegund, Chilperic had Galswintha murdered. Prompted by Brunhild, Sigebert then exacted Galswintha's marriage settlement (Bordeaux, Limoges, Quercy, Béarn, and Bigorre) as retribution from Chilperic. When Chilperic tried to recover this territory, war broke out between him and Sigebert (573). At first it ran in Sigebert's favour, but in 575 he was assassinated and Brunhild was imprisoned at Rouen. There, however, Merovech, one of Chilperic's sons, went through a form of marriage with her (576). Chilperic soon had this union dissolved, but Brunhild was allowed to go to Metz in Austrasia, where her young son Childebert II had been proclaimed king. There she was to assert herself against the Austrasian magnates for the next 30 years.

After Childebert's death (595 or 596), Brunhild failed to set herself up as guardian over Childebert's elder son, Theodebert II of Austrasia, and thus stirred up against him his brother Theodoric II, who had succeeded to Burgundy. Theodebert was finally overthrown in 612, but Theodoric died soon afterward (613), whereupon Brunhild tried to make the latter's eldest son, the 12-year-old Sigebert II, king of Austrasia. The Austrasian magnates, reluctant to endure her tyrannous regency, appealed to Chlotar II of Neustria against her. Brunhild tried in vain to enlist the help of the tribes east of the Rhine, then fled to Burgundy, but was handed over to Chlotar at Renève (northeast of Dijon). She was tortured for three days, bound on to a camel and exposed to the mockery of the army, and finally dragged to death at a horse's tail (autumn 613).

Bruni, Leonardo, also called LEONARDO ARETINO (b. *c.* 1370, Arezzo, Florence—d. March 9, 1444, Florence), Humanist scholar of the Renaissance and chancellor of the republic of Florence (1427–44).

His *Historiarum Florentini populi libri XII* (1610; "Twelve Books of Histories of the Florentine People") is the first history of Florence based on a critical examination of the source material. An elegant Ciceronian stylist, he made Latin translations of many classical Greek works, including those of Plato, Aristotle, and Plutarch, that furthered the study of Greek literature in the West. His Italian biographies of Dante, Petrarch, and Boccaccio aided Humanism's growing appreciation for Italian poetry.

Bruniaceae, family of shrubby evergreen plants, in the order Saxifragales, comprising 12 genera native to southern Africa, many of them somewhat resembling heather in habit. Members of the family have clusters of thin branches and small leaves. *Brunia stokoei* develops hairy red and white flowers, and grows to 1 to 5 metres (3 to 16 feet) in height. Species of the genera *Brunia* and *Berzelia* are cultivated as ornamentals.

Brüning, Heinrich (b. Nov. 26, 1885, Münster, Ger.—d. March 30, 1970, Norwich, Vt., U.S.), conservative German statesman who was chancellor and foreign minister shortly before Adolf Hitler came to power (March 1930–May 1932). Unable to solve his country's economic problems, he hastened the drift toward rightist dictatorship by ignoring the Reichstag and governing by presidential decree.

After World War I, in which he served on active duty, Brüning, a Roman Catholic, managed the Christian trade unions and from 1924 was a member of the Catholic Centre Party's Reichstag (lower house) delegation. In the Reichstag he became known as a financial and an economic expert, and by 1929 he had become the leader of his party.

Unable to save the coalition government of the Social Democrat Hermann Müller, Brüning formed a new, more conservative ministry on March 28, 1930, without a Reichstag majority. His policies, dictated by a severe depression, involved increased taxation, reduced government expenditure, high tariffs on foreign agricultural products, cutback in salaries and unemployment insurance benefits, and payment of the reparations imposed on Germany by the Treaty of Versailles (1919).

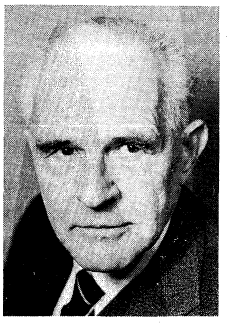
On July 16, 1930, after the Reichstag rejected a major part of his plans, Brüning began governing by presidential emergency decree, using constitutional article 48 as a basis, a move that violated ministerial responsibility for the first time since the founding of the Weimar Republic. He dissolved the Reichstag, which returned after new elections in September 1930 with Communist and, more important, Nazi representation greatly increased. To accommodate this shift to the right, the Chancellor enacted a more nationalistic foreign policy.

In October 1931, Brüning took over the foreign ministry while retaining the chancellorship. He secured Pres. Paul von Hindenburg's reelection in the spring of 1932 and at this time seems to have toyed with the idea of a constitutional monarchy after the President's death. Nothing came of such schemes. On May 30, 1932, the Chancellor resigned, a victim of intrigue by the men surrounding Hindenburg. The immediate cause of his dismissal was his project to partition several bankrupt East Elbian estates. The President, himself an eastern landowner, considered this plan Bolshevism, and the "hunger chancellor" was forced to resign. He never entered politics again.

Brünn (Czechoslovakia): *see* Brno.

Brunner, (Heinrich) Emil (b. Dec. 23, 1889, Winterthur, Switz.—d. April 6, 1966, Zürich), Swiss theologian in the Reformed tradition who helped direct the course of modern Protestant theology.

Ordained in the Swiss Reformed Church, Brunner served as a pastor at Obstalden, Switz. (1916–24). In 1924 he became professor of systematic and practical theology at the University of Zürich, where he taught continuously, except for extensive lecture tours in the U.S. and in Asia. Concerned with ecumenism from the 1930s, he was a delegate to the first assembly of the World Council of Churches (Amsterdam, 1948). In retirement he was professor of Christian philosophy at the International Christian University of Tōkyō (1953–55).



Brunner
By courtesy of Pro Helvetia

Among Brunner's earlier works are *The Mediator* (1927), a study of Christology; *The Theology of Crisis* (1929), a repudiation of post-World War I European culture; and *The Divine Imperative* (1932), on Christian ethics. With *Natur und Gnade: Zum Gespräch mit Karl Barth* ("Nature and Grace: A Conversation with Karl Barth"; published in 1946 as *Natural Theology*), Brunner broke with Barth's theology by asserting that man has borne the "image of God" since creation and has never wholly lost it, a view that provoked Barth's vigorous disagreement. A decisive shift occurred in Brunner's theology with *The Divine-Human Encounter* (1937) and *Man in Revolt* (1937), in which he reflected the position of Martin Buber in *I and Thou* (1923) that a fundamental difference exists between knowledge of impersonal objects and knowledge of other persons. Brunner saw this doctrine as a key to the biblical conception of revelation and further developed his views in several books, among them *Revelation and Reason* (1941), *Dogmatics* (3 vol., 1946–60), *Justice and the Social Order* (1945), and *Christianity and Civilization* (1948–49).

A leading exponent of Neo-orthodoxy, the U.S. term for the "Theology of Crisis" arising from the despair of post-World War I culture, Brunner sought to reaffirm the central themes of the Protestant Reformation against the liberal theologies. While seeking a continuing dialogue between theology and humanistic culture, Brunner considered idealism, scientism, evolutionism, and liberalism as indicative of man's pride and self-deification, the conditions that he regarded as at the root of all evil in the modern world.

BIBLIOGRAPHY. Cornelius van Til, *The New Modernism; An Appraisal of the Theology of Barth and Brunner* (1946); John W. Moran, *Catholic Faith and Modern Theologies: The Theology of Emil Brunner* (1948); Paul King Jewett, *Emil Brunner's Concept of Revelation* (1954).

Bruno, GRAF (count) VON EGISHEIM UND DAGSBURG: *see* Leo IX *under* Leo (Papacy).

Bruno OF CARINTHIA, German BRUN VON KÄRNTEN (pope): *see* Gregory V.

Bruno OF QUERFURT, SAINT, also called SAINT BONIFACE OF QUERFURT (b. *c.* 974, Querfurt, Saxony—d. March 14, 1009, near Braunsberg, Prussia; feast day June 19), missionary to the Prussians, bishop, and martyr.

A member of the family of the counts of Querfurt, Bruno was educated at the cathedral school at Magdeburg, Saxony, and, at the age of 20, he was attached to the clerical household of the Holy Roman emperor Otto III. In 997 he accompanied Otto to Rome, where he was influenced by St. Romuald toward severe asceticism. When news reached Rome of the martyrdom of St. Adalbert, bishop of Prague (997), Bruno entered the monastery of SS. Bonifazio ed Alessio, taking the name of Boniface; hence, he is also known as St. Boniface.

Otto founded a monastery for Bruno and Romuald at Pereum near Ravenna in 1001, from which Bruno carried on Adalbert's mission of Christianizing the pagan Prussians by first sending a small mission (the "Five Martyred Brothers"), including SS. Benedict and John, to Poland. The party was slaughtered en route. Subsequently, Bruno wrote their biographies, and, after being appointed archbishop by Pope Sylvester II, he set out for Germany to seek the aid of the devout German king (later Holy Roman Emperor) Henry II. Henry, however, opposed his enterprise. Bruno then went first to the court of King Stephen of Hungary, receiving weak encouragement, and then to the grand prince Vladimir at Kiev, Ukraine.

During his stay in Hungary (1004), Bruno wrote the best of the three extant biographies of Adalbert. He was so successful in converting the pagan Pechenegs, who inhabited the country between the Don and the Danube, that they made peace with Vladimir and were for a while nominal Christians. Determined to proceed with his Prussian mission, Bruno set out with 18 companions, but they were massacred by the heathens.

Bruno THE CARTHUSIAN, SAINT, also called SAINT BRUNO OF COLOGNE (b. *c.* 1030, Cologne—d. Oct. 6, 1101, La Torre monastery, Calabria; canonized 1514; feast day October 6), founder of the Carthusian order who was noted for his learning and for his sanctity.

Ordained at Cologne, in 1057 Bruno was called to Reims, Fr., by Archbishop Gervase to become head of the cathedral school and overseer of the schools of the diocese. Among his pupils was Eudes de Châtillon, later Pope Urban II. Bruno was made chancellor of the church of Reims in 1075. Having protested against the misdoings of the new archbishop Manasses de Gournai, he was deprived of all his offices and fled to safety (1076). On the deposition of the Archbishop (1080), Bruno was presented to the pope by the ecclesiastical authorities for the see, but he refused, for he had already determined to forsake the world. With six companions, he was led to a place called Chartreuse in the mountains near Grenoble, Fr., by St. Hugh of Châteauneuf, bishop of Grenoble. There the seven retired, building a monastery and founding the Carthusian order (1084). Bruno did not write a rule for the order, but the customs he established, modifying the Benedictine Rule, became the basis for the new foundations. After six years Pope Urban II called Bruno to Rome and offered him the archbishopric of Reggio, Italy, which he refused. He then retired to Calabria where he established his second colony of hermits at La Torre.

Bruno THE GREAT, SAINT (b. 925, Cologne —d. Oct. 11, 965, Reims, Champagne; feast day Oct. 11), archbishop of Cologne and coregent of the Holy Roman Empire.

The youngest son of King Henry I the Fowler of Germany and St. Matilda, and brother of Emperor Otto I the Great, Bruno was educated at the cathedral school of Utrecht and the court school of Otto. Proficient in Latin and Greek, he was a patron of learning. As chancellor from 940, he prepared his brother's official papers and after ordination to the priesthood accompanied him to Italy in 951. Already abbot of Lorsch and Corvey, where he restored monastic observance, he was elected to the see of Cologne in 953 and soon was named duke of Lorraine by Otto. As bishop, Bruno was a zealous and exemplary pastor, and his episcopate marked a new epoch in the city's growth; among the many institutions he founded was the monastery of St. Pantaleon at Cologne. In the troubled duchy of Lorraine, by his prudent and statesmanlike policies he restored peace and devised a new administrative division, maintaining at the same time cordial relations with France. During Otto's absence in Italy for his imperial coronation (962), Bruno shared the responsibilities of government and care of the Emperor's son, Otto II. Bruno died on a mission to France and was buried at St. Pantaleon.

Bruno, Giordano, original name FILIPPO BRUNO, byname IL NOLANO (b. 1548, Nola, near Naples—d. Feb. 17, 1600, Rome), Italian philosopher, astronomer, mathematician, and occultist whose theories anticipated modern science. The most notable of these were his theories of the infinite universe and the multiplicity of worlds, in which he rejected the traditional geocentric (or Earth-centred) astronomy and intuitively went beyond the Copernican heliocentric (Sun-centred) theory, which still maintained a finite universe with a sphere of fixed stars. Bruno is, perhaps, chiefly remembered for the tragic death he suffered at the stake because of the tenacity with which he maintained his unorthodox ideas at a time when both the Roman Catholic and the Reformed churches were reaffirming rigid Aristotelian and Scholastic principles in their struggle for the evangelization of Europe.

Early life. Bruno was the son of a professional soldier. He was named Filippo at his baptism and was later called "il Nolano," after the place of his birth. In 1562 Bruno went to Naples to study the humanities, logic, and dialectics (argumentation). He was impressed by the lectures of G.V. de Colle, who was known for his tendencies toward Averroism—*i.e.,* the thought of a number of Western Christian philosophers who drew their inspiration from the interpretation of Aristotle put forward by the Muslim philosopher Averroës—and by his own reading of works on memory devices and the arts of memory (mnemotechnical works). In 1565 he entered the Dominican convent of San Domenico Maggiore in Naples and assumed the name Giordano. Because of his unorthodox attitudes, he was soon suspected of heresy. Nevertheless, in 1572 he was ordained as a priest. During the same year he was sent back to the Neapolitan convent to continue his study of theology. In July 1575 Bruno completed the prescribed course, which generated in him an annoyance at theological subtleties. He had read two forbidden commentaries by Erasmus and freely discussed the Arian heresy, which denied the divinity of Christ; as a result, a trial for heresy was prepared against him by the provincial father of the order, and he fled to Rome in February 1576. There he found himself unjustly accused of a murder. A second excommunication process was started, and in April 1576 he fled again. He abandoned the Dominican Order, and, after wandering in northern Italy, he went in 1578 to Geneva, where he earned his living by proofreading. Bruno formally embraced Calvinism; after publishing a broadsheet against a Calvinist professor, however, he discovered that the Reformed Church was no less intolerant than the Catholic. He was arrested, excommunicated, rehabilitated after retraction, and finally allowed to leave the city. He moved to France, first to Toulouse—where he unsuccessfully sought to be absolved by the Catholic Church but was nevertheless appointed to a lectureship in philosophy—and then in 1581 to Paris.

In Paris Bruno at last found a congenial place to work and teach. Despite the strife between the Catholics and the Huguenots (French Protestants), the court of Henry III was then dominated by the tolerant faction of the Politiques (moderate Catholics, sympathizers of the Protestant king of Navarre, Henry of Bourbon, who became the heir apparent to the throne of France in 1584). Bruno's religious attitude was compatible with this group, and he received the protection of the French king, who appointed him one of his temporary *lecteurs royaux.* In 1582 Bruno published three mnemotechnical works, in which he explored new means to attain an intimate knowledge of reality. He also published a vernacular comedy, *Il candelaio* (1582; "The Candlemaker"), which, through a vivid representation of contemporary Neapolitan society, constituted a protest against the moral and social corruption of the time.

In the spring of 1583 Bruno moved to London with an introductory letter from Henry III for his ambassador Michel de Castelnau. He was soon attracted to Oxford, where, during the summer, he started a series of lectures in which he expounded the Copernican theory maintaining the reality of the movement of the Earth. Because of the hostile reception of the Oxonians, however, he went back to London as the guest of the French ambassador. He frequented the court of Elizabeth I and became associated with such influential figures as Sir Philip Sidney and Robert Dudley, the earl of Leicester.

Works. In February 1584 he was invited by Fulke Greville, a member of Sidney's circle, to discuss his theory of the movement of the Earth with some Oxonian doctors; but the discussion degenerated into a quarrel. A few days later he started writing his Italian dialogues, which constitute the first systematic exposition of his philosophy. There are six dialogues, three cosmological—on the theory of the universe—and three moral. In the *Cena de le Ceneri* (1584; "The Ash Wednesday Supper"), he not only reaffirmed the reality of the heliocentric theory but also suggested that the universe is infinite, constituted of innumerable worlds substantially similar to those of the solar system. In the same dialogue he anticipated his fellow Italian astronomer Galileo Galilei by maintaining that the Bible should be followed for its moral teaching but not for its astronomical implications. He also strongly criticized the manners of English society and the pedantry of the Oxonian doctors. In the *De la causa, principio e uno* (1584; *Concerning the Cause, Principle, and One*) he elaborated the physical theory on which his conception of the universe was based: "form" and "matter" are intimately united and constitute the "one." Thus, the traditional dualism of the Aristotelian physics was reduced by him to a monistic conception of the world, implying the basic unity of all substances and the coincidence of opposites in the infinite unity of Being. In the *De l'infinito universo e mondi* (1584; *On the Infinite Universe and Worlds*), he developed his cosmological theory by systematically criticizing Aristotelian physics; he also formulated his Averroistic view of the relation between philosophy and religion, according to which religion is considered as a means to instruct and govern ignorant people, philosophy as the discipline of the elect who are able to behave themselves and govern others. The *Spaccio de la bestia trionfante* (1584; *The Expulsion of the Triumphant Beast*), the first dialogue of his moral trilogy, is a satire on contemporary superstitions and vices, embodying a strong criticism of Christian ethics—particularly the Calvinistic principle of salvation by faith alone, to which Bruno opposes an exalted view of the dignity of all human activities. The *Cabala del cavallo Pegaseo* (1585; "Cabal of the Horse Pegasus"), similar to but more pessimistic than the previous work, includes a discussion of the relationship between the human soul and the universal soul, concluding with the negation of the absolute individuality of the former. In the *De gli eroici furori* (1585; *The Heroic Frenzies*), Bruno, making use of Neoplatonic imagery, treats the attainment of union with the infinite One by the human soul and exhorts man to the conquest of virtue and truth.

In October 1585 Bruno returned to Paris, where he found a changed political atmosphere. Henry III had abrogated the edict of pacification with the Protestants, and the King of Navarre had been excommunicated. Far from adopting a cautious line of behaviour, however, Bruno entered into a polemic with a protégé of the Catholic party, the mathematician Fabrizio Mordente, whom he ridiculed in four *Dialogi,* and in May 1586 he dared to attack Aristotle publicly in his *Centum et viginti articuli de natura et mundo adversus Peripateticos* ("120 Articles on Nature and the World Against the Peripatetics"). The Politiques disavowed him, and Bruno left Paris.

He went to Germany, where he wandered from one university city to another, lecturing and publishing a variety of minor works, including the *Articuli centum et sexaginta* (1588; "160 Articles") against contemporary mathematicians and philosophers, in which he expounded his conception of religion—a theory of the peaceful coexistence of all religions based upon mutual understanding and the freedom of reciprocal discussion. At Helmstedt, however, in January 1589 he was excommunicated by the local Lutheran Church. He remained in Helmstedt until the spring, completing works on natural and mathematical

magic (posthumously published) and working on three Latin poems—*De triplici minimo et mensura* ("On the Threefold Minimum and Measure"), *De monade, numero et figura* ("On the Monad, Number, and Figure"), and *De immenso, innumerabilibus et infigurabilibus* ("On the Immeasurable and Innumerable")—which reelaborate the theories expounded in the Italian dialogues and develop Bruno's concept of an atomic basis of matter and being. To publish these, he went in 1590 to Frankfurt am Main, where the senate rejected his application to stay. Nevertheless, he took up residence in the Carmelite convent, lecturing to Protestant doctors and acquiring a reputation of being a "universal man" who, the Prior thought, "did not possess a trace of religion" and who "was chiefly occupied in writing and in the vain and chimerical imagining of novelties."

Final years. In August 1591, at the invitation of the Venetian patrician Giovanni Mocenigo, Bruno made the fatal move of returning to Italy. At the time such a move did not seem to be too much of a risk: Venice was by far the most liberal of the Italian states; the European tension had been temporarily eased after the death of the intransigent pope Sixtus V in 1590; the Protestant Henry of Bourbon was now on the throne of France, and a religious pacification seemed to be imminent. Furthermore, Bruno was still looking for an academic platform from which to expound his theories, and he must have known that the chair of mathematics at the University of Padua was then vacant. Indeed, he went almost immediately to Padua and, during the late summer of 1591, started a private course of lectures for German students and composed the *Praelectiones geometricae* ("Lectures on Geometry") and *Ars deformationum* ("Art of Deformation"). At the beginning of the winter, when it appeared that he was not going to receive the chair (it was offered to Galileo in 1592), he returned to Venice, as the guest of Mocenigo, and took part in the discussions of progressive Venetian aristocrats who, like Bruno, favoured philosophical investigation irrespective of its theological implications. Bruno's liberty came to an end when Mocenigo—disappointed by his private lessons from Bruno on the art of memory and resentful of Bruno's intention to go back to Frankfurt to have a new work published—denounced him to the Venetian Inquisition in May 1592 for his heretical theories. Bruno was arrested and tried. He defended himself by admitting minor theological errors, emphasizing, however, the philosophical rather than the theological character of his basic tenets. The Venetian stage of the trial seemed to be proceeding in a way that was favourable to Bruno; then, however, the Roman Inquisition demanded his extradition, and on Jan. 27, 1593, Bruno entered the jail of the Roman palace of the Sant'Uffizio (Holy Office). During the seven-year Roman period of the trial, Bruno at first developed his previous defensive line, disclaiming any particular interest in theological matters and reaffirming the philosophical character of his speculation. This distinction did not satisfy the inquisitors, who demanded an unconditional retraction of his theories. Bruno then made a desperate attempt to demonstrate that his views were not incompatible with the Christian conception of God and creation. The inquisitors rejected his arguments and pressed him for a formal retraction. Bruno finally declared that he had nothing to retract and that he did not even know what he was expected to retract. At that point, Pope Clement VIII ordered that he be sentenced as an impenitent and pertinacious heretic. On Feb. 8, 1600, when the death sentence was formally read to him, he addressed his judges, saying: "Perhaps your fear in passing judgment on me is greater than mine in receiving it." Not long after, he was brought to the Campo di Fiori, his tongue in a gag, and burned alive.

Influence. Bruno's theories influenced 17th-century scientific and philosophical thought and, since the 18th century, have been absorbed by many modern philosophers. As a symbol of the freedom of thought, Bruno inspired the European liberal movements of the 19th century, particularly the Italian Risorgimento (the movement for national political unity). Because of the variety of his interests, modern scholars are divided as to the chief significance of his work. Bruno's cosmological vision certainly anticipates some fundamental aspects of the modern conception of the universe; his ethical ideas, in contrast with religious ascetical ethics, appeal to modern humanistic activism; and his ideal of religious and philosophical tolerance has influenced liberal thinkers. On the other hand, his emphasis on the magical and the occult has been the source of criticism as has his impetuous personality. Bruno stands, however, as one of the important figures in the history of Western thought, a precursor of modern civilization.

(G.A.)

BIBLIOGRAPHY. *Editions.* Modern editions of Bruno's works are (*Latin*): *Opera latine conscripta,* ed. by Francesco Fiorentino *et al.,* 3 vol. in 8 parts (1879–91, reprinted 1962), supplemented by *Due dialoghi sconosciuti e due dialoghi noti* (1957) and *"Praelectiones geometricae" e "Ars deformationum"* by Giovanni Aquilecchia (1964), which were unknown to the previous editors. (*Italian*): *Dialoghi Italiani,* by Giovanni Gentile, 3rd ed. by Giovanni Aquilecchia (1958), is the standard edition of the six dialogues. "Concerning the Cause, Principle and One," in Sidney Greenberg, *The Infinite in Giordano Bruno* (1950); *Cause, Principle and Unity,* by Jack Lindsay (1962); "On the Infinite Universe and Worlds," in Dorothea Waley Singer, *Giordano Bruno: His Life and Thought* (1950); *The Expulsion of the Triumphant Beast,* anon. (1713) and by A.D. Imerti (1964); *The Heroic Frenzies,* by P.E. Memmo, Jr. (1964).

Biography. Vincenzo Spampanato, *Vita di Giordano Bruno* (1921), with an appendix of documents reprinted with new documents in *Documenti della vita di Giordano Bruno,* ed. by Vincenzo Spampanato and Giovanni Gentile (1933); Giovanni Aquilecchia, *Giordano Bruno* (1971), a synthetic but exhaustive biography, with a bibliographical appendix that substantially brings up to date that contained in Virgilio Salvestrini, *Bibliografia de Giordano Bruno, 1582–1950,* 2nd posthumous ed. by Luigi Firpo (1958).

Critical studies. Giovanni Gentile, *Il pensiero italiano del Rinascimento,* 4th ed. (1968), which considers Bruno as a precursor of the 19th- and 20th-century philosophical Idealism; Paul O. Kristeller, *Eight Philosophers of the Italian Renaissance* (1964); Frances A. Yates, *Giordano Bruno and the Hermetic Tradition* (1964), which reacts to the progressive interpretation of Bruno's thought by considering it as belonging to the occult tradition based on the texts of the pseudo-Hermes Trimegistus; and *The Art of Memory* (1966), which includes a study of Bruno's mnemotechnic works considered against their historical and philosophical background.

Brunonia, only genus in the family Brunoniaceae, containing one species (*B. australis*), commonly known as blue pincushion. It is a perennial herb, 30 centimetres (1 foot) tall, with heads of blue, five-lobed flowers, native to Australia and Tasmania.

Its spade-shaped leaves occur in basal rosettes. The fruits are one-seeded nuts.

Brunschvicg, Léon (b. Nov. 10, 1869, Paris—d. Feb. 2, 1944, Aix-les-Bains, Fr.), French Idealist philosopher who regarded mathematical judgment as the highest form of human thought.

After cofounding the *Revue de Métaphysique et de Morale* (1893) and the Société Française de Philosophie (1901), Brunschvicg became professor of general philosophy in 1909 at the Sorbonne, where he remained (except for the war years, 1914–18) until 1940. In 1919 he was elected to the Académie des Sciences Morales et Politiques and served as its president in 1932.

In his widely acclaimed doctoral thesis, *La Modalité du jugement* (1897; Sorbonne), Brunschvicg set down his fundamental assertion that knowledge creates the only world we know. He maintained that there can be no philosophy beyond judgment, for judgment is the first activity of the mind and synthesizes the form and content of concepts. Philosophy, therefore, must be a critical appraisal of thought itself, for knowledge can be subjected to reflection only by thought, which provides intelligibility. The spirit's own activity, not concepts, is the principal object of thought.

Brunschvicg's critical Idealism studied the activity of the mind as manifested in the history of mathematics, science, and philosophy, an approach differentiating his method from Kant's deductive one. By contributing to man's progressive self-understanding, science refines man's conscience and thus takes on a moral or spiritual aspect. History, he says, is *le progrès de la conscience,* meaning both conscience and consciousness. His influence was profound both in France and throughout Europe.

Brunswick (Germany): *see* Braunschweig.

Brunswick, city, seat (1777) of Glynn County, southeastern Georgia, U.S., on St. Simons Sound and the Atlantic Intracoastal Waterway. Mark Carr established a tobacco plantation in the 1740s on the site (known as Plug Point) across from Ft. Frederica (1736, now a national monument), on St. Simons Island, the southernmost British outpost in North America. Brunswick, founded in 1771 by Georgia's Royal Provincial Colonial Council, was named after the seat in Germany of England's reigning House of Hanover. Evacuated in 1862, it was reoccupied (1863) by the Confederates, who repulsed the only Federal attack. It is a commercial fishing port with a thriving seafood industry. Naval stores, pulp and wood products, and tourism based on the nearby Golden Isles also are important to its economy. Brunswick Junior College was opened in 1961. Glynn Academy (1778) in the city is the oldest school in the state. A Federal Law Enforcement Training Center is at Glynco, 6 mi (10 km) north. Inc. 1856. Pop. (1980) 17,605.

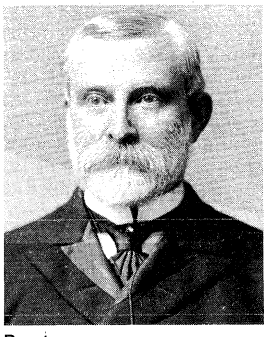
Brunswick, town, Cumberland County, southwestern Maine, U.S., at the falls of the Androscoggin River, 26 mi (42 km) northeast of Portland. First known as Pejepscot, the town originated in 1628 as a trading post, but Indian hostility retarded its early development. Growth began with its incorporation as a township in 1717, when it was named for the Duchy of Brunswick to which the King of England belonged. Control of municipal affairs by town meetings open to all registered voters continued until 1969, when a council–town manager government was adopted. The falls of the Androscoggin River furnished power for lumber and cotton milling and the manufacture of paper, textiles, and other products, but the closing of the last mill in 1955 ended the textile era. Manufactures now include shoes, children's clothes, artists' supplies, and paper. Bowdoin College was founded there in 1794; its graduates include authors Henry Wadsworth Longfellow, Nathaniel Hawthorne, and Pres. Franklin Pierce; the Peary-MacMillan Arctic Museum on its campus displays memorabilia of explorers Robert Peary and Donald MacMillan, also college alumni. The Brunswick Naval Air Station, established during World War II, was reactivated in 1951. The town is the site of the Stowe House (1804), where Harriet Beecher

Stowe wrote *Uncle Tom's Cabin.* Facilities for both summer and winter recreation are nearby. Inc. 1739. Pop. (1980) 17,366.

Brunswick black, quick-drying black varnish used for metal, particularly iron, stoves, fenders, and surfaces of indoor equipment. Because of its bitumen content, the coating is highly protective and the finish is attractive and reasonably durable.

Melted bitumen, or natural asphalt, is dissolved in a solvent of suitable boiling point (white spirit or turpentine). If common rosin (colophony) is included, the lustre of the black finish is increased, but, unless the amount is carefully controlled, the durability of the residual film will suffer, either cracking on aging or softening with heat. If boiled linseed oil is added with the bitumen, tougher films result. For exterior protection, more elaborate formulations may be needed.

Brunton, Sir Thomas Lauder, 1ST BARONET (b. March 14, 1844, Hiltonshill, Roxburgh, Scot.—d. Sept. 16, 1916, London), Scottish physician who played a major role in establishing pharmacology as a rigorous science. He is best known for his discovery that amyl nitrite relieves the pain of angina pectoris.



Brunton
BBC Hulton Picture Library

Brunton studied medicine at the University of Edinburgh and for three years abroad. He returned to London and was associated in turn with the Middlesex (1870) and St. Bartholomew's (1871–1904) hospitals. His most important work is *A Textbook of Pharmacology, Therapeutics, and Materia Medica* (1885), which was the first comprehensive treatise on pharmacology.

Bruny Island, island in the Tasman Sea, lying off the southeastern coast of Tasmania, Australia, from which it is separated by the D'Entrecasteaux Channel (west) and Storm Bay (northeast). With an area of 140 sq mi (362 sq km) the 35-mi- (55-km-) long island is divided into northern and southern sections joined by a narrow isthmus. Deeply indented by Adventure, Cloudy, and Great Taylor bays and generally wooded, the island has a rugged east coast and rises to mountains in the south, one of the highest being Mt. Bruny (1,659 ft [506 m]). The Friars Rocks lie just offshore to the south. Visited in 1642 by the Dutch navigator Abel Tasman and in 1792 named by the French explorer Adm. Bruni d'Entrecasteaux, who navigated the coastal waters. By 1804 the island was a whaling base. In the 20th century it has been slowly losing its population. Bruny is crossed by a road from Dennes Point south to Cape Bruny, linking the settlements of Simpsons and Adventure bays, Alonnah, and Lunawanna. Producing some fruits, mixed crops, flowers, and dairy foods, Bruny also receives tourists from Hobart (23 mi north) via a ferry from Kettering. Pop. (1954) 591; (1981) 366.

Brus FAMILY (of Scotland): *see* Bruce family.

Brusa (Turkey): *see* Bursa.

Brusewitz, Axel (Karl Adolf) (b. June 9, 1881, Vichtis, Fin.—d. Sept. 30, 1950, Uppsala, Sweden), leading Swedish political scientist who was known for authoritative studies of Swedish constitutional history and Swiss popular democracy.

Brusewitz resettled in Sweden from Finland with his parents, who were Swedish, and, having studied at Uppsala University, became lecturer in political science in 1913. He served as an assistant at the provincial archives at Uppsala in 1906–20 and as a college teacher in 1919–23. He became Skytteansk professor of rhetoric and political science at Uppsala in 1923 and served until 1947. He was a prominent member of the government-appointed committee on the popular vote and served as an aide to key parliamentary committees.

Brusewitz' doctoral dissertation, *Representationsfrågan vid 1809–10 års Riksdag* (1913; "Representation in 1809–10 [Swedish] Parliament Session") and his *Studier över 1809 års författningskris* (1917; "Studies on the Constitutional Crisis of 1809"), his most noted works, revolutionized the field of Swedish constitutional history. He demonstrated the influence of foreign political theory, notably that of the French philosopher Montesquieu, on the authors of the Swedish constitution and rejected the notion that the constitution was an expression of national unity but rather asserted that it was a compromise between strongly opposed factions.

Brusewitz also authored *Folkomröstningsinstitutet i den schweiziska demokratien* (1923; "The Institution of the Popular Vote and Swiss Democracy"), a study for the committee on the popular vote now regarded as the best work on the subject.

Brusewitz was also an authority on the relative roles of the Swedish government and parliament in the development of foreign policy, on British parliamentary history, and on Swedish crown law.

brush, device composed of natural or synthetic fibres set into a handle that is used for cleaning, grooming, polishing, writing, or painting. Brushes were used by man as early as the Paleolithic Period (began about 2,500,000 years ago) to apply pigment, as shown by the cave paintings of Altamira in Spain and the Périgord in France. In historical times the early Egyptians used brushes to create their elaborate tomb paintings, while the ancient Chinese employed the tip of a long-haired brush to make the many intricate characters of their writing, a practice continued in the Orient today.

The type of material used to make a brush and its design are dictated by the intended use. Hog bristles, for example, have long been used for paintbrushes and art brushes because such animal fibres are flexible and resilient and display an excellent capacity for holding paint. Each individual bristle has a broad, sturdy base and a tapered tip that splits into several fine filaments. The hair of other animals such as horses, oxen, squirrels, and badgers is used in certain kinds of household and toilet brushes, as are various types of plant fibres, the most important of which are piassava obtained from a Brazilian palm and palmyra bassine derived from the palmyra palm of Africa and Sri Lanka. Such plant fibres are converted into brush material by soaking, beating, and drying. Cotton fibres also can be used for brush bristles. They are treated with acetic acid followed by diffusion of the acetylated product in acetone. The resulting solution is spun and projected through the tiny orifices of a device known as a spinnerette and allowed to solidify. Artificial brush fibres are most commonly made of nylon and polyethylene, though vinyl and steel wire are also used for certain applications. Nylon fibres are either tapered and split like hog bristles for use in paintbrushes or left untapered for making cleaning brushes, hair brushes, and toothbrushes. Polyethylene fibres, which are rather short and stumplike, are suitable for massage brushes.

Brush bristles are joined to handles and backs of wood, plastic, or metal in several ways. Paintbrushes and art brushes are assembled in a metal cup that forms a mold for the desired brush shape. After the bristles are trimmed to size and bound together, they are transferred to a metal ferrule into which cement or a gum rubber solution is poured. When this adhesive has hardened, a handle is fastened to the ferrule. Many household and toilet brushes are produced by inserting tufts of fibres into holes drilled in brush backs.

Brush, Charles Francis (b. March 17, 1849, Euclid, Ohio, U.S.—d. June 15, 1929, Cleveland), U.S. inventor and industrialist who devised an electric arc lamp and a generator that produced a variable voltage controlled by the load and a constant current.

He installed his lamps in Wanamaker's Department Store, Philadelphia, in 1878. The following year he installed the first Brush streetlighting system in Cleveland, and in 1880 he installed a system in New York City. Brush's arc light was more satisfactory than the candle of Pavel Yablochkov of Russia because the Brush light burned twice as long as the Yablochkov candle.

Brush established the Brush Electric Company and was a founder and the first president of the Linde Air Products Company. In 1899 the American Academy of Arts and Sciences awarded him the Rumford Medal for his work in lighting.

brush drawing, in the visual arts, technique in which a brush, usually round and pointed (in contrast to the flat and even-edged ones used for oil painting), is used to make drawings in ink or watercolour, although some

"Woman Fixing Her Hair," brush and ink drawing by Katsushika Hokusai; in the Metropolitan Museum of Art, New York City
By courtesy of the Metropolitan Museum of Art, New York City, gift in memory of Charles Stewart Smith, 1914

artists (*e.g.,* Degas) have used oil paint heavily diluted with turpentine. The brushes are made of Siberian mink (known as sables) and of squirrel (known as camel's hair). In the past, ermine hair was also used.

Stone Age artists used brushes of feathers, bristles, or leaves to mark out the general shape of their paintings. At sites such as Altamira in northern Spain, images clearly executed with a brush have been preserved. In classical antiquity, the brush was considered an appropriate tool for drawing. The ancient Greek painters Protogenes and Apelles were said to have had a contest to determine who could draw the steadiest line with a brush. Brush drawing was also used in the Middle Ages, both for drawing figures in illuminated manuscripts and for sketching the areas to be painted for fresco and panel paintings. Brush drawing since the Renaissance, as in works by Tintoretto, Rembrandt, and Eugène Delacroix, has tended to be loose and sketchlike in effect. There are, however, many examples of a tighter and more meticulous use of brush-drawn lines, such as the famous drawing by Albrecht Dürer, "Praying Hands" (1508; Albertina, Vienna). Brush drawing has been used by many 20th-century artists, notably Picasso, Henri Matisse, and Oskar Kokoschka.

Probably the highest consistent level of brush drawing was achieved by the Chinese, Koreans, and Japanese. In China the technique dates from at least the 3rd century BC. In East Asia, a very fine brush, mounted on a bamboo handle, was used with ink made of boiled pine soot or with watercolours. A brush is also used for fine calligraphy in East Asian cultures.

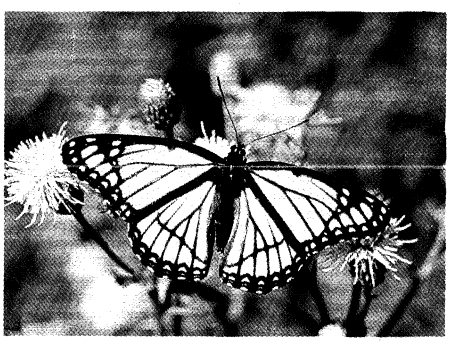
brush fire, fire in vegetation that is less than 1.8 m (6 feet) tall, such as grasses, grains, brush, and saplings. *See* wildland fire.

brush-footed butterfly, also called FOUR-FOOTED BUTTERFLY, any insect of the cosmopolitan family Nymphalidae (order Lepidoptera), named for their characteristically reduced adult forelegs, which are frequently hairy and resemble brushes. The insects' alternative name derives from the fact that only four feet are functional, or walking, legs. Most species have a wingspan of 35–90 mm (1½–3½ inches) and white, yellow, or brown wings with contrasting markings and undersurfaces often with duller, more protective, coloration.

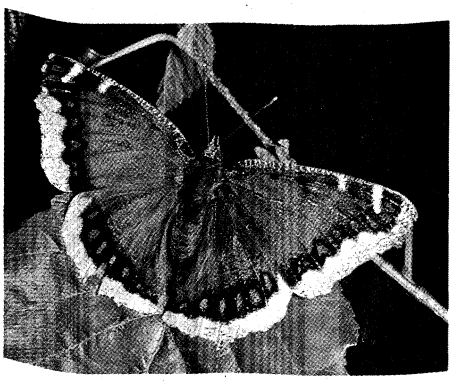
Most nymphalid larvae are brightly coloured and have knobby projections (tubercules), horns, and branching spines. The naked pupae, or chrysalids, hang head downward. Common nymphalids include the anglewing, fritillary, mourning cloak, thistle, and viceroy butterflies.

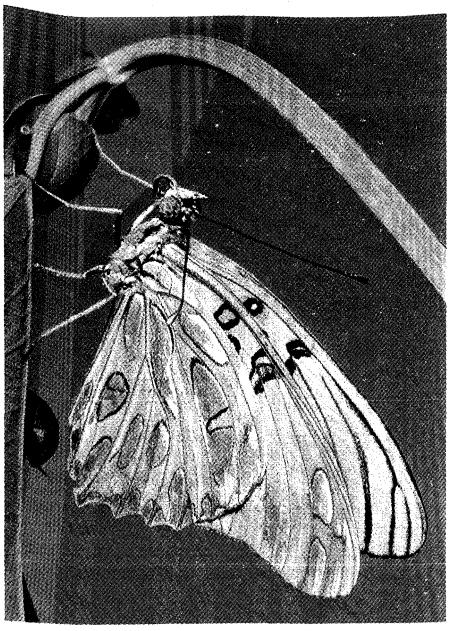
Adult anglewings show seasonal dimorphism, with the autumnal generation being hairy and lighter-coloured. Some also exhibit sexual dimorphism, the female being less conspicuous. Most species have a silvery spot on the undersurface of each hindwing. The spiny larvae attack elm and birch trees, hops, and nettles.

The name fritillary is applied to several nymphalid genera. The large fritillaries, or silverspots, belong to the genus *Speyeria* and usually have silver markings on the undersides of the wings. Many of the smaller fritillaries are members of the genus *Boloria.* Many fritillary larvae are nocturnal and feed on violet leaves.



Viceroy (*Basilarchia archippus*, or *Limenitis archippus*)
Norman R. Lightfoot—Photo Researchers/EB Inc.





Brush-footed butterflies
(Top) Mourning cloak, or Camberwell beauty (*Nymphalis antiopa*), (centre) anglewing (*Polygonia interrogationis*), and (bottom) gulf fritillary (*Agraulis vanillae*)
(Top) Stephen Dalton—EB Inc., (centre) Alexander B. Klots, (bottom) Otto W. Wehrle—Photo Researchers/EB Inc.

The mourning cloak (*Nymphalis antiopa*), known as Camberwell beauties in England, overwinter as adults. The larvae, often known as spiny elm caterpillars, are gregarious in habit and feed principally on elm, willow, and poplar foliage.

The thistle butterfly (*Vanessa*) is named for its principal larval host plant. Some species, such as the painted lady (*V. cardui*), migrate during adulthood, traveling in large groups.

The viceroy (*Basilarchia archippus*, or *Limenitis archippus*) is known for its imitation of the monarch butterfly (*q.v.*), which is distasteful to predators. Through this resemblance the edible viceroy (which can be distinguished by its smaller size and by a black transverse band on each hindwing) probably derives protection from predatory attack. Viceroy larvae feed on willow, aspen, and poplar foliage.

brush-tailed possum, marsupial mammal, a species of phalanger (*q.v.*).

brush wolf: *see* coyote.

brushite, rare mineral, a hydrated calcium phosphate ($CaHPO_4 \cdot 2H_2O$), that forms colourless to pale-yellow, transparent to translucent efflorescences or tiny crystals. It occurs in small quantities in many phosphate deposits, particularly as an incrustation on ancient bones and as a decomposition product of guano (seafowl excrement). It dehydrates readily to form monetite. For detailed physical properties, *see* phosphate mineral (table).

Brusilov, Aleksey Alekseyevich (b. Aug. 31 [Aug. 19, Old Style], 1853, Tiflis, Russia—d. March 17, 1926, Moscow), Russian general distinguished for the "Brusilov breakthrough" on the Eastern Front with Austria-Hungary (June–August 1916), which aided Russia's Western allies at a crucial time during World War I.

Brusilov was educated in the Imperial Corps of Pages, and he began his military career as a cavalry officer in the Caucasus. He distinguished himself in the Russo-Turkish War of 1877–78 and was promoted to the rank of general in 1906. Upon the outbreak of World War I Brusilov was given command of the Russian 8th Army, and he played a brilliant part in the Russian campaign in Galicia (autumn 1914).

In the spring of 1916 Brusilov succeeded the elderly and irresolute general N.Y. Ivanov as commander of the four Russian armies on the southwest sector of the Eastern Front. From June 4, 1916, Brusilov led these armies, who were billeted south of the Pripet Marshes, in a massive attack against the Austro-Hungarian forces. Though they suffered heavy losses, Brusilov's forces by August had taken 375,000 Austrian prisoners (200,000 in the first three days of the offensive) and had overrun all of Bukovina and part of eastern Galicia. Largely because of this offensive, Germany was forced to divert troops that might have sufficed to secure a final victory against the French in the Battle of Verdun. The offensive had other beneficial effects for the Allies; Romania decided to enter the war on their side, and Austria had to abandon its assault in northern Italy. Brusilov's offensive produced no decisive results on the Eastern Front itself, however.

Brusilov
Novosti Press Agency

Brusilov served briefly as commander-in-chief of the Russian armies from May 22 to July 19 (O.S. [June 4 to Aug. 1, N.S.]), 1917. Under the Bolshevik government he served as a military consultant and an inspector of cavalry from 1920 to 1924, after which he retired. His memoirs of World War I were translated in 1930 as *A Soldier's Note-Book, 1914–1918.*

Brusque, city, eastern Santa Catarina state, southern Brazil. It lies in the Itajaí-Mirim River Valley and is located about 16 miles (25 km) southwest of the port of Itajaí and about 40 miles (65 km) northwest of Florianópolis, the state capital. Founded in 1860 by German immigrants, it is now an agricultural market centre with some light industry. Both cotton and silk are produced in the area, and the manufacture of textiles, including towels, is important. In the late 1980s Brusque was accessible only by secondary roads. Pop. (1980 prelim.) 37,898.

Brussels, Flemish BRUSSEL, French BRUXELLES, city, capital of Brabant *province* and of Belgium. It is located in the valley of the Senne (Flemish: Zenne) River, a tributary of the Scheldt. Bruxelles-Capitale, also called Greater Brussels, the country's largest urban agglomeration, consists of 19 administratively autonomous *communes* forming a regional metropolis and is an international economic and political centre. The city, which is officially bilingual (French and Flemish), is located in the Flemish linguistic zone of Belgium; despite this fact, the majority of residents in the metropolitan area speak French.

A brief treatment of Brussels follows. For full treatment, *see* MACROPAEDIA: Brussels.

A rapid expansion of the original town (Inner Brussels) occurred in the 19th century. The Senne and other waterways were covered over and converted into sewers; ponds were filled in; and hollows were banked up. The boundaries of the metropolitan area changed constantly, providing an outlet for the ever-growing population of Flemings, Walloons, and foreigners (largely "guest-worker" migrants from Mediterranean countries) until 1963, when legislation was passed prohibiting the city from expanding beyond the borders of its 19 constituent *communes*. The climate is temperate, with moderate rainfall and mild temperatures throughout the year.

Industrial, commercial, and service activities constitute the greatest part of Brussels' economic life. Industries in Greater Brussels include mining, food processing, and the manufacture of clothing, chemicals, machinery, clocks, and electrical equipment. A north–south industrial zone has sprung up along the valley of the Senne, where canals and docks service the port and where the railway lines also run. The commercial quarter, consisting of the western half of Inner Brussels (the lower town), houses domestic and foreign banking institutions and insurance firms, as well as an important stock exchange. The city is host to such international organizations as the European Communities and the North Atlantic Treaty Organization (NATO), and many national and multinational corporations have set up regional offices there.

Near the central boulevards are located the Grand Place (the heart of the Old Town), the Gothic Town Hall (Hôtel de Ville), and the Maison du Roi (practically rebuilt during 1873–95 and containing a historical museum). The Manneken-Pis Fountain (1619), which portrays a small boy urinating, is a nearby landmark. The eastern, upper town houses the principal governmental buildings, including the Royal Palace and the Palace of the Nation. Close by are several cultural centres, including the Albert I Royal Library, the Museum of Modern Art, the Museum of Ancient Art, and the Palace of Fine Arts.

In addition to the Free University of Brussels (1834), with French-speaking and Flemish-speaking divisions, the city's academic institutions include the Saint-Louis Institute, several royal academies, and other institutes and colleges. The city also enjoys a vigorous theatrical and musical life.

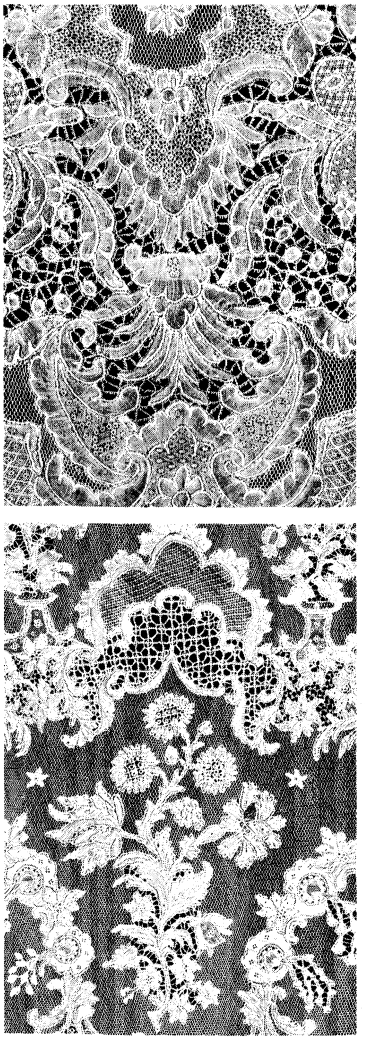
The Belgian state has developed a semi-metro (part subway and part elevated) network of electric trains designed to cover Greater Brussels. The city is the focal point of the Belgian railway system; a special line links the Central Station and Brussels National Airport. Area *commune,* 13 square miles (33 square km); Bruxelles-Capitale, 62 square miles (162 square km). Pop. (1986 est.) *commune,* 136,-453; Bruxelles-Capitale, 976,536.

Brussels Classification (library science): *see* Universal Decimal Classification.

Brussels griffon, breed of toy dog developed in late 19th-century Belgium, from the affenpinscher (*q.v.*) and an ordinary street dog. The Brussels griffon is a sturdily built dog, noted for an intelligent and affectionate nature. It stands about 7 to 8 inches (18 to 20 cm) and weighs 4 to 11 pounds (2 to 5 kg). Typically alert in appearance, it has a domed head, large, dark eyes, a short face, and an upturned nose. The coat may be reddish brown, black, or a combination of the two and appears in two varieties, one rough and wiry and the other smooth. The smooth-coated Brussels griffon is called a Brabançon.

Brussels lace, lace made in Brussels from the second half of the 17th century, when much of it was imported clandestinely to England and sold there under the name of point d'Angleterre (*see* Angleterre). This bobbin lace had a characteristic mesh, a hexagon with four twisted sides and two sides plaited four times, though the design was sometimes joined by a background of bars, or brides, or a background of both bars and mesh. The thread, from local Brabant flax, was of high quality. An expensive lace, it was much-used at court. Brussels lace was famous for its bold and sweeping floral and plant designs, which formed large serpentine curves on pieces used to adorn clothing. In the late 17th and early 18th centuries, figures in narrative scenes were set in a naturalistic surrounding, giving the whole a closely wrought allover effect.

By the mid-18th century the lace's production was divided among specialists, each charged with one stage of the work. Toward 1800 the motifs of the design (sometimes bobbin-made, sometimes needle-made) were being worked separately and applied to bobbin net and, after 1820, to machine net. Needle lace was made from 1720 in imitation of Alençon; needle lace had another revival after 1851 in "gauze lace." From 1840 a rather crude, mostly bobbin-made lace called duchesse lace was made.



(Top) Brussels lace of the bobbin variety with background of brides and *drochel,* second half of the 18th century, in the Rijksmuseum, Amsterdam; (bottom) Brussels lace of the mixed lace variety, *c.* 1745, in the Institut Royal du Patrimoine Artistique, Brussels

By courtesy of (top) the Rijksmuseum, Amsterdam; (bottom) the Institut Royal du Patrimoine Artistique, Brussels; photograph, (bottom) © A.C.L., Brussels

Brussels sprouts, small cabbage belonging to the mustard family (*Brassica oleracea* variety *gemmifera*), widely grown in Europe and the United States. In its seedling stage and early development, the plant closely resembles the common cabbage, but the main stem grows to a height of 60 to 90 cm (2 to 3 feet) and the axillary buds along the stem develop into small heads (sprouts) similar to heads of cabbage but measuring 25 to 40 mm (1 to 1.6 inches) in diameter.

Brussels sprouts may have been grown in Belgium as early as 1200, but the first recorded description of it dates to 1587. The plant requires a mild, cool climate and is harmed by hot weather. The strongly flavoured vegetable is usually served as a cooked side dish. The most desirable specimens are bright green in colour, with tightly closed leaves; the small, young sprouts have a more delicate flavour than older types. Brussels sprouts are a good source of vitamins A and C.

Brussels sprouts (*Brassica oleracea* variety *gemmifera*)

Derek Fell

Brustolon, Andrea (b. July 20, 1662, Belluno, Republic of Venice [now in Italy]—d. Oct. 25, 1732), Italian wood-carver, known for his furniture in the Venetian Baroque style, characterized by extravagant curves and lavish ornamentation.

Brustolon went to Venice in 1677 for a year of training, moving to Rome in 1678. Returning to Venice in 1680, he engaged in decorative carving for several churches and created the furniture that became known as his outstanding work. Made for the Venier di S. Vio and Correr di S. Simeone families, the walnut and ebony pieces were decorated with carved figures.

Brustolon returned to Belluno in 1685 and from that time devoted himself mainly to work for religious uses, usually in wood but occasionally in ivory. His furniture can be seen at the Ca' Rezzonico, Venice.

Brutalism (architecture): *see* New Brutalism.

Brutus, Dennis (Vincent) (b. Nov. 28, 1924, Salisbury, Southern Rhodesia), poet, many of whose works centre on his sufferings and those of his fellow blacks in South Africa. In addition to overt political aims, the chief concern of his work is to preserve human sensitivity in a world of brutality.

For 14 years Brutus taught English and Afrikaans in South Africa. His outspoken protests against racial discrimination (apartheid), particularly in sports, resulted in an 18-month term in prison, as well as his being banned from teaching, writing, publishing, attending social or political meetings, and pursuing studies in law at the University of the Witwatersrand.

After leaving South Africa in 1966 with a Rhodesian passport, Brutus made his home in England and then taught at the University of Denver. In 1971 he became professor of African literature at Northwestern University, Evanston, Ill. In 1983, after a protracted legal struggle, he won the right to stay in the United States as a political refugee. Brutus was largely responsible for South Africa's exclusion from the 1972 Olympic Games for practicing racial segregation in school athletics and he continually became involved in anti-apartheid and related activities. In the late 1960s he served as director of the World Campaign for the Release of South African Prisoners.

Brutus' first collection of poetry, *Sirens, Knuckles and Boots* (1962), was published by the Mbari Press in Nigeria while he was in prison. It received the 1962 Mbari Poetry Prize for Poetry in Africa, though he rejected the award in protest against its being limited to black poets. Although Brutus' work is protest poetry, there is a maturity and restraint in his poems that prevent them from ever becoming self-pitying: "... all our land is scarred with terror / rendered unlovely and unlovable; / sundered are we and all our passionate surrender / but somehow tenderness survives" (from "Somehow We Survive"). Even in *Letters to Martha and Other Poems from a South African Prison* (1969), which records his experiences of misery and loneliness as a political prisoner, Brutus exhibits a restrained artistic control and combines tenderness with anger. His later works include *A Simple Lust* (1973), *China Poems* (1975), and *Stubborn Hope* (1978).

Brutus, Lucius Junius (fl. late 6th century BC), probably a historical figure who is held to have ousted the despotic Etruscan king Lucius Tarquinius Superbus from Rome in 509 and then to have founded the republic. He is said to have been elected to the first consulship in that year and then to have condemned his own sons to death when they joined in a conspiracy to restore the Tarquins. Tradition holds that he was killed in single combat with the son of Tarquinius Superbus during a battle with the Etruscans.

Brutus, Marcus Junius, also called QUINTUS CAEPIO BRUTUS (b. 85 BC—d. 42, near Philippi, Macedonia), a leader of the conspirators who assassinated the Roman dictator Julius Caesar in March 44 BC. The son of Marcus Junius Brutus (died 77), he acquired the alternative name Quintus Caepio through adoption by his uncle, Quintus Servilius Caepio.

Brutus joined Pompey's army on the outbreak of the Civil War between Pompey and Caesar in 49. He was pardoned by Caesar after Pompey's death the next year, and Caesar appointed him governor of Cisalpine Gaul in 46 and city praetor in 44. Nevertheless, Brutus resented Caesar's autocratic rule and longed for the restoration of republican government. Hence he joined Gaius Cassius Longinus' plot to murder Caesar. Brutus' prestige attracted several dozen other senators to the cause.

Marcus Brutus, marble bust; in the Capitoline Museum, Rome

Alinari—Art Resource/EB Inc.

Five months after the assassination, Brutus and Cassius were forced by the Caesarian commander Mark Antony to leave Rome for Macedonia, where they raised an army against him. In February 43 the Senate granted them supreme command in the East. Brutus defeated the Caesarians under Octavian (later the emperor Augustus) in the first engagement of the Battle of Philippi, but his army was crushed by Antony and Octavian in a second encounter three weeks later (Oct. 23, 42). Realizing that the republican cause was lost, he committed suicide.

Although Brutus was admired by his contemporaries for his dignity and idealism, he was extortionate and cruel in his financial dealings with provincials. Shakespeare's portrayal of Brutus in *Julius Caesar* is flattering. A Stoic, Brutus wrote a number of philosophical treatises and other literary works, none of which have survived. Only two of the nine books of his correspondence with the famed orator Cicero are extant. Radin's *Marcus Brutus* appeared in 1939.

Brutus Albinus, Decimus Junius (d. 43 BC), Roman general who participated in the assassination of the dictator Julius Caesar, although he had been Caesar's protégé, and who later led the republican forces against the Caesarian army of Mark Antony.

The surname Albinus was taken from that of his adoptive father, Aulus Postumius Albinus. After serving under Caesar in Gaul, Brutus was given command of Caesar's fleet. In 56 he defeated the Veneti in a naval engagement, and, in 49, during the Civil War between Caesar and Pompey, he led a fleet at the siege of Massilia (now Marseille, Fr.). Caesar then made him governor of Transalpine Gaul (48) and nominated him as one of his heirs in the event of the death of his primary successor, Octavian (later the emperor Augustus).

After taking part in the assassination of Caesar in March 44, Brutus left Rome to occupy Cisalpine Gaul for the republicans. Antony besieged him at Mutina, but senatorial forces, supported by Octavian, relieved the siege in April 43. The Senate then gave Brutus the command against Antony. Brutus pursued Antony into Gallia Narbonensis but failed to bring him to battle. Deserted by his soldiers, he attempted to escape to Macedonia to join two other assassins, Marcus Junius Brutus and Gaius Cassius Longinus. Brutus was captured, however, by a Gallic chieftain and put to death on Antony's orders.

Bruun, Malte Conrad (geographer): *see* Malte-Brun, Conrad.

Brüx (Czechoslovakia): *see* Most.

Bruxelles (Belgium): *see* Brussels.

Bruyère, Jean de la: *see* La Bruyère, Jean de.

Bry, Théodore de (b. 1528, Liège, Belg.—d. March 27, 1598, Frankfurt am Main), German engraver and publisher, whose illustrations for travel works are of special interest.

De Bry established an engraving and publishing business at Frankfurt and also visited London in or before 1587. There he became acquainted with the geographer Richard Hakluyt, with whose assistance he collected materials for a finely illustrated collection of voyages and travels, *Collectiones peregrinationum in Indiam orientalem et Indiam occidentalem* (25 parts, 1590–1634). Among other works he engraved is a set of plates illustrating Thomas Hariot's *Briefe and True Report of the New Found Land of Virginia* (Frankfurt, 1595).

Bryan, city, seat (1843) of Brazos County, east central Texas, U.S., 99 mi (159 km) northwest of Houston. Settled in the 1820s and formally founded in 1855, it was named for William Joel Bryan, who inherited the land for the townsite from his uncle, Stephen F. Austin (the father of Texas). Cotton, dairying, and poultry are basic to the economy. The Allen Academy (1886) is in Bryan, and the Texas Agricultural and Mechanical University (1876) and the Agricultural Experiment Station are at nearby College Station. The university's research programs include a nuclear science centre and other facilities on what was formerly Bryan Air Force Base. Bryan's economy includes an expanding industrial base. The Texas International Speedway is immediately east. Inc. 1872. Pop. (1980) city, 44,337; metropolitan area (SMSA), 93,588.

Bryan, Kirk (b. July 22, 1888, Albuquerque, N.M., U.S.—d. Aug. 22, 1950, Cody, Wyo.), geologist and geomorphologist who pioneered in explaining the forces that molded the present landforms of arid climates and emphasized the importance of pediments (plains formed by desert erosion at the foot of mountains). A geologist with the U.S. Geological Survey from 1912 to 1926, he worked on the problem of water resources in arid and semi-arid regions.

In 1926 Bryan began teaching at Harvard University. In 1932 he helped introduce the study of pollen in old rock formations to reconstruct the climate of North America during the Pleistocene Epoch (from 2,500,000 years ago to the present), a technique then little known in the U.S. He also proposed that the effects of frost and freezing in the top part of soil and rock formations should reveal much about climate and coined the term cryopedology to cover the effects of cold climate on soils.

Bryan, William Jennings (b. March 19, 1860, Salem, Ill., U.S.—d. July 26, 1925, Dayton, Tenn.), Democratic and Populist leader and a magnetic orator who ran unsuccessfully three times for the U.S. presidency (1896, 1900, 1908). His enemies regarded him as an ambitious demagogue, but his supporters viewed him as a champion of liberal causes. He was influential in the eventual adoption of such reforms as popular election of senators, income tax, creation of a Department of Labor, Prohibition, and woman suffrage. Throughout his career, his Midwestern roots clearly identified him with agrarian interests, in opposition to those of the urban East.

Reared in Illinois, he practiced law at Jacksonville (1883–87) before moving to Lincoln, Neb., where he was elected to the U.S.

Congress in 1890. Renowned as a gifted debater, he opposed high tarriffs and came to be considered the national leader of the Free Silver Movement (bimetallism) as opposed to the "hard money" policy of the Eastern bankers and industrialists, who favoured the gold standard.

William Jennings Bryan, *c.* 1908
By courtesy of the Library of Congress, Washington, D.C.

Defeated for the U.S. Senate in 1894, he spent the next two years as editor of the *Omaha World-Herald* and as a popular public lecturer. The climax of Bryan's career was undoubtedly the 1896 presidential campaign. At the Democratic convention in Chicago, his famous "Cross of Gold" speech (July 8) won him the nomination at the age of 36. His panacea for the depressed economy after the Panic of 1893 was an "easy money" policy based on the unlimited coinage of silver at a ratio to gold of 16 to 1. On that platform he also received the nominations of the Populist and National Silver parties. In the ensuing campaign, he travelled more than 18,000 miles through 27 states and attracted a large and enthusiastic following, but the well-financed Republican machine won 271 electoral votes for William McKinley, to Bryan's 176. Bryan lost to McKinley again in 1900 and to William Howard Taft in 1908.

In recognition of his role in securing the Democratic nomination for Woodrow Wilson in 1912, Bryan was appointed secretary of state the following year. Despite his diplomatic inexperience, he made a distinctive contribution to world law by espousing arbitration to prevent war. Bryan convinced thirty-one nations to agree in principle to his proposal of new treaties that would provide a "cooling-off" period of one year during which a question in dispute could be studied by an international commission. In the meantime World War I broke out. An avowed pacifist, Bryan finally resigned over Wilson's second note to Germany (June 8, 1915) protesting the sinking of the "Lusitania." Nonetheless, he urged loyal support of the war when it was finally declared.

The concluding episode of his life was the famous Scopes trial in July 1925. A firm believer in a literal interpretation of the Bible, Bryan went to Dayton, Tenn., to assist in the prosecution of a schoolteacher accused of teaching Darwinism, or the theory of the evolutionary origin of man, rather than the doctrine of divine creation. With Clarence Darrow as chief defense counsel, the trial attracted worldwide attention as a dramatic duel between fundamentalism and modernism. John T. Scopes was found guilty and fined (later overruled), but the excesses and passions of the court battle took their toll: soon after the trial, Bryan fell ill and died.

The standard biographies of Bryan are Louis W. Koenig's *Bryan: A Political Biography* (1971); and P.E. Coletta's *William Jennings Bryan,* 3 vol. (1964–69).

Bryan–Chamorro Treaty (Aug. 5, 1914), treaty between the United States and Nicaragua, by which the United States gained the right to construct a canal across Nicaragua, an option to build a naval base on the Gulf of Fonseca, and a long-term lease on the Corn Islands in the Caribbean. Nicaragua's neighbours protested, claiming the treaty imperilled their security, and the Central American Court of Justice upheld the validity of their claim. The United States and Nicaragua ignored the ruling; the treaty remained in effect, but the United States used it only to build a lighthouse on the Corn Islands. The refusal of the United States to honour the ruling of the court destroyed the influence of that body, and in March 1918 the court formally ceased to exist.

Bryanka, also spelled BRIANKA, city, Voroshilovgrad *oblast* (administrative region), Ukrainian Soviet Socialist Republic. Bryanka is located on the Lozovaya River, a tributary of the Lugan River, in the Donets basin. It developed around a mining camp in 1889 and remains the centre of an active coal-mining area. Until 1962, when it became a city, Bryanka was a district of the city of Kadiyevka (now Stakhanov). Besides the numerous coal mines, Bryanka has industries specializing in drilling equipment and reinforced concrete products. Several professional schools are located there. Pop. (1983 est.) 63,000.

Bryansk, also spelled BR'ANSK, or BRIANSK, *oblast* (administrative region), western Russian Soviet Federated Socialist Republic, with an area of 13,475 sq mi (34,900 sq km), in the broad basin of the Desna River. In the north and east are low hills with mixed forest cover, but elsewhere most of the land has been plowed. Agriculture, particularly grain and industrial crops, is highly developed. Towns are small (with the exception of Bryansk, the capital) and engaged chiefly in processing farm products and in engineering. The iron ore in the *oblast* has been exploited. Pop. (1983 est.) 1,485,000.

Bryansk, also spelled BR'ANSK, or BRIANSK, city and administrative centre of Bryansk *oblast* (region), western Russian Soviet Federated Socialist Republic, on the Desna River just below its confluence with the Bolva. First mentioned in 1146, it stood in an important strategic and geographic position on the trade route between Moscow and the Ukraine, and it was a stronghold on Russia's southern frontier in the 16th century. Bryansk is now a major industrial centre with large-scale and varied engineering, building-materials, cement, and consumer-goods industries. Six rail lines lead to Moscow, Vyazma, Smolensk, Gomel, Kiev, and Oryol, via small industrial towns. Pop. (1983 est.) 418,000.

Bryant, Sir Arthur (Wynne Morgan) (b. Feb. 18, 1899, Dersingham, Norfolk, Eng.—d. Jan. 2, 1985, Salisbury, Wiltshire), British historian and biographer particularly noted for his three-volume life of Samuel Pepys (1933, 1935, 1938). His histories have an epic sweep that gained them popular readership. Typical of his approach is the panoramic view of English history he began during World War II with *The Years of Endurance, 1793–1802* (1942) and *Years of Victory, 1802–1812* (1944) and continued with *The Age of Elegance, 1812–1822* (1950).

Bryant left his studies at Harrow at 18 to become one of the early pilots in the Royal Air Force in World War I. After graduation from Oxford, he became principal of the Cambridge School of Arts, Crafts and Technology (1923–25) and then history lecturer in Oxford's extra-mural studies department (1925–36). His first works were biographies of King Charles II (1931) and Macaulay (1932). His interest in United States history is revealed in *The American Ideal* (1936). Among his other biographies are *George V* (1936), *Stanley Baldwin* (1937), *Nelson* (1970), and *The Great Duke* (*i.e.*, Wellington; 1971). Later histories include *A Thousand Years of British Monarchy* (1975) and *The Spirit of England* (1982). He was knighted in 1954.

Bryant, Bear, byname of PAUL WILLIAM BRYANT (b. Sept. 11, 1913, Kingsland, Ark., U.S.—d. Jan. 26, 1983, Tuscaloosa, Ala.), U.S. collegiate football coach who won more games than any other coach.

Bryant played tackle and was all-state at Fordyce (Ark.) High School; he went on to the University of Alabama, Tuscaloosa (1932–36; B.S., 1936), where he played blocking end. During his collegiate career the team won 23 games, lost 3, and tied 2. He played on the team that beat Stanford in the Rose Bowl game (1935).

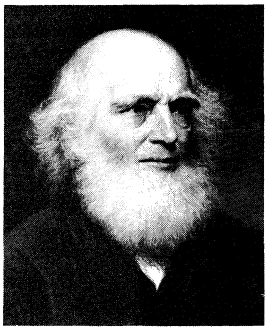
Bryant was an assistant coach at Alabama (1936–40) and at Vanderbilt University in Nashville, Tenn. (1940–41). After serving in the Navy during World War II, he began his career as a head coach in 1945 at the University of Maryland, College Park. Bryant resigned after the president reinstated an athlete Bryant had dismissed for breaking training rules. At the University of Kentucky, Lexington (1946–53), his team won 60 games, lost 23, and tied 5; won the school's first Southeastern Conference championship; and won three of four bowl games. Bowl games, which became increasingly popular after World War II, became an important part of his career; in all he coached in 29 bowl games. Bryant left Kentucky after losing a battle of wills with Adolph Rupp as to whether basketball or football should be the dominant sport.

In 1954, Bryant's first year as a coach at Texas Agricultural and Mechanical University, College Station, the team lost 9 of 10 games. In the next three seasons, however, they lost only four games and won one Southwest Conference championship.

In 1958 Bryant returned to Alabama, where he spent the rest of his coaching career. Six of his teams were ranked first nationally, and they played in 24 straight bowl games, including the 1982 Liberty Bowl, played on December 29, which was Bryant's last game and final victory. His Alabama coaching record of 323 regular season wins, 85 losses, and 17 ties broke the long-standing record of Amos Alonzo Stagg. Notable among Bryant's players were quarterbacks George Blanda, Joe Namath, and Ken Stabler.

Bryant, William Cullen (b. Nov. 3, 1794, Cummington, Mass., U.S.—d. June 12, 1878, New York City), poet of nature, best remembered for "Thanatopsis," and editor for 50 years of the New York *Evening Post.*

A descendant of early Puritan immigrants, Bryant at 16 entered the sophomore class of Williams College. Because of finances and in hopes of attending Yale, he withdrew without graduating. Unable to enter Yale, he studied law under private guidance at Worthington and at Bridgewater and at 21 was admitted to the bar. He spent nearly 10 years in Plainfield and at Great Barrington as an attorney, a calling for which he held a lifelong aversion. At 26 Bryant married Frances Fairchild, with whom he was happy until her death nearly half a century later. In 1825 he moved to New York City to become coeditor of the *New York Review.* He became an editor of



William Cullen Bryant, detail of an oil painting by Daniel Huntington, 1866; in the Brooklyn Museum collection

By courtesy of the Brooklyn Museum, New York

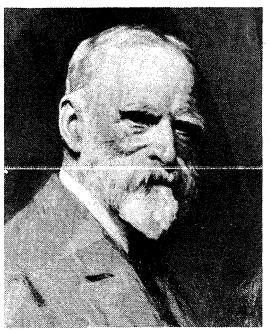
the *Evening Post* in 1827; in 1829 he became editor in chief and part owner and continued in this position until his death. His careful investment of his income made Bryant wealthy. He was an active patron of the arts and letters.

The religious conservatism imposed on Bryant in childhood found expression in pious doggerel; the political conservatism of his father stimulated "The Embargo" (1808), in which the 13-year-old poet demanded the resignation of President Jefferson. But in "Thanatopsis" (from the Greek "a view of death"), which he wrote when he was 17 and which made him famous when it was published in *The North American Review* in 1817, he rejected Puritan dogma for Deism; thereafter he was a Unitarian. Turning also from Federalism, he joined the Democratic party and made the *Post* an organ of free trade, workingmen's rights, free speech, and abolition. Bryant was for a time a Free-Soiler and later one of the founders of the Republican party. As a man of letters, Bryant securely established himself at the age of 27 with *Poems* (1821). In his later years he devoted considerable time to translations.

Bryant will be remembered longest as the poet of his native Berkshire hills and streams in such poems as "Thanatopsis" and "To a Waterfowl."

Bryce (of Dechmont), James Bryce, Viscount (b. May 10, 1838, Belfast, Ire.—d. Jan. 22, 1922, Sidmouth, Devon, Eng.), British politician, diplomat, and historian best known for his highly successful ambassadorship to the United States (1907–13) and for his study of the U.S. Constitution, *The American Commonwealth,* which remains a classic.

At Trinity College, Oxford (B.A., 1862; doctor of civil law, 1870), Bryce wrote a prize essay that was published in book form as *The Holy Roman Empire* (1864). In 1867 he was called to the bar, and from 1870 to 1893 he served as regius professor of civil law at Oxford, where, with Lord Acton, he founded the *English Historical Review* (1885). From 1880 to 1907 he was a Liberal member of the House of Commons, serving as undersecretary of state for foreign affairs (1886), chancellor of the duchy of Lancaster (1892), and president of the Board of Trade (1894–95). During those two years he also presided over what came to be called the Bryce Commission, which recommended the establishment of a ministry for education.



Bryce, detail of an oil painting by Sir George Reid; in the collection of Oriel College, Oxford

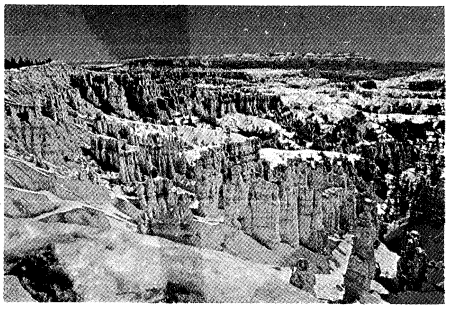
By courtesy of Oriel College, Oxford

At about this time he began to attack the expansionist British policy that led to the South African War (1899–1902). Thus, when Sir Henry Campbell-Bannerman, who had also opposed the war, became prime minister in December 1905, he appointed Bryce chief secretary for Ireland.

Bryce, who had made the first of his several visits to the U.S. in 1870, was sent as ambassador to Washington, D.C., in February 1907. He already had made many friends in American political, educational, and literary circles and had become widely popular in the U.S. for *The American Commonwealth,* 3 vol. (1888), in which he expressed admiration for the American people and their government. As ambassador he dealt principally with U.S.–Canadian relations, which he greatly improved, in part by personal consultation with the Canadian governor general and ministers. In the process he also bettered relations between Great Britain and Canada, securing Canadian acceptance of an arbitration convention (April 4, 1908) originally signed by Great Britain and the United States. He retired as ambassador in April 1913.

On Jan. 1, 1914, Bryce was created a viscount. In the same year he became a member of the International Court of Justice, The Hague. Later, during World War I, he headed a committee that judged Germany guilty of atrocities in Belgium and France. Subsequently, he advocated the establishment of the League of Nations.

Bryce Canyon National Park, national park in southern Utah, U.S., actually a series of natural amphitheatres rather than a canyon, below which stands an array of white and orange limestone and sandstone columns and walls sculptured by erosion. It was created in 1928, five years after part of the present area (56 sq mi [145 sq km]) had been set aside as a national monument. The geologic story of Bryce Canyon is related to that of nearby Grand Canyon and Zion national parks (*qq.v.*), since the stone of all three was laid down while the entire region was inundated by a shallow sea, although the sandstone and limestone beds of Bryce Canyon were formed more recently. The high rim country of the park is part forest and part grass and sage, with fir, pine, and aspen the dominant species. At lower, drier altitudes, piñon pine and Utah juniper predominate. The sanctuary harbours many mammals and birds. The canyon was named for Ebenezer Bryce, an early settler in the area.

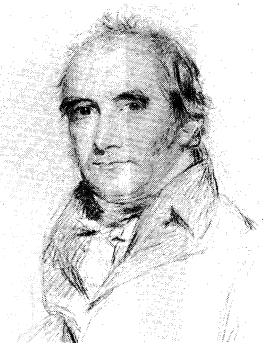


Bryce Canyon, Utah

Milt and Joan Mann from CameraMann

Brydges, James: *see* Chandos, James Brydges, 1st duke of.

Brydges, Sir Samuel Egerton, 1ST BARONET (b. Nov. 30, 1762, Wootton, Kent, Eng.—d. Sept. 8, 1837, Geneva), English writer and genealogist chiefly important as the editor of rare Elizabethan and 17th-century texts, notably the 17th-century writer Edward Phillips' critical miscellany *Theatrum Poetarum* (1800; "Theatre of Poets") and Robert Greene's autobiographical pamphlet *Greenes groatsworth of witte . . .* (1813). Persuaded that he and his family were heirs to a barony, he filed a suit in the courts but lost the case, though he never gave up the claim. He edited Arthur Collins' *Peerage of England,* inserting a statement about his supposed right. He was made a baronet in 1814, thereafter living mostly out of England.



Brydges, chalk drawing by Benjamin Burnell, 1817; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Bryennios, Philotheos (b. 1833, Istanbul—d. 1914, Istanbul), Eastern Church theologian and metropolitan who discovered the *Didachē* manuscript, an important early Christian document.

Educated at Khálki, Greece, and at the universities of Berlin, Munich, and Leipzig, Bryennios became professor (1861) and then director (1863) of the school at Khálki. In 1867 he was made head of the Great School of the Nation in Istanbul, where he remained until 1875, when he was selected metropolitan of Sérrai, Greece. He became metropolitan of Nicomedia, Tur., in 1877.

While at Istanbul, Bryennios discovered, in 1873, manuscripts containing the *Didachē,* the two epistles of St. Clement of Rome to the Corinthians, and other important religious documents. Although the *Didachē,* 16 short chapters dealing largely with morals and church practice, had been known from references in early writers, it was presumed lost. From these discoveries, Bryennios published the first complete text of St. Clement's epistles (1875) and *The Teaching of the Twelve Apostles* (1883), both with valuable notes of his own.

Bryennius, Nicephorus (b. 1062, Adrianople, Byzantine Empire—d. 1137, Constantinople), Byzantine soldier, statesman, and historian who wrote a history of the imperial Comnenus family.

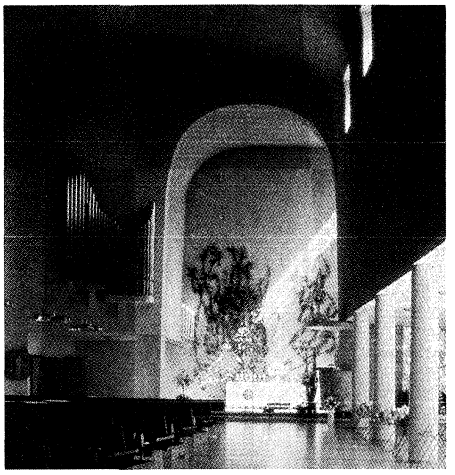
A favourite of the emperor Alexius I Comnenus, who gave him the title of caesar, Bryennius assisted Alexius in dealing with Godfrey of Bouillon, the leader of the First Crusade by successfully defending Constantinople against him (1097); he conducted the peace negotiations between Alexius and Bohemond, prince of Antioch (1108); and played an important part in the defeat of Malik-Shāh, Seljuq sultan of Iconium (1116). At the suggestion of his mother-in-law, the empress Irene, he wrote the chronicle ("Materials for a History") of the Comnenus family in the 11th century, particularly during the years 1070–76. In addition to information derived from older contemporaries, such as his father and his father-in-law,

and from official sources, Bryennius also used the works of Michael Psellus, Joannes Scylitzes, and Michael Attaleiates. His style is concise and simple, and his views are influenced by his intimacy with the imperial family, which at the same time afforded him unusual facilities for obtaining material.

Bryggman, Erik (b. July 2, 1891, Turku, Fin.—d. Dec. 21, 1955, Turku), architect notable for his role in bringing modern Functionalist architecture to Finland.

Bryggman studied at the Design School of the Turku Art Society and at the Helsinki Polytechnic School (graduated 1916). Shortly thereafter he collaborated on the design of a number of important works, including the Helsinki War Memorial.

With the Finnish architect and designer Alvar Aalto he organized the 1929 exhibition celebrating the 700th anniversary of the city of Turku, an event that many consider to be the beginning of modern architecture in Finland. His important works during the 1930s include the Vierumäki Sports Club (1930–36) and the library of the Turku Academy (1935), both notable for their smooth, undecorated surfaces. His most important work is considered to be the chapel of the Turku cemetery (1938–41), which, though in the Functionalist idiom, makes a strong emotional appeal, particularly through the use of light entering the interior as an architectural element.



Chapel of the cemetery at Turku, Fin., by Erik Bryggman, 1938–41

By courtesy of the Museum of Finnish Architecture, Helsinki

Bryggman's later works, showing considerable romanticism in their use of indigenous materials and traditional forms, include houses at Pansio, near Turku (1946), the Students' Union and chemistry laboratory of Turku Academy (1948–50), and the Water Tower at Riihimäki (1951–52).

Brygos, also spelled BRYGUS, signature appearing on several cups and vases of Greek red-figure pottery (*q.v.*) executed in the late 6th or early 5th century BC. Because it is not known whether the signature is that of the potter or of the painter, those artisans are called, by convention, the Brygos Potter and the Brygos Painter.

The Brygos Painter is best known for a kylix (drinking cup), frequently called the "Brygos Cup," now in the Louvre, Paris. A work of *c.* 490 BC, it depicts the "Iliupersis" ("Sack of Troy"). Several other vessels thought to have been decorated by the Brygos Painter include a kylix, "Youth Carrying a Skyphos," now in the Metropolitan Museum of Art, New York City; a cup, "Dionysus with a Troop of Maenads and Satyrs," now at Munich; and a cup, "Satyrs Attacking Iris and Hera," now in the British Museum. The Brygos Painter is known for drinking-party scenes as well as more formal mythological scenes. The naturalness of his forms and the flow of his draperies are consonant with the early Classical period.

"Sack of Troy," detail of the Brygos Cup, a kylix decorated by the Brygos Painter, *c.* 490 BC; in the Louvre, Paris

Chuzeville from Rapho/Photo Researchers—EB Inc.

Bryher, byname of ANNIE WINIFRED ELLERMAN (b. Sept. 2, 1894, Margate, Kent, Eng.—d. Jan. 28, 1983, Vevey, Switz.), British novelist, poet, and critic, best known for her historical fiction. She was also a cofounder and coeditor of *Close-Up,* an authoritative journal on silent motion pictures.

Bryher, the daughter of British shipping magnate Sir John Ellerman, traveled extensively throughout Europe, the Middle East, and the Mediterranean with her parents. She took the name Bryher (from her favourite of the Isles of Scilly) when she began to write because she did not want the eminent family name to influence publishers or critics.

Although Bryher wrote some poetry and nonfiction, among which was *Film Problems of Soviet Russia* (1929), it was her historical novels that brought her critical acclaim. These works include *Beowulf* (1948), *The Fourteenth of October* (1952), *The Player's Boy* (1953), and *Ruan* (1960), all set in Britain at various historical eras; and *The Roman Wall* (1954) and *The Coin of Carthage* (1964), which are set in the Roman Empire. Bryher was notable for the vivid artistry with which she accurately re-created ancient cultures during periods of change, disorder, and conflict.

Brynner, Yul, original name TAIDJE KHAN (b. July 11, 1920?, Sakhalin Island, U.S.S.R.—d. Oct. 10, 1985, New York City), American stage and motion picture actor known primarily for his performance as the Siamese monarch in *The King and I.*

The son of a Mongolian mining engineer and his Romanian gypsy bride, Brynner became at age 13 a nightclub balladeer and then a circus acrobat in France. An accident cut short his career on the trapeze, however, and by the early 1940s he had drifted into acting with a touring company. He made a successful Broadway stage debut in 1946, playing an Oriental prince in *Lute Song.* He then worked as a television director from 1948 until 1951, when he was offered the role of the King of Siam in the Rodgers and Hammerstein musical *The King and I.* With his commanding presence, lyrical voice, and shaven head and exotically handsome features, Brynner proved to be the ideal actor for the role and won immediate acclaim for his performance. He gave 1,246 performances as the King on Broadway from 1951 to 1954 and then starred in the screen version of *The King and I* in 1956, winning an Academy Award for best actor for the role. He went on to give a total of 4,625 performances of the part, taking his last curtain call as the Siamese king in 1985. Brynner also had starring roles in such major motion pictures as *The Ten Commandments* and *Anastasia* (both 1956), *The Brothers Karamazov* (1958), and *The Magnificent Seven* (1960).

bryony, any plant of the genus *Bryonia,* of the gourd family (Cucurbitaceae). These plants are mostly herbs or long-tendriled climbing vines that are native to Eurasia. White bryony (*B. cretica* or *B. dioica*) has a thick, fleshy white root, large lobed leaves, pale-yellow flowers arranged in clusters in the leaf axils, and small red berries. In North America, white bryony refers to *B. alba,* which differs from *B. cretica* in having male and female flowers on the same plant, and black berries. *Bryonia cretica* was formerly used as a cathartic and as a diuretic. The plant contains the poisonous alkaloid bryonin.

White bryony (*Bryonia cretica*)

G.E. Hyde—EB Inc.

Bryophyta, a division of primitive green plants, numbering about 24,000 species and including the liverworts and mosses.

A brief treatment of bryophytes follows. For full treatment, *see* MACROPAEDIA: Bryophytes and Primitive Vascular Plants.

"Bryophyte" means "moss plant." Some are so small that a hand lens is needed to see them, but a few (*Fontinalis, Dawsonia*) may be more than 30 centimetres (one foot) long. Bryophytes are of little economic importance, but some species serve as seedbeds for trees and as cover for small animals. Some are used ornamentally, as in moss gardens. In nature they carpet rocks, logs, and forest litter, retaining water and retarding soil erosion.

Bryophytes are distinguished from algae by

having their sex cells (gametes) enclosed in a cellular jacket and from ferns and higher plants by the absence of true roots, stems, leaves, and vessels. Leaflike phyllids occur during the gametophyte phase of the life cycle (the sex-cell producing generation), and rootlike rhizoids serve mainly for anchorage (water is absorbed throughout the plant surface). In contrast to the vascular plants (*compare* tracheophyte), bryophytes show a conspicuous gametophyte phase and a less noticeable sporophyte (spore-producing) phase. Reproduction occurs often by asexual means from fragments of the plant body. Bryophytes are only remotely related to the algae. They presumably originated from several primitive sources, evidence of which is now obscure. Moreover, there appear to be no groups of higher plants for which the bryophytes could have served as ancestors.

Bryology, the study of bryophytes, began during the 19th century—the word was coined in 1863—but was a field pursued mainly by amateurs. Only since the 1930s has bryology attained the stature of an independent branch of botany.

Bryopsida (plant class): *see* moss.

bryozoan: *see* moss animal.

brytenwalda, also spelled BRYTENWEALD (Anglo-Saxon ruler): *see* bretwalda.

Brythonic languages, one of two groups of the modern Celtic languages, the other being Goidelic. The Brythonic languages (Welsh *brython,* "Briton") are or were spoken on the island of Great Britain and consist of Welsh, Cornish, and Breton. They are distinguished from the Goidelic group by the presence of the sound *p* where Goidelic has *k* (spelled *c,* earlier *q*), both derived from an ancestral form $*k^w$ in the Indo-European parent language. (An asterisk identifies a sound as a hypothetical and reconstructed form.) The Brythonic languages are therefore sometimes referred to as P-Celtic.

Bryullov, Karl Pavlovich, original name CHARLES BRULEAU, Bryullov also spelled BRIULLOV, BRYULOV, BRÜLOV, BRÜLLOV, or BRÜLOW (b. Dec. 12 [Dec. 23, Old Style], 1799, St. Petersburg [Leningrad]—d. June 11 [June 23, Old Style], 1852, Marsciano, near Rome), Russian painter who combined technical proficiency and classical academic training with a Romantic spontaneity to produce some of the liveliest examples of Russian art of the period.

Bryullov was descended from French Huguenots, and his father was a sculptor. (The family name was Russified in 1821.) Bryullov was educated at the St. Petersburg Academy of Fine Arts (1809–21). He studied in Italy from 1823, painting his best known work, the monumental *Last Day of Pompeii* (1830–33; State Russian Museum), while there; it brought him an international reputation. Though he painted other large canvases with historical subjects, none was as successful as *Pompeii.* Much of his continuing reputation rests on his more intimate portraits and his watercolours and travel sketches.

Bryusov, Valery Yakovlevich, Bryusov also spelled BRIUSOV (b. Dec. 13 [Dec. 1, Old Style], 1873, Moscow—d. Oct. 9, 1924, Moscow), poet, novelist, playwright, translator, and essayist who was a pioneering advocate of Russian modernist literature.

The son of a prosperous merchant, Bryusov received a liberal education and became interested in French Symbolist poetry in the early 1890s. He first gained critical recognition when he published (with A.A. Lang) *Russkie simvolisty* (two parts, 1894–95; "Russian Symbolists"), an anthology of original poems by Russian Symbolists as well as of translations from the French (Verlaine, Rimbaud, Mallarmé). This work was an important landmark in the Russian modernist move-

Bryusov, portrait by an unknown artist
Novosti Press Agency

ment, and Bryusov eventually became the recognized leader of Russian Symbolism when he assumed in 1904 the editorship of its leading critical journal, *Vesy* ("The Scales"). The most important of Bryusov's own 10 volumes of original poetry published between 1895 and 1921 were *Tertia vigilia* (1900), *Urbi et orbi* (1903), and *Stephanos* (1906). As a poet Bryusov displayed great technical skill and erudition in his mystical and eroticized treatments of history and mythology. His highly ornate and cerebral poetry also evinces qualities of coldness, detachment, and artificiality, however, particularly in the later phase of his artistic production. His prose fiction includes the novels *Ognenny angel* (1908; *The Fiery Angel*) and *Altar pobedy* (1913; "Altar of Victory"). Having broken with the Symbolist movement in 1910, Bryusov taught literature after the Russian Revolution and held teaching and publishing posts until his death. He is best remembered for his efforts as a translator, critic, and essayist to raise the stature of modern poetry in Russia.

Brzeg, German BRIEG, city, Opole *województwo* (province), southwestern Poland, situated on high bluffs on the western side of the Oder River. An important Silesian settlement since the 14th century, when Prince Ludwik I built his castle there, Brzeg was the home of the Piast family, rulers of the duchy of Brzeg from 1311 until 1675. Brzeg was the centre of the Renaissance in Silesia in the 16th century. During the 17th and 18th centuries, it was known for the excellence of its printing industry. In the 19th century it grew, and its industrial base was diversified until World War II, when 70 percent of the city was destroyed. The rebuilt Brzeg is once again developing industrially. Historic landmarks include the chapel of St. Hedviga (Jadwiga, 1349); the Piast family castle, now a museum; and the 16th-century Brama Odrzańska (Oder Gateway), a remnant of the old town walls. Pop. (1985 est.) 37,200.

Brzozowski, Stanisław Leopold (b. June 28, 1878, Maziarnia, near Chełm, Kingdom of Poland—d. April 30, 1911, Florence), Polish critic, novelist, and playwright who applied Marxist criteria in the field of literary criticism.

Brzozowski's novel *Płomienie* (1908; "Flames") is a fictional account of the Russian revolutionary movements connected with the secret organization Zemlya i Volya ("Land and Freedom"). The story is set against the wider background of European radical movements, particularly the Paris Commune. Brzozowski presents events from the Russian viewpoint, emphasizing the common bond of the Poles and Russians in their struggle against the tsarist government. His *Sam wśród ludzi* (1911; "Alone Among Men") is a novel that contains long theoretical analyses of religious and political problems. Brzozowski's major philosophical achievement is his so-called philosophy of work, in which he states that man does not understand the world but rather creates it through his work. He uses this thesis in his incisive analyses of the connections between culture and society.

Brzozowski, Tadeusz (b. Oct. 21, 1749, Malbork, Pol.—d. Feb. 5, 1820, Płock), first general of the restored Society of Jesus.

In 1765 Brzozowski joined the Jesuits in Poland. He was ordained in Vilnius and taught in Minsk. In 1805, after serving 16 years as secretary and assistant to his predecessors, he was elected superior of the order, which had survived in Russian-annexed Poland and in Russia. When Pope Pius VII restored the Society of Jesus throughout the world in 1814, he conferred full powers on Brzozowski, making him the 19th general. During his generalate he witnessed the expulsion of the Jesuits from Russia (1815) but also their rapid restoration elsewhere in the world. Brzozowski translated into Polish the *Dictionnaire philosophique de la religion* (1782) by Claude-Adrien Nonnotte.

BSP test: *see* Bromsulphalein test.

Bstan-'gyur (Tibetan: "Translation of Teachings"), also spelled BSTAN-ḤGYUR, TANJUR, TANGYUR, TEN-GYUR, or TENJUR, the second great collection of Buddhist sacred writings in Tibet, comprising more than 3,600 texts filling some 225 volumes and supplementary to the canonical *Bka'-'gyur* ("Translation of the Buddha-Word").

This collection is made up of translations of works by individual Indian authors. It is divided into two major sections. About one-sixth of the texts (but nearly two-thirds in terms of volume) are based on canonical works antedating the development of Tantrism, primarily the vast and varied corpus of Mahāyāna sutras. Most of the rest of the texts are oriented toward the Tantras, the ritual and meditative texts of the Vajrayāna form of Buddhism. Along with commentaries and treatises on the canonical texts themselves, there are works on such diverse topics as grammar, logic, medicine, astrology, and the lives of saints.

BTU: *see* British thermal unit.

Bū Sa'īd DYNASTY: *see* Āl Bū Sa'īd dynasty.

Buache, Philippe (b. Feb. 7, 1700, Paris—d. Jan. 27, 1773, Paris), French geographer and cartographer who contributed to the theory of physical geography.

Buache worked for his father-in-law, the cartographer Guillaume Delisle, and became royal geographer in 1729. He was elected to the Académie des Sciences the next year. His physiographic system divided the Earth's surface into four basins, separated by a scaffolding of mountain ranges overland and beneath the oceans. He applied this theory particularly to interpreting the geography of North America and the Pacific. From Russian discoveries in the Bering Strait he deduced the existence of Alaska and the Aleutians. Buache was also a pioneer in the use of contour lines to express relief on maps.

Buade, Louis de: *see* Frontenac, Louis de Buade, comte de Palluau et de.

Buākhar (Sudanese army): *see* 'Abīd al-Bukhārī.

Bubastis, modern TALL BASṬAH, ancient Egyptian city in the Nile Delta. It became important when the pharaohs of the 19th dynasty (1320–1200 BC) moved their capital from Thebes to the Delta and reached its peak of prosperity when its prince, Sheshonk I (the biblical Shishak, 952 BC), became pharaoh. Later, however, it shared in the decay of the rest of the country and fell into ruin. The city's god was the cat-headed Bast, whose festival was among the most revelrous in Egypt.

Bubastite DYNASTY, the 22nd dynasty of ancient Egypt (945–*c.* 730 BC), ruled by Libyans.

Libyan soldiers had long been employed in the Egyptian army, and military chiefs had

settled in the large towns and acquired wealth and power while the native rulers had grown weaker and weaker. The rulers of the 22nd dynasty were clearly, from their names, of foreign extraction, and their genealogy indicates a Libyan origin. Sheshonk (the biblical Shishak) I, the founder of the dynasty, seems to have fixed his residence at Bubastis in the Delta, married his son to the daughter of the last king of the Tanite dynasty, and secured Thebes. Whereas King Solomon of Israel appears to have dealt with a 21st-dynasty king on basically an equal footing, Sheshonk sacked Jerusalem and carried off an enormous treasure in *c.* 930 BC.

Osorkon I inherited a prosperous kingdom from his father and succeeded in making his son high priest of Amon, but no further progress was made. It required a strong hand to curb the Libyan chieftains, and divisions soon began to show themselves in the increasingly feudalized kingdom.

The 23rd, or Theban, dynasty (*c.* 817–*c.* 730 BC) was contemporaneous with the end of the 22nd and was dominated by another branch of the Bubastites. By then the kings of both the 22nd and the 23rd dynasties had little hold upon the subject princes, who spent the resources of the country in feuds among themselves.

Bubb Dodington, George, BARON MELCOMBE: *see* Dodington, George Bubb.

bubble chamber, radiation detector, developed in 1952 by a U.S. nuclear physicist, Donald A. Glaser, that uses as the detecting medium a superheated liquid that boils into tiny bubbles of vapour around the ions produced along the tracks of subatomic particles. Because of the relatively high density of the bubble-chamber liquid, often a species of liquid hydrogen, in contrast to vapour-filled cloud chambers, many nuclear reactions are observable in detail.

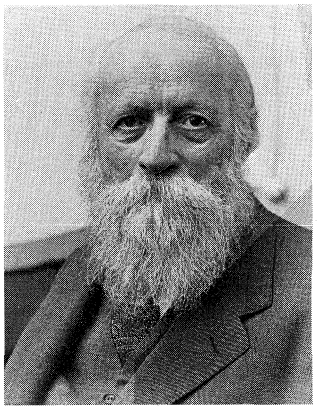
bubble shell, any of various marine snails of the order Cephalaspidae (subclass Opisthobranchia of the class Gastropoda). It characteristically has a thin, fragile, globular shell that is more or less embedded in the body of the animal.

Many of these snails are active predators, feeding on other gastropods as well as on bivalves and polychaete worms, which they swallow whole and then crush between gizzard plates of calcareous material. Some of the larger forms, such as the genera *Bulla, Haminoea,* and *Akera,* are, however, herbivorous, feeding largely on green algae. Bubble shells are hermaphroditic (*i.e.*, functional reproductive organs of both sexes occur in the same individual); most lay eggs in jelly-like strings on mud or seagrasses. Bubble shells are found in all the oceans. Species of *Bulla* are particularly common in shallow-water seagrass meadows of the Tropics.

Bubenberg, Adrian von (b. 1431?, Spiez, Switz.—d. August 1479, Bern), Swiss soldier and politician, leader of the Bernese forces at the Battle of Morat (June 22, 1476), which marked the end of the Swiss Confederation's war with Burgundy (1474–76).

Magistrate for Bern (1468–69, 1473–74, 1477–79) and a partisan of the feudal aristocracy in its struggle with the emerging Bernese bourgeoisie, Bubenberg opposed the alliance of the Swiss Confederation with France against Burgundy and attempted to secure peaceful relations with the ambitious ruler of Burgundy, Charles the Bold. With the outbreak of the Burgundian War (October 1474), he went temporarily into exile but returned shortly to lead the Bernese contingent in the defense of Morat, an encounter that won for the Swiss Army a reputation as the finest force in Europe. For his outstanding role at Morat, Bubenberg has remained a popular figure in Swiss history.

Buber, Martin (b. Feb. 8, 1878, Vienna—d. June 13, 1965, Jerusalem), German-Jewish religious philosopher, biblical translator and interpreter, and master of German prose style. During the Nazi regime, his outspoken Zionism and opposition to Nazi principles resulted in a ban on his public lectures; in 1938 he migrated to Palestine. Buber's philosophy was centred on the encounter, or dialogue, of man with other beings, particularly exemplified in the relation with other men but ultimately



Buber
By courtesy of Israel Information Services

resting on and pointing to the relation with God. This thought reached its fullest dialogical expression in *Ich und Du* (1923; *I and Thou*). Among his biblical works was his translation of the Bible (with Franz Rosenzweig).

From Vienna to Jerusalem. Buber was the son of Carl Buber, an agronomist, and his wife—both assimilated Jews. When Martin was three his mother left his father, and the boy was brought up by his grandparents in Lemberg (now Lvov, Ukrainian S.S.R.). The search after the lost mother became a strong motive for his dialogical thinking—his I–Thou philosophy (see below).

Solomon Buber (1827–1906), the Lemberg grandfather, a wealthy philanthropist, dedicated his life to the critical edition of Midrashim, a part of the nonlegal rabbinic lore. His works show him as a Hebrew gentleman-scholar who was also interested in Greek linguistic parallels. His wife, Adele, was even more a product of the 19th-century Enlightenment movement among eastern European Jewry that sought to modernize Jewish culture. Though strongly influenced by both his grandparents and taught Hebrew by Solomon, young Martin was drawn more to Schiller's poems than to the Talmud. His inclination toward general culture was strengthened by his grammar school education, which provided him with an excellent grounding in the classics. During his adolescence his active participation in Jewish religious observances ceased altogether.

In his university days—he attended the universities of Vienna, Berlin, Leipzig, and Zürich—Buber studied philosophy and art. His doctoral dissertation (Vienna, 1904) dealt with the theories of individuation in the thought of two great mystics, Nicholas of Cusa and Jakob Böhme, but it was Friedrich Nietzsche's proclamation of heroic nihilism and his criticism of modern culture that exerted the greatest influence on Buber at that time. The Nietzschean influence was reflected in Buber's turn to Zionism and its call for a return to roots and a more wholesome culture.

On the invitation of the Zionist leader Theodor Herzl, in 1901 he became editor of the Zionist weekly *Die Welt* ("The World"). But soon a significant difference of opinion developed between the two men. Buber favoured an overall spiritual renewal and, at its core, immediate agricultural settlements in Palestine, as against Herzl's emphasis on diplomacy to bring about the establishment of a Jewish homeland secured by public law. Consequently, Buber resigned his post the same year he assumed it; he remained a Zionist but generally stood in opposition to official party policies and later to official state policies of Israel. He was among the early protagonists of a Hebrew university in Jerusalem.

In 1916 Buber founded the influential monthly *Der Jude* ("The Jew"), which he edited until 1924 and which became the central forum for practically all German-reading Jewish intellectuals. In its pages he advocated the unpopular cause of Jewish-Arab cooperation in the formation of a binational state in Palestine.

After his marriage (1901) to a non-Jewish, pro-Zionist author, Paula Winckler, who converted to Judaism, Buber took up the study of Ḥasidism. His *Chassidischen Bücher* (1927) made the legacy of this popular 18th-century eastern European Jewish pietistic movement a part of Western literature. In Ḥasidism Buber saw a healing power for the malaise of Judaism and mankind in an age of alienation that had shaken three vital human relationships: those between man and God, man and man, and man and nature. They can be restored, he asserted, only by man's again meeting the other person or being who stands over against him, on all three levels—the divine, human, and natural. Buber maintained that early Ḥasidism accomplished this encounter and that Zionism should follow its example.

In *Paths in Utopia* (English translation of the original Hebrew; 1949) he referred to the Israeli kibbutz—a cooperative agricultural community the members of which work in a natural environment and live together in a voluntary communion—as a "bold Jewish undertaking" that proved to be "an exemplary non-failure," one example of a "utopian" socialism that works. Yet he did not ascribe ultimate success to it. His reservation stemmed from the fact that, generally, members of the kibbutz disregarded the relation between man and God, denying or doubting the existence or presence of a divine counterpart. In the interpersonal area they fulfilled God's commandment to build a just community while yet denying the divine origin of the implicit imperative. Buber as an educator tried to refute these ideological "prejudices of youth," who, he asserted, rightly criticize outworn images of God but wrongly identify them with the imageless living God himself.

Buber's pedagogical work reached a climax under the new conditions created by the Nazi assumption of power. In November 1933 he became head of the newly reopened Freies Jüdisches Lehrhaus for Jewish adult education in Frankfurt am Main. In 1934 he became director of the whole organization of Jewish adult education and retraining of Jewish teachers in Nazi Germany, where Jewish teachers and students were being progressively excluded from the educational system. He was a courageous spokesman of spiritual resistance. As against the Nazi nationalism of "blood and soil," he stressed that, while the Jew must maintain his authentic Jewish existence, the educational aim could not be racist (*Völkisch*). His old slogan "to be human in a Jewish way" was now completed by the demand to be Jewish in a humane way.

After the Nazi secret police forbade his public lectures and then all of his teaching activities, he emigrated as a man of 60 to Palestine. He activated his Hebrew and soon took part in the social and intellectual life of the Palestinian Jewish community. He was appointed to a professorship in social philosophy at Hebrew University in Jerusalem, a post he held until 1951. He was the first president of the Is-

raeli Academy of Sciences and Arts. After the establishment of the State of Israel and with the beginning of mass immigration from the Islāmic countries, Buber initiated the founding of the Teachers Training College for Adult Education in Jerusalem and became its head (1949). This college trained what were probably the best educators for the immigrants from the Middle East and North Africa, many of them having been chosen from among the immigrants.

As a teacher of adults, Buber enjoyed the cooperation of his political adversaries and sometimes also of his religious adversaries. Though he denied the obligatory character of Jewish religious Law and emphasized a nonlegalistic prophetic type of religion, some of the Orthodox also worked with him. Buber's endeavours in adult education were based on his insight that adults again become educable when crisis threatens their spurious security.

From mysticism to dialogue. Buber's manifold activities were inspired by his philosophy of encounter—of man's meeting with other beings. An early mystical period culminated in *Daniel* (1913), five dialogues on orientation and realization, man's two basic stances toward the world. Orientation takes the world as a static state of affairs governed by comprehensible laws. It is a receptive, analytical, or systematizing attitude. Realization, on the other hand, is a creative, participative attitude that realizes the possibilities in things, experiencing through one's own full reality the full reality of the world. It operates within an open horizon of possibilities.

The *Reden über das Judentum* (1923; "Talks on Judaism") mark another step in his development. The early "Talks" were delivered in 1909–11 before large Zionist student audiences in Prague; each of the speeches tries to answer its opening question: "Jews, why do we call ourselves Jews?" To half-assimilated Zionists in search of a rationale for their Jewish existence, Buber offered his theories regarding the essence of Judaism, basing his quest for it on his listeners' assumed identity as Jews. In some of the "Talks," as well as in *Daniel,* the mystic element still prevails, but Buber later abandoned the notion of a mystical union between man and God and embraced instead the notion of their encounter, which presupposes and preserves their separate existence.

This basic view underlies Buber's mature thinking; it was expressed with great philosophic and poetic power in his famous work *Ich und Du* (1923; *I and Thou*). According to this view, God, the great Thou, enables human I–Thou relations between man and other beings. Their measure of mutuality is related to the levels of being: it is almost nil on the inorganic and botanic levels, rare on the animal level, but always possible and sometimes actual between human beings. A true relationship with God, as experienced from the human side, must be an I–Thou relationship, in which God is truly met and addressed, not merely thought of and expressed.

Between man and man, the I–Thou relationship into which both parties enter in the fullness of their being—as in a great love at its highest moment or in an ideal friendship—is an exception. Generally, we enter into relationships not with the fullness of our being but only with some fraction of it. This is the I–It relationship, as in scholarly pursuits in which other beings are reduced to mere objects of thought or in social relations (*e.g.,* boss and worker) wherein persons are treated largely as tools or conveniences. This form of relationship enables the creation of pure and applied science as well as the manipulation of man by man. Buber's ethical concept of the demarcation line—to be drawn anew every day between the maximum of good that can be done in a concrete situation and the minimum of evil that must be done in it—calls for an I–Thou relation whenever possible and settles for an I–It relation whenever necessary—*e.g.,* for the purpose of human survival.

Toward God, any type of I–It relationship should be avoided, be it theoretical by making him an object of dogmas, juridical by turning him into a legislator of fixed rules or prayers, or organizational by confining him to churches, mosques, or synagogues. Buber's so-called religious anarchism—his rejection of any fixed rules of behaviour in the relation between man and God—opened to him new insights in his works on the Bible but also served as a block to an objective evaluation of biblical, let alone Talmudic, Law. He saw the Bible as originating in the ever-renewed encounter between God and his people, followed by a tradition that authentically reflected this experience and another that distorted it to serve later ideological aims. He ascribed most of the legal prescriptions of the Talmud to what he called the spurious tradition removed from the Thou relation with God. This interpretation has been criticized as one-sided and subjective; Buber mitigated it somewhat in his later years.

After the religious philosopher Franz Rosenzweig, Buber's friend and fellow translator of the Bible, read *Ich und Du,* he remarked: "Buber gives more recognition to the 'Thou' than anybody before him, but he wrongs the 'It'." To this Buber replied, many years later, that had he lived in a time when the Thou was flowering, he would have "sounded the praises of the It," but that in his time, when the Thou was withering, he had to do the reverse. This argument between Buber and his closest and greatest friend indicates his attitude toward normative Judaism. While Rosenzweig tried to live it as much as possible and became more and more a practicing Jew, Buber stood his ground as one who embodied his Judaism in no prescribed, special manner. This stance, in addition to his political views (*i.e.,* his opposition to Zionist policy toward the Arabs), set him apart from his own people. It made him, however, their main spokesman in the Jewish–Christian dialogue. In his *Zwei Glaubensweisen* (1950) he construed two religious types according to their approach to God: one called by the Hebrew term for trust, *emuna,* spelling mutual confidence between God and man (I and Thou), and the other called by the Greek term for faith, *pistis,* spelling the belief in the factuality of crucial events in salvation history—*e.g.,* Paul's statements about Jesus' life, death, and Resurrection. Judaism for Buber was the classical example of *emuna* and Christianity of *pistis,* although there was a good deal of *pistis* in historical Judaism and a good deal of *emuna* in historical Christianity. His Christian opponents on this and other matters still found a common ground with Buber, because he agreed to a dialogically open, if not dogmatically defined, universe of discourse in which they could talk fruitfully with one another.

The final years. In his last years a group of kibbutz members turned to him with their personal and communal problems. *Siḥot loḥamin* (1967; *The Seventh Day,* 1970), published by them shortly after the Six-Day War, testifies to Buber's living spirit by its self-searching attitude on ethical questions of war and peace and on Arab–Jewish relations.

An unprecedented event occurred at Buber's funeral in Jerusalem, a high state function: a delegation of the Arab Students' Organization placed a wreath on the grave of one who strove mightily for peace between Israel's and Palestine's two peoples. (A.E.Si.)

MAJOR WORKS. Some of Buber's works were written in Hebrew and later translated into German or English or both. Other works, particularly collections of essays, were published originally in German and later translated into English. Those of his writings that appeared only in Hebrew are not listed here.

Philosophical works. Ich und Du (1923; *I and Thou,* 1937 and 1970); *Rede über das Erzieherische* (1926); *Bildung und Weltanschauung* (1935); *Die Frage an den Einzelnen* (1936); *Netivot be-uṭopya* (1947; *Paths in Utopia,* 1949; *Pfade in Utopia,* 1950); *Das Problem des Menschen* (1948; published in *Dialogisches Leben,* 1947; "What Is Man?" in *Between Man and Man,* 1947); *Zwei Glaubensweisen* (1950; *Two Types of Faith,* 1951); *Zwischen Gesellschaft und Staat* (1952); *Bilder von Gut und Böse* (1952; *Images of Good and Evil,* 1952; *Good and Evil, Two Interpretations,* 1953); *Eclipse of God* (1952; *Gottesfinsternis,* 1953).

Biblical and religious works. Daniel: Gespräche von der Verwirklichung (1913; rev. ed. 1919); *Die Schrift,* 15 vol. (1926?–?37; rev. ed. 1954–62), a translation of the Hebrew Bible into German; *Königtum Gottes,* vol. 1 of *Das Kommende* (1932; Eng. trans. from the 3rd German ed. of 1956, *Kingship of God,* 1966); *Gog u-megog* (1941; *For the Sake of Heaven,* 1945; *Gog und Magog,* 1957); *Torat ha-nevi'im* (1942; *The Prophetic Faith,* 1949; *Der Glaube der Propheten,* 1950); *Moshe* (1945; *Moses,* 1946 and 1952); *Ha-tzedeq weha'awon* (1950; *Right and Wrong,* 1952); *Elija: ein Mysterienspiel* (1963).

Ḥasidism. Die Geschichten des Rabbi Nachman (1906, rev. ed. 1955; *The Tales of Rabbi Nachman,* 1956); *Die Legende des Baalschem* (1908; *The Legend of the Baal-Shem,* 1955); *Die chassidischen Bücher* (1927; Eng. trans. in 2 vol., *Tales of the Hasidim,* 1947–48; later German ed. *Die Erzählungen der Chassim,* 1949); *Der Weg des Menschen nach der Chassidischen Lehre* (1948; *The Way of Man, According to the Teachings of Hasidism,* 1950; 2 vol., *Hasidism and the Way of Man,* 1958, 1960).

Other works. Ben 'am le-'artzo (1945; *Israel und Palästina,* 1950; Eng. trans. from the German, *Israel and Palestine,* 1952); *Bücher und Menschen* (1952); *An der Wende* (1952; *At the Turning,* 1952); *Der Mensch und sein Gebild* (1955).

BIBLIOGRAPHY. Moshe Cattane (comp.), *A Bibliography of Martin Buber's Works (1897–1957)* (1958).

Biographies. Maurice Friedman, *Martin Buber's Life and Works,* vol. 1, *The Early Years, 1878–1923* (1981), vol. 2, *The Middle Years, 1923–1945* (1983), vol. 3, *The Later Years, 1945–1965* (1984), definitive biography in English; Hans Kohn, *Martin Buber: Sein Werk und seine Zeit* (1930; new ed. with a postscript by Robert Weltsch, 1963), authoritative biography in German; "My Way to Hasidism" in *Hasidism and Modern Man* (1958); "Autobiographical Fragments: Martin Buber," in Schilpp and Friedman, ch. 1 (cited below); Aubrey Hodes, *Martin Buber: An Intimate Portrait* (1971), worthwhile reading, though not fully reliable in all factual details.

Writings on Buber. Paul Arthur Schilpp and Maurice Friedman (eds.), *The Philosophy of Martin Buber* (1967), 30 critical essays by different authors on Buber's impact on such fields as theology, philosophy, Zionism, Ḥasidism, and education; Sidney and Beatrice Rome (eds.), "Interrogation of Martin Buber," in *Philosophical Interrogations,* new ed. (1970), queries by various thinkers and scholars with answers by Buber; Hans Urs von Balthasar, *Einsame Zwiesprache: Martin Buber und das Christentum* (1958; *Martin Buber and Christianity: A Dialogue Between Israel and the Church,* 1961), a Roman Catholic scholar's friendly but critical answer to *Two Types of Faith;* Arthur A. Cohen, *Martin Buber* (1957), a critical appreciation from a more traditional Jewish standpoint; Malcolm L. Diamond, *Martin Buber: Jewish Existentialist* (1968), an empathetic analysis of one central aspect of Buber's thought; Maurice Friedman, *Martin Buber: The Life of Dialogue* (1960, 3rd ed. 1976), the pioneer work on Buber in English; Will Herberg, *The Writing of Martin Buber* (1956), an excellent introduction and a good selection of quotations from Buber's work; Roy Oliver, *The Wanderer and the Way: The Hebrew Tradition in the Writings of Martin Buber* (1968), a personal testimony of a former follower and student of Gandhi for whom Buber's biblical work became a turning point; Grete Schaeder, *Martin Buber: Hebräischer Humanismus* (1966; *The Hebrew Humanism of Martin*

Buber, 1973), a standard work, partly done under Buber's personal supervision; Akiba Ernst Simon, "Jewish Adult Education in Nazi Germany As Spiritual Resistance," in *Yearbook I* of the Leo Baeck Institute, pp. 68–104 (1956), deals largely with Buber's initiative, educational philosophy, and practical leadership; "Martin Buber and German Jewry," in *Yearbook III*, pp. 3–39 (1958), deals inter alia with Buber's relation to Herzl, H. Cohen, and F. Rosenzweig.

Būbiyān, island of Kuwait, located at the head of the Persian Gulf. It is the largest of a group of eight islands situated just southwest of the mouth of the Shatt (stream) al-Arab that divides Iraq and Iran. Like all of the group except Jazīrat (island) Faylakah, about 8 mi (13 km) to the south, Būbiyān is uninhabited. Būbiyān is separated from the Kuwait mainland to the west by the narrow Khawr (channel) aṣ-Ṣabīyah. The island is about 25 mi long and 15 mi wide and covers an area of 333 sq mi (863 sq km). The topography of the island is flat and low; salt marshes run almost the entire length of its coast, and the northwestern coast is deeply indented swampland. There are a few intermittent wadis in the central part of the island. A storehouse was established in 1902 by the Ottoman Turks near Ra's (cape) al-Qayd, the easternmost point of the island, but was subsequently abandoned. Iraq, whose port Umm Qaṣr is located nearby on the Khawr az-Zubayr, unsuccessfully claimed half of the island of Būbiyān in the 1970s.

Bubnov, Andrey Sergeyevich (b. April 4 [March 23, old style], 1883, Ivanovo–Voznesensk, Russia—d. Jan. 12, 1940), Bolshevik revolutionary and Communist Party and Soviet government official who became a prominent education official.

Expelled in his youth from the Moscow Agricultural Institute for revolutionary activities, Bubnov joined the Russian Soviet Democratic Labour Party in 1903. He carried out various organizational and other party assignments from 1905 to 1917 and was repeatedly arrested and imprisoned by the tsarist regime. A longtime supporter of Lenin's faction within the party, Bubnov was raised to full membership in the Bolshevik Central Committee after the February Revolution of 1917.

Bubnov was responsible for securing control of the railroad stations in Petrograd (now Leningrad) during the October Revolution. After the Bolsheviks' seizure of power he continued to hold high party and also high government posts despite briefly participating in the Left Communist (1918) and Democratic Centralist (early 1920s) oppositions to Bolshevik rule. After 1924, however, Bubnov became a staunch supporter of Stalin. As people's commissar of education (1929–37), Bubnov ended the period of progressive, experimental educational practices in the Soviet Union. He struggled to institute universal compulsory education and reorganized the educational system to emphasize training in practical industrial skills. He was arrested during the purges of the late 1930s and executed, but was posthumously rehabilitated.

Bucaramanga, capital of Santander department, north central Colombia, situated on the northeastern slopes of the Andean Cordillera (mountains) Oriental at 3,146 ft (959 m) above sea level. Founded in 1622, Bucaramanga gained commercial significance at an early date. It is in a coffee- and tobacco-producing area, and its manufactures include cigars, cigarettes, textiles, straw hats, and iron products. The Industrial University of Santander was established in Bucaramanga in 1947. The city is connected by railroad with Puerto Wilches, on the Río Magdalena; by highway with major cities of eastern Colombia and Venezuela; and by air services with

A small park in the centre of Bucaramanga, Colom.
Carl Frank

Bogotá and the cities of the Caribbean coast. Pop. (1984 est.) 405,810.

Bucareli y Ursúa, Antonio María (b. Jan. 24, 1717, Seville—d. April 9, 1779, Mexico City), Spanish soldier and statesman, noted for his excellent administration as the prudent and humane colonial viceroy of New Spain (Mexico) from 1771 to 1779. Under his rule Mexico enjoyed greater prosperity and security than most of Spanish America.

Bucareli began his military career as a soldier for Spain in Italy, where he attained the rank of lieutenant general. In 1760 he was made viceroy of Cuba, a post he held until he was appointed governor of New Spain (1771).

Bucareli's military accomplishments in Mexico included the pacification of the Indian tribes in the north, the elimination of bands of criminals that had roamed freely throughout the country, and the construction of forts at Acapulco, Perote, and Acordada. He also fostered the drainage of the Valley of Mexico, reformed the system of taxation, and promoted improvements in minting currency and in establishing fixed weights for coins. He encouraged the settlement of California and assisted in the founding of the port of San Francisco.

Advanced for their time, Bucareli's welfare policies included the construction of the mental asylum of San Hipólito and the founding of a hospital for the poor in Mexico City. In the field of culture, he promoted the arts and sciences and helped to beautify Mexico City by encouraging the construction of the square that bears his name. Shortly before his death he compiled a collection of documents known as the *Colección de todas las providencias de su gobierno y reglamento para el cuerno de militares invalidos en la N. E.* ("Collection from All the Provinces of His Government and Rules for the Incapacitated Military in New Spain").

buccaneer, English, French, or Dutch sea adventurer, who haunted chiefly the Caribbean and the Pacific seaboard of South America, preying on Spanish settlements and shipping during the second half of the 17th century. In their own day buccaneers were usually called privateers; the word buccaneer came into use after the publication, in 1684, of *Bucaniers* [sic] *of America,* the English translation of *De Americaensche zee-rovers,* by the Dutchman Alexander Esquemelin (or Exquemelin), whose work was a fecund source of tales of these men.

The term buccaneer is derived from the French *boucan,* a grill for the smoking of *viande boucanée,* or dried meat, for use in ships at sea. The French called their adventurers *flibustiers* (from the Dutch *vrijbuiter,* "freebooter"), and the Dutch called theirs *zeerovers;* the Spaniards called them *corsarios.* The earliest buccaneers were hunters in western Hispaniola (Haiti) in the early 17th century. They spread from there to the island of Tortuga, the French governors of which were liberal in issuing commissions for attacks on Spanish maritime trade. Jamaica, after its capture by the English in 1655, also afforded a base for their activities.

The early buccaneers were escaped servants, former soldiers, and logwood cutters from the Campeche coast (in present southern Mexico). They exercised a democratic discipline among themselves when they went off "on the account," electing their captains, marooning mutineers, arranging for the equitable distribution of shares of plunder and drawing up elaborate insurance schemes for injuries suffered. Since they attracted to their ranks such remarkable men as William Dampier, Lionel Wafer, and Basil Ringrose, who wrote racy accounts of their adventurous cruises, they exercised a greater influence on subsequent generations than was justified by their exploits.

The historical importance of the buccaneers lies chiefly in the influence they had on the founding of the abortive Scottish colony at Darién, on the Isthmus of Panama (1698), and on the foundation of the South Sea Company and also in the way in which they inspired later and more serious voyages of exploration in the Pacific by the publicity their writings enjoyed. Their stories also influenced such important authors as Jonathan Swift, Daniel Defoe, and Robert Louis Stevenson. The chief bond between these Brethren of the Coast, as they styled themselves, was hostility toward the Spaniards, who then regarded the Caribbean and the South Pacific sea lanes as their monopoly.

The buccaneers were largely inspired by the example of 16th-century seamen, such as Sir Francis Drake, but they are to be distinguished from genuine privateers because the commissions that they held were seldom valid. They are also to be distinguished from the outlawed pirates of the 18th century, although many of their actions can be called piratical. The earliest buccaneers went under assumed names, such as L'Olonnais (Jean-David Nau) or Rock Brasiliano, a Dutchman who had lived in Brazil. With the appearance of Henry Morgan, an outstanding leader, they began to organize themselves into powerful bands that captured Portobelo in 1668 and Panamá in 1671. As the Treaty of Madrid (1670) had only recently been signed to compose Anglo-Spanish differences in those parts, the news of his success at Panamá was not officially welcome. Morgan was brought back to England under arrest, but, on the renewal of trouble with Spain, he was knighted and sent out as deputy governor of Jamaica. He and his superiors attempted to suppress buccaneering, a task impossible without adequate naval patrols. The last great buccaneering enterprise was the unsuccessful attack on Panamá in about 1685 by a force of about 3,000 men led by Edward Davis, John Eaton, Charles Swan, and others. On the outbreak of the War of the Grand Alliance in 1689, these freebooters became legitimate privateers in the service of their respective nations, and buccaneering came to an end. *See also* privateer.

bucchero ware, Etruscan earthenware pottery common in pre-Roman Italy chiefly between about the 7th and early 5th centuries BC. Characteristically, the ware is black, sometimes gray, and often shiny from polishing. The colour was achieved by firing in an atmosphere charged with carbon monoxide instead of oxygen. This is known as a reducing firing, and it converts the red of the clay, due to the presence of iron oxide, to the typical *bucchero* colours. Although opinions vary about the precise times at which certain features of *bucchero* appeared, there is a scholarly consensus about the overall development of the ware. The finest products, the light, thin-walled *bucchero sottile,* appear to have been made in the 7th and early 6th centuries. In these wares technique is excellent, form tends to be refined and controlled, and decoration, usually incised or in relief, is generally subordinate to

form. The shapes and motifs of the mid- to late 7th century are derived largely from Oriental models, especially metalwork imported from Phoenicia and Cyprus. In the 6th century the influence of the Greeks emerges and forms change: alabastrums, amphoras, kraters, kylikes, etc., decorated with incised, modelled, or applied birds and animals in friezes or in association with geometric schemes appear. Decoration is sometimes limited to continuous bands of narrative figure reliefs, like those on painted Greek vessels. These were produced by rolling a cylinder with a recessed design over the soft clay. Eventually the Greek black pigment came to be used. Stylized human and animal figures were painted on the surface of *bucchero* in black, red, and white; and the black-figure style was expertly copied. Technique and workmanship declined from about the mid-6th century onward, when *bucchero sottile* was replaced by *bucchero pasantë,* a heavy, thick-walled ware, overly complex in form and ostentatiously decorated with reliefs.

Buccleuch, James Scott, duke of: *see* Monmouth, James Scott, duke of.

Bucegi Massif, Romanian MUNŢII BUCEGI, mountain massif, one of the four forming the Transylvanian Alps (Southern Carpathians), south central Romania, rising to 8,225 ft (2,507 m) in Mt. Omu. The group includes the Leaota Massif and Piatra Craiului, both structurally part of the Bucegi Massif but separated from it by the Bran Pass and often considered to be part of the eastern Făgăraş Mountains (*q.v.*). Leaota is a rounded profile of crystalline rocks, but Bucegi and Piatra Craiului are overlain by calcareous conglomerates and have sharper landforms. These include the Sphinx and Babele (Old Women), the latter shaped like giant toadstools. The mountains are a centre for hiking, climbing, and winter sports.

Bucentaur, Italian BUCINTORO, in the Republic of Venice, a highly decorated galley used by the doge on solemn state occasions, especially at the annual ceremony of the "wedding of the sea" (*sposalizio del mare*) on Ascension Day. That ceremony was inaugurated about 1000 and symbolized the maritime supremacy of Venice. It took the form of a solemn procession of boats out to sea, headed by the doge's *maesta nave* (from 1311, the bucentaur). When at sea, the doge dropped a consecrated ring into the water, with the words *Desponsamus te, mare* ("We wed thee, sea"). The last Bucentaur, built in 1729, was destroyed by the French in 1798 for the sake of its gold decorations, but remains of it are preserved at Venice in the Civico Museo Correr and in the Arsenal.

Bucer, Martin, Bucer also spelled BUTZER (b. Nov. 11, 1491, Schlettstadt, Alsace—d. Feb. 28, 1551, England), Protestant Reformer, mediator, and liturgical scholar best known for his ceaseless attempts to make peace between conflicting reform groups. He influenced not only the development of Calvinism but also the liturgical development of the Anglican Communion.

Bucer, medal by Friedrich Hagenauer, 1543; in the Archives et Bibliothèque de la Ville de Strasbourg

By courtesy of the Archives et Bibliotheque de la Ville de Strasbourg

Bucer entered the Dominican monastic order in 1506. He was sent to study at the University of Heidelberg, Germany, where he became acquainted with the works of the great Humanist scholar Erasmus and of Martin Luther, the founder of the Protestant Reformation. In 1521 Bucer withdrew from the Dominicans and entered the service of the count palatine of the Rhine, one of the seven electors of the Holy Roman emperor. The following year he became pastor of Landstuhl, where he married a former nun. Excommunicated by the church in 1523, he made his way to Strassburg, where his parents' citizenship assured him of protection. His personal charm, intellectual abilities, and zeal eventually gained him a position of leadership in Strassburg and southern Germany.

Under the influence of Erasmus, he had accepted the ideals of Christian Humanism and the Renaissance, which called for a rebirth of what the Humanists believed was the true good, the original rightness, in man and society.

When caught up in the enthusiasm of the Reformation that was rapidly spreading in northern Europe, Bucer became a Protestant Reformer. He envisioned a renewal of man and society that was based on his earlier Humanist views, and he believed that such a renewal would result from the preaching of the true gospel and from faithful adherence to the divinely given pattern of living found in the Bible. This reform through conversion, piety, and discipline found its fullest expression in the massive program for the reformation of England that he presented to King Edward VI of England in 1551.

Bucer's adopted city, Strassburg, lay between the area influenced by the most important Swiss Reformer, Huldrych Zwingli—southern Germany and Switzerland—and the area influenced by Luther—northern Germany. After 1524 Luther and Zwingli clashed over the meaning of the words,"This is my body," a central phrase in the liturgy of the Lord's Supper. Summoned to Marburg by the landgrave, Philip of Hesse, in 1529, the two leading Reformers and other Reformers engaged in a colloquy to settle the dispute. Luther held to the traditional view that Christ was really present in the bread and wine of the sacrament of the Lord's Supper; Zwingli espoused a spiritual interpretation that was common among the Humanists; Bucer believed that the two opposing views could be reconciled. But when, at the end of the colloquy, Zwingli and Bucer proffered their hands in fellowship to Luther, he refused.

Believing that the rift between the two reform movements could be bridged, Bucer participated in nearly every conference on religious questions held in Germany and Switzerland between 1524 and 1548. In the various colloquies between Protestants and Catholics or between German Lutheran and Swiss Reform churchmen, Bucer often advocated the use of obscure language and ambiguous formulas when explicit agreement between the opposing parties was impossible to attain. His justification for the use of ambiguity was that he believed that the essential goal was the reform of the people and the doctrinal issues could be worked out later. At Basel, in 1536, Bucer participated in the writing of the First Helvetic Confession, a document that was considered by many Reformed theologians to veer too much toward Luther's views, especially regarding the Lord's Supper. At Wittenberg, Ger., in the same year, Bucer took part in a conference between Lutheran and Reformed theologians. Philipp Melanchthon, a Lutheran Humanist theologian with whom he has often been compared, also attended the conference. It appeared for a time as though Bucer and Melanchthon were about to achieve their goal of ending the dispute over the Lord's Supper, a dispute that had split the Reformation on the Continent into two major groups. Luther, in satisfaction over the apparent agreement that Bucer and Melanchthon had helped to bring about, declared, "We are one, and we acknowledge and receive you as our dear brethren in the Lord." Bucer is reported to have shed tears at Luther's words. Melanchthon subsequently drew up the Wittenberg Concord incorporating the agreement, but, to Bucer's and Melanchthon's disappointment, it failed to effect a lasting union. The Swiss were unhappy that Bucer had made concessions that leaned toward the doctrine of the real presence, and some thought that he should formally recant his statements as they were incorporated in the Wittenberg Concord.

Even though Bucer was criticized for his evasive approach and concealment of the issues in the controversies between the adherents of Zwingli and Luther, the civil authorities in many southern German areas sought his advice and guidance in arranging compromises based on edicts by local authorities. Since Bucer regarded these compromises as tailored to local circumstances, he soon was charged by all parties as having no conviction except that the end justifies the means. In his defense he claimed that each of these compromises was only a temporary measure, that he hoped that further changes gradually would be made. Bucer's policy of agreement by compromise was seen in a better light when it was applied to the problem of religious toleration. Under Bucer's policies there was less persecution of Anabaptists—the left wing of the early Reformers who espoused revolutionary concepts in political and social organization—and other minority groups in Strassburg than in most of Europe.

Bucer's policy of pragmatic solutions of problems proved to be especially controversial in the case of the bigamy of Philip of Hesse. Philip, the landgrave of Hesse who had given much support to Luther, Bucer, and other Reformers, had serious marital problems but thought it inadvisable to divorce his wife. Bucer aided Philip in persuading Luther, Melanchthon, and others to sanction a second wife for him on the basis of Old Testament plural marriages. In an effort to keep the scandal of Philip's bigamy secret, falsehoods were used, and the matter caused the Reformers' reputations much harm.

Apart from promoting intra-Protestant union, Bucer had long dreamed of healing the Protestant–Catholic rift, and in an effort to bridge these differences he engaged in secret negotiations with certain liberal, reform-minded Catholics. The Holy Roman emperor Charles V, for political reasons, pursued similar aims. Fearing a Turkish invasion of central Europe, he wanted, at almost any price, to restore unity between the princes of Germany. He accordingly called for a colloquy between Catholics and Protestants at Regensburg in 1541. Charles selected three Catholic and three Protestant theologians (including Bucer) to discuss the anonymous Regensburg Book, which proposed steps toward Catholic–Protestant union. When Charles used Bucer's rather far-reaching concessions in his secret negotiations with the liberal Catholics as the basis for an official solution of the controversy over the Reformation, Bucer, taken by surprise, denied any participation in a scheme for union. Both Catholics and Protestants rejected the Regensburg Book. Charles settled the matter for a time by subduing the Protestant powers, which would not accept any religious compromise by military force, and by

enforcing his own compromise scheme, the Augsburg Interim of 1548.

Although the Augsburg Interim did not concede much more to Catholicism than had some of his own earlier compromise solutions, Bucer vigorously opposed its acceptance by Strassburg. His view was that even a poor compromise was justified if it made some progress toward reform but that if Strassburg accepted the Augsburg Interim it would be a step backward. The armies of Charles, however, prevailed, and Strassburg discharged Bucer and several other Protestant ministers, all of whom were invited to England by the archbishop of Canterbury, Thomas Cranmer. There Bucer supported the offical, cautious reform program of Cranmer and the scholarly Nicholas Ridley against the more radical reform of the English Church urged by the Zwinglian John Hooper and the Scottish Reformer John Knox. *The First Prayer Book of Edward VI* (1549), the liturgical book of the newly reformed English Church that contained evidence of Lutheran influence, was submitted for formal criticism to Bucer, who could not speak English. His assessment, the *Censura,* delivered to the Bishop Ely a month before Bucer died, pointed out the vague Lutheranisms of the prayer book. *The Second Prayer Book of Edward VI* (1552), utilizing Bucer's criticism, offended the conservatives in the English Church and did not satisfy the more radical Reformers; it remained in force for about eight months. Bucer's influence as a mediator, however, continued to have its effect in subsequent attempts at compromise in the English Church in the 16th century.

(L.J.T.)

BIBLIOGRAPHY. The standard biography in English is Hastings Eells, *Martin Bucer* (1931). François Wendel, *Calvin: Sources et évolution de sa pensée religieuse* (1950; *Calvin: The Origins and Development of His Religious Thought,* 1963), discusses Bucer's influence upon Calvin. Wilhelm Pauck (ed.), *Melanchthon and Bucer,* pp. 155–394 (1969), gives an English translation, with an excellent introduction and commentary, of Bucer's *On the Kingdom of Christ,* presented to King Edward VI for the reform of the whole of English society. Constantin Hopf, *Martin Bucer and the English Reformation* (1946), is a scholarly study of Bucer's role in England and is supplemented on liturgical matters by G.J. van de Poll, *Martin Bucer's Liturgical Ideas* (1944). Among the few monographs in English on Bucer's theology is W. Peter Stephens, *The Holy Spirit in the Theology of Martin Bucer* (1970). Each of the above works contains an extensive bibliography. The definitive edition of the collected works of Bucer is now in progress; the Latin works edited by François Wendel *et al.* (1955–), and the German works edited by Robert Stupperich *et al.* (1960–).

Bucerotidae (bird family): *see* hornbill.

Buch, (Christian) Leopold, Freiherr von (baron of) (b. April 26, 1774, Angermünde, Prussia—d. March 4, 1853, Berlin), geologist and geographer whose far-flung wanderings and lucid writings had an inestimable influence on the development of geology during the 19th century.

From 1790 to 1793 Buch studied at the Freiberg School of Mining under the noted German geologist Abraham G. Werner. In 1796 he secured a position as an inspector of mines, but, because he was from a wealthy family, he soon was able to resign and devote himself to geological studies. His investigations of the Alps began in 1797. The following year he went to Italy, where his observations of the volcano Vesuvius first brought to his attention possible flaws in Werner's Neptunism, the theory that all rocks are formed by sedimentation (settling out at the bottom of the sea). His visit to the Auvergne Mountains in 1802 furthered his gradual conversion to volcanism, the theory that granite and many other rocks are formed by volcanic action. His studies vastly extended knowledge of volcanoes, and his search for combustible material, such

Buch, engraving by C. Schmetzer after a xylograph by Adolf Neumann

By courtesy of the Bild-Archiv, Österreichische Nationalbibliothek, Vienna

as coal, which Werner insisted was necessary for volcanic action, proved fruitless. The final blow was delivered to Werner's theories when Buch found volcanoes resting upon solid granite, implying that they are generated below primitive rock.

In 1806 Buch went to Scandinavia, where he established the parent source of many of the rocks found on the north German plains. He also was the first to observe that Sweden, from Frederikshald to Åbo, is slowly rising above the sea. His Scandinavian findings are given in *Reise durch Norwegen und Lappland* (1810; *Travels Through Norway and Lapland,* 1813).

Buch visited the Canary Islands in 1815, where he studied the complex volcanic system to which the islands owe their existence. Later he walked through the Hebrides and along the coasts of Scotland and Ireland, where he examined basalt deposits.

Upon his return to Germany, Buch continued his investigations of the structure of the Alps in an effort to explain their origin. He finally concluded that they resulted from vast upheavals of the Earth's crust. His magnificent geological map of Germany, composed of 42 sheets, anonymously published in 1826, was the first of its kind.

Articles are alphabetized word by word, not letter by letter

Buchalter, Louis, byname LEPKE (b. 1897, New York City—d. March 4, 1944, Ossining, N.Y., U.S.), U.S. crime syndicate boss and founder of the murder-for-hire organization popularly known as Murder, Inc.

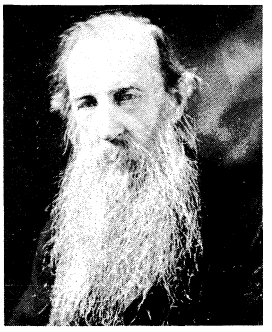
Born on New York's Lower East Side, Buchalter derived his nickname from "Lepkeleh" (Yiddish for "Little Louis"). As a youth he was already into shoplifting and burglary and, by the age of 22 in 1919, had served two prison terms. In the 1920s he ganged up with a collection of Jewish, Irish, and Italian mobsters engaged mainly in extortion and labour racketeering. Between 1932 and 1934 he allied with Lucky Luciano in founding the national crime syndicate. About 1933 he put together his best killer-enforcers, under the command of such gunmen as Albert Anastasia and Abe "Kid Twist" Reles, and established as a sideline an organization that would kill—or beat or mutilate—anyone (except syndicate members) for a price. As an associate would comment, "Lep loves to hurt people." The outfit was later popularly dubbed Murder, Inc.

In 1937 U.S. federal and New York agencies of justice began closing in on Buchalter, forcing him into hiding; and not until Aug. 24, 1939, did he surface again, tricked into surrendering to the FBI. Within a month he was convicted of narcotics conspiracy and sentenced to 14 years in federal prison. The following year he was tried in New York for murder on the testimony of Abe Reles and another former associate. Convicted, he and two of his lieutenants, Mendy Weiss and Louis Capone, died in the electric chair at Sing Sing State Prison in 1944.

Buchan (Scotland): *see* Banff and Buchan.

Buchan, Alexander (b. April 11, 1829, Kinneswood, Kinross, Scot.—d. May 13, 1907, Edinburgh), eminent British meteorologist who first noticed what became known as Buchan spells—departures from the normally expected temperature occurring during certain seasons. They are now believed by meteorologists to be more or less random. Buchan is credited with establishing the weather map as the basis of weather forecasting as a result of his tracing, in 1868, the path of a storm across North America and the Atlantic into northern Europe.

Buchan took up teaching as a profession and botany as a hobby. In December 1860 he was appointed secretary of the Scottish Meteorological Society and edited and largely wrote the society's journal, thereby gaining an international reputation. In 1887 he was made a



Alexander Buchan

BBC Hulton Picture Library

member of the Meteorological Council and in 1898 was elected a fellow of the Royal Society. In 1902 he received the first award of the Symons medal as the most eminent British meteorologist. He had a full share in the opening, in 1883, of the Ben Nevis observatory and in the discussion of the observations until it closed in 1904.

In 1867 Buchan published his *Handy Book of Meteorology,* for many years a standard textbook. In 1869 he contributed to the Royal Society of Edinburgh a paper on "The Mean Pressure of the Atmosphere and the Prevailing Winds Over the Globe, for the Months and for the Year" which secured for him a preeminent place among meteorologists.

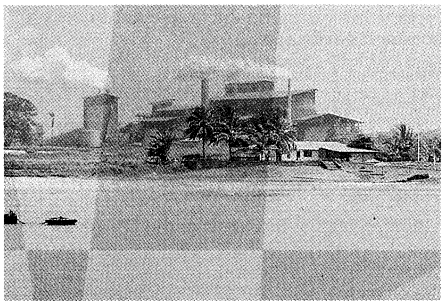
Buchan, John, 1ST BARON TWEEDSMUIR (b. Aug. 26, 1875, Perth, Perthshire, Scot.—d. Feb. 11, 1940, Montreal), statesman and writer best known for his swift-paced adventure stories. His 50 books, all written in his spare time while pursuing an active career in politics, diplomacy, and publishing, include many historical novels and biographies.

A clergyman's son, Buchan was educated at the universities of Glasgow and Oxford, where he began to publish fiction and history. He was called to the bar in 1901 and worked on the staff of the high commissioner for South Africa in that country (1901–03), forming a lifelong attachment to the cause of empire. Back in London, he became a director of Nelson's, the publishers for whom he wrote what is often held to be the best of his adventure stories in the style of Robert Louis Stevenson, *Prester John* (1910); it is a vivid, prophetic account of an African rising. During World War I Buchan held a staff appointment, and in 1917 he became director of information for the British government. His *Thirty-Nine*

Steps (1915) was the most popular of his series of secret-service thrillers and the first of many to feature Richard Hannay. The 1935 film of *The Thirty-Nine Steps,* directed by Alfred Hitchcock, is often acclaimed a classic motion-picture thriller.

After the war Buchan became assistant director of the British news agency Reuters and was member of Parliament for the Scottish universities, 1927–35. His biographies, *Montrose* (1928) and *Sir Walter Scott* (1932), are illuminated by compassionate understanding of Scottish history and literature. In 1935 he was raised to the peerage and appointed governor-general of Canada, which was the setting for his novel, *Sick Heart River* (1941; U.S. title, *Mountain Meadow*). His autobiography, *Memory Hold-the-Door,* was published in 1940.

Buchanan, also called GRAND BASSA, town, Atlantic seaport, central Liberia, West Africa. In 1835 Grand Bassa was founded at the mouth of the St. John River (2 miles [3 km] north-northwest) by black Quakers of the Young Men's Colonization Society of Pennsylvania. Subsequent communities on these sites were called Lower Buchanan and Upper Buchanan for Thomas Buchanan (a relative of James Buchanan, who later became the 15th president of the United States), who was the first U.S. governor of Liberia before



Iron-ore washing plant at Buchanan, Liberia
Bo Dahlin—Ostman Agency

its independence was proclaimed. The port (1963) exports iron ore, rubber, and palm oil and kernels. The Liberian American-Swedish Minerals Company (Lamco) built a railroad from its mine in the Nimba Range, 165 mi inland, to the port, where in 1968 it opened Africa's first iron-ore washing and pelletizing plant. Pop. (1974) 23,999.

Buchanan, Franklin (b. Sept. 17, 1800, Baltimore—d. May 11, 1874, Talbot County, Md., U.S.), first superintendent of the U.S. Naval Academy at Annapolis, Md. (1845–47), and senior naval officer of the Confederacy during the American Civil War (1861–65).

Franklin Buchanan, 1861
By courtesy of the U.S. Navy

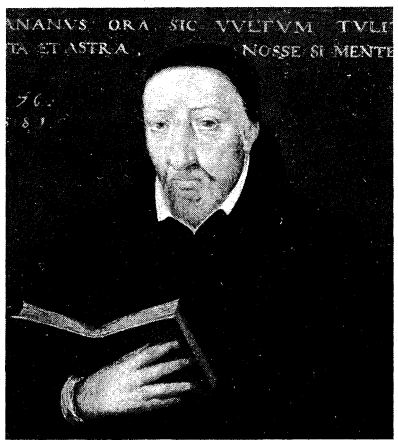
A midshipman in 1815, Buchanan served until 1845, when he submitted a plan for organizing a national naval academy at Annapolis. When the academy was founded in the same year, he was appointed to head it. In 1847–48 he saw active service in the Mexican War, and in 1852–54 he accompanied Commo. Matthew C. Perry's expedition to Japan.

In April 1861, on the eve of the Civil War, Buchanan resigned his commission, believing that Maryland would secede from the Union. He tried to recall his resignation but was dismissed the following month and entered the Confederate Navy. He commanded the ironclad ram *Virginia* (*Merrimack*) when it sank the Union frigates *Cumberland* and *Congress* in Hampton Roads (March 1862). Promoted to the rank of admiral in August, he served as senior officer thereafter. In Mobile Bay (August 1864) he fought Union ships with the ram *Tennessee* after other vessels of his own squadron were disabled or captured.

Buchanan, George (b. February 1506, Killearn, Stirlingshire, Scot.—d. Sept. 29, 1582, Edinburgh), Scottish Humanist, educator, and man of letters, who was an eloquent critic of corruption and inefficiency in church and state during the period of the Reformation in Scotland. He was also known throughout Europe as a scholar and a Latin poet.

After attending the University of Paris and the University of St. Andrews, Buchanan became a teacher in the Collège de Sainte-Barbe in Paris. There he taught Latin according to the new method of Thomas Linacre, whose book in English on Latin grammar he translated into Latin (1533). Because of Buchanan's two bitter attacks on the Franciscans—*Somnium* (1535) and *Franciscanus et fratres* (1527)—he was jailed as a heretic. He escaped and accepted a position as teacher at the Collège de Guyenne in Bordeaux, Fr. There Montaigne was one of his pupils. Buchanan found diversion in translating Euripides' *Medea* and *Alcestis* into Latin and in writing original dramas—*e.g., Baptistes* (1534) and *Jepthes* (1578)—attacking tyranny.

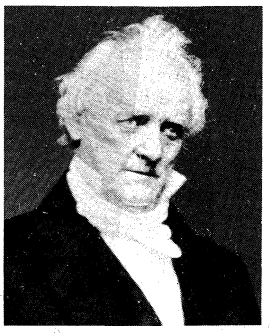
In 1547 he was teaching in a Portuguese experimental school. Accused of heresy, he was immured in a monastery for instruction but was released and allowed to leave Portugal in 1552. In captivity he had composed a paraphrase of the Psalms that was long used to instruct Scottish youth in Latin.



George Buchanan, detail of an oil painting by an unknown artist after a portrait by Arnold Bronkhorst, 1581; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

After serving as a tutor in France, during which time he wrote *De sphaera* (1555), a Latin poem in five books, and *Epithalamium* (1558), a poem on the marriage of Mary, Queen of Scots, to the French dauphin, he returned to Scotland in 1561. At first a supporter of Mary, he became her bitter enemy after the murder of her second husband, Lord Darnley, in 1567. He helped to prepare the case against Mary that was presented to Elizabeth I and that resulted eventually in Mary's execution. Under the several succeeding regents, he was tutor to the young king James VI (the future James I of England) and held other offices. *De jure regni apud Scotos* (1579), the most important of his political writings, was a resolute assertion of limited monarchy in dialogue form; *Rerum Scoticarum historia* (1582), which he was completing at the time of his death, traces the history of Scotland from the mythical Fergus.

Buchanan, James (b. April 23, 1791, near Mercersburg, Pa., U.S.—d. June 1, 1868, near Lancaster, Pa.), 15th U.S. president (1857–61), moderate Democratic leader whose efforts to find a compromise in the conflict between the North and the South failed to avert the Civil War (1861–65).



James Buchanan, photograph by Mathew Brady
By courtesy of the Library of Congress, Washington, D.C.

As a Federalist lawyer, Buchanan served in the Pennsylvania legislature (1814–16) and in the U.S. House of Representatives (1821–31). When his party disintegrated in the 1820s, Buchanan associated himself with the emerging Democratic Party. He served as U.S. minister to St. Petersburg (now Leningrad; 1831–33), U.S. senator (1834–45), and secretary of state (1845–49) in the Cabinet of Pres. James K. Polk. Failing to receive the presidential nomination in 1848, Buchanan retired from public service until 1853, when he was appointed minister to Great Britain.

Although he felt that slavery was morally wrong, Buchanan tried to impress the Southern party leadership with his respect for the Constitutional safeguards for the practice. Thus in 1846 he opposed the Wilmot Proviso, which would have prohibited the extension of slavery into the U.S. territories, and he supported the Compromise of 1850, which attempted to maintain a balance of Senate seats between slave and free states. In Europe he played a large part in drafting the Ostend Manifesto (Oct. 18, 1854), a diplomatic report recommending the U.S. acquisition of Cuba from Spain to forestall any possibility of a slave uprising there. It was feared that such an uprising might have an inflammatory effect on slaves in the United States. Having thus consolidated his position in the South, Buchanan was nominated for president in 1856 and was elected over Republican John C. Frémont and Millard Fillmore, the American (Know-Nothing) Party candidate.

Although well endowed with legal knowledge and experience in government, Buchanan lacked the soundness of judgment and moral courage to deal effectively with the slavery crisis. His strategy for the preservation of the Union consisted in the prevention of Northern antislavery agitation and the enforcement of the Fugitive Slave Act (1850). Embroiled in the explosive Kansas struggle (1854–59), he attempted to persuade Kansas voters to accept the unpopular Lecompton Constitution, which would have permitted slavery there. The economic panic of 1857 and the raid on the arsenal at Harpers Ferry, Va. (1859),

by the Abolitionist John Brown added to the national turmoil. Buchanan's position was further weakened by a split within the Democratic Party, which opened the way for the election of the Republican Abraham Lincoln as president in 1860.

By February 1861 seven Southern states had seceded from the Union. Buchanan denounced secession but admitted that he could find no means to stop it. The President refused to surrender any of the federal forts he could hold, however. Notably, he ordered reinforcements (January 1861) sent to Fort Sumter at Charleston, S.C., but when the federal supply ship was fired upon by shore batteries, it turned back, and Buchanan turned the problem over to the new administration.

Upon leaving office (March 4), Buchanan retired to his home near Lancaster, where he actively supported the Union cause until his death. His papers, edited by J.B. Moore, were published in *The Works of James Buchanan, Comprising His Speeches, State Papers, and Private Correspondence* (1908–10).

Buchanan, James M(cGill) (b. Oct. 2, 1919, Murfreesboro, Tenn., U.S.), American economist and educator who received the Nobel Prize for Economic Science in 1986 for his development of the "public choice theory," a unique method of analyzing economic and political decision making.

Buchanan attended Middle Tennessee State College (B.S., 1940), the University of Tennessee (M.A., 1941), and—after five years in the Navy—the University of Chicago (Ph.D., 1948). He taught at a number of universities from 1950 to 1969. From 1969 to 1983 he was distinguished professor of economics at the Virginia Polytechnic Institute, and from 1983 he held that title at George Mason University in Fairfax, Va.

Buchanan wrote a number of significant books—both with others and alone—the best known of which is *The Calculus of Consent: Logical Foundations of Constitutional Democracy* (1962), with Gordon Tullock. In this and other books, Buchanan discusses the politician's self-interest and other social (that is, noneconomic) forces that affect governmental economic policy. Among his other books are *The Demand and Supply of Public Goods* (1968); *Theory of Public Choice: Political Applications of Economics* (1972), ed. with Robert D. Tollison; *Democracy in Deficit: The Political Legacy of Lord Keynes* (1977), with Richard E. Wagner; and *The Power to Tax* (1980), with Geoffrey Brennan. He also cofounded (1969) and was director of the Center for Study of Public Choice.

Buchara (*oblast* and city, Uzbek S.S.R.): *see* Bukhara.

Bucharest, Romanian BUCUREŞTI, city and municipality, the economic, administrative, and cultural centre of Romania and the most easterly of European capitals outside the Soviet Union. It lies in the middle of the Romanian plain, on the banks of the Dîmboviţa, a minor northern tributary of the Danube.

Although archaeological excavations have revealed evidence of prehistoric settlement, the first written appearance of the name Bucureşti dates from 1459, when it was recorded in a document of Vlad Ţepeş (Vlad III the Impaler), whose rule (1448, 1456 to 1462, and again in 1476) of Walachia offered the area a brief respite from an ever-present Turkish threat. He built the fortress of Bucharest—the first of many fortifications—with the aim of holding back the Turks who were threatening the existence of the Walachian state and particularly its then capital, Tîrgovişte, 43 miles (69 km) away to the northwest.

Under the Ottoman suzerainty that was eventually established, Bucharest developed rapidly as the main economic centre of Walachia, becoming the capital in 1659. The names of some streets—Uliţa Blănarilor (Furriers' Lane), Uliţa Şelarilor (Saddlemakers' Lane), Uliţa Şepcarilor (Capmakers' Lane)—testify to the emergence of guild organizations, and, during the reign (1688–1714) of Prince Constantin Brâncoveanu (Brîncoveanu), large, broad thoroughfares were built.

By the 18th century, government was no longer in the hands of native princes but was controlled instead by Phanariotes (*i.e.*, Greeks originating in the Phanar district of Constantinople). In 1821 a popular uprising, led by the Walachian national hero Tudor Vladimirescu, ended Phanariote rule. Again, in 1859, civic unrest played a part in forcing the union of Walachia and Moldavia, followed in 1862 by the proclamation of Bucharest as the capital of the Romanian state. These events, coupled with a land reform in 1864 and the final achievement of national independence in the war of 1877–78, gave a strong impetus to the economic development of both the nation and its capital city.

After World War I, Bucharest strengthened its position as the most important city of a greatly enlarged country. Further growth took place after World War II, and since the nationalization of land in 1948 this growth has been characterized by large-scale projects and a marked architectural uniformity.

On March 4, 1977, Bucharest was shaken by a severe earthquake. It killed some 1,400 people and injured 7,600. Many homes and buildings were destroyed or damaged.

The city has a large number of churches, usually small, in Byzantine style. Apart from the Curtea Veche (Old Court) church, the Antim Monastery (1715) and the churches of SS. Stavropoleos (1724) and Spiridon (1747) are of considerable architectural interest.

Republic Square—with the new palace hall and the historic Creţulescu church (1722)—has become one of the most beautiful squares of the town. It is linked to Palace Square, which is surrounded by an imposing group of administrative, political, and cultural buildings including the headquarters of the Communist Party of Romania and the massive Romanian Athenaeum, notable for its columned facade.

The most important centres for higher education are the "Gh. Gheorghiu-Dej" Polytechnic Institute (founded 1819) and the University of Bucharest (founded 1864). In addition, there are several academies in both arts and sciences, as well as numerous research institutes. Bucharest has three central libraries (the Library of the Academy of the Socialist Republic of Romania, the Central State Library, and a central university library) and a large number of public library units.

Many of the city's theatres—for example, the National Theatre "I.L. Caragiale" and the Theatre of Opera and Ballet of the Socialist Republic of Romania—have long traditions. Bucharest is also the seat of the state philharmonic orchestra. Among the many museums are the Museum of the History of the City of Bucharest and the Art Museum of the Socialist Republic of Romania, the latter maintaining large collections of national, European, and Oriental art. A highly original ethnographic collection, the Village Museum (founded 1936), is made up of peasant houses brought from various parts of the country, complete with outbuildings, furniture, and the household objects appropriate to each region.

Manufactures include engineering products, notably machine tools and agricultural machinery, as well as electrical and automotive equipment, buses, trolleybuses, and a wide variety of other goods, including consumer goods. The city is served by an international airport at Otopeni and the smaller Băneasa Airport. Pop. (1984 est.) city, 1,961,189; municipality, 2,197,702.

Bucharest, Treaty of (May 7, 1918), settlement forced upon Romania after it had been defeated by the Central Powers during World War I. According to the terms of the treaty, Romania had to return southern Dobruja to Bulgaria, give Austria-Hungary control of the passes in the Carpathian Mountains, and lease its oil wells to Germany for a period of 90 years. When the Central Powers collapsed in November, however, the Treaty of Bucharest was nullified.

Buchenwald, one of the first and biggest of the German Nazi concentration camps, located on a wooded hill about 4.5 miles (7 km) northwest of Weimar, then in Thuringia, Ger. Set up in 1937, it complemented the concentration camps of Sachsenhausen to the north and Dachau to the south. In World War II it held about 20,000 prisoners, most of whom worked as slave labourers in nearby factories in 12-hour shifts round the clock. Although there were no gas chambers, hundreds perished monthly through disease, malnutrition, exhaustion, beatings, and executions. The camp contained an official department for medical research, the Division for Typhus and Virus Research of the Hygiene Institute of the Waffen SS, whose doctors and technicians used inmates to test the effects of viral infections and vaccines. Buchenwald camp was run with martinet discipline, and from 1939 to 1945 Ilsa Koch, the "Witch of Buchenwald," wife of the SS commandant, achieved infamy for her aggressive sadism.

Bucher, (Adolf) Lothar (b. Oct. 25, 1817, Neustettin, Pomerania [now Szczecinek, Pol.]—d. Oct. 10, 1892, Glion, Switz.), German publicist and one of Bismarck's most trusted aides, who collaborated in writing Bismarck's memoirs, *Gedanken und Erinnerungen* (1898; *Reflections and Reminiscences*).

Bucher was a member of the Prussian National Assembly (1848) and of the Prussian second chamber (1849), in which he sat with the extreme left. In 1850 he was sentenced to a 15-month prison term for organizing a movement against the payment of taxes, but he fled to London and wrote for the *National Zeitung* (1850–61). Returning to Berlin, he continued to write for that paper and collaborated with the socialist Ferdinand Lassalle.

In 1864 Bucher entered the Prussian Foreign Office and soon won Bismarck's complete confidence. He drew up the text of the

Lothar Bucher, detail from an engraving by C. Kolb, 1876

Archiv fur Kunst und Geschichte, West Berlin

constitution of the North German Confederation (1867), went on confidential missions to Spain in connection with the Hohenzollern candidacy for the Spanish crown (1870), assisted Bismarck in the final negotiations for the Treaty of Frankfurt ending the Franco-German War (1871), and was *secrétaire archiviste* to the Congress of Berlin (1878). Bucher, also responsible for Bismarck's press and public relations, aroused the animosity of some influential Prussian aristocrats, and he finally had to resign in 1886.

In addition to collaborating on Bismarck's memoirs, Bucher published other works, including *Bilder aus der Fremde* (2 vol., 1862; "Pictures from Foreign Countries").

Bucher, Walter Herman (b. March 12, 1888, Akron, Ohio, U.S.—d. Feb. 17, 1965, Houston, Texas), U.S. geologist known for his studies of cryptovolcanic and other structural features of the Earth's crust. He studied the primary structures of sediments and described the process of orogenic deformation (mountain building) and megatectonics (large-scale structural deformations). In 1956 he formed the theory of the origin and geographic pattern of mountain chains on the Earth's surface.

Bucher was a member of the faculty at the University of Cincinnati, Ohio, from 1913 until 1940, when he became professor of structural geology at Columbia University; he retired as professor emeritus in 1956. In 1933 he wrote *The Deformation of the Earth's Crust.*

Buchholz (East Germany): *see* Annaberg-Buchholz.

Buchis, in ancient Egyptian religion, black bull worshipped as a favourite incarnation of the war god Mentu, or Mont. He was represented with the solar disk and two tall plumes between his horns and special markings upon his body. According to Macrobius, his hair grew in the opposite direction from that of ordinary animals and changed colour every hour. At Hermonthis in Upper Egypt, a special centre of Mentu's worship, a particular bull was traditionally chosen to receive veneration as Buchis. Upon its death, it was mummified and buried in a sarcophagus with divine honours.

Buchmanism (religious movement): *see* Moral Re-armament.

Buchner, Eduard (b. May 20, 1860, Munich—d. Aug. 13, 1917, Focşani, Rom.), biochemist who was awarded the 1907 Nobel Prize for Chemistry for demonstrating that the fermentation of carbohydrates results from the action of different enzymes contained in yeast and not the yeast cell itself. He showed that an enzyme, zymase, can be extracted from yeast cells and that it causes sugar to break up into carbon dioxide and alcohol.

Buchner studied with Adolf von Baeyer, received his doctorate in 1888, and held professorships at the universities of Kiel, Tübingen, Berlin, Breslau, and Würzburg. Despite lack of encouragement, he persisted in his researches with fermentation and made notable advances during 1896 and 1897. His agricultural professorship at Berlin (1898) allowed him to continue his biochemical studies. Buchner was a major in the German Army when he was killed in World War I.

Büchner, Georg (b. Oct. 17, 1813, Goddelau, Hesse-Darmstadt—d. Feb. 19, 1837, Zürich), German dramatist, a major forerunner of the Expressionist school of playwriting of the early 20th century.

Georg Büchner, engraving by Aimbach after a portrait by A. Hoffman

Archiv fur Kunst und Geschichte, West Berlin

Caught up in the revolutionary movement inspired by the Paris rising of 1830, Büchner published a pamphlet in 1834 that called for economic and political revolution and founded a radical society. He escaped arrest and became a lecturer in natural science at Zürich in 1836.

Büchner's three plays were clearly influenced in style by Shakespeare and by the German Romantic Sturm und Drang movement. In content and form they were far ahead of their time. Their short, abrupt scenes combined extreme Naturalism with visionary power. His first play, *Dantons Tod* ("Danton's Death," 1835), is a drama of the French Revolution that is suffused with deep pessimism. Its protagonist, the revolutionary Danton, is shown as a man deeply distraught at the bloodshed he had helped unleash. *Leonce und Lena* (1836), a satire on the nebulous nature of Romantic ideas, shows the influence of Alfred de Musset and Clemens Brentano. His last work, *Woyzeck* (1836), which remained a fragment, anticipated the social drama of the 1890s with its compassion for the poor and oppressed. Except for *Dantons Tod*, not produced until 1902, and the fragment of a novel, *Lenz*, Büchner's writings appeared only after his death, *Woyzeck* not until 1879. It served as the libretto for Alban Berg's opera *Wozzeck* (1925).

Büchner, who was the elder brother of Ludwig Büchner, exercised a marked influence on the Naturalistic drama that came into vogue in the 1890s and, later, on the Expressionism that voiced the disillusionment of many artists and intellectuals after World War I. He became recognized as one of the outstanding figures in German dramatic literature.

Buchner, Hans (b. Dec. 16, 1850, Munich—d. April 5, 1902, Munich), German bacteriologist who in the course of extensive immunological studies (1886–90) discovered the blood-borne natural bactericides called alexins. A pioneer in research on gamma globulins, he also devised methods of studying anaerobic bacteria.

Brother of the Nobel Prize-winning chemist Eduard Buchner, Hans was educated at the universities of Munich and Leipzig (M.D., 1874) and, after serving as a physician for the Bavarian Army in the 1870s, taught at the University of Munich from 1880 until his death. Buchner became professor of hygiene and director of the Hygienisches Institut in 1894. He wrote *Ätiologische Therapie and Prophylaxis der Tuberkulose* (1883; "The Etiology, Treatment, and Prevention of Tuberculosis") and a work on immunology (1892).

Büchner, Ludwig (b. March 29, 1824, Darmstadt, Hesse-Darmstadt—d. April 30, 1899, Darmstadt, Ger.), German physician and philosopher, the younger brother of the playwright Georg Büchner.

Büchner's materialistic interpretation of the universe created an uproar for its rejection of God, creation, religion, and free will and for its explanation of mind and consciousness as physical states of the brain produced by matter in motion. His celebrated *Kraft und Stoff* (1855; *Force and Matter*, 1870) went through numerous editions and forced his resignation as lecturer of medicine at the University of Tübingen. He applied determinism to social and political issues, pleading the cause of criminals. His continued defense of atheism and atomism and his denial of any distinction between mind and matter (*Natur und Geist*, 1857; "Nature and Spirit") appealed strongly to freethinkers, but dialectical materialists condemned his acceptance of competitive capitalism, viewed by Büchner as an example of Darwin's "struggle for survival." An English translation of *Die Stellung des Menschen in der Natur* (1869) appeared as *Man, Past, Present and Future* (1872).

Bucintoro (galley): *see* Bucentaur.

Buck, Pearl, *née* SYDENSTRICKER, pseudonym JOHN SEDGES (b. June 26, 1892, Hillsboro, W.Va., U.S.—d. March 6, 1973, Danby, Vt.), U.S. author noted for her novels of life in China and recipient of the Nobel Prize for Literature in 1938.

She spent her youth in China, where her parents were Presbyterian missionaries. She received her early education in Shanghai and was graduated from Randolph-Macon Wom-

Pearl Buck

By courtesy of the John Day Co.; photograph, Clara E. Sipprell

an's College, Lynchburg, Va., in 1914. She then returned to China and later became a university teacher in Nanking.

Her articles and stories about Chinese life first appeared in U.S. magazines in 1923, but it was not until 1931 that she reached a wide audience with *The Good Earth*, which described sympathetically the struggle of a Chinese peasant and his slave-wife to gain land and position. That novel, widely translated, was followed by *Sons* (1932) and *A House Divided* (1935); the trilogy was published as *The House of Earth* (1935).

In 1934 she was divorced from John L. Buck, a missionary; they had been married in 1917. She was married to Richard J. Walsh, a New York publisher, in 1935 and thereafter lived in the United States. After World War II, in a move to aid illegitimate children of U.S. servicemen in Asian countries, she instituted the Pearl S. Buck Foundation; in 1967 she turned over to the foundation most of her earnings—more than $7,000,000.

Continuing to write under the name Pearl Buck, she turned to biography with lives of her father, Absalom Sydenstricker, *Fighting Angel* (1936), and her mother, Caroline, *The Exile* (1936). Her later books include *Dragon Seed* (1942), and *Imperial Woman* (1956), novels; *The First Wife and Other Stories . . .* (1933), *Far and Near* (1947), and *The Good Deed* (1969), short stories; *The Child Who Never Grew* (1950), concerning her retarded daughter; and an autobiography, *My Several Worlds* (1954). Under her pseudonym, John Sedges, she published five novels unlike her others.

Buck, Sir Peter (Henry), original name TE RANGI HIROA (b. Dec. 15, 1880, Uremi, N.Z.—d. Dec. 1, 1951, Honolulu), Maori anthropologist, physician, and politician who made major contributions to Maori public health and became one of the world's leading Polynesian studies scholars.

The son of William Henry Buck and Ngarongo-ki-tua, a Ngnti Mutunga Maori tribeswoman, Buck was a medical officer for Maori health with the New Zealand health department (1905–08). He launched a successful drive (1905–14) with Sir Maui Pomare, a fellow member of the Young Maori Party, to

improve medical care for Maoris. From 1909 to 1914 he represented the northern Maori constituency in Parliament, serving as minister of the Maori race (1912–14). After duty with the New Zealand medical corps in World War I, he resumed his public health work as director of the division of Maori hygiene for the New Zealand department of health.

Between 1922 and 1927 Buck published a series of scientific papers on Maori life, and in 1927 he became a researcher in Polynesian ethnology for the Bernice P. Bishop Museum in Honolulu. He spent the following 25 years studying and writing about the native Polynesian cultures, becoming director of the Bishop Museum and visiting professor of anthropology at Yale University (1932–34, 1936, 1939). He was knighted in 1946. His books include *Vikings of the Sunrise* (1938), a survey of Polynesian life, and *The Coming of the Maori* (1947), his final reflections on the Maori.

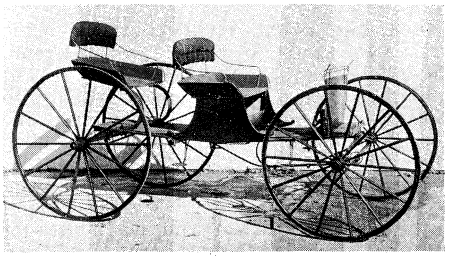
buckbean, member of the flowering plant family Menyanthaceae of the gentian order (Gentianales), consisting of 5 genera and 33 species of aquatic or marsh herbs with creeping stems, native to temperate areas of the world. Some species have single leaves that

Buckbean (*Menyanthes trifoliata*)
A to Z Botanical Collection—EB Inc.

alternate along the stem; others have leaves composed of three leaflets that have sheathing leafstalks.

Buckbean, or bogbean (*Menyanthes trifoliata*), a medicinal plant of wet soils, has white or pink flowers, bitter-tasting leaves, and hard, light-brown seeds. The species of fringed water lily, water snowflake, and floating heart (*Nymphoides*)—all submerged plants with buried rootstalks and floating leaves—have yellow or white flowers.

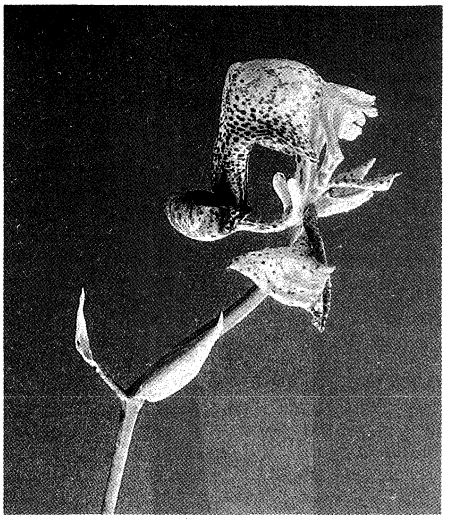
buckboard, open, flat-bottomed, four-wheeled carriage in which a springy board fastened to the axles supplemented or served in place of actual springs. Springs, if present, were between the board and the seat and not attached to the axles.



Buckboard, *c.* 1880; in the Suffolk Museum and Carriage House, Stony Brook, Long Island, N.Y.
By courtesy of the Suffolk Museum and Carriage House at Stony Brook, Long Island, N.Y., Melville Collection

Several varieties of buckboard carriage, such as the surrey buckboard, were popular in the United States in about 1900. Buckboards were usually built with one to three double seats.

bucket orchid, any plant of the genus *Coryanthes,* family Orchidaceae, consisting of about 15 species of tropical American orchids that



Bucket orchid (*Coryanthes*)
G.C.K. Dunsterville

have an unusual pollination mechanism. One to three flowers are borne on a pendent stem that arises from the base of the tall pseudobulbs (bulblike stems).

A fluid secreted by specialized glands collects in the bucket-shaped flower lip, which has a spoutlike opening just below the pollen packets. An insect attracted by the strong odour produced by the upper fleshy part of the lip slips into the bucket. As the only way out is through the spout, the pollen packets stick to the insect as it crawls out of the bucket and are deposited on the stigma of the next bucket orchid that the insect enters.

buckeye, any of about 13 trees belonging to the genus *Aesculus*, in the horse-chestnut

Ohio buckeye (*Aesculus glabra*)
Kitty Kohout from Root Resources—EB Inc.

family (Hippocastanaceae), native to North America. The name refers to the resemblance of the nut, which has a pale patch on a shiny red ground, to the eye of a deer. Buckeyes, like the related horse-chestnut (*q.v.*), are valued as ornamental trees for their handsome candelabra-like flower clusters. The fruits have hard leathery husks, smooth to weakly spiny, turning brown in fall; ripe fruits split into three parts to release one to three glossy brown, inedible nuts. Both the young foliage and the nuts are poisonous.

Among the most notable is the Ohio buckeye (*A. glabra*), also called fetid buckeye and American horse-chestnut, a tree growing up to 21 metres (70 feet) in height, with twigs and leaves that yield an unpleasant odour when crushed. The digitate leaves, of five to seven leaflets, turn orange to yellow in fall.

The sweet, or yellow, buckeye (*A. flava,* or *A. octandra*), with yellow flowers, is the largest buckeye, up to 27 m, and is naturally abundant in the Great Smoky Mountains National Park. Red buckeye (*A. pavia*), with red flowers, is an attractive small tree, reaching a height of up to 3.5 m, rarely taller.

Bottlebrush buckeye (*A. parviflora*), from Georgia and Alabama, is an attractive shrub, up to 4.5 m high. The white flowers are borne in erect spikes about 30 centimetres (1 foot) long. Painted, or Georgia, buckeye (*A. sylvatica*), a rounded shrub or small tree, up to 6 m, has variably coloured flowers, yellow to reddish on the flower spikes.

Buckfastleigh, parish (town), Teignbridge district, county of Devon, England, on the River Dart. Buckfast Abbey, founded in 1018, was left in ruins after the dissolution of the monasteries (1536–39). No attempt was made to rebuild it until 1882, when a small group of French Benedictine monks took over the reconstruction; the work was not completed until 1937. The monks produce a tonic wine and honey. Pop. (1981 prelim.) 2,889.

Buckhaven, small burgh and port on the northern shore of the Firth of Forth, Kirkcaldy district, Fife region, Scotland. The burgh comprises the former localities of Buckhaven, Methilhill, and Methil, a former coal port in an industrially depressed area, which turned to the manufacture of steel production platforms for the North Sea offshore petroleum industry. Additional light industry was being sought in the 1980s because of the essentially temporary market for oil production platforms. Pop. (1981) 18,265.

Buckingham, town, Outaouais region, southwestern Quebec province, Canada, on the Rivière du Lièvre. It was founded in 1827 by natives of Buckingham, Buckinghamshire, Eng.—hence its name. The town, 17 mi (27 km) northeast of Ottawa, is a regional centre of a lumbering, mining, and dairying area. Two hydroelectric plants on the river power paper mills and a chemical industry. Buckingham is a distributing centre for a large hunting and fishing area. Pop. (1981) 7,992.

Buckingham, parish (town), Aylesbury Vale district, county of Buckinghamshire, England, on the River Ouse. The site of a Roman settlement, it was the seat of the dukes of Buckingham; remains of their 17th-century castle stand in notable gardens, now part of a boys' school. The town has agricultural trade and light industries. Pop. (1981 prelim.) 6,627.

Buckingham, EARLS, MARQUESSES, AND DUKES OF, titled English nobility of several creations, notably in the families Stafford, Villiers, and Grenville, grouped below chronologically and indicated by the symbol •.

• Buckingham, Henry Stafford, 2nd duke of (b. *c.* 1454—d. Nov. 2, 1483, Salisbury, Wiltshire, Eng.), a leading supporter, and later opponent, of King Richard III. He was a Lancastrian descendant of King Edward III, and a number of his forebears had been killed fighting the Yorkists in the Wars of the Roses (1455–85).

In 1460 he succeeded his grandfather as duke

of Buckingham, and six years later he was married to Catherine Woodville, sister-in-law of the Yorkist king Edward IV. Nevertheless, as a Lancastrian, Buckingham was excluded from almost all public activity during Edward IV's reign. Upon Edward's death on April 9, 1483, Buckingham moved to help Richard, duke of Gloucester, usurp the throne of the dead king's son and successor, the 12-year-old king Edward V. Buckingham arrested several members of Edward V's party and arranged for the seizure of Edward and his younger brother. He then publicly denied the legitimacy of Edward IV's heirs and exhorted the people to make Gloucester their ruler. After the coronation of Gloucester as King Richard III on July 6, the Duke was showered with honours and titles.

Within two months, however, Buckingham had begun plotting with the Lancastrians to overthrow Richard. The plan called for the elevation of the exiled Lancastrian Henry Tudor, earl of Richmond, to the kingship, but Buckingham may have intended ultimately to seize the crown for himself. He was possibly responsible at this time for the mysterious disappearance—and presumed murder—of Edward V and his brother. If so, he probably intended to eliminate two claimants to the throne and blame Richard for the crime. At any rate, in mid-October Buckingham moved with his troops into Herefordshire, but floods barred his passage to London, and in a few days his demoralized army broke up. Buckingham fled but was captured and beheaded.

• **Buckingham, Edward Stafford, 3rd duke of** (b. Feb. 3, 1478, Brecknock Castle, Brecon, Brecknockshire, Wales—d. May 17, 1521, London), eldest son of Henry Stafford, the 2nd duke, succeeding to the title in 1485, after the attainder had been removed, two years after the execution of his father.

On the accession of Henry VIII he began to play an important role in political affairs and, as lord high constable, bore the crown at the coronation (June 23, 1509) and in the following November became a privy councillor. As constable and as a descendant of Edward III, he was one of the most powerful men in the kingdom, and on at least one occasion, under the previous reign of Henry VII, had been considered a possible successor to the crown. Thus he was viewed suspiciously by Henry VIII and especially by Henry's minister Cardinal Wolsey and seems to have fuelled the suspicion by becoming a spokesman for those nobles excluded from office under the Tudors. At last he was accused, probably falsely, of treasonable practices—of having heeded prophesies of the King's death and his own accession to the throne and having voiced intentions to kill the King. The King himself examined witnesses and accusers (spring 1521); and the Duke was lodged in the Tower of London (April 16), tried the following month, and executed on Tower Hill. He figures in Shakespeare's play *Henry VIII*.

• **Buckingham, George Villiers, 1st duke of,** also called (1614–16) SIR GEORGE VILLIERS, or (1616–17) BARON WHADDON, VISCOUNT VILLIERS, or (1617–18) EARL OF BUCKINGHAM, or (1618–23) MARQUESS OF BUCKINGHAM (b. Aug. 28, 1592, Brooksby, Leicestershire, Eng.—d. Aug. 23, 1628, Portsmouth, Hampshire), royal favourite and statesman who virtually ruled England during the last years of King James I and the first years of the reign of Charles I. Buckingham was extremely unpopular, and the failure of his aggressive, erratic foreign policy increased the tensions that eventually exploded in the Civil War between the Royalists and the Parliamentarians.

George Villiers' father was a knight and a sheriff in Leicestershire. Introduced to James I in August 1614, the immensely charming, handsome Villiers soon replaced the Scottish favourite Robert Carr, earl of Somerset, in the

1st Duke of Buckingham, portrait by Sir Anthony Van Dyck; in the Pitti Palace, Florence

Alinari—Art Resource/EB Inc.

King's esteem. He became master of the horse in 1616, earl of Buckingham in 1617, and lord high admiral in 1619. By using his power both to elevate and to enrich his relatives, he alienated the upper classes from the crown.

Buckingham played his first major part in politics in 1623, when he and James's son, Prince Charles (later King Charles I), visited Madrid to arrange a marriage between Charles and the daughter of the Spanish king. In attempting to conclude an alliance with Spain, Buckingham hoped to use Spanish influence to recover the Palatinate, an electorate of the Holy Roman Empire, for James's son-in-law, Frederick V. But the arrogance of Buckingham (now a duke) contributed to the collapse of the marriage negotiations. He then returned to London and, with Parliamentary backing, pressured James to go to war with Spain. James had already created him a duke (May 18, 1623), the first known in England since the execution of the Duke of Norfolk (1572).

After Charles ascended the throne in March 1625, Buckingham's leadership led to a series of disasters. The marriage he arranged between Charles and the French Roman Catholic princess Henrietta Maria failed to bring about an Anglo-French alliance, and it angered Parliament by raising the threat of a Catholic succession to the English throne. In addition, the vast naval and land expedition Buckingham sent against the Spanish port of Cadiz in October 1625 was so poorly organized and equipped that it disintegrated before it could storm the city. Hence a bill to impeach the Duke was introduced in Parliament in May 1626. In order to save him, Charles dissolved Parliament in June. Buckingham's case was then tried before the Royal Court of the Star Chamber, where, to no one's surprise, the charges were dismissed.

Meanwhile England was drifting toward war with France. In June 1627 Buckingham personally took command of an 8,000-man force sent to relieve the port of La Rochelle, a Huguenot (French Protestant) stronghold under attack by French government troops. After a four-month campaign in which Buckingham showed bravery—and an ignorance of the arts of war—his shattered army was compelled to withdraw. The Parliament of 1628 tried to force Charles to dismiss the favourite, but the King was unflinchingly loyal to his friend. On August 17 Buckingham arrived at Portsmouth to organize another expedition to La Rochelle. Five days later he was stabbed to death by John Felton, a naval lieutenant who had served in his campaigns and who misguidedly believed that he was acting in defense of principles asserted in the House of Commons. The populace of London rejoiced at the news.

BIBLIOGRAPHY. M.A. Gibb, *Buckingham* (1935); H. Ross Williamson, *George Villiers, First Duke of Buckingham* (1940); P. Erlanger, *George Villiers, Duke of Buckingham* (Eng. trans. 1953).

• **Buckingham, George Villiers, 2nd duke of** (b. Jan. 30, 1628, London—d. April 16, 1687, Kirkby Moorside, Yorkshire, Eng.), English politician, a leading member of King Charles II's inner circle of ministers known as the Cabal. Although he was brilliant and colourful, Buckingham's pleasure-seeking, capricious personality prevented him from exercising a decisive influence in Charles's government.

His father, the 1st duke of Buckingham, was the closest adviser and friend of King Charles I (ruled 1625–49). After the assassination of his father in 1628, George was brought up in Charles's family, where he became a constant companion of the King's son, Prince Charles. When the Prince was proclaimed King Charles II in 1649—following the execution of Charles I by Parliament—Buckingham joined his cause and fought beside him at Worcester (September 1651) in an abortive attempt to gain the English throne. The two men then took separate paths into exile.

2nd Duke of Buckingham, detail of a painting by Sir Peter Lely (1618–80); in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Buckingham returned illegally to England in 1657 and was imprisoned by the Commonwealth government until February 1659. After the restoration of Charles II to the throne in 1660, he became a privy councillor. Soon he was leading the opposition to Charles's lord chancellor Edward Hyde, earl of Clarendon. Buckingham's brawling behaviour and intrigues resulted in his brief imprisonment in 1667; he was released in time to help bring about Clarendon's downfall.

In the Cabal ministry that followed, Buckingham at first had great influence with the King, but he lost out in a power struggle with the secretary of state Henry Bennet, earl of Arlington. Although Buckingham supported the alliance with France, Charles and Arlington never told him of their intention to use French troops to restore Catholicism to England. Nevertheless, in 1674 Parliament had Buckingham dismissed from his posts for alleged Catholic sympathies. For a while he sided with the opposition leader, Anthony Ashley Cooper, earl of Shaftesbury. Then in 1681 he withdrew to his Yorkshire estates.

Buckingham's satirical play *The Rehearsal,* first performed in 1671, was a successful parody of contemporary drama. John Dryden portrayed the Duke as "A man so various, that he seem'd to be/Not one, but all Mankind's Epitome." His career is recounted in H.W. Chapman's biography *Great Villiers* (1949).

• **Buckingham, George Nugent Temple Grenville, 1st marquess of,** also called (1779–84) 2ND EARL TEMPLE (b. June 17, 1753—d. Feb. 11, 1813, Stowe House, Buckinghamshire, Eng.), George Grenville's second son, created (1784) the marquess of Buckingham (the town). He made his mark as lord lieutenant of Ireland.

Educated at Eton and Christ Church, Oxford, Temple was member of Parliament for Buckinghamshire from 1774 to 1779. In the House of Commons he was a sharp critic of the American policy of Lord North. In September 1779 he succeeded his uncle as the 2nd Earl Temple; in July 1782 he became a member of the privy council and lord lieutenant of Ireland in the Rockingham ministry. On his advice the Irish Judicature Act of 1783 was passed, which supplemented the legislative independence granted to Ireland in 1782. By royal warrant he created the Order of St. Patrick in February 1783, with himself as the first grand master. Temple left Ireland in 1783 and again turned his attention to English politics. He enjoyed the confidence of George III, and having opposed Fox's East India bill, he was authorized by the King to say that "whoever voted for the India bill was not only not his friend, but would be considered by him as an enemy," a message which ensured the defeat of the bill.

He was appointed a secretary of state when the younger Pitt formed his ministry in December 1783, but resigned two days later. In December 1784 he was created marquess of Buckingham "in the county of Buckingham." In November 1787 he was appointed lord lieutenant of Ireland under Pitt, but his second tenure of this office was hardly as successful as the first. He was censured by the Irish houses of parliament and could only maintain his position by resorting to bribery on a large scale. He resigned in September 1789 and subsequently took very little part in politics, although he spoke in favour of the union with Ireland.

Consult the INDEX *first*

Buckingham and Normanby, John Sheffield, 1st duke of, 3RD EARL OF MULGRAVE (b. April 7, 1648, London—d. Feb. 24, 1721, London), English statesman, patron of the poet John Dryden, and author of poetic essays in heroic couplets.

The son of Edmund, 2nd earl of Mulgrave, he succeeded to the title on his father's death in 1658. He served under Charles II and was a favourite until 1682, when he incurred Charles's displeasure by courting Princess Anne and was banished from court. He made his peace within two years and on the accession of James II was again in high favour, receiving appointments first as a privy councilor and later as lord chamberlain.

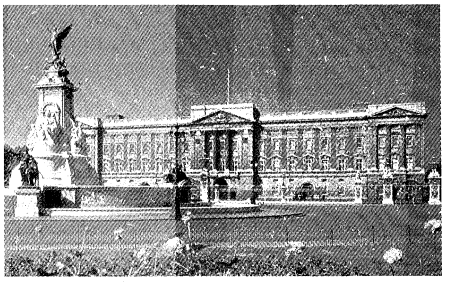
Despite his acquiescence in the Revolution of 1688 he belonged essentially to the opposition during William III's reign, but on Anne's accession in 1702 she made him a member of the privy council, and later lord privy seal and duke of Buckingham and Normanby. The Whig ascendancy between 1704 and 1710 compelled him to resign his appointments, but during the period of Tory government between 1710 and 1714 he held several high offices, including that of lord president of the council. After the accession of George I in 1714 his active political life was at an end.

As a poet Sheffield is chiefly remembered for *An Essay Upon Poetry* (1682) and *An Essay on Satire* (circulated in manuscript in 1679 but not published until later). *An Essay Upon Poetry,* written in couplets and in a manner intended to resemble that of Horace's *Epistles,* aims to delineate the chief characteristics of the various literary kinds: the ode, the elegy, the epic, etc. *An Essay on Satire* begins as a critical treatise but develops into a satire, attacking Charles II, the Earl of Rochester, and many distinguished courtiers. The work was frequently attributed to Dryden (it appears in most editions of his work, and he was assaulted by hirelings of the Earl of Rochester because of it), but it is generally acknowledged to be Sheffield's. It was probably touched up a little by Dryden.

Sheffield's prose *Account of the Revolution* is interesting historically, although he is not entirely reliable when he is personally concerned.

Buckingham Canal (India): *see* Kommamur Canal.

Buckingham Palace, palace, London residence of the British sovereign in the City of Westminster that takes its name from the



East facade of Buckingham Palace and the Queen Victoria Memorial (left), London
Colour Library International

house built early in the 18th century for the dukes of Buckingham. It was bought in 1761 by George III for his wife and became known as the queen's house. It was rebuilt in 1825 for George IV by John Nash; his garden (west) front remains virtually unchanged, but the Mall (east) front was redesigned in 1913 by Sir Aston Webb as a background for the Queen Victoria Memorial statue. Victoria was the first sovereign to live there. The royal standard is flown and the ceremony of changing the guard takes place daily when the sovereign is in residence.

Buckinghamshire, county of southern England, with an area of 727 sq mi (1,883 sq km). It stretches from the River Thames in the south and the outskirts of London in the southeast across the ridge of chalk upland known as the Chiltern Hills, thence across the fertile Vale of Aylesbury and a low sandy ridge to the valley of the River Great Ouse in the north. The county is divided into five districts: Aylesbury Vale, Chiltern, Milton Keynes, South Bucks, and Wycombe.

Landscapes are varied, and prior to the 20th century it was deeply rural. The modern growth of London has, with the help of excellent road and rail links with the city, dominated the southernmost quarter of the county and created long ribbons of suburban development in the valleys of the Chiltern Hills. Commuter rail services extend to Aylesbury, the county town (seat), and High Wycombe, and the areas thus served represent some of London's wealthiest suburbs.

Buckinghamshire was affected by each phase of English settlement from the Neolithic to the Saxon, and under the latter's rule it was part of the kingdom of Mercia, resisted Danish invasion from the east, and became prosperous. The Chiltern Hills were heavily forested, however, and clearance of the woodland was completed only in the early 17th century. A principal feature of the period that followed was the creation of great estates with magnificent houses, *e.g.,* Cliveden, now owned by the National Trust, and Stowe, converted into a school. Access to London was a factor in this development and continues to be responsible for population growth in the county.

Industry in Buckinghamshire was, until after World War II, represented by printing and light manufacturing at Aylesbury, furniture at High Wycombe, and railway workshops at Wolverton. More recently, however, a remarkable new growth has been registered in the northernmost tip of the county, where the small towns of Bletchley, Newport Pagnell, and Wolverton have been submerged by the new town of Milton Keynes, created in 1967. This new development has attracted industry and research institutions and is the headquarters of Great Britain's Open University. Pop. (1982 est.) 580,800.

Buckinghamshire lace, lace made in Buckinghamshire, Eng., from *c.* 1665 or earlier until the first quarter of the 20th century. This bobbin-lace industry, which was centred in Olney and Newport Pagnell, is thought to have originated from the successive influx of refugee laceworkers to the east Midlands counties. These refugees were reportedly Flemish, especially from Mechlin (1563–68), and French, especially from Lille (1572). It is true that Buckinghamshire, or "Bucks," lace has the type of hexagonal mesh ground known as "Lille" and floral motifs reminiscent of Mechlin and Lille lace, but these could be 18th-century rather than 16th-century influences. Among the many patterns characteristic of Bucks lace is the so-called rose and tulip, alluding to William III of Orange.

Buckland, William (b. March 12, 1784, Axminster, Devonshire, Eng.—d. Aug. 15, 1856, London), pioneer geologist and minister, known for his effort to reconcile geological discoveries with the Bible and anti-evolutionary theories.

He disclaimed the theory of fluvial processes and held the biblical Deluge to be the agent of all erosion and sedimentation upon the Earth. He did much important work on paleontological (fossil) formations and was the first in England to note the evidence of glaciation. He wrote *Reliquiae Diluvianae* (1823; "Relics of the Deluge") and *Geology and Mineralogy Considered with Reference to Natural Theology* (1836), published as one of the Bridgewater Treatises.

Buckland was ordained an Anglican priest in 1808, and in 1813 he was appointed professor of mineralogy at Oxford University; he served as dean of Westminster from 1845 until 1856.

buckle, clasp or catch, particularly for fastening the ends of a belt; or a clasplike ornament, especially for shoes. The belt buckle was often used in Greece and Rome and became an indispensable part of the Teutonic warrior's equipment, as well as the object of special care on the part of metalsmiths, who ornamented many buckles with rich and intricate designs.

The Germanic invaders imported animal motifs characteristic of Scythian-Sarmatian decorative arts, their belts and buckles often representing animals entwined in mortal combat. The belt buckles almost invariably present in the graves of the Franks and Burgundians are often ornamented with bosses of silver or bronze, chased or inlaid. A fine example of a buckle of a heavy rectangular type decorated with filigree was found in the tomb of Childeric I, king of the Franks, who died in AD 481/482. Several 7th-century gold buckles with interlacing curvilinear patterns and cutaway tongues, now in the British Museum, London, were found in the Sutton Hoo ship burial. Throughout the Middle Ages, the buckle was used especially for ornamentation; but, during the second half of the 14th century, the knightly belt and buckle took on its most splendid form, and, after the early 15th century, the belt and buckle never again regained such importance.

The shoe buckle has also been important as an ornament. Jewelled buckles (with real or imitation gems) were worn during the reign of Louis XIV, and at about the same time, the shoe buckle became popular in the U.S. In 18th-century Europe, buckles became

even more decorative. Fashionable fops of the 1770s reacted against simple styles and wore thin shoes with large buckles made of gold, silver, and other precious metals and set with imitation or real gems. In the 20th century, jewelled or ornamented buckles have been popular in women's fashions, though precious gems have rarely been used.

Buckley, William F(rank), Jr. (b. Nov. 24, 1925, New York City), versatile editor, author, and conservative gadfly who became an important intellectual influence in conservative U.S. politics. Buckley founded the conservative journal *National Review* in 1955, and as editor in chief he used the journal as a forum for conservative views and ideas. His column of political commentary, "On the Right," was syndicated in 1962 and appeared regularly in more than 200 newspapers. Starting in 1966, Buckley served as host of a weekly television interview program dealing with politics and public affairs, "Firing Line."

The oil fortune amassed by Buckley's immigrant grandfather enabled the boy to be reared in comfortable circumstances in France, England, and Connecticut, U.S. His early education was by private tutors and at two English boys' schools, and he attended a preparatory school in New York State. He spent a year at the University of Mexico, then served three years in the U.S. Army during World War II before entering Yale University. There he taught Spanish, distinguished himself in debate, and was chairman of the *Yale Daily News,* among other things. He later joined the staff of *The American Mercury.* A former chairman of the Starr Broadcasting Group, he served on the United States Information Agency (USIA) Advisory Commission from 1969 to 1972. In 1973 he was U.S. delegate to the United Nations General Assembly.

A contributor to many magazines, Buckley wrote a number of books, among them *God and Man at Yale* (1951), *Up from Liberalism* (1959), and *Rumbles Left and Right* (1963). He co-authored *McCarthy and His Enemies* (1954), and in the late 1970s he turned his hand to writing spy novels; among them were *Saving the Queen* (1976), *Stained Glass* (1978), and *Marco Polo If You Can* (1982).

Buckner, Simon Bolivar (b. April 1, 1823, near Mundfordville, Ky., U.S.—d. Jan. 8, 1914, near Mundfordville), Confederate general during the U.S. Civil War (1861–65) and governor of Kentucky (1887–91).

A graduate of the United States Military Academy at West Point, N.Y., Buckner served in the Mexican War (1846–48) and thereafter at various army posts until 1855, when he resigned his commission to become manager of family property in Chicago. At the outbreak of the Civil War, he worked to build up the state guard of Kentucky and to ensure the neutrality of the state, but eventually he espoused the Confederate cause and was commissioned a brigadier general.

Ordered to reinforce Ft. Donelson, Tennessee, he found the military situation hopeless and surrendered unconditionally to Gen. Ulysses S. Grant (Feb. 16, 1862). After a war-prisoner exchange he served the Confederacy in many capacities and was a lieutenant general when the war ended.

In 1868 Buckner returned to Kentucky, became editor of the *Louisville Courier* for a short time, and eventually recovered his valuable real property in Chicago. After some years in private business he entered politics as a Democrat and served as governor of Kentucky from 1887 to 1891. In 1896 Buckner ran unsuccessfully for the vice presidency on the same ticket with John M. Palmer, as a gold Democrat, in opposition to the Free Silver majority.

Buckner, Simon Bolivar, Jr. (b. July 18, 1886, Mundfordville, Ky., U.S.—d. June 18, 1945, Okinawa), U.S. Army general in World War II who climaxed his career of more than 41 years by leading the successful invasion of the Japanese-held Ryukyu Islands in the Pacific Ocean (1945).

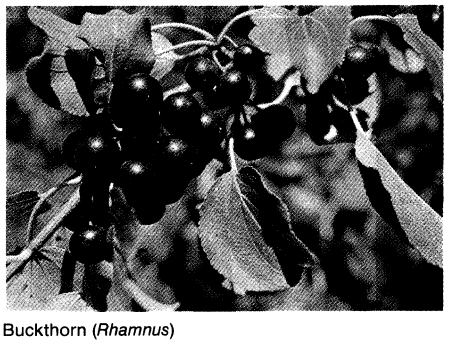
Simon B. Buckner, Jr., 1943
By courtesy of the U.S. Army

The only son of the Confederate Civil War general of the same name, Buckner was commissioned in the infantry after graduating from the U.S. Military Academy at West Point, N.Y. (1908). Rising in rank, he became a brigadier general in the regular army and from August 1940 to June 1944 was commanding general, Alaska Defense Command, with headquarters at Ft. Richardson, Alaska.

Following a short assignment to the central Pacific area, he was appointed (September 1944) commanding general of the 10th Army, holding the rank of lieutenant general. In that post he was charged with the invasion of the strategic Ryukyu Islands, still held tenaciously by the Japanese; he fought and won the Pacific front's last great land battle on Okinawa (April–June 1945). He was killed in action while visiting a forward observation post near the southwest tip of the island. The large naval anchorage on the east side of Okinawa, formerly called Nakagusuku-wan (Nakagusuku Bay), was renamed Buckner Bay in his honour.

buckthorn, any of several shrubs or trees belonging to the genus *Rhamnus,* family Rhamnaceae, native to temperate areas in the Northern Hemisphere. The buckthorns are related to *Rhamnus purshiana,* the source of cascara sagrada (*q.v.*), a cathartic drug.

The common, or European, buckthorn (*R. cathartica*), about 3.5 metres (12 feet) high, native to Eurasia, is widely naturalized. It has dark bark, often bears spines, and has



Buckthorn (*Rhamnus*)
Joan E. Rahn—EB Inc.

dark-green, oval leaves. The bark yields a yellow dye, and the small black fruits provide a purgative. The alder, or glossy, buckthorn (*R. frangula*), also up to 3.5 m, is used as an ornamental; a variety, the tallhedge buckthorn (*R. frangula* 'Columnaris'), forms a narrow hedge up to 4.5 m high and a little more than 1 m wide.

Carolina buckthorn (*R. caroliniana*), also called Indian cherry, forms copses from New York to Florida and Texas. Italian buckthorn (*R. alaternus*), with several cultivated varieties, is grown as an ornamental in warm areas. The rock buckthorn (*R. saxatilis*), about 1 m tall, is a low spiny shrub.

buckwheat, *Fagopyrum esculentum* (or *F. sagittatum*) and the allied species *F. tataricum,* herbaceous plant and its edible seeds, native to Asia. The kernels of the triangular shaped seeds are enclosed by a tough, dark-brown or gray rind. The white flowers are pollinated by bees and other insects. Although the seeds are used as cereal, the plant is not one of the cereal grasses.

Buckwheat is less productive than other grain crops on good soils but is particularly adapted to arid, hilly land and cool climates and, because it matures quickly, can be grown as a late season crop. Buckwheat flowers provide both pollen and nectar for bees. The plants improve conditions for the cultivation of other crops by smothering weeds and may be planted as a green manure crop that is plowed under to improve the soil.

Buckwheat is a staple grain crop in the U.S.S.R. and Poland; France, Canada, and the U.S. are also important producers. It is often used as a feed for poultry and other livestock, and in England it is considered especially suitable for feeding pheasants. It is high in carbohydrates and contains about 11 percent protein, 2 percent fat, and small amounts of vitamins B_1 and B_2. In eastern European cookery the hulled kernels, or groats, cooked and served much like rice, are called kasha, and in France they are called *sayraisin.* Buckwheat flour is unsatisfactory for bread, but it is used in the U.S. and Canada, alone or mixed with wheat flour, to make griddle cakes called buckwheat cakes.

buckwheat-note hymnal (music notation): *see* shape-note hymnal.

buckwheat tree, also called TITI, or BLACK TITI (*Cliftonia monophylla*), evergreen shrub or small tree, of the family Cyrillaceae, native to southern North America. It grows to about 15 metres (50 feet) tall and has oblong or lance-shaped leaves about 4–5 centimetres (1.5–2 inches) long. Its fragrant white or pinkish flowers, about 1 cm across, are much visited by bees.

bucranium, decorative motif representing the ox killed in religious sacrifice, originating in a ceremony wherein an ox's head was hung from the wooden beams supporting the temple roof; this scene was later represented, in stone, on the frieze, or stone lintels, above the columns in Doric temples.

The motif has been found on painted pottery in Iraq dating from 5000 BC. It was later imported into Bronze Age Crete as part of the bull and double-ax cult, where the bull's head was decorated with a garland of bay leaves. In Roman examples, the garland of bay leaves was omitted. The motif was also used in Renaissance architecture, for example, at the 17th-century Knole Palace in Kent, England.

Bucureşti (Romania): *see* Bucharest.

Buda (Hungary): *see* Budapest.

Budaeus, Guglielmus (French classicist): *see* Budé, Guillaume.

Budapest, city, capital of Hungary, and the administrative centre of Budai *járás* (district) and Pest *megye* (county). The city, situated astride the Danube River, is the political, administrative, industrial, and commercial centre of Hungary. The site has been continuously settled since at least the 3rd millennium BC and now is the home of about one-fifth of the country's population.

The following article treats briefly the modern city of Budapest. Fuller treatment is provided in the following MACROPAEDIA articles.

For history and contemporary life, *see* Budapest; for additional perspective on the city in its national context, *see* Hungary.

The city acquired the name Budapest in 1873 when the communities of Pest (on the left bank of the Danube), Buda (on the right bank), and Óbuda (Old Buda, to the north of Buda) amalgamated. The area of the city has been extended to include the outer industrial suburbs. Whereas Pest is located on a flat and featureless plain, Buda is built on the slopes of the Buda Hills, sweeping picturesquely down to the Danube's western bank. Much of the city's area comprises agricultural land and open country, largely wooded. Hot mineral springs, some containing radium, have long been tapped for medicinal purposes. Budapest's climate is transitional between a harsh continental type and a temperate, western European type, with a mean annual precipitation of about 24 inches (600 mm).

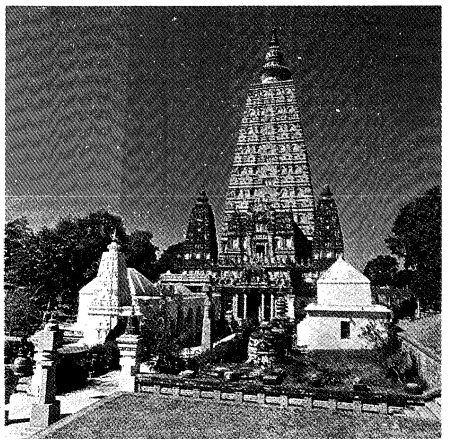
Agriculture is little practiced in the immediate environs of Budapest, and the role of industry in the city's economy has declined with the decentralization of manufacturing. Heavy industry, the manufacture of textiles and instruments, telecommunications, and electronics are still important, however, and the city's service and administrative sectors have grown. Budapest plays a vital role in the transport and communications services of Hungary, and the Danubian countries maintain shipping agencies there. Many foreign trade companies are located in the city as well. Commerce is promoted by international fairs and exhibitions.

A steady shift of population from the inner city to the suburban periphery has accompanied inner-city redevelopment and the relocation of industry out of the city centre. While postwar reconstruction has given the city a more modern appearance, many traditional structures remain, such as the restored Buda Castle and Matthias Church (dating from the 13th century) in Buda's Castle Hill district, the Town Hall (1735) in Pest's Inner Town, and the Parliament Building (1904) along the river to the north of the latter district. People's Democracy Avenue, the city's finest thoroughfare, extends northeastward from Pest's Inner Town to City Park. Notable structures along its route include the State Opera House (1884) and the Museum of Fine Arts. In addition to the Hungarian Academy of Sciences, Budapest has numerous institutions of higher learning, including Loránd Eötvös University (founded 1635). There are also many museums, art galleries, theatres, and concert halls.

Budapest has an extensive subway and tramway system. Buda is connected with Pest by bridges and a railway tunnel. International transport links include the Danube, with its Csepel Free Port for use by members of the Danube Commission, and transcontinental highways and railways. The Ferihegy International Airport is located 10 miles (16 km) southeast of the city centre. Area city, 203 square miles (525 square km). Pop. (1987 est.) 2,093,487.

Budaun, town, north-central Uttar Pradesh state, northern India. It lies near the Sot River, a tributary of the Ganges. Budaun is said to have been founded about AD 905 by Buddh, a Hindu raja. In the 13th century it was an important frontier outpost of the Muslim kingdom of Delhi, and the town remained the seat of a provincial governorship until replaced by Bareilly in 1657. It became a district headquarters in 1838. Situated on a major road and rail line, it is primarily an agricultural trade centre, with some small industries. The town contains a large mosque, the Jāmiʿ Masjid, built in 1223 and restored in the 14th, 16th, and 19th centuries. There is also a ruined fort. The surrounding area's crops include rice, wheat, barley, millet, and gram (chick-pea). Pop. (1981) 93,004.

Buddh Gayā, also called BODH GAYĀ, village in central Bihār state, northeastern India. It is situated west of the Phalgu River, a tributary of the Ganges. One of the holiest of Buddhist sites, it was there, under the sacred pipal, or Bodhi (Bo) tree, that Gautama Buddha (Prince Siddhārtha) attained enlightenment and became the Buddha. A simple shrine was built by the emperor Aśoka (3rd century BC) to mark the spot, and this was later enclosed by a stone railing (1st century BC), part of which still remains. The uprights have representations of the Vedic gods Indra and Sūrya, and the railing medallions are carved with



The Mahābodhi temple at Buddh Gayā, Bihār state, India

Art Resource—EB Inc.

imaginary beasts. This shrine was replaced in the Kushān period (2nd century AD) by the present Mahābodhi temple, which was itself provided with revetment and statuary in the Pāla-Sena period (750–1200), heavily restored by Sir Alexander Cunningham in the second half of the 19th century, and finally restored by Burmese Buddhists in 1882. The temple's central tower stands 180 feet (54 m) above the ground. A museum contains various Buddhist relics. Buddh Gayā is the site of Magadh University (1962). Pop. (1981) 15,724.

Buddha, original name GAUTAMA, also called SIDDHĀRTHA (fl. *c.* 6th–4th centuries BC; b. Kapilavastu, Śākya Republic, Kosala Kingdom [India]—d. Kusinārā, Malla Republic, Magadha Kingdom [India]), founder of Buddhism, the religion and philosophical system that produced a great culture throughout much of southern and eastern Asia. Buddha, meaning "awakened one," or "enlightened one," is a title, not a proper name.

A brief treatment of the life and works of Buddha follows. For a full biography, *see* MACROPAEDIA: Buddhism, The Buddha and.

According to the traditional account, Gautama was the son of the rulers of the kingdom of the Śākyas, and was thus a member of the Kṣatriya, or warrior, caste. Various legends are narrated about his birth and upbringing. He married at the age of 16 and lived in luxury and comfort. The turning point in his life came when he was 29, when he realized that men are subject to old age, sickness, and death. He thus became aware of the suffering implicit in existence. He resolved on "the great renunciation": to give up the princely life and become a wandering ascetic. He departed from the palace, leaving his wife and infant son behind, and went south to the Magadha kingdom in search of teachers to instruct him in the way of truth. With two of them he attained mystical states of elevated consciousness, but, unsatisfied with these states, he continued his search for truth. He was joined by five ascetics at a beautiful grove near Uruvelā, where he practiced severe austerities and self-mortifications for nearly six years. When he fainted away in weakness, he abandoned ascetic practices to seek his own path to Enlightenment. This he accomplished soon afterward, and, at the age of 35, Gautama became a supreme buddha. He resolved to teach other men what he had discovered about the nature of reality and the means of transcending the human condition. The Buddha spent the rest of his life spreading his teachings, making converts to the religious truths and beliefs he propounded, and training large numbers of learned, well-disciplined followers to continue the work after his death.

Buddhacarita, in full BUDDHACARITA-KĀVYA-SŪTRA (Sanskrit: "Poetic Discourse on the Acts of the Buddha"), poetic narrative of the life of Buddha by the Sanskrit poet Aśvaghoṣa, one of the finest examples of Buddhist literature. The author, who lived in northern India in the 1st–2nd century AD, created a loving account of the Buddha's life and teachings, one that—in contrast to other treatments such as the *Mahāvastu* ("Great Story") and *Lalitavistara* ("Full Description of the Play [of the Buddha]")—is both artistically arranged and restrained in its description of miracles. His work also reflects a vast knowledge of Indian mythology and of pre-Buddhist philosophies, plus a court poet's interest in love, battle, and statecraft. Only the first half of the *Buddhacarita* remains intact in Sanskrit, but all 28 chapters are preserved in Chinese (5th century) and Tibetan translations.

Buddhaghosa (b. Andhra?, India, fl. early 5th century AD), Indian Buddhist scholar, famous for his *Visuddhi-magga* ("Way to Purity"), a summary of current Buddhist doctrines. Originally from near Buddh Gayā, one of the most holy places in the Buddhist world, he traveled to Anurādhapura, Ceylon (now Sri Lanka), where he discovered many still largely unknown Sinhalese Buddhist commentaries; these he translated into Pāli and communicated to his countrymen.

Buddhāvataṃsaka-sūtra (Buddhist text): *see* Avataṃsaka-sūtra.

Buddhism, a religion and philosophy founded by Siddhārtha Gautama in northeast India in the 5th century BC. Spreading from India to Central and Southeast Asia, China, Korea, and Japan, Buddhism has played an influential role in the spiritual, cultural, and social life of much of the Eastern world; during the present century it has attracted some adherents in the West.

A brief treatment of Buddhism follows. For full treatment, *see* MACROPAEDIA: Buddhism, The Buddha and.

The Buddha's life and teachings. The Buddha, a designation which means the "Enlightened One," died in northeastern India between 500 and 350 BC. According to tradition, his family name was Gautama; later sources call him Siddhārtha, which means "He Who Has Reached His Goal." He was reared in a royal family of the ruling Kṣatriya, or warrior, caste. Shocked as a young man by the inevitability of sickness, old age, and death, he renounced his family life in order to wander as a *śramaṇa,* or ascetic, in search of religious understanding and a way of release from the human condition. Discarding the teachings of his contemporaries, through meditation he achieved Enlightenment, or ultimate understanding. Thereafter, the Buddha instructed his followers (the sangha) in the dharma (Pāli *dhamma*: "truth") and the "Middle Way," a path between a worldly life and extremes of self-denial.

The essence of the Buddha's early preaching was said to be the Four Noble Truths: (1) life is fundamentally disappointment and suffering; (2) suffering is a result of one's desires for pleasure, power, and continued existence;

(3) to stop disappointment and suffering one must stop desiring; and (4) the way to stop desiring and thus suffering is the Noble Eightfold Path—right views, right intention, right speech, right action, right livelihood, right effort, right awareness, and right concentration. The realization of the truth of *anātman* (no eternal self) and *pratītya-samutpāda* (the law of dependent origination) was taught as essential for the indescribable state of release called nirvana (Pāli nibbāna: "blowing out").

The Theravāda tradition. After the death of the Buddha (at which time he passed into final nirvana) efforts were made to consolidate the teachings and structures of the Buddhist community. Several important Buddhist councils were held to decide questions of faith and order, leading finally to the distinction between those who believed they held to the most ancient traditions (the Theravādins) and those who claimed their understandings represented the highest and most complete account of Buddha's message (the Mahāyānists). Scholars think that by the 3rd century BC, Theravāda doctrine and practice were fairly formalized. The Theravāda canon of sacred scriptures, the *Tipiṭaka* (Sanskrit *Tripiṭaka*: "The Three Baskets"), all written in the Pāli language, include the *Vinaya Piṭaka* ("Basket of Discipline"), the *Sutta Piṭaka* ("Basket of Discourses"), and *Abhidhamma Piṭaka* ("Basket of Scholasticism").

Theravāda doctrine emphasizes the composite nature of all things. Phenomenal realities are conceived as being in constant flux, as aggregates of momentary elements without any enduring selfhood. The Theravāda tradition explicated necessary regulations for the community, meditative techniques and rituals, and the stages leading to arhatship (the pinnacle of spiritual attainment). Moral instruction for both monastic and lay followers was elaborated by reference to specific rules and to paradigms available in the *Jataka* tales of the Buddha's incarnations. The great Indian king Aśoka (reigned mid-3rd century BC) patronized Buddhism, supporting a missionary enterprise that carried the Theravāda tradition into Ceylon (modern Sri Lanka) and the rest of Southeast Asia, where it remains the predominant form of Buddhism.

The Mahāyāna tradition. Between the 2nd century BC and the 2nd century AD, there appeared new Buddhist scriptures that purported to represent the Buddha's most advanced and complete teaching. The communities for which these new Sanskrit texts were important called themselves followers of the "Greater Vehicle" (Mahāyāna), in contradistinction to followers of what they regarded as the "Lesser Vehicle" (Hīnayāna). Their ideal was that of the bodhisattva ("Enlightenment being"; one who has taken the vow to become a buddha), whose compassionate vow to save all sentient beings was contrasted with the aloof self-preoccupation of the Theravāda arhat.

The Mahāyāna schools developed an expanded vision of the universe and a new understanding of the Buddha. The human manifestation of the True Law in the figure of Gautama Buddha was identified with the many celestial forms experienced in meditation and with the *dharmakāya,* the ineffable absolute. Certain Mahāyāna schools (Mādhyamika in India, T'ien-t'ai and Hua-yen in China, etc.) developed sophisticated philosophical arguments concerning the two levels of truth (the relative and absolute) and the identification of samsara (this world of life and death) with nirvana. The Pure Land schools of Mahāyāna emphasized simple faith over logic and were more concerned with salvific rebirth in Buddha's "pure lands" than with the achievement of Enlightenment in this world. The influential Dhyāna (Chinese Ch'an; Japanese Zen) tradition stressed meditation and a sudden Enlightenment experience. Mahāyāna became the predominant form of Buddhism throughout East Asia and has had an immeasurable impact on the civilizations of China, Korea, and Japan. Numerous sects have arisen as a result of doctrinal disputes, charismatic leaders, and various points of emphasis.

Tantric Buddhism. Known also as Vajrayāna (the "Adamantine Vehicle," or "Diamond Vehicle"), or Mantrayāna (the "Vehicle of the Mantra"), Tantric Buddhism became prominent in India in the 7th century AD. An esoteric path requiring strict guidance under an accomplished master, Tantric ritual involved both the identification of the initiate with a visualized deity and action intended to demonstrate the adept's transcendence of all dualistic categories such as good and evil, male and female, samsara and nirvana. Tantric masters developed elaborate ritual usage of mudras (sacred gestures), mantras (sacred sounds), and mandalas (maps of the spiritual cosmos). Tantrism became the predominant influence on the development of a special form of Buddhism in Mongolia and Tibet.

Buddhist architecture and iconography. Wherever Buddhist doctrine and philosophy have spread in Asia, they have given rise to a remarkable flowering of material culture. Architectural and iconographic features naturally vary from country to country, but basic functions remain the same. The temple is the main sanctuary, in which services, both public and private, are performed. The monastery is a complex of buildings, located usually in a spot chosen for its beauty and seclusion. Its function is to house the activities of the monks.

Images are important features of temples, monasteries, and shrines in both Theravāda and Mahāyāna. Throughout Southeast Asia these generally represent the historic Buddha in postures of meditating, teaching, or reclining. For the devout these call to mind his enlightenment, years of teaching, and passing to nirvana. In countries of central Asia, the treatment of images is more complex. In Mahāyāna sanctuaries, the representations are of different Buddhas, bodhisattvas, saints, and guardian deities derived from India. In China and Tibet these constitute a pantheon, the worship of which is practically polytheistic.

Veneration of relics and personal belongings of the Buddha has been present in Buddhism from the beginning and has given rise to a profusion of reliquary structures—stūpas, dagobas, and pagodas—throughout the Buddhist lands. All these structures have the same basic function. They honour the Buddha in the preservation of his relics or those of his chief disciples. They also serve as objects of pilgrimage and places for symbolic acts of devotion.

In addition to temple design and decoration, Buddhism historically has stimulated creativity in other artistic areas; the traditions of poetry and painting associated with Zen Buddhism are notable examples.

Buddhist council, any of several assemblies convened in the centuries following the death of the Buddha to recite approved texts of scriptures and to settle doctrinal disputes. Little reliable evidence of the historicity of the councils exists, and not all councils are recognized by all the traditions; on occasion they resulted in schisms within the Buddhist community.

The first council, held at Rājagṛha (modern Rājgīr, Bihār state, India), is said to have taken place during the first rainy season following the Buddha's death. Compilations were made of the Buddha's rules of Vinaya (monastic discipline), under the direction of the elder Upāli, and of the sutras (instructive aphorisms), under the direction of the disciple Ananda. The entire assembly of 500 arhats (those who have reached the final stage of spiritual progress) then recited the approved texts.

The second council, held at Vaiśālī (Bihār state), was called to settle a dispute regarding the relaxed rules of discipline followed by the monks of Vaiśālī. According to the Ceylonese Theravāda ("Way of the Elders") tradition, the assembled council of monks was split between those who supported the relaxed practices of the Vaiśālī monks and those who were opposed to them. A majority of the council voted against the Vaiśālī rules, whereupon the defeated minority of monks withdrew and formed the Mahāsaṅghika school. The list of 10 disputed practices differs in various accounts of the council but apparently dealt with such questions as the storing of salt, eating or begging after the prescribed hours, taking as precedent for one's actions the practices of one's tutor, and accepting gold and silver as alms. Accounts of the schism between the Mahāsaṅghikas and the Theravādins (Sanskrit Sthaviravādins) give significance also to doctrinal differences on the nature of the arhat. Scholarship has shown that the Theravādin account of the council is probably incorrect; all Buddhist traditions disagree in their accounts of the council.

The third council, held during the reign of the emperor Aśoka at his capital, Pāṭaliputra (modern Patna), about 247 BC, may have been confined to an assembly of the Theravādas. By then the faithful had divided into schools and subschools holding different interpretations of monastic discipline; it thus became difficult for monks of separate schools who presided together to hold the fortnightly *uposatha* ceremony, which required prior confession by monks of any breach of discipline. This difficulty may have prompted the convening of the third council. Those monks who failed to declare themselves Vibhajyavādins (adherents of the "doctrine of analysis," presumably Theravādins) were turned out of the assembly. The fifth book of the *Abhidhamma Piṭaka* ("Basket of Scholasticism"; a part of the Theravāda canon) contains an examination and refutation of the views held by the third council to be heretical.

The chronicles of the Sarvāstivāda ("All Is Real") school do not mention the Council of Aśoka. The council that they speak of as the third—and about which the Theravādas, in turn, are silent—was held during the reign of Kaniṣka at Jālandhara (or, according to other sources, in Kashmir). The uncertainty of Kaniṣka's dates makes dating of the council equally difficult, but it may have been held *c.* AD 100. The renowned scholar Vasumitra was named president of the council; and, according, to one tradition, commentaries on the scriptures were composed under his direction and copies were enclosed in stupas (reliquaries).

In the modern era, a notable Buddhist council was the sixth, which convened in Rangoon from May 1954 to May 1956 to commemorate the 2,500th anniversary (according to Theravāda chronology) of the death of Gautama Buddha. The entire text of the Pāli Theravāda canon was reviewed and recited by the assembly of monks from Burma, India, Ceylon (now Sri Lanka), Nepal, Cambodia, Thailand, Laos, and Pakistan.

Buddhist Hybrid Sanskrit language, Middle Indo-Aryan literary language, a Prākrit dialect heavily infiltrated with Sanskrit, in which the texts of the northern Buddhist scriptures were written. It was developed before the Christian Era; its Sanskrit influence originated in the Mahāyāna Buddhists' use of Sanskrit in their writings.

Buddhist meditation, the practice of mental concentration leading ultimately through a succession of stages to the final goal of spiritual freedom, Nirvāṇa. Meditation occupies

a central place in Buddhism and combines, in its highest stages, the discipline of progressively increased introversion with the insight brought about by wisdom, or *prajñā*.

The object of concentration (the *kammaṭṭhāna*) may vary according to individual and situation. One Pāli text lists 40 *kammaṭṭhānas*, including devices (such as a colour or a light), repulsive things (such as a corpse), recollections (as of the Buddha), and the *brahmavihāras* (virtues, such as friendliness).

Four stages (called in Sanskrit *dhyānas*; Pāli *jhānas*) are distinguished in the shift of attention from the outward sensory world: (1) detachment from the external world and a consciousness of joy and ease; (2) concentration, with suppression of reasoning and investigation; (3) the passing away of joy, with the sense of ease remaining; and (4) the passing away of ease also, bringing about a state of pure self-possession and equanimity.

The *dhyānas* are followed by four further spiritual exercises, the *samāpattis* ("attainments"). They are described as: (1) consciousness of infinity of space; (2) consciousness of the infinity of cognition; (3) concern with the unreality of things (nihility); and (4) consciousness of unreality as the object of thought.

The stages of Buddhist meditation show many similarities with Hindu meditation (*see* Yoga), reflecting a common tradition in ancient India. The Buddhists, however, describe the culminating trancelike state as transient; final Nirvāṇa requires the insight of wisdom. The exercises meant to develop wisdom involve meditation on the true nature of reality or the conditioned and unconditioned *dharmas* (elements) that make up all phenomena.

Meditation, though important in all schools of Buddhism, has developed characteristic variations within different traditions. In China and Japan the practice of *dhyāna* (meditation) assumed sufficient importance to develop into a school of its own (Ch'an and Zen; *q.v.*), in which meditation is the most essential feature of the school.

budding, in biology, a form of asexual reproduction in which a new individual develops from some generative anatomical point of the parent organism. In some species buds may be produced from almost any point of the body, but in many cases budding is restricted to specialized areas. The initial protuberance of proliferating cytoplasm or cells, the bud, eventually develops into an organism duplicating the parent. The new individual may separate to exist independently, or the buds may remain attached, forming aggregates or colonies. Budding is characteristic of a few unicellular organisms (*e.g.*, certain bacteria, yeasts, and protozoans); however, a number of metazoan animals (*e.g.*, certain cnidarian species) regularly reproduce by budding. In horticulture the term budding refers to a method of plant propagation in which a bud of the plant to be propagated is grafted onto the stem of another plant.

budding bacteria, name for a problematic group of bacteria that reproduce by budding. They are widespread inhabitants of soil and aquatic environments. The genus *Hyphomicrobium* is representative. Filaments (hyphae) develop at the ends of the cell, at the tips of which buds form and grow into mature cells that soon separate. *Hyphomonas, Pasteuria,* and *Planctomyces* share this peculiar budding habit. Other genera allied to the budding bacteria include *Caulobacter* and *Gallionella,* which exhibit stalks but reproduce by fission.

Budé, Guillaume, Latin GUGLIELMUS BUDAEUS (b. Jan. 26, 1467, Paris—d. Aug. 20, 1540, Paris), French scholar who brought about a revival of classical studies in France and founded the Collège de France, Paris; he was also a diplomat and royal librarian.

Educated in Paris and Orléans, he became especially proficient in Greek, learning philosophy, law, theology, and medicine as well. In 1502 King Louis XII sent him to Rome as French ambassador to the coronation of Pope Julius II. He later returned to Paris, served as a king's secretary until 1515, then travelled again to Rome as ambassador to Pope Leo X. When the new king, Francis I, appointed him royal librarian upon his return to Paris from this second mission, Budé directed the assembling in the Palais de Fontainebleau of various royal manuscript collections; the library that he built formed the nucleus of today's French national library, the Bibliothèque Nationale. To his king, Budé suggested the creation of a college for the study of Greek, Latin, and Hebrew. After some difficulties, this institution opened in 1530; it became a centre for higher studies in France and reawakened interest in classical languages and literature.

Budé's *Commentarii linguae Graecae* (1529; "Commentaries on the Greek Language"), one of his many books, was instrumental in the classical revival. *See also* France, Collège de.

Bude-Stratton, parish (town), North Cornwall district, county of Cornwall, England, consisting of the coastal resort of Bude and the smaller inland settlement of Stratton. The area faces westward onto Widemouth Bay and the Atlantic Ocean, and its beaches are much used by surf riders. Stratton's parish church (St. Andrew's) dates from the 15th century, but that of Bude (St. Michael's) dates only from 1835. Pop. (1981 prelim.) 6,783.

Budenny, Semyon Mikhaylovich (b. April 25 [April 13, old style], 1883, Kozyurin, near Rostov-on-Don, Russia—d. Oct. 17, 1973, Moscow), Red Army officer who played a prominent role in the Russian Civil War and later became a marshal of the Soviet Union.

Having come from a poor peasant family, Budenny began his military career in the Imperial Russian Army, in 1903, in the Far East. Later he took part in the Revolution that overthrew the imperial government, became chairman of the divisional soviet of soldiers in the Caucasus, and formed a cavalry unit to fight the Whites (anti-Bolsheviks) in the northern Caucasus (February 1918). In 1919 he joined the Communist Party and, having become commander of the 1st Cavalry Army (1919–24), played a crucial role in defeating the White generals Anton Denikin and Pyotr Wrangel and in fighting the Poles (1920); in 1922 he also became commander of all the troops in the north Caucasian military district.

While serving as inspector of the Red Army's cavalry (1924–37) and commander of the Moscow military district (1937–40), Budenny attended the Frunze Military Academy (graduating in 1932) and was promoted to the rank of marshal of the Soviet Union. He also became a member of the Presidium of the Supreme Soviet (1938), a full member of the party's Central Committee (1939), and first deputy commissar for defense (1940). When Germany invaded the Soviet Union in 1941, Budenny was placed in command of the southwest front, but he soon suffered serious defeats and was replaced. In 1953 he resumed his post of inspector of the cavalry. He was named Hero of the Soviet Union in 1958; in 1961, however, he was reduced to a candidate member of the Central Committee.

Buderim, town, southeastern Queensland, Australia, about 62 mi (100 km) north of Brisbane by the Bruce Highway, on the Sunshine Coast. The town was proclaimed in 1869, its name coming from an Aboriginal word for honeysuckle. The red volcanic soil of the area produces avocados, citrus fruits, vegetables, and ginger. The town has a ginger-processing factory (the only one in Australia) and manufactures car parts. Tourism is a major industry. Pop. (1981) 4,016.

Budge, Don, byname of JOHN DONALD BUDGE (b. June 13, 1915, Oakland, Calif., U.S.), first amateur lawn tennis player to win the grand slam—*i.e.,* the four major singles championships of the time, Australia, France, Great Britain, and the U.S.—in one year (1938).

Budge was active in sports as a boy but was not particularly interested in tennis. In the first tournament he ever entered, however, Budge won the California state boys' singles (1930). Representing the U.S. four times (1935–38) in international team competition for the Davis Cup, he won 25 of 29 matches, and in 1937 he led the U.S. team to its first victory since 1926. At Wimbledon in 1937 and again in 1938 he won not only the singles but also the men's doubles (with Gene Mako) and the mixed doubles (with Alice Marble). In the U.S. tournament at Forest Hills, N.Y., he won four titles: two singles (1937–38) and two men's doubles (1936 and 1938, with Mako). For his feats in 1937 he became the first tennis player to be awarded the James E. Sullivan Memorial Trophy as the outstanding U.S. amateur athlete of the year. Budge played his first professional match early in 1939, the same year in which his book *Budge on Tennis* was published. Budge was famous for his backhand, which with him became an offensive rather than a defensive stroke. In 1964 he was elected to the National Lawn Tennis Association Hall of Fame.

Budge, Sir (Ernest Alfred Thompson) Wallis (b. July 27, 1857, Cornwall, Eng.—d. Nov. 23, 1934, London), Orientalist and curator (1894–1924) of Egyptian and Assyrian antiquities at the British Museum, London, for which he collected vast numbers of cuneiform tablets, Egyptian papyri, and Greek, Coptic, Arabic, Syriac, and Ethiopic manuscripts. He entered the museum's service in 1883 and subsequently made many trips to Mesopotamia, Egypt, and the Sudan to conduct archaeological excavations. He published many works, including translations of ancient texts. He was knighted in 1920.

Budge Budge, also spelled BAJ BAJ, town, Twenty-four Parganas district, West Bengal state, northeastern India, just southeast of the Hooghly River. Connected by road and rail with Alīpore and Calcutta, it is a jute- and cotton-milling centre and serves as the oil depot for Calcutta. A major boot and shoe factory is nearby in Batanagar. Remains of a fort captured by the British general Robert Clive in 1756 are still visible. Budge Budge was constituted a municipality in 1900. Pop. (1981) 70,404.

Budgell, Eustace (b. Aug. 19, 1686, St. Thomas, near Exeter, Eng.—d. May 4, 1737,

Budgell, detail of an engraving by C. Knight after a painting by D. Firmin, 1720

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

London), British writer who, apart from Joseph Addison and Richard Steele, was the principal contributor to *The Spectator.* Thirty-seven papers (those marked with an X) are attributed to him.

In 1710 Addison, his cousin, then secretary to the lord lieutenant of Ireland, offered Budgell a clerkship; and until 1718 Budgell filled many posts with considerable ability. Meanwhile, after perhaps helping with *The Tatler,* he wrote his *Spectator* papers and a few for *The Guardian.* In 1718, when the Duke of Bolton became lord lieutenant, Budgell quarreled with him and was dismissed. His difficulties were aggravated by the loss of £20,000 in the South Sea Bubble, an incident involving the South Sea (trading) Company and the wild speculation of a number of investors. Budgell wrote libels against Sir Robert Walpole in the antigovernmental *Craftsman* and founded his own weekly, the *Bee* (1733–35), which ran to 100 numbers, many filled with vainglorious self-justification. Disliked by many, Budgell was criticized by Alexander Pope in the *Epistle to Dr. Arbuthnot* and *The Dunciad.* His last years were spent in litigation concerning a will that he may have forged, making him beneficiary. Finally, Budgell weighted his pockets with stones and threw himself into the Thames.

budgerigar, also called SHELL PARAKEET, popular species of parakeet (*q.v.*).

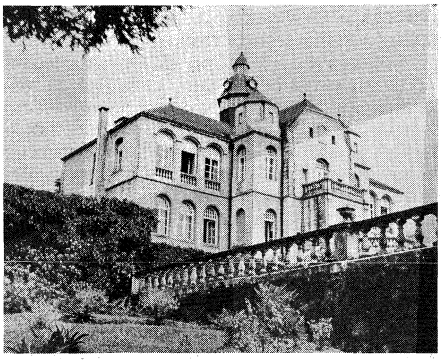
Budi Utomo (Indonesian: "High Endeavour"), the first Indonesian nationalist organization. It was founded on May 20, 1908, a day designated by the Indonesian government as the Day of National Awakening.

A few years before the formation of the Budi Utomo, Mas Wahidin Sudirohusodo (also spelled Sudira Usada, or Soediraoesada), a retired Javanese physician, sought to elevate the Javanese people through the study of Western knowledge as well as their own cultural heritage. His efforts were finally supported by Dutch-educated Javanese students in Batavia (Jakarta) and later by Javanese aristocrats and *priyayi* (elite). They met in Yogyakarta in 1908 and founded the Budi Utomo, which aimed at promoting the cultural and economic status of the Javanese. Its concept of a "people" was limited to the populations of Java and Madura, and even as late as 1931, long after it had begun to seek political goals, it accepted as members only ethnic Javanese.

As a Javanese cultural organization, it developed rapidly in the initial period. By the end of 1909 it claimed to have 40 branches with 10,000 members, predominantly civil servants. Initially, however, the Budi Utomo was not a political party. It was dominated by relatively conservative leaders who did not seek mass support. Its numerical strength declined when the Sarekat Islām, a proto-nationalist party, appeared. The Budi Utomo began to play a political role in 1918 by joining the Volksraad (People's Council), but it remained a minor organization. In 1935 it was dissolved.

Budweis (Czechoslovakia): *see* České Budějovice.

Buea, also spelled BOUEA, city, southwestern Cameroon, west central Africa, situated 3,000 feet (900 m) above sea level on the southeast slope of Mount Cameroon. It was formerly the capital of German Kamerun (1884–1919), and several historic sites of the early mission and colonial periods have been preserved, including the Prime Minister's Lodge (1902), the old Secretariat, the Bismarck Fountain, the Native Authority School (1902–04), and the German Burial Ground (1911). In 1922 Buea became the seat of the British commissioner for Southern Cameroons. Today it is an administrative and trade centre. It has textile, construction, and wood industries, and nearby are a number of oil-palm and rubber plantations owned by the Cameroon Development Corporation. Tourism is important. Buea is served by an airfield, roads, a hospital, and a branch campus (arts) of the University of Yaoundé. Pop. (1981 est.) 29,953.



The Prime Minister's Lodge in Buea, Cameroon
Tomas D.W. Friedmann—Photo Researchers

Buell, Don Carlos (b. March 23, 1818, near Marietta, Ohio, U.S.—d. Nov. 19, 1898, Rockport, Ky.), Union general in the American Civil War.

Buell graduated from West Point in 1841 and was company officer of infantry in the Seminole War of 1841–42 and the Mexican War. From 1848 to 1861 he acted chiefly as assistant adjutant general. On the outbreak of the Civil War he was appointed lieutenant colonel, then brigadier general of volunteers and major general of volunteers in March 1862. He aided in organizing the Army of the Potomac and was sent, in November 1861, to Kentucky to succeed General William T. Sherman in command. There he organized and trained the Army of the Ohio, which to the end of its career retained a standard surpassed only by that of the Army of the Potomac. In the spring of 1862 Buell pursued the retiring Confederates under General Sidney Johnston, served under General Henry W. Halleck in the Union advance on Corinth, and in the autumn commanded in the campaign in Kentucky against General Braxton Bragg. A period of maneuvering ended in the indecisive Battle of Perryville. The alleged tardiness of his pursuit and his objection to a plan of campaign ordered by the Washington authorities brought about his removal from command. The complaints made against him were investigated in 1862–63, but the result was not published.

Subsequently he was offered military employment, which he declined. He resigned his volunteer commission in May and his regular commission in June 1864. After the war he settled in Kentucky, where he engaged in mining.

Where the same name may denote a person, place, or thing, the articles will be found in that order

Buen Retiro ware, porcelain manufactured at the royal residence of Buen Retiro, outside Madrid, from 1760 to about 1808, by Capodimonte potters. When Charles III of Naples, who had founded Capodimonte in 1743, succeeded to the Spanish throne as Charles III, he removed his own potters, molds, models, and even materials to Buen Retiro, ensuring a continuation of the Neapolitan factory. Because the Bourbon fleur-de-lis remained the factory mark, it is difficult to distinguish the later Italian from the early Spanish ware, though inevitably the standards of Capodimonte were not long maintained. Two early tasks at the factory were to equip, at vast expense, entire Rococo porcelain rooms at the palace of Aranjuez, under the direction of Giuseppe Gricci, and at the palace in Madrid. There, among other achievements, were a porcelain clock, surmounted with figures, and vases more than 6 feet (1.8 m) tall, filled with porcelain flowers. Other grandiose Buen Retiro work included ceilings and mirrors. In its less flamboyant expressions, the porcelain is of great charm, with bright, soft colours, stippling, and gilt used to advantage; the style is a Spanish version of Louis XVI style.

Buen Retiro porcelain was reserved for the Spanish court until shortly before Charles III's death in 1788. Under the management of Bartolomé Sureda, who in 1803 replaced the old soft porcelain with a hard paste of inferior quality, useful ware was more extensively manufactured. During the Peninsular War the French turned the factory into a fort in 1808, and it was destroyed by the British in 1812. In 1817, however, manufacture was resumed at La Moncloa and continued until 1850.

Buena Park, city, Orange County, southern California, U.S. The site known as Buena Plaza, part of the Rancho Los Coyotes, was laid out and named Buena Park in 1887 by James A. Whitaker. It developed as a dairy centre, later becoming a residential community connected by freeway to Los Angeles to the northwest. Knott's Berry Farm, an expansive amusement centre, the Movieland Wax Museum, Palace of Living Art, and an automobile and aircraft museum are in the city. Aircraft and food industries are prevalent. Inc. 1953. Pop. (1984 est.) 65,322.

Buena Vista, Battle of, also called BATTLE OF ANGOSTURA (Feb. 22–23, 1847), battle fought near Monterrey, Mex., in the Mexican War (1846–48), the war between the United States and Mexico. A U.S. army of about 5,000 men under General Zachary Taylor had invaded northeastern Mexico, taking Monterrey and Saltillo. General Antonio López de Santa Anna meanwhile had gathered a force of about 14,000 troops and was marching north from San Luis Potosí to engage the invader. When reports of the Mexican threat reached Taylor, he moved his forces on February 21 to La Angostura, near the hacienda of Buena Vista, where there is a pass between two high ranges of mountains. Taylor's communications line was cut by Mexican cavalry the next day, and the main Mexican attack began on February 23, pressing the exposed left flank facing the eastern side of the pass, which Taylor had failed to fortify. Despite the retreat of some volunteer infantry regiments, the heavy U.S. artillery fire turned back the Mexicans, and, by nightfall, they had suffered estimated casualties of about 1,500 to Taylor's 700. Leaving their campfires burning as a ruse, the Mexican army retreated during the night. Taylor did not pursue Santa Anna. In April at the Battle of Cerro Gordo, Santa Anna failed to halt the invasion of another U.S. army under General Winfield Scott, who captured Mexico City in September, thus assuring a U.S. victory in the war. Taylor's victory enhanced his national reputation and helped him win the U.S. presidency in 1848.

Buenaventura, port of Valle del Cauca department, western Colombia, on the Isla (island) Cascajal, where the Río Dagua reaches the Bahía (bay) de Buenaventura. Although founded in 1540, it remained relatively unimportant because of the warm, humid climate and poor transportation. In the 1930s inland connections were improved, resulting in the growth of road-borne traffic; modern port facilities and an airport were also constructed. Buenaventura is now Colombia's main Pacific port, handling the sugar, coffee, and cotton of the fertile upper basin of the Cauca Valley, sawn wood from coastal forests of southwestern Colombia, and most of the gold and platinum of the Chocó region to the north. A major fishing port from which frozen shrimp

are exported, it is also the terminus of an oil pipeline from Puerto Berrío via Cali and of a spur from Cali of the Puerto Berrío–Popayán railway. Pop. (1973) 110,713.

Bueno, Maria Ester Audion (b. *c.* 1939, São Paulo, Braz.), amateur tennis player who won 17 Wimbledon and United States (Forest Hills, N.Y., and Brookline, Mass.) championships from 1958 through 1968.

Bueno began playing tennis at about the age of six and won her first tournament at São Paolo at the age of 12 and the women's tennis championship of Brazil at 15. In 1958 she won the women's doubles championship, with Althea Gibson, at Wimbledon, and in 1959 she won the singles championships at Wimbledon and Forest Hills. In 1960 she repeated her Wimbledon singles victory and teamed with Darlene Hard to win the Wimbledon and U.S. doubles titles. After a serious illness she returned to competition in 1962, winning the U.S. doubles championship with Hard. In 1963 she won the U.S. singles title and shared Wimbledon doubles honours, again with Hard. She swept the Wimbledon and Forest Hills singles events in 1964, and in 1965 she won the Wimbledon doubles with Billie Jean Moffitt (afterward Billie Jean King). In 1966 she won her fourth U.S. singles title and, with Nancy Richey (afterward Nancy Richey Gunter), captured the doubles championships at Wimbledon and Forest Hills. In 1968 she joined Margaret Smith Court to win the women's doubles title in the first open tournament (both amateurs and professionals eligible) at Forest Hills. Bueno and Court also won doubles honours in the 1968 U.S. amateur tournament, held at Brookline. After a long retirement because of injuries, she joined the professional tour in 1975 and played at Wimbledon in 1976 and 1977. Bueno was particularly graceful as an amateur, with a good range of shots.

Buenos Aires, province, eastern Argentina, lying south of the Río Paraná and southeast of the Río de la Plata (which forms the border with Uruguay) and extending westward from the Atlantic Ocean to include the major part of the humid Argentine Pampa, a vast, grass-covered plain. The province, which surrounds the federal district of Buenos Aires and includes Martín García Island, has an area of 118,843 sq mi [307,804 sq km]. The largest and most populated of the provinces, it is the cultural and economic centre of Argentina. One main river, the Salado, crosses the province (northwest–southeast) for a distance of 360 mi (580 km). In the south, two low mountain ranges, the Sierra del Tandil and the Sierra de la Ventana, extend inland from the coast in northwesterly directions.

During colonial times the region was virtually unexploited, save for hides from the vast herds of cattle and horses that ran wild on the Pampa. The inhabitants supported separation from Spain in 1810, but throughout most of the 19th century there was continued internal strife during the efforts to organize the nation. Provincial status was attained in 1862. The city of Buenos Aires became the site of the national government in 1880, and the provincial authorities moved their administration to La Plata (*q.v.*). About the same time, the Pampa Indians were subdued. The period of peace that followed, as well as an influx of foreign immigrants, provided stimulus for economic development.

The late 19th and early 20th centuries witnessed the expansion of cattle raising and the development of wheat, corn (maize), and alfalfa growing as major sources of income for both domestic and European markets. Although Buenos Aires province ranks first in the republic for the number and quality of its livestock and uses about half of its land for grazing, an increasing area has been given over to crops. Livestock raising is concentrated in the coastal area below the federal district, extending inland for 150 mi and southward to Mar del Plata. A broad band running north and south through the province and growing wider in the southern coastal region is devoted to wheat. Corn (maize) is raised in the north, while around the federal district, for a radius of 50 mi, are intensive truck gardens that supply the urban population with fresh fruits and vegetables. Industry and transportation systems are concentrated in the federal capital of Buenos Aires and its suburbs, but Bahía Blanca, Mar del Plata, and La Plata are also important industrial and communication centres. Pop. (1983 est.) 11,625,000.

Buenos Aires, city, federal district, and capital of Argentina, situated on the western shore of the Río de la Plata, 150 mi (240 km) from the Atlantic Ocean. The city, a cosmopolitan, sprawling megalopolis, is one of the world's major ports, as well as the national centre of commerce, industry, politics, and culture.

The following article treats briefly the modern city of Buenos Aires. Fuller treatment is provided in the following MACROPAEDIA articles. For history and contemporary life, *see* Buenos Aires; for additional perspective on the city in its national context, *see* Argentina.

Buenos Aires lies on the southeastern corner of the plain stretching between the Río Reconquista to the west and the Río Riachuelo (Matanza) to the southeast. Except for the vast estuary on its eastern side, the federal district is surrounded by Buenos Aires province. Gran (Greater) Buenos Aires is composed of the federal district and 22 adjacent municipalities. The temperate climate of the Pampas (the extensive Argentinian plain), characteristic of the Río de la Plata's coastal area, is marked by a long summer, abrupt daily changes in temperature, and high humidity.

A preponderance of Argentinian industry is located in Buenos Aires proper. Main industries include food processing (meat, fish, and grain), metalworking, automobile assembly, oil refining, printing, and the manufacture of textiles, paper, and chemicals. Service industries are important in suburban areas. The national banking system is controlled by the Banco Central de la República Argentina; private and foreign banks, credit institutions, and a stock market are also located there. The port of Buenos Aires handles more than one-third of the country's shipping.

Most of the more than 50 *barrios* (neighbourhoods) in the city were founded in the 19th century; the more important include San Telmo, in the *centro* (city centre); the waterfront La Boca, now primarily Italian; and Flores. The *centro* coincides with the original settlement. Part of the *centro* is known as the capital zone because it contains the principal government buildings and the larger commercial concerns. The urban core is to be found at the convergence of major avenues on a wide green composed of the Plaza de Mayo and the Parque Colón.

Buildings of the 20th century are interspersed with earlier structures; some 17th- and 18th-century examples survive from the Spanish viceregal period. Many luxurious palaces dating from the late 19th or early 20th centuries have been converted for public and private use.

The University of Buenos Aires (1821) is the principal university among the more than 40 in the city. Other educational institutions include the Universidad Tecnológica Nacional (1959), the Universidad Católica Argentina (1912), and the Universidad del Salvador (1959). Public and institutional libraries include the National Library and that of the National Congress. The city's numerous museums house varied collections of scientific artifacts, fine arts, antiques, and historical memorabilia.

The transportation system includes *colectivos* (microbuses) and taxis. Five expressways radiate from the *centro* and connect with the encircling General Paz Expressway. The city has five interconnected subway lines, as well as two electrically powered interurban lines running to the towns of Tigre and Moreno, and it is the terminus of the major railways in Argentina. The two international airports of Ezeiza and Don Torcuato are located outside the city limits, in Matanza and Tigre, respectively; the Buenos Aires City Airport also serves flights from neighbouring countries. The port, one of the world's largest, stretches for 5 mi and has an entirely man-made harbour at the west end of an estuary about 175 mi long that requires constant dredging. Area city (federal district), 77 sq mi (200 sq km); metropolitan area, 1,497 sq mi. Pop. (1982 est.) city (federal district), 2,879,000; (1980) metropolitan area, 9,766,030.

Buerger, Martin Julian (b. April 8, 1903, Detroit), U.S. crystallographer who devised or improved many of the standard methods, techniques, and instruments of modern crystal-structure analysis.

Upon receiving his Ph.D. from the Massachusetts Institute of Technology, Cambridge, in 1929, he was appointed to its faculty. He became institute professor in 1956 and emeritus in 1968. He was also named university professor (1968–73) by the University of Connecticut.

Among the most important of his innovations is the precession method of X-ray diffraction analysis (the determination of the spatial arrangement of atoms in crystals by observing the pattern in which they scatter a beam of X-rays), one of the two most commonly used methods of recording diffraction intensities.

Buerger's disease, also called THROMBOANGIITIS OBLITERANS, inflammation of the peripheral arteries primarily, which occurs chiefly in men from adolescence to middle age. The cause is unknown but may be hypersensitivity, especially to tobacco, because affected persons are often heavy smokers. As in peripheral arteriosclerosis, the disease causes intermittent lameness and pain during periods of rest. Buerger's disease may eventually block arteries and cause gangrene. Some authorities classify the disease as atherosclerosis.

Buero Vallejo, Antonio (b. Sept. 29, 1916, Guadalajara, Spain), playwright considered the most important Spanish dramatist of the post-World War II generation.

Buero Vallejo studied art in Madrid and Guadalajara from 1934 to 1936. During the Civil War (1936–39), he served as a medical orderly in the Spanish Republican Army. After the war, he was condemned to death by the Nationalists but the sentence was commuted to imprisonment. He was held in prison for more than six years.

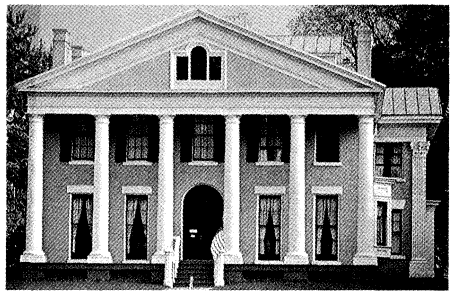
In 1949 he won national notice with his play *Historia de una escalera* (1950; "The Story of a Stairway"), for which he was awarded the Lope de Vega, an important literary prize. The play portrays the frustrations of poor apartment house tenants in a slum of Madrid. His one-act play produced in the same year, *Palabras en la arena* ("Words in the Sand"), which had for its theme adultery and the need for mercy, won another Spanish literary award, as did many of his plays that followed. In *En la ardiente oscuridad* (1951; "In the Burning Darkness"), his second full-length play, a home for the blind stands as a metaphor for society. *La tejedora de sueños* (1952; *The Dream Weaver,* 1967) is based on mythology and *Irene o el tesoro* (1955; "Irene or the Treasure") on the fantastic. His basic theme is the yearning for human happiness and the obstacles that frustrate its attainment.

In *Hoy es fiesta* (1957; "Fiesta Today"), he returned to the slums of Madrid for his ironic and realistic material. His realism echoes the style of Arthur Miller. Buero Vallejo's later works show the influence of Bertolt Brecht, whose works he translated.

His historical plays were carefully researched. They include *Un soñador para un pueblo* (1959; "A Dreamer for the Nation"), which deals with the failure to modernize Spain under Charles III, *Las meninas* (1961; "The Ladies-in-Waiting"), which is about Velázquez, and *El concierto de San Ovidio* (1963; *The Concert at Saint Ovide,* 1967), set in Paris during the French Revolution. *El tragaluz* (1968; "The Basement Window") deals with the Civil War. Later works include *El sueño de la razón* (1970; "The Dream of Reason") and *La doble historia del doctor Valmy* (1978; "The Double Life of Doctor Valmy").

In 1971 Buero Vallejo was elected to the Spanish Academy. R.L. Nicholas wrote *The Tragic Stages of Antonio Buero Vallejo* (1972).

Buffalo, city and port of entry, seat (1821) of Erie County, northwestern New York, U.S., at the eastern end of Lake Erie (as it narrows into the Niagara River). New York's second largest city, it is the metropolis of a large urban complex that includes the cities of Niagara Falls,



The Ansley Wilcox Mansion, Buffalo
Milt and Joan Mann from CameraMann

North Tonawanda, Lockport, Lackawanna, and Tonawanda, and the towns (townships) of Amherst, Hamburg, Cheektowaga, Lancaster, and West Seneca.

Its site, at the natural junction of east–west transportation routes from the Hudson–Mohawk valleys to the Great Lakes Basin, was visited by early French trappers and Jesuit missionaries. It was there on the banks of the Niagara River that René-Robert Cavelier, sieur de la Salle, built his ship the "Griffon" in 1679. A French trading post under Chabert Joncaire was established in 1758 but was abandoned the following year. Seneca Indians under British protection settled the area in 1780. The town was laid out in 1803 by Joseph Ellicott for the Holland Land Company. Named New Amsterdam (but popularly called Buffalo), it had a population of 1,500 at the time of the War of 1812 and became the American military headquarters for operations on the Niagara Frontier. Burned by the British in 1813, it was rebuilt and incorporated as the village of Buffalo in 1816. The origin of the place-name is in dispute as buffalo (bison) did not inhabit the area; it may reflect a mispronunciation of the French *beau fleuve* ("beautiful river") in reference to the local Buffalo Creek.

The first steamboat on the upper Great Lakes, "Walk-on-the-Water," was built at Buffalo in 1818. The completion of the Erie Canal in 1825 brought a tremendous economic boom to the community, attracting immigrants and boosting its population to 10,000 at the time of its incorporation as a city in 1832. Trade with the expanding West grew rapidly during the Civil War period. Railroads, attracted by existing markets and trade routes, converged on the city. Shipyards, iron and steel mills, meat-packing plants, flour mills, and railroad-car industries developed. The harnessing of Niagara water power in the 1890s further stimulated the growth of highly diversified industry. Buffalo has become a major port of the St. Lawrence Seaway; it is the terminus of the New York State Barge Canal and is a major rail centre and highway crossroads handling large tonnages of grain, limestone, coal, iron ore, lumber, petroleum, and automobiles. As the main U.S. gateway to the Toronto–Hamilton industrial region of Ontario, it processes a large percentage of U.S.–Canadian trade. The international Peace Bridge to Fort Erie, Ont., was opened in 1927 as a memorial to 100 years of U.S.–Canadian peace.

Buffalo was the home of two U.S. presidents—Millard Fillmore and Grover Cleveland, who was elected mayor in 1881. Pres. William McKinley was assassinated while visiting the Pan-American Exposition held (1901) in the city. The Ansley Wilcox Mansion, where Theodore Roosevelt took the oath of office following the assassination, was dedicated a national historic site in 1966. Niagara Square, dominated by the McKinley Monument and site of the City Hall (1932) and federal buildings, is the focus of the city.

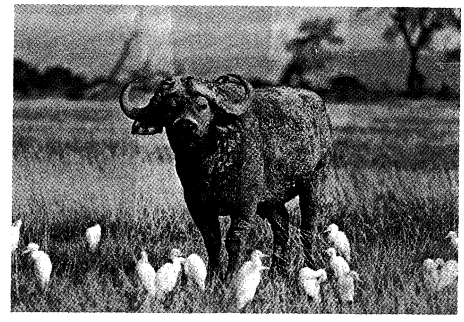
The State University of New York at Buffalo was founded in 1846 and the State University College at Buffalo originated in 1867 as a normal school. Colleges in the city include Canisius (1870), D'Youville (1908), Medaille (1937), Daemen (1947), Daemon College (1948), Villa Maria (1960), Trocaire (1958), and Erie Community (1946). Buffalo is also an established centre for nuclear, aerospace, and medical research. Notable cultural institutions are the Albright-Knox Art Gallery, the Historical Museum, the Museum of Science, Kleinhans Music Hall (home of the Buffalo Philharmonic Orchestra), and Studio Arena, a professional theatre founded in 1965. Rich Stadium is the home of the Bills (football team) and the Memorial Auditorium of the Braves (basketball) and Sabres (ice hockey) teams. Pop. (1970) city, 462,768; metropolitan area (SMSA), 1,349,211; (1980) city, 357,870; metropolitan area (SMSA), 1,242,573.

Buffalo, town, seat of Johnson County, north central Wyoming, U.S., on Clear Creek, immediately east of the Bighorn Mountains and Bighorn National Forest. Founded in 1879 on a buffalo trail that forded the creek, the town saw much conflict between farmers and cattlemen, and the site where the Johnson County Cattle War (1892) terminated is 13 mi (21 km) south at the TA Ranch. Many Indian battles were also fought in the vicinity, and the sites of Ft. Phil Kearney and the Fetterman Massacre (1886) are a few miles northwest. Buffalo is a shipping point for livestock and lumber, with grain and sugar beet cultivation, and oil wells in the vicinity. Lake De Smet is 7 mi (11 km) north. Inc. 1884. Pop. (1980) 3,799.

buffalo, any of several cud-chewing mammals of the family Bovidae (order Artiodactyla). The name is often applied to the bison (*q.v.*) of North America.

The Indian buffalo (*Bubalus bubalis*), also called water buffalo and carabao, roams wild in southeastern Asia and is kept as a domestic animal throughout the warmer parts of the Old World; it is the principal draft animal in the rice-growing countries of Southeast Asia. A massively built, oxlike animal, it is dull black with a sparse coat and large horns that are triangular in cross section. It stands 1.5 metres (5 feet) or more at the shoulder and weighs up to 800 kilograms (1,760 pounds). The horns, which together may be more than 1.2 m long, curve outward and backward. The horns of the cow are more slender than those of the bull.

In the wild, the Indian buffalo lives in herds, most often in swampland and grass jungle. Bold and even savage, it will often charge intruders. In summer, the female bears one or two calves, 10 months after conception. Domestic races of the Indian buffalo are kept mainly as draft animals and for milk, butter, and hides.



Cape, or African, buffalo (*Syncerus caffer*)
Mark Boulton—The National Audubon Society Collection/Photo Researchers

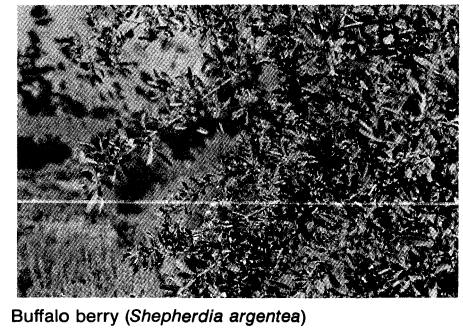
The Cape, or African, buffalo (*Syncerus caffer*) is a similar massive, black, sparsely haired animal standing up to 1.5 m at the shoulder; bulls weigh up to about 900 kg. Its heavy horns typically curve downward, then up and inward; at their bases, they form large bosses. A subspecies of Cape buffalo found in dense West African forests is smaller, reddish brown, and has shorter horns.

Formerly found over all of Africa south of the Sahara, the Cape buffalo has been greatly reduced in numbers by disease and hunting. It is a gregarious animal of open or scrub-covered plains and open forests. The cow bears a single young after about 11 months' gestation. When wounded, the Cape buffalo is regarded as one of the most dangerous animals to man. It has never been domesticated.

The anoa (*Anoa depressicornis*) is a diminutive, dark-brown buffalo of dense, mature forests of Celebes. A shy animal restricted to the interior of the island, the anoa stands 0.75–1 m at the shoulder and has straight, sharp-tipped horns. It is hunted for food and for hides and horns. A closely related, slightly larger species, the tamarau, or tamaraw (*Anoa mindorensis*), inhabits the Philippine island of Mindoro. Exceedingly shy and wild, the tamarau has been badly depleted in numbers. Like several races of anoa, it is listed as endangered in the *Red Data Book.*

The Cape buffalo, tamarau, and anoa are sometimes considered to be of the same genus (*Bubalus*) as the Indian buffalo.

buffalo berry, also called RABBIT BERRY, or NEBRASKA CURRANT (*Shepherdia argentea*), shrub, 2 to 6 metres (about 6 to 20 feet) high, of the oleaster family (Elaeagnaceae) with whitish, somewhat thorny branches and small, oblong, silvery leaves. It is a very hardy



Buffalo berry (*Shepherdia argentea*)
Miles C. Labrum

shrub, growing wild along stream banks in the Great Plains of North America. Because it is also tolerant of windswept sites on dry, rocky

soil, it is valued as an ornamental and hedge plant where other shrubs often fail.

The fruit, borne in profusion in August or September, is a currant-sized, scarlet-red or golden-yellow berry with a tart flavour. The berries are used to make a meat relish and jelly. Male and female flowers are borne on separate plants, and in cultivation where fruit is desired it is necessary to set out one male plant for every four to six females.

A smaller relative, the Canadian buffalo berry (*S. canadensis*), grows to about 2½ m high, has oval leaves that are silvery only on the underside, and occurs on wooded banks and hillsides from Newfoundland and New York to Alaska and Oregon and southward along the Rocky Mountains to New Mexico. Its fruits are edible but not highly esteemed.

Buffalo Bill: *see* Cody, William F(rederick).

buffalo bur, also called BEAKED NIGHTSHADE or PRICKLY POTATO (*Solanum rostratum*), plant of the nightshade family Solanaceae (order Scrophulariales), native to high plains east of the Rocky Mountains from North Dakota to Mexico. It bears small yellow flowers from May to September.

The buffalo bur, named for its prickly covering enclosing the berry, is the original host plant of the destructive Colorado potato beetle. It is now an aggressive weed in many places.

buffalo gnat: *see* black fly.

buffalo grass (*Buchloe dactyloides*), perennial western North American grass of the family Poaceae and the only species in the genus *Buchloe*. The plant is less than 20 centimetres (8 inches) tall, with gray-green, curly leaves

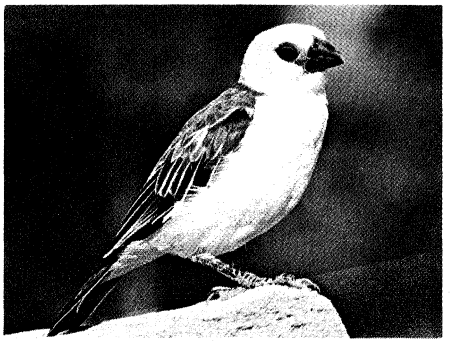
Buffalo grass (*Buchloe dactyloides*)
Arthur O. Tucker

and extensively creeping stolons (horizontal, root-forming stems). Buffalo grass forms a dense turf and thick sod, which early settlers used in the construction of dwellings. It is also an important year-round forage plant.

Buffalo Indian: *see* Plains Indian.

Buffalo Range (Malaysia): *see* Main Range.

buffalo weaver, either of the two African birds constituting the subfamily Bubalornithinae of the family Ploceidae. The more widespread species is the black buffalo weaver, or oxbird (*Bubalornis albirostris*); it is black, with white in the wings. The white-headed buffalo weaver (*Dinemellia dinemelli*), confined to eastern Africa, is brown and white, with red rump and vent. Both are stout-bodied, heavy-billed birds 20–25 centimetres (8–



White-headed buffalo weaver (*Dinemellia dinemelli*)
Jacques Six

10 inches) long. In breeding season the male's bill becomes whitish and swollen at the base. Buffalo weavers live in dry regions, where they forage omnivorously on the ground in small noisy flocks, often in the wake of buffalo herds. The nest, a heap of thorny twigs, contains compartments for two or more pairs; several nests may occupy the same tree.

buffer, in chemistry, solution usually containing an acid and a base, or a salt, that tends to maintain a constant hydrogen ion concentration. Ions are atoms or molecules that have lost or gained one or more electrons. An example of a common buffer is a solution of acetic acid (CH_3COOH) and sodium acetate. In water solution, sodium acetate is completely dissociated into sodium (Na^+) and acetate (CH_3COO^-) ions. The hydrogen ion concentration of the buffer solution is given by the expression:

$$[H^+] = K_a \frac{[CH_3COOH]}{[CH_3COO^-]},$$

in which K_a is the ionization constant of acetic acid and the expressions in brackets are the concentrations of the respective substances. The hydrogen ion concentration of the buffer solution is dependent on the relative amounts of acetic acid and acetate ion (or sodium acetate) present, known as the buffer ratio. The addition of an acid or a base will cause corresponding changes in the concentration of acetic acid and acetate ion, but as long as the concentration of the added substances is small compared to the concentration of the individual buffer components, the new hydrogen ion concentration will remain close to its original value.

Buffer solutions with different hydrogen ion concentrations may be prepared by varying the buffer ratio and by choice of an acid of appropriate intrinsic strength. Buffer solutions commonly used include phosphoric, citric, or boric acids and their salts.

Because acids and bases tend to promote a wide range of chemical reactions, the maintenance of a certain level of acidity or alkalinity in a solution through the use of buffer solutions is essential to many chemical and biological experiments. Many biochemical processes occur only at specific pH values, which are maintained by natural buffers present in the body.

Buffier, Claude (b. May 25, 1661, Warsaw—d. May 17, 1737, Paris), original and prolific French philosopher, historian, philologist, and educator, considered by the anticlerical Voltaire to be "the only Jesuit who has given a reasonable system of philosophy."

Buffier taught philosophy and theology at Rouen and literature at the college of the Jesuits in Paris, where he spent most of his life. In 1696 he was exiled for five years because of opposition to his archbishop's support of Jansenism, a movement within Roman Catholicism that stressed predestination and denied free will. In his best known work, *Traité des vérités premières et de la source de nos jugements* (1724; "Treatise on First Truths and on the Source of Our Judgments"), Buffier sought to discover the ultimate principle of human knowledge. Beginning with the sense of the self's existence, he adopted the approach taken by Descartes, though he rejected the Cartesian method of a priori, or deductive, reasoning. Instead, he relied on common sense, a faculty that allows different men to reach similar conclusions. Thus, he was able to affirm the Cartesian conclusion that objects external to the human mind do indeed have their own separate existences.

Buffier's influence extended to 19th-century French philosophy by way of the Scottish school of common sense, notably Thomas Reid. Buffier also wrote *Éléments de métaphysique* (1725), a widely used French grammar (1709), *Cours de sciences* (1732), and numerous essays in history, religion, and education.

bufflehead (*Bucephala albeola*), small, rapid-flying duck of the family Anatidae, which breeds in woodland ponds and bogs from Alaska and northern California east to Ontario. It winters along both coasts of North America. The bufflehead, at a length of about 33–39 centimetres (13–15.5 inches), is among the smallest of hunted waterfowl. The black-and-white drake has a white wedge on the back of his head; his mate has a white bar below and behind her eye. Buffleheads begin breeding at the age of two. The pale eggs, about nine in an average clutch, are laid in holes abandoned by flickers, in trees fairly near the water. The diet consists of small aquatic invertebrates, plus some fish in winter. Not shy of hunters, buffleheads will often circle and return to the same spot from which they were flushed.

Buffon, Georges-Louis Leclerc, comte de (count of), original name (until *c.* 1725) GEORGES-LOUIS LECLERC, or (*c.* 1725–73) GEORGES-LOUIS LECLERC DE BUFFON (b. Sept. 7, 1707, Montbard, Fr.—d. April 16, 1788, Paris), French naturalist, remembered for his

Buffon, engraving by C. Baron, 1761, after a painting
By courtesy of the Hunt Botanical Library, Carnegie-Mellon University, Pittsburgh, Pennsylvania

comprehensive work on natural history, *Histoire naturelle, générale et particulière* (begun in 1749). He was created a count in 1773.

Buffon's father, Benjamin Leclerc, was a state official in Burgundy; his mother was a woman of spirit and learning, and he was fond of saying that he got his intelligence from her. The name Buffon came from an estate that he inherited from his mother at about the age of 25.

Beginning his studies at the College of Godrans in Dijon, which was run by the Jesuits, he seems now to have been only an average student, but one with a marked taste for mathematics. His father wanted him to have a legal career, and in 1723 he began the study of law. In 1728, however, he went to Angers, where he seems to have studied medicine and botany as well as mathematics.

He was forced to leave Angers after a duel

and took refuge at Nantes, where he lived with a young Englishman, the Duke of Kingston. In his correspondence he gives an impression of the town, where "one lives very well and drinks excellent wine." The two young men travelled to Italy, arriving in Rome at the beginning of 1732. They also visited England, and while there Buffon was elected a member of the Royal Society.

The death of his mother called him back to France. He settled down on the family estate at Montbard, where he undertook his first research in the calculus of probability and in the physical sciences. Buffon at that time was particularly interested in questions of plant physiology. In 1735 he published a translation of Stephen Hales's *Vegetable Staticks,* in the preface of which he developed his conception of scientific method. Maintaining an interest in mathematics, in 1740 he published a translation of Sir Isaac Newton's *Fluxions.* In his preface to this work he discussed the history of the differences between Newton and Leibniz over the discovery of the infinitesimal calculus. He also made researches on the properties of timbers and their improvement in his forests in Burgundy.

In 1739, at the age of 32, he was appointed keeper of the Jardin du Roi and of the museum that formed part of it through the patronage of the minister of marine, J.-F.-P. de Maurepas, who realized the importance of science and was anxious to use Buffon's knowledge of timber for the shipbuilding projects of the French government. Maurepas also charged Buffon to undertake a catalog of the king's museum, which the ambitious Buffon transformed into an undertaking to produce an account of the whole of nature. This became his great work, *Histoire naturelle, générale et particulière.*

Though he laboured arduously on it—he spent eight months of the year on his estate at Montbard, working up to 12 hours a day—he was able to publish only 36 of the proposed 50 volumes before his death. He had several collaborators. In the preparation of the first 15 volumes, which appeared in 1749–67, he was assisted by several associates. The next seven volumes formed a supplement to the preceding and appeared in 1774–89, the most famous section, *Époques de la nature* (1778), being contained in the fifth of them. They were succeeded by nine volumes on birds (1770–83), and these again by five volumes on minerals (1783–88). The remaining eight volumes, which complete the first edition, appeared after Buffon's death; they covered reptiles, fishes, and cetaceans. To keep the descriptions of the animals from becoming monotonous, Buffon interspersed them with philosophic discussions on nature, the degeneration of animals, the nature of birds, and other topics.

He was elected to the Académie Française, where, on Aug. 25, 1753, he delivered his celebrated *Discours sur le style,* containing the line, "*Le style c'est l'homme même*" ("The style is the man himself"). He was also treasurer to the Académie des Sciences. During the brief trips he made each year to Paris, he frequented the literary and philosophical salons. Although he was a friend of Diderot and d'Alembert, he did not collaborate on their *Encyclopédie.* He enjoyed his life at Montbard, living in contact with nature and the peasants and managing his properties himself. He built a menagerie and a large aviary there. He also transformed one of his outbuildings into a laboratory, with a furnace large enough to conduct experiments on the nature of fire.

Buffon's wife died in 1769, leaving him with a five-year-old son. The boy showed signs of brilliance, and when he was 17 Buffon asked the naturalist J.-B. Lamarck to take him along on his botanical travels across Europe. But the younger Buffon was not interested in study. He developed into a spendthrift, and his imprudences eventually led him to the guillotine during the French Revolution (1794).

In 1785 Buffon's health began to decline. To his physical disabilities were added family cares, particularly the public liaison between his son's wife and the Duc d'Orléans. At the beginning of 1788, feeling his end near, he returned to Paris. Unable to leave his room, he was visited each day by his "sublime friend" Mme Necker, the wife of the finance minister Jacques Necker. Mme Necker, who was with him to the very end, is said to have understood him to murmur, "I declare that I die in the religion in which I was born. . . . I declare publicly that I believe in it."

Buffon's position among his contemporaries was by no means assured. Though the public was nearly unanimous in its admiration of him, he met with numerous detractors among the learned. The theologians were aroused by his conceptions of geological history; others criticized his views on classification; the philosopher Étienne de Condillac disputed his views on the faculties of animals; and many took from his work only some general philosophical ideas about nature that were not faithful to what he had written. Voltaire did not appreciate his style, and d'Alembert called him "the great phrasemonger." According to the writer J.-F. Marmontel, Buffon had to put up with snubs from the mathematicians, chemists, and astronomers, while the naturalists themselves gave him little support and some even reproached him for writing ostentatiously in a subject that required a simple and natural style. He was even accused of plagiarism but made no reply to his detractors, writing to a friend that "I shall keep absolute silence. . . . and let their attacks fall upon themselves."

In some areas of natural science Buffon had a lasting influence. He was the first to reconstruct geological history in a series of stages, in *Époques de la nature* (1778). With his notion of lost species he opened the way to the development of paleontology. He was the first to propose the theory that the planets had been created in a collision between the Sun and a comet. While his great project opened up vast areas of knowledge that were beyond his powers to encompass, his *Histoire naturelle* was the first work to present the previously isolated and apparently disconnected facts of natural history in a generally intelligible form.

(J.Piv.)

BIBLIOGRAPHY. Buffon's writings are collected in *Oeuvres complètes de Buffon,* 12 vol. (1853–55), rev. and annotated by Pierre Flourens; *Oeuvres philosophiques de Buffon,* ed. by Jean Piveteau (1954), includes a detailed bibliography; and *Histoire naturelle, générale et particulière,* 44 vol. (1749–1804; *Natural History, General and Particular,* 20 vol., 1781–1812).

Evaluations of his work include D. Mornet, *Les Sciences de la nature en France au XVIII^e siècle* (1911), essential to the study of Buffon, particularly the bibliography and the chapter on the controversial Buffon; Emile Guyénot, *Les Sciences de la vie aux XVII^e et XVIII^e siècles: l'idée d'évolution* (1941), which contains passages on the origin of the idea of evolution, the idea of transformism in Buffon, and Buffon as the precursor of Lamarck. For an analysis of the contribution of Buffon's thought to the doctrine of evolution, see J.S. Wilkie, "Buffon, Lamarck and Darwin: The Originality of Darwin's Theory of Evolution," in P.R. Bell (ed.), *Darwin's Biological Work* (1964).

bufotenine, weak hallucinogenic agent active by intravenous injection, isolated from several natural sources or prepared by chemical synthesis. Bufotenine is a constituent of toad poison, the poisonous, milky secretion of glands found in the skin on the back of the animal. It was first isolated in 1934.

Structurally, bufotenine is an indole hallucinogen that can block the action of serotonin, which is the indole amine transmitter of nerve impulses and is found in normal brain tissue (and in toad poison). Bufotenine also acts as a powerful constrictor of blood vessels.

Other sources of bufotenine are the mushroom *Amanita muscaria* and the tropical American tree *Piptadenia peregrina,* the seeds of which were once used by the Indians of Trinidad and of the Orinoco Plain to make the hallucinogenic snuff called cohoba.

In modern medicine, bufotenine has been used only experimentally, to simulate psychotic disease states for the purpose of psychiatric study.

bufotoxin, a moderately potent poison secreted in the skin of many anuran amphibians, especially the typical toads (genus *Bufo*). The milky fluid contains several identifiable components: bufagin, with effects on the heart similar to those of digitalis; bufotenine, a hallucinogen; and serotonin, a vasoconstrictor. The composition of the poison varies with the species of toad. Taken internally, the poison causes severe, even fatal reaction in many predators, but some animals (*e.g.,* hognosed snakes) are not affected. The poison does not normally affect human skin, but it does irritate the eyes and mucous membranes.

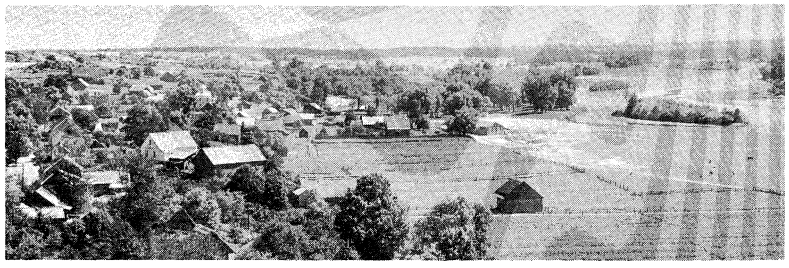
bug, commonly, any insect. In entomology, however, it is any member of the insect order Heteroptera (*e.g.,* chinch bug, bedbug).

When the word bug is part of the common name for a member of the "true bug" order Heteroptera, it is usually a separate word (exceptions are bedbug and stinkbug). When used as part of the common name for an organism that is not a heteropteran, the word bug is usually not separated; *e.g.,* ladybug (a member of the beetle order Coleoptera), mealybug (a homopteran), doodlebug (a neuropteran larva), and sowbug (a crustacean). There are many exceptions to this convention. In the British Isles the name applies solely to one member of the heteropteran order, the bedbug *Cimex lectularius.*

Consult the INDEX *first*

bug-on-a-stick, any of the mosses of the genus *Buxbaumia* (order Bryales), about five species that grow on soil or rotten wood in the Northern Hemisphere. The four species native to North America are uncommon. Male and female organs are borne on separate plants. The male plant has one clamshell-shaped, leaflike structure that protects the sex organ. The female plant bears a few phyllids (leaves) at the base of the long seta (stalk) supporting the bug-shaped capsule (spore case); the phyllids are shed before the capsule ripens. *Buxbaumia* differs from most other mosses in having an asexual phase plant much larger than the sexual phase plant.

Bug River, also called ZAPADNY BUG (Western Bug River), tributary of the Vistula River, rising in the western Ukrainian S.S.R. on the slopes of the Volyn-Podolsk Upland in Lvov *oblast* (administrative region). The river has a length of 516 mi (830 km) and a drainage area of 28,367 sq mi (73,470 sq km). Excepting its extreme upper course, the Bug flows across a level plain through alternating forest and farming land. For about 125 mi of its course the Bug forms the international frontier (since 1945) between Poland and the U.S.S.R. Near Brest it swings west into Poland to join the Vistula, 23 mi below Warsaw, to which it is linked by a canal that avoids difficult currents



Farmlands along the Bug River, Poland
Eastfoto

near the confluence. It is also linked by river and canal to the Neman and Dnepr river systems. The Bug is navigable for 195 mi above its confluence with the Vistula.

Buga, city, Valle del Cauca department, western Colombia, in the Cauca Valley. Founded in 1650, it is an agricultural centre in a coffee and cotton region on the Pan-American Highway and on a main highway between Bogotá and Buenaventura. Cattle, rice, tobacco, and sugarcane are also raised in the area. Its basilica contains the shrine of the Milagroso Cristo de Buga (Miraculous Christ of Buga), to which pilgrimages are made each year. The city has a national agricultural school. The hydroelectric plant and reservoir of Calima are nearby. Pop. (1973) city, 75,688; mun., 91,713.

Būga, Kazimieras (b. Nov. 6 [Oct. 25, old style], 1879, Pažiege, Lithuania, Russian Empire—d. Jan. 1, 1924, Kaunas, Lithuania), linguist who began the most thorough dictionary of the Lithuanian language and whose extensive linguistic interests had an abiding influence on later generations of Baltic and Slavic linguists.

His etymological research, which occupied a considerable part of his professional interest, began around 1902 and was the subject of valuable articles over a period of two decades. His research of Lithuanian personal names (*c.* 1910) led him into the study of place-names. From them he was able to determine that the homeland of the Lithuanians and other Baltic peoples up to the 6th to 9th century AD had been just north of the Ukraine around the Pripyat River. In addition, he studied the chronological sequence of Slavic loanwords in the Baltic languages.

Būga began teaching in Russia in 1916, but after his return to Lithuania in 1920 he immediately began to prepare his ambitious *Lietuvių kalbos žodynas* ("Dictionary of the Lithuanian Language"), which was to be a comprehensive thesaurus that would include definitions, etymologies, histories of words, and notes on their geographical distribution. From 1922, however, he was burdened with teaching responsibilities at the newly founded University of Kaunas. By the time of his death, he had completed relatively little of his enormous lexicographic undertaking. Work has continued, however, and the dictionary will comprise 17 volumes.

Bugaev, Boris Nikolayevich: *see* Bely, Andrey.

bugaku, repertoire of dances of the Japanese Imperial court, derived from traditional dance forms imported from China, Korea, India, and Southeast Asia. The dances comprise two basic forms: *sahō no mai* ("dances of the left"), accompanied by *tōgaku* (music derived mainly from Chinese forms); and *uhō samai no mai* ("dances of the right"), accompanied primarily by *komagaku* (music introduced from Korea). The two forms are also differentiated by the colour of the dancers' costumes.

Bugaku are of four genres: civil dances, warrior dances, running dances, and dances for children. All *bugaku* consist of highly conventionalized movements cued by the beat of a drum. Positions of arms, hands, and feet are highly stylized, and overall choreography consists of simple geometric patterns. An important element is the masks worn by the dancers. *Bugaku* masks sometimes have movable parts and have attenuated features intended to convey the characters of the fictional persons whom they represent. The masks called the "Twelve Deities" (1486; Tō-ji, Kyōto), carved by Buddhist sculptors, are among the oldest and best known examples. A *bugaku* program usually begins with a selection performed by the head dancers of the two forms, followed by alternate dances from both repertoires.

Ryōō, *bugaku* mask, painted wood, Edo period (1603–1867); in the Imperial Household, Japan
By courtesy of Kokusai Bunka Shinkokai, Tokyo

Buganda, powerful kingdom of East Africa during the 19th century, located along the northern shore of Lake Victoria, in the present republic of Uganda.

By the 19th century the *kabaka,* or ruler, of the Ganda people had come to exercise strong centralized control over his domains, called Buganda. Local chiefs became his personal appointees and subject to his control, rather than hereditary rulers. Foreign influences, including the Islāmic and Christian religions, began to reach Buganda in the 19th century, especially during the rule of Kabaka Mutesa I (1856–84); after his death the kingdom was split into a number of politico-religious factions. In 1894 Buganda became part of the British sphere of influence, and in 1900 the Buganda Agreement made it formally a British protectorate. The Ganda subsequently played a major role in assisting British administration in East Africa. When Uganda became an independent nation in 1962, Buganda was accorded special federal status within the state, but tensions between Buganda and the central government worsened, eventually ending in war. The kingdom was abolished in the late 1960s.

Bugatti, Ettore Arco Isidoro (b. Sept. 15, 1881, Milan—d. Aug. 21, 1947, Paris), builder of racing and luxury automobiles who founded a factory at Molsheim, Alsace, in 1909 and shortly thereafter produced a highly successful low-powered racer for Le Mans. His Type 22 and Type 35 models also were exceptional. Type 41 ("Golden Bugatti," or "La Royale"), produced in the 1920s, was probably the most meticulously built of all cars and one of the most costly; only a few (six to eight) were constructed. The firm did not long survive him, partly because his eldest son and successor-to-be died before him.

Bugayev, Boris Nikolayevich: *see* Bely, Andrey.

bugbane, also called RATTLETOP, any of about 15 species of tall perennial herb constituting the genus *Cimicifuga* of the buttercup family (Ranunculaceae) native to North Temperate woodlands. They are said to put bugs to flight by the rustling of their dried seed heads.

In North America the American bugbane, or summer cohosh (*C. americana*), about 120 centimetres (4 feet) tall, and the black cohosh, or black snakeroot (*C. racemosa*), about 180 cm tall, have roots that have been used medicinally. *C. foetida,* native to Europe and Siberia, is used medicinally by the Chinese. These species are sometimes grown in the shady woodland garden for their whitish branched flower stalks that rise strikingly above the large, divided leaves.

Bugbane (*Cimicifuga racemosa*)
W.H. Hodge

Bugeaud, Thomas-Robert, MARQUIS DE LA PICONNERIE, DUC (duke) D'ISLY (b. Oct. 15, 1784, Limoges, Fr.—d. June 10, 1849, Paris), marshal of France who played an important part in the French conquest of Algeria. Bugeaud joined Napoleon's imperial guard and later distinguished himself during the Peninsular War, after which he rose to the rank of colonel. He supported the First Restoration (1814), but his troops forced him to side with Napoleon during the Hundred Days (1815). During the Second Restoration, Bugeaud made a rich marriage and repurchased his family lands lost in the Revolution. He then took up farming until the July Revolution of 1830 allowed him to resume his military career.

Sent to Algeria for a short period in 1836, Bugeaud defeated Abdelkader, amīr of Mascara and hero of the Arab resistance, at Sikkah (July 6). Critical of the traditional cumbersome French military tactics used in Algeria, Bugeaud successfully developed techniques more suited to conditions of irregular warfare. In 1841, when he returned to Alge-

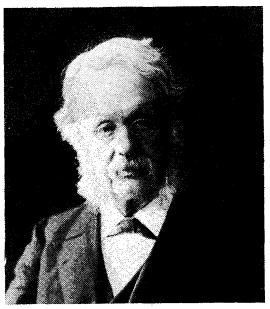
Bugeaud, detail of a lithograph by Maurin after a portrait by Charles-Philippe de Larivière
By courtesy of the Bibliotheque Nationale, Paris

ria as governor general, his new tactics won early successes over the Algerians. In 1843 he was made a marshal of France. After crushing Abdelkader's Moroccan allies at the Battle of Isly (1844), Bugeaud received his ducal title. He returned to Algeria for short periods in 1845 and 1847 but resigned as governor general in September 1847 in protest over the government's neglect of his plans for military colonization.

When revolution broke out in Paris in 1848, Bugeaud commanded Louis-Philippe's troops in the city but failed to save the monarchy. Under the Second Republic he published many anti-Socialist pamphlets and accepted command of the Army of the Alps. His collected military writings were published in 1883 and served as a handbook of colonial warfare.

Bugembe, town, Busoga province, southeastern Uganda, East Africa, about 48 mi (77 km) northeast of Kampala (the national capital), and about 3 mi north of Jinja. It is linked by road and railway with a number of towns including Kakira, Nyenga, and Buikwe, and it is a commercial and processing centre for cotton, sugarcane, corn (maize), and peanuts (groundnuts) grown in the surrounding region. Industries produce textiles, soap, processed food, tobacco, beverages, metal goods, footwear, wood and wood products, and oils. Bugembe was part of the historical Kingdom of Buganda. Pop. (latest census) 46,884.

Bugge, (Elseus) Sophus (b. Jan. 5, 1833, Lurvik, Nor.—d. July 8, 1907, Kristiania), philologist who pioneered in the collection and study of Norwegian folk songs, gathered a massive bulk of ancient Norwegian inscriptions, and prepared one of the finest critical editions of the *Poetic Edda,* the 13th-century

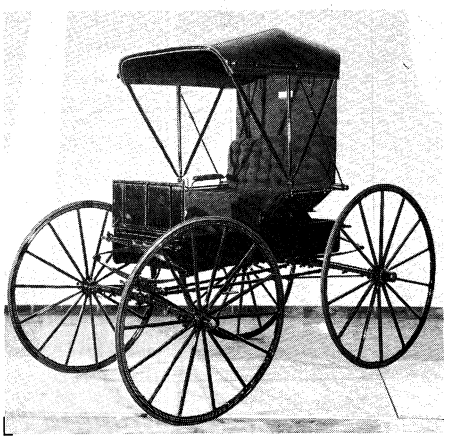


Bugge
By courtesy of Forlagshuset Norden, Malmo, Swed.

Icelandic collection of heroic and mythological poetry. His edition of Old Norse folk songs appeared in 1858.

Professor of comparative philology and Old Norse at the University of Christiania (Oslo) from 1866, he published *Norraen fornkvaedi,* his edition of the *Edda,* in 1867. He maintained that the songs of the *Edda* and the earlier sagas were largely founded on Christian and Latin tradition imported to Scandinavia by way of England. Publication of his monumental edition of inscriptions began in 1891. His writings also include *Helgedigtene i den aeldre Edda* (1896; *The Home of the Eddic Poems,* 1899).

buggy, also called ROAD WAGON, light, hooded (with a folding, or falling, top), two- or four-wheeled carriage of the 19th and early 20th centuries, usually pulled by one horse. In England, where the term seems to have originated late in the 18th century, the buggy held only one person and commonly had two wheels. By the mid-19th century the term had come to the United States and the buggy had become a four-wheeler for two passengers. Shapes in which the vehicle was built varied widely. The coal-box buggy and, especially, the piano-box or square-box buggy enjoyed great popularity. Without a top a buggy was



Buggy, 1900; in the Smithsonian Institution, Washington, D.C.
By courtesy of the Smithsonian Institution, Washington, D.C.

usually called a runabout or a driving wagon, and if it had a standing top it was called a Jenny Lind.

The buggy became the universal American vehicle, and by the 1870s its popularity, along with that of the road cart and the spring wagon, brought about the mass production of carriages in Cincinnati, Ohio, and other carriage-building centres. This led to price reductions which further stimulated the popularity of the buggy. It was the Model T Ford of its day, and it continued to be widely used for 10 or 15 years into the 20th century.

Buginese, also called BUGIS, people of Celebes (Sulawesi), Indonesia, and their language, belonging to the Austronesian (Malayo-Polynesian) family. They are the culturally dominant ethnic group of the island and are often linked with the closely related Makasarese. The Buginese population was estimated at 3,800,000 in the mid-1970s. Their village economy is based on rice cultivation, but the Buginese are also a maritime people and engage in some interisland trade.

The Buginese originated in Makasar, the southwest limb of Celebes, where they were well known for their adventurism and maritime skill. They levied nominal customs duties in Makasar, which made the city a prosperous trading port. By 1667, however, Makasar had fallen to the Dutch East India Company, and the Buginese began to emigrate from Celebes to places in the Malay Archipelago not yet reached by the Western powers. During the 17th century they established settlements on the Klang and Selangor rivers. By 1710 they had created a Buginese state in Selangor, and by 1722 they had established themselves in Riau. The expansion of the Buginese jeopardized the company's position, especially in the tin trade. By the 1770s Selangor, assisted by Riau, had attacked the Dutch in Malacca. The Buginese leader Raja Haji personally led a fleet to the Malay Peninsula and was killed in June 1784. The Dutch were able to control Riau until the end of the 18th century, when the British intervened; a Malay sultan was restored, and the Dutch garrison was removed from Riau. The Buginese Raja Ali seized power and drove away the Malay sultan, which caused trouble for many years in the Malay world. Conflict between the Buginese and the Malay states weakened both and resulted in the end of Buginese supremacy after 1800.

The Buginese were among the early Malay converts to Buddhism who accepted many Indian customs, including a hierarchical society, ranging from the raja at the top through district officers and princes to village heads. Along with these Indian influences came an Indian form of writing in which a rich literature was recorded. Early in the 17th century, however, the Makasarese and Buginese were converted to Islām.

bugle, wind instrument sounded by the vibration of the lips against a cup mouthpiece. As a modern military signalling instrument, it dates from *c.* 1750, when Hanoverian *Jäger* (light infantry) battalions adopted the semicircular copper horn with widely expanding bore, used by the *Flügelmeister,* an official of the hunt. English light infantry did the same, the German flügelhorn, or horn, taking the name bugle horn (from Old French *bugle,* derived from the Latin *buculus,* "bullock"). This early semicircular bugle was pitched in C or D, often lowered to B by a coiled crook, a detachable piece of tubing. From *c.* 1800 it was once-looped in trumpet shape; the British design, twice-coiled with narrow bell, became official in 1858.

Spanish cavalry bugle, 19th century; in the Cincinnati Art Museum, Ohio
By courtesy of the Cincinnati Art Museum, Ohio

Bugle calls require only the second to sixth notes of the natural harmonic series (notes produced by whole and partial vibration of the enclosed air column), written c′–g′–c″–e″–g″ (c′ = middle C) but sounding a tone lower. The calls are grouped as regimental calls, field calls, and routine calls. Some of the most familiar, including the reveille and the last post, remain virtually unchanged since 1815, if not earlier. Other calls, especially field calls, were originally played at a lower pitch, making use of the C below middle C (the first harmonic, or fundamental). The first official list of bugle calls was issued in 1798.

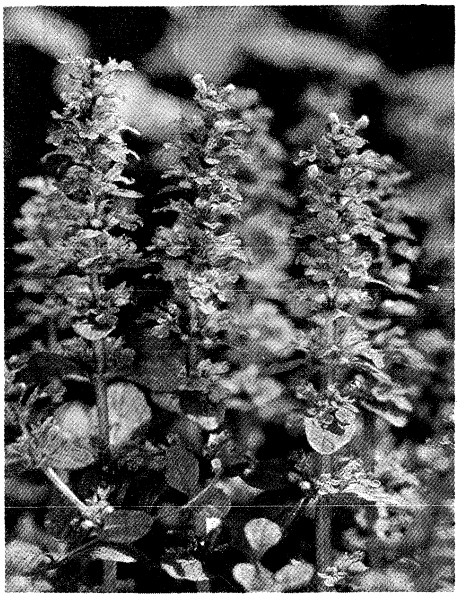
The popularity of the bugle horn at the end of the 18th century is reflected both in the publication of many bugle marches with military band and in the featuring of the instrument in light operas. In 1810 Joseph Halliday patented the key bugle, or Royal Kent bugle, with six brass keys (five closed, one open-standing) fitted to the once-coiled bugle to give it a complete diatonic (seven-note) scale. It became a leading solo instrument in

military bands until replaced by the cornet. In France it inspired the ophicleide, its bass version.

Valves were fitted to the same once-coiled bugle during the 1820s, the new instrument keeping the old name flügelhorn. It is pitched in B♭ and remains the principal treble brass instrument of continental military and brass bands. Soprano and alto versions in E♭ are sometimes used with it. Modern instruments are considerably narrower in bore than earlier ones.

The valved bugle also gave rise to related instruments in the tenor, baritone, and bass ranges. Their names vary from country to country and often apply to more than one instrument. They include the baritone, euphonium, and the saxhorns (some of which are also referred to as flügelhorns). These instruments also vary in the degree to which they retain the bugle's characteristic wide bore.

bugleweed (*Ajuga*), genus of about 40 species of Eurasian plants of the mint family (Lamiaceae), order Lamiales, but lacking the floral upper lip characteristic of the family. Some creeping species, used as ground covers, are widely naturalized.

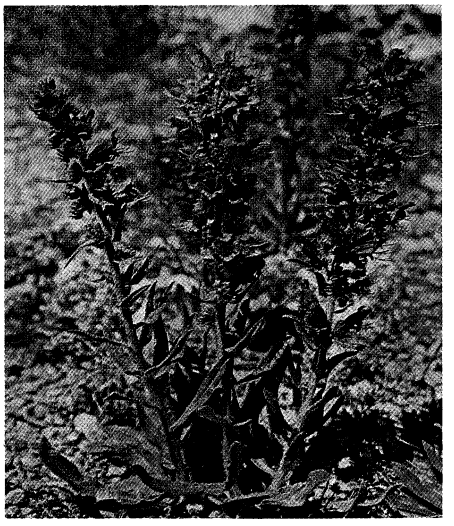


Carpet, or common, bugleweed (*Ajuga reptans*)
Walter Chandoha

Carpet, or common, bugleweed (*A. reptans*) forms colonies of rosettes of dark green, oval leaves in damp meadows or woodlands. It produces short spikes of blue, occasionally pink or white, flowers on stems up to 30 cm (12 inches) long. Ground pine (*A. chamaepitys*) is shorter and has yellow flowers and three-parted needlelike leaves that are pine-scented.

bugloss, any plant of the genera *Lycopsis* and *Echium* of the family Boraginaceae; they are weedy, bristly annuals with small, bright-blue flowers that have hairy white throats. The blooms resemble small clusters of half-closed forget-me-nots with a bend at the middle of the floral tube. The 40-centimetre- (about 16-inch-) high plants have toothed, spiny leaf margins. They grow in sandy places and fields throughout Europe and have become naturalized in eastern North America.

Viper's bugloss (*Echium vulgare*), also known as blue devil, or blue weed, has bright-blue flowers and grows to a height of about 90 cm (35 inches). It is a bristly European plant that has become naturalized in North America. Purple viper's bugloss (*E. lycopsis,* or *E. plantagineum*), from the Mediterranean, is similar



Viper's bugloss (*Echium vulgare*)
Sven Samelius

but is larger-flowered and shorter, with softer hair. It is a garden flower.

Bugti Hills, hill range in Pakistan, comprising the tribal tract known as Bugti country. A westward continuation of the Sulaimān Range, pointing toward the Quetta node, it is a barren area inhabited by the nomadic Bugtis, a Baluchi tribe. The discovery of natural gas deposits at Sūi (*q.v.*) has brought new economic life to the area. Several valleys and plateaus in the range are being brought gradually under cultivation.

Bugulma, city, Tatar Autonomous Soviet Socialist Republic, west-central Russian S.F.S.R. It is situated on the Bugulma-Belebey Upland at the confluence of the Bugulminka and Stepnoy Zay rivers. Founded in 1736, it is the centre of petroleum mining in the Tatar A.S.S.R. Other economic activity includes machinery production, the processing of agricultural products, and construction. A local technical institute is devoted to training for the petroleum industry. Pop. (1987 est.) 88,000.

Buguruslan, city, Orenburg *oblast* (province), in the southern Ural Mountains of the Russian Soviet Federated Socialist Republic. It lies along the Great Kinel River. Founded in 1748, it was chartered in 1781. It is an important centre of petroleum production in the Volga–Urals oil region. Other industries include sawmilling and the production of automotive parts. Pop. (1987 est.) 53,000.

Buḥayrah, al-, also spelled BEHEIRA, *muḥāfaẓah* (governorate) of the Nile Delta, Lower Egypt. It embraces the whole of the delta west of the Rosetta Branch, with a considerable desert region to the south, and has a total area of 3,911 square miles (10,130 square km). The capital and largest city is Damanhūr (*q.v.*); other principal towns are Idkū, Kafr Salim, and Rosetta (Rashīd), where the Rosetta Stone was discovered. The area's political history dates from the division of Egypt into provinces by the Fāṭimid caliph al-Mustanṣir (ruled AD 1036–94), when Damanhūr was made its capital.

Agriculture is the principal occupation of the delta portion of the governorate; long-staple cotton is the major crop. Rice, other cereals, potatoes, sugar beets, onions, peanuts (groundnuts), tomatoes, and sesame are also harvested, and there are vineyards near Alexandria. The barrage on the Rosetta Branch at Idfinā, 12 miles (20 km) southeast of Rosetta, supplies irrigation water during the low (winter) season and also prevents seawater from entering the irrigation channels. Along the an-Nubāriyah Canal, in the western part of the governorate, a large reclamation project has converted unproductive land to vegetable-producing farmland. The Taḥrīr Authority has also undertaken an extensive agricultural reclamation project in the far western part of the governorate, which includes housing projects and health clinics. Natron (hydrated sodium carbonate) is obtained from the lake-dotted depression of Gharrāqat al-Barnūjī, 12 miles (19 km) south of Damanhūr, and from the an-Naṭrūn Wadi, in the southwestern desert area. At Kafr ad-Dawwār southeast of Alexandria there are cellophane and textile mills. In the mid-1970s a major natural-gas deposit was discovered offshore in Abū Qīr Bay, and it has since been developed to power industries in the northern part of al-Buḥayrah governorate and in Alexandria. The governorate is crossed by two Suez-Mediterranean oil pipelines. Sadat City, 57 miles (92 km) northwest of Cairo, was built in the late 1970s on the Fu'ād al-Auwa desert highway to house new industries and also to relieve the overpopulation of Cairo.

At Kawm Ju'ayf are the ruins of ancient Naukratis, a Greek trading centre that flourished in the 6th century BC. A railway along the north coast links Alexandria to Rosetta and Idfinā; the Cairo–Alexandria highway with a railway parallel to it crosses the governorate. The newer Fu'ād al-Auwa limited-access highway crosses the desert in western al-Buḥayrah governorate, bypassing the densely populated delta region. Pop. (1986 est.) 3,271,000.

Buhl, André-Charles: *see* Boulle, André-Charles.

Buhl, Vilhelm (b. Oct. 16, 1881, Fredericia, Den.—d. Dec. 18, 1954, Copenhagen), twice prime minister of Denmark (1942, 1945), whose opposition to cooperation with Nazi Germany during his first term of office resulted in his dismissal by the Germans.

After serving as collector of taxes for Copenhagen in the 1920s, Buhl, an active member of the Social Democratic Party, entered parliament in 1937. In the same year he became finance minister under Thorvald Stauning in Denmark's first Social Democratic government. A determined opponent of Denmark's forced adherence to the renewed Anti-Comintern Pact in 1941 during the German occupation of Denmark in World War II, Buhl became prime minister on Stauning's death in May 1942. Forced by the Germans to resign in November 1942, Buhl again became prime minister of the first postwar government (1945). In the minority Social Democratic government of Hans Hedtoft, he served as minister of economic coordination (1947–50) and concurrently as minister of justice from March to September 1950.

Bühler, Karl (b. May 27, 1879, Meckesheim, Baden, Ger. [now in West Germany]—d. Oct. 24, 1963, Los Angeles), German psychiatrist and psychologist known chiefly for his studies of the thought process.

Bühler received a medical degree from the University of Strasbourg, studied psychology at the University of Berlin and the University of Bonn, and then taught at several German universities before World War I. His seminal paper, "Über Gedanken" (1907; "On Thoughts"), was a major contribution to the Würzburg school of imageless thought; it demonstrated that the mind is capable of purely abstract thinking and does not need to employ images or past observations to conceive of an idea. Bühler made his subjects think by having them read a passage from Nietzsche or by asking them questions and timing their answers, then asked them to describe the experience. He called this experimental technique the *Ausfragemethode*—"inquiry method." After serving in the German Army during World War I, Bühler was named professor of psychiatry at the University of Vienna in 1922. He was forced to flee

to Norway in 1938 and reached the United States in 1939, residing there until his death. While there he expanded his paper of 1907 into a book, *Facts and Problems of the Psychology of the Thought Process.*

Bühren, Ernst Johann, Reichsgraf von (Imperial count of): *see* Biron, Ernst Johann, Reichsgraf von.

Buḥturī, al-, in full ABŪ ʿUBĀDAH AL-WALĪD IBN ʿUBAYD ALLĀH AL-BUḤTURĪ (b. 821, Manbij, Syria—d. 897, Manbij), one of the most outstanding poets of the ʿAbbāsid period (750–1258).

Al-Buḥturī devoted his early poetry, written between the ages of 16 and 19, to his tribe, the Ṭayyiʾ. Sometime after 840 he came to the attention of the prominent poet Abū Tammām, who encouraged his panegyrics and brought him to the caliphal capital of Baghdad. Al-Buḥturī met with little success there and returned to Syria in 844. On his second visit to Baghdad, *c.* 848, he was introduced to the caliph, al-Mutawakkil, and thus launched a court career, notorious for its opportunism and greed, which enjoyed the patronage of successive caliphs, through al-Muʿtaḍid. In 892 he went to Egypt as court poet to its ruler and finally returned to his birthplace, where he died in 897.

The majority of al-Buḥturī's poems, produced during his years as court poet, are panegyrics, famed for their finely conceived and detailed descriptions and their musicality of tone. Those written during the early part of his career are historically valuable for the allusions they make to contemporary events. Like his mentor Abū Tammām, al-Buḥturī wrote a *Ḥamāsah,* an anthology of early Arabic verse, but it was only mildly successful.

Buick, David Dunbar (b. Sept. 17, 1854, Arbroth, Scot.—d. March 6, 1929, Detroit, Mich., U.S.), pioneer American automobile manufacturer, after whom the Buick line of automobiles is named.

Buick was taken to the United States in 1856. His first independent business venture was a company that made plumbing equipment, started in 1884. In about 1899 he became interested in gasoline engines for agricultural and marine purposes, and in 1902 he formed the Buick Manufacturing Company with the aim of producing engines for automobiles. He built his first automobile in early 1903. Buick was a capable inventor, and he originated the valve-in-head engine and the windshield. His company soon ran into debt, however, and in late 1903 the two Detroit manufacturers who had financed it merged Buick's company with the Flint Wagon Works to form the Buick Motor Car Company. Under the management of James Whiting and with the talents of William C. Durant, who joined the firm in 1904, the reorganized Buick company quickly expanded its production, making more than 8,000 cars in 1908. Durant took over the company in November 1904. Buick, meanwhile, left the company in 1906 and engaged in further, unsuccessful business ventures that were unconnected with automotive manufacturing.

building construction, the techniques and industry involved in the assembly and erection of structures, primarily those used to provide shelter.

A brief treatment of building construction materials and techniques follows. For full treatment, *see* MACROPAEDIA: Building Construction.

Early man built with reeds, grasses and trees, animal skins, stones, ice, and mud. As construction evolved, however, two basic materials came to the fore: wood and stone. In Europe and other places where timber was available, wood was split into planks and then cut into posts that could be used to support a roof and to subdivide the space into multiple units, or rooms. Stone construction can be traced to the 3rd and 4th millennium BC, when the Egyptians began building their palaces, temples, and tombs out of limestone. The precision and durability of their work is evident in such extant structures as the pyramids. The ancient Greeks built with pieces of stone that were skillfully fitted together and sometimes bonded with clay. They subsequently developed mortar, and by the 2nd century BC this was being mixed with stone to make concrete. Made from clays, and easier to use than stone because of their size and standardization, bricks made possible the construction of the arches, vaults, and domes that were popular in Europe from the Roman era on.

With the Industrial Revolution of the 18th century, iron brought on a new era in building in which rigid frames could be riveted together to support a building's weight. Iron was quickly replaced by steel in the early 20th century, and this development, along with the invention of modern concrete in the 1870s, made possible the multistoried buildings that epitomize modern building construction. At the end of World War II, shortage of labour, extensive demand for housing because of bombings, and government participation led to the widespread development of prefabricated building systems. The design, manufacture, transportation, and erection of components could be accomplished for many structures from a single source company, utilizing interchangeable parts.

Before most buildings are constructed, the function of the proposed building must be determined, a geographic location chosen, a cost estimate drawn up, and a design plan accompanied by sketches prepared by an architect. Architectural design proceeds in a series of stages of increasing detail and specificity. Schematic design sketches that give a rough idea of the building's look and form are followed by detailed development design, comprising drawings of plans, elevations, building cross sections, and perspectives. These are followed by working drawings and specifications, which are contract documents that describe the design, location, and dimensions of the elements of the building and that also describe the quality of materials and workmanship to be used in the construction of the building.

Surveying and laying out, or locating, the foundation are the first steps in the actual construction of most buildings. The foundation itself (those portions of a building resting upon earth or rock) is dependent on the weight of the building and on the resistance of the earth on which it rests. These two factors must balance each other for the foundation to be cohesive and for excessive or unequal settling of the building to be avoided.

Small buildings such as residences usually use a masonry wall foundation, consisting of a horizontal slab of concrete with a continuous vertical ledge of concrete on its outer rim, upon which the walls of the building are supported. Larger, heavier buildings have supporting steel columns embedded in the concrete foundation, and the foundation itself may be augmented by steel or concrete piles driven deep into the soil to provide extra stability.

The three major types of structural frames are wood, steel, and concrete. Wood frames are light, cheap, and simple, consisting of interlocking arrays of vertical and horizontal beams and studs. Steel structural frames consist of vertical members (columns) and horizontal members (girders and beams) that are riveted, bolted, or welded together. Concrete structural frames have the advantage of costing less than steel ones, but they must usually be reinforced by steel to carry heavy loads. Steel rods are positioned in an interconnected framework surrounded by a wooden or steel form, and then concrete is poured into the form. The form is withdrawn once the concrete has set. In a method known as prestressing, high-strength wires are stretched and held tight while concrete is set around them. In this way a concrete span as long as 100 feet (30 m) can be attained.

Flooring must support whatever loads are to be placed within the structure, and it must transmit its load to the structural frame. Roofing may be flat or pitched, depending upon the type of framing, the load to be carried, fire resistance required, and the overall character of the building. Structural elements called trusses, which are composed of interfaced triangles, can be utilized to make vast roof spans possible.

There are a number of auxiliaries necessary in a building, including insulation, usually accomplished by filling in spaces within flooring or walls with fire-resistant material; ventilation, provided by complex systems of ducts or by windows; electricity, which is wired beneath or within the finished walls; plumbing (both for provision of clean water and for the disposal of wastes), using cast-iron pipe inside and clay pipe underground outside; and heating and air-conditioning, which may be accomplished by a steam boiler system, electricity, gas, or other energy source, such as solar radiation.

Consult the INDEX *first*

Builth Wells, market town, Brecknock district, Powys county, Wales, in the Upper Wye Valley. The Normans made the district (Buellt) a lordship marcher (*i.e.,* part of the political buffer zone between Wales and England) and constructed a fine motte-and-bailey castle at Builth. But town and castle suffered severely from Welsh attacks, notably by Prince Llywelyn ap Gruffyd in 1260; it was nearby that Llywelyn was killed in 1282, thus ending most Welsh resistance to English conquest.

Builth was once an important collecting point in the cattle-droving trade between Welsh breeding areas and England. It has also been a spa and still enjoys a tourist traffic, set as it is among the mountain scenery of Powys. Pop. (1981) 1,597.

Buir Lake, Wade–Giles romanization PEI-ERH HU, Mongol Pinyin BUIR NUR, lake on the border of the Mongolian People's Republic and China. It has an area of 235 square miles (609 square km). It receives the Ha-lohsin River from the southeast, and its outlet, the Orchun River, flows into Hu-lun Lake to the north.

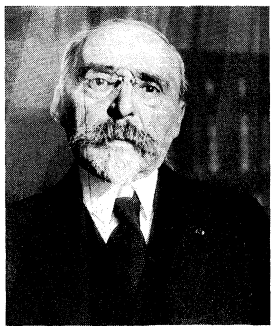
buisine, long, straight trumpet of the Middle Ages, used for military and ceremonial purposes and, later, for music. It was a six-foot- (almost two-metre-) long counterpart of the shorter *trompe,* a straight military trumpet, and ultimately gave rise to the later S-shaped and coiled forms of the trumpet.

The name derives from Latin buccina, a Roman shepherds' and later military horn made first of animal horn and subsequently of metal. The later buisine was made of brass, copper, or silver.

Buisson, Ferdinand-Édouard (b. Dec. 20, 1841, Paris—d. Feb. 16, 1932, Thieuloy-Saint-Antoine, Fr.), French educator who reorganized the French primary school system and who was awarded the Nobel Prize for Peace in 1927 jointly with the German pacifist Ludwig Quidde.

Refusing to take the teacher's oath of loyalty to the French Second Empire of Napoleon III, Buisson went to Switzerland, teaching philosophy at Neuchâtel from 1866 to 1870. In

1867 he took part in the first Geneva peace conference, where he advocated a United States of Europe. After the fall of Paris in the Franco-German War of 1870–71, he organized an asylum for war orphans. Under



Buisson
H. Roger-Viollet

the French Third Republic he was appointed inspector general of the Paris public schools in 1871, but he was forced to resign for recommending the elimination of religious instruction. As national director of elementary education (1879–96), he aided Premier Jules Ferry in drafting statutes that took the public schools out of church control (1881, 1886) and made primary education free and compulsory (1882). After teaching at the Sorbonne (1896–1902), he sat in the national Chamber of Deputies (1902–14, 1919–23).

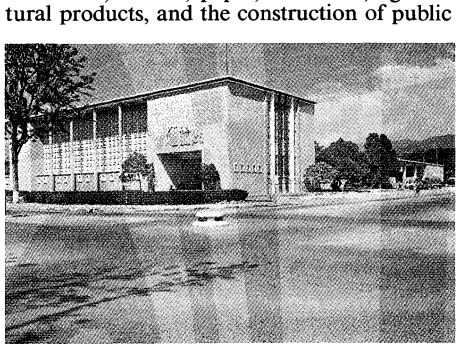
In 1898 Buisson helped to found the Ligue des Droits de l'Homme (League of Human Rights). His peacemaking efforts as its president from 1913 to 1926, including the period of World War I, in addition to his postwar work for Franco-German amity, earned him the Nobel Prize.

Buitenzorg (Indonesia): *see* Bogor.

Bujah (people): *see* Beja.

Bujalance, city, Córdoba province, in the Andalusian autonomous community (region) of southern Spain, located 24 miles (39 km) east of Córdoba city. There is evidence in Bujalance of early Roman occupation. The ancient city was also the site of a seven-towered castle built in 935 by ʿAbd ar-Raḥmān III, the first caliph and greatest ruler of the Umayyad (Arab Muslim) dynasty of Spain; the castle's ruins are within the city. In 1227 the city was taken from the Almohads by Ferdinand III of Castile and León and was brought under the administration of Córdoba. It purchased independence from Córdoba in 1584 and became a city in 1639. The contemporary city is an agricultural trade centre. Flour is milled and olive oil is processed there. Pop. (1981) 8,612.

Bujumbura, city, western Burundi. Bujumbura is the nation's capital and largest urban centre. The city's industry specializes in textiles, leather, paper, chemicals, agricultural products, and the construction of public buildings. Bujumbura also serves as the country's main port on Lake Tanganyika; most of Burundi's foreign trade is shipped between the capital and Kigoma, Tanzania, and, less frequently, to Kalemi, Zaire. There is an international airport directly northwest of the city and road connections with Bukavu and Goma in Zaire and Kigali in Rwanda. The University of Burundi and the Museum of African Civilization are two of the city's most important cultural institutions. The surrounding region yields bananas, cassava (manioc), beans, corn (maize), wheat, and cotton. Pop. (1986 est.) 272,622.



Parliament house in Bujumbura, Burundi
Kay Honkanen—Ostman Agency

Buka Island, one of the northern Solomon Islands, Papua New Guinea, in the southwestern Pacific. It lies northwest of Bougainville Island, from which it is separated by the deep Buka Passage (5 miles [8 km] wide). A volcanic formation measuring 35 miles by 9 miles (56 km by 14 km), Buka has a total land area of 190 square miles (490 square km). Rising to 1,634 feet (498 m) in hills on the southwest, the island is densely forested in the interior. Rainfall is abundant, with more than 100 inches (2,500 mm) annually. Coral reefs fringe the south and west coasts, the latter deeply indented by Queen Carola Harbour.

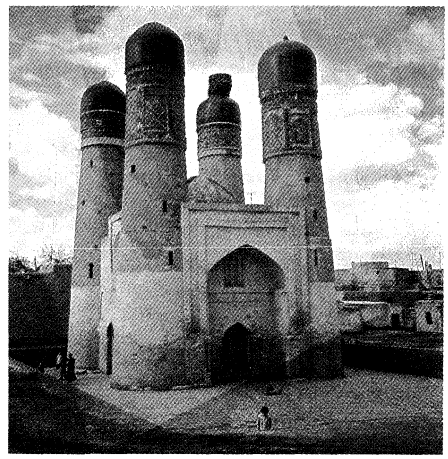
Buka was visited in 1767 by a British navigator, Philip Carteret, who named it Winchelsea. Placed under a German protectorate in 1885, the island remained under that administration by virtue of a British–American–German agreement reached just before the turn of the century. The island was taken by Australian troops in 1914 and mandated to Australia in 1920. Held by the Japanese from 1942 to 1945, it was included in the UN Trust Territory of New Guinea after World War II and became part of Papua New Guinea when that country achieved its independence in 1975. Pop. (1980 est.) Buka and adjacent small islands, 20,000.

Bukavu, formerly (until 1966) COSTERMANSVILLE, city, eastern Zaire, central Africa, on a peninsula extending into Lake Kivu. It is a commercial and industrial centre, a lake port, and a tourist city with road access northwest to Kisangani, southwest to Kasai, south to Lubumbashi and Shaba and to East Africa. There is also air transport to Zairian cities and Burundi. The region is known for its agricultural products (coffee, tea, tobacco, quinine, strawberries), its livestock, and its tin and gold. More than 100,000 tons of cargo pass through the port annually, and the city is headquarters for tourists bound for Goma and the Virunga National Park. The city has a school of social studies, a teacher-training college, and a scientific research institute. It also has a brewery, printing plant, and the Mururu hydroelectric installation.

Bukavu is in one of the most densely populated areas of Zaire. In the 1970s it received thousands of political refugees from neighboring Burundi and Rwanda. Pop. (1984 prelim.) 171,064.

Bukhara, also spelled BUCHARA, or BOKHARA, *oblast* (administrative region), central Uzbek Soviet Socialist Republic, with an area of 15,200 square miles (39,400 square km). The *oblast* was originally constituted in 1938, but in 1982 much of its territory was transferred to the newly formed Navoi *oblast,* bordering it on the north and east. The second largest *oblast* in the republic, Bukhara mainly comprises the Kimirekkum Desert, with the lower reaches of the Zeravshan River in the southwest. The climate is continental, with cold winters and long, hot, dry summers. Annual precipitation is only 5–7 inches (125–175 mm). Karakul sheep are raised in the desert. Natural gas from major deposits discovered in the southwest in the 1950s is piped to the Urals and central European Russia as well as to the other Central Asian republics. The major cities are Bukhara, the administrative centre; Kagan; and Gizhduvan. Uzbeks constitute more than 70 percent of the population. About 36 percent of the population is urban. Pop. (1985 est.) 1,017,000.

Bukhara, also spelled BUCHARA, or BOKHARA, city and administrative centre, Bukhara *oblast,* Uzbek Soviet Socialist Republic, on the Shakhrud Canal in the delta of the Zeravshan River, at the centre of Bukhara oasis. It was founded not later than the 1st century AD and was already an important centre of trade and crafts when it was captured by the Arabs



Char-Minar mosque and *madrasan,* Bukhara, Uzbek S.S.R.
J. Allan Cash—EB Inc.

in 709. The capital of the Sāmānid dynasty in the 9th–10th century, it later was seized by the Qarakhanids and Karakitais before falling to Genghis Khan in 1220 and to Timur (Tamerlane) in 1370. In 1506 Bukhara was conquered by the Uzbek Shaybānids, who, from the mid-16th century, made it the capital of their state, which became known as the khanate of Bukhara.

Bukhara attained its greatest importance in the late 16th century, when the Shaybānids' possessions included most of present-day Soviet Central Asia as well as northern Persia and Afghanistan. The emir Mohammed Rahim freed himself from Persian vassalage in the mid-18th century and founded the Mangit dynasty. In 1868 the khanate was made a Russian protectorate, and in 1920 the emir was overthrown by Red Army troops. Bukhara remained the capital of the Bukharan People's Soviet Republic, which replaced the khanate, until the republic was absorbed into the Uzbek S.S.R. in 1924. The city grew rapidly after the discovery in the late 1950s of natural gas nearby.

The old town still retains much of its former aspect, with its mosques, *madāris* (theological schools), flat-roofed houses of sun-dried bricks, and remains of covered bazaars. Among important buildings are the Ismail Samani Mausoleum (9th–10th century); the Kalyan minaret (1127) and mosque; the Ulūgh Beg (1417), Kukeldash (16th century), Abdulaziz-Khan (1652), and Miri-Arab (1536) *madāris* (the latter the only one still functioning in Soviet Central Asia); and the Ark, the city fortress, which is the oldest structure in Bukhara. The city's economy is based on a number of food and light industrial undertakings, including a large works processing Karakul lambs' fleece. Bukhara is also growing in importance as the largest city in a natural gas region. Certain traditional handicrafts, such as gold embroidery and metalworking, are still practiced. Cultural amenities include a teacher-training institute, a theatre, and a museum. Pop. (1985 est.) 209,000.

Bukhārī, al-, in full ABŪ ʿABD ALLĀH MUḤAMMAD IBN ISMĀʿĪL AL-BUKHĀRĪ (b. July 19,

810, Bukhara, Central Asia—d. Aug. 31, 870, Khartank, near Samarkand), one of the greatest Muslim compilers and scholars of Ḥadīth (the recorded corpus of the sayings and acts of the Prophet Muḥammad). His chief work is accepted by Sunnite Muslims—*i.e.*, those following the majority tradition—as second only to the Qur'ān as both a source of religious law and a sacred work.

Al-Bukhārī began learning the utterances and actions of the Prophet by heart while still a child. His travels in search of more information about them began with a pilgrimage to Mecca when he was 16. He then went to Egypt, and for 16 years he sought out informants from Cairo to Merv in Central Asia. Al-Bukhārī was an extremely scrupulous compiler, showing great critical discrimination and editorial skill in his selection of traditions as authentic ones. From the some 600,000 traditions he gathered, he selected only about 7,275 that he deemed completely reliable and thus meriting inclusion in his *Kitab al-Jāmiʿ aṣ-Ṣaḥīḥ* (French trans., *Les Traditions Islamiques*). He arranged his collection in sections according to subject so that the reader can compare the soundest accounts of the Prophet's example, in word or deed, on points of law and religious doctrine as diverse as the validity of good deeds performed before conversion to Islām, marriage law, and proclamation of the unity of God.

As a preliminary to his *Ṣaḥīḥ,* al-Bukhārī wrote *at-Tārīkh al-kabīr* ("The Large History"), which contains biographies of the persons forming the living chain of oral transmission and recollection of traditions back to the Prophet. Toward the end of his life, he was involved in a theological dispute in Nīshāpūr and left that city for Bukhara, but, following his refusal to give special classes for Bukhara's governor and his children, he was forced into exile in Khartank, a village near Samarkand.

Bukharin, Nikolay Ivanovich (b. Oct. 9 [Sept. 27, Old Style], 1888, Moscow—d. March 14, 1938, Moscow), Bolshevik and Marxist theoretician and economist, who was

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a prominent leader of the Communist International (Comintern).

Having become a revolutionary while studying economics, Bukharin joined the Russian Social-Democratic Workers' Party in 1906 and became a member of the Moscow committee of the party's Bolshevik wing in 1908. He was arrested and deported to Onega (a region near the White Sea) in 1911 but escaped to western Europe, where he met the Bolshevik leader Lenin in Kraków (1912) and worked with him on the party's newspaper *Pravda* ("Truth"). In October 1916 he went to New York, where he edited a Leninist newspaper, *Novy Mir* ("New World").

After the February Revolution of 1917 Bukharin returned to Russia. He was elected to his party's central committee in August, and after the Bolsheviks seized power, he became editor of *Pravda.* In 1918, when Lenin insisted upon signing the Brest-Litovsk treaty with Germany and withdrawing Russia from World War I, Bukharin briefly resigned his post at *Pravda* and led an opposition group, the Left Communists, which proposed instead to transform the war into a general Communist revolution throughout Europe. In March 1919 he became a member of the Comintern's executive committee. During the next few years he published several theoretical economic works, including *The Economics of the Transitional Period* (1920), *The ABC of Communism* (with Yevgeny Preobrazhensky; 1921), and *The Theory of Historical Materialism* (1921).

After Lenin's death in 1924, Bukharin became a full member of the Politburo. He opposed the policy of initiating rapid industrialization and collectivization in agriculture and, therefore, became allied with Stalin, who used this issue to undermine his chief rivals—Leon Trotsky, Grigory Zinovyev, and Lev Kamenev. In 1926 Bukharin succeeded Zinovyev as chairman of the Comintern's executive committee. Nevertheless, in 1928 Stalin reversed himself, espoused the program of his defeated opponents, and denounced Bukharin for opposing it. Bukharin lost his Comintern post in April 1929 and was expelled from the Politburo in November. He recanted his views under pressure and was partially reinstated in the party by Stalin. But though he was made editor of *Izvestia,* the official government newspaper, in 1934 and participated in writing the 1936 Soviet constitution, he never regained his earlier influence and power. Bukharin was secretly arrested in January 1937 and was expelled from the Communist Party for being a "Trotskyite." In March 1938 he was a defendant in the last public purge trial, falsely accused of counterrevolutionary activities and of espionage, found guilty, and executed.

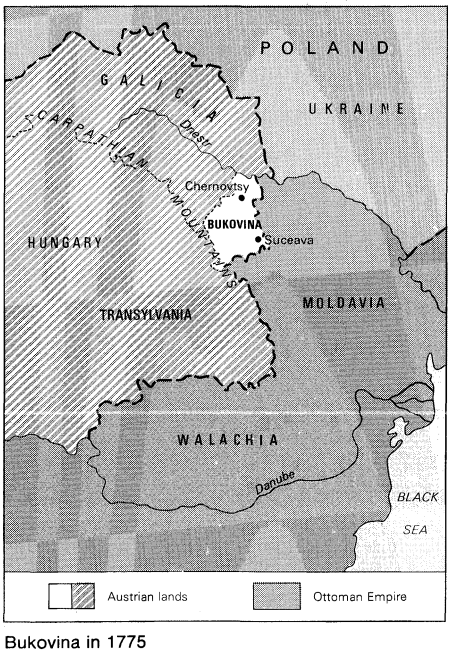
Bukit Fraser, formerly FRASERS HILL, mountain resort in the Main Range, West Malaysia (Malaya). It lies 40 miles (65 km) north of Kuala Lumpur, at an elevation of 4,280 feet (1,305 m). The site was named for Louis James Fraser, a trader and mule-train operator who disappeared in the area in 1916. The hill station, built on seven hills, was surveyed in 1919 and later developed by the Federated Malay States. Facilities include bungalows and hotels, a government nursery, a golf course, Jeriau Waterfalls, and jungle treks to the surrounding peaks. The resort is reached via Kuala Kubu Baharu and the twisting "Gap" road. Pop. (1980) 956.

Bukittinggi, formerly FORT DE KOCK, city, Sumatera Barat *propinsi* (West Sumatra province), Sumatra, Indonesia. It lies at an elevation of 3,000 feet (900 m) on the Agam Plateau, a ridge of high land parallel to the coast. The city is in the Minangkabau country, one of the most scenic sections of Indonesia. Typical of the region are houses with saddle-shaped roofs, the ends pointing upward like buffalo horns. Bukittinggi is an important commercial centre and is connected by road with other Sumatran cities and by rail with Padang, Padangpanjang, and Sawahlunto. The city has a museum set amid botanical gardens, a Dutch fort constructed in 1825, and an airfield. Pop. (1980) 70,771.

Bükk Mountains, a southward-projecting spur of the Carpathian Mountains, in northeastern Hungary. It comprises a forested highland area extending some 30 miles (50 km) from the Tarna River on the west to the Sajó River in the east and 20 miles (32 km) from north to south. Maximum elevation is reached at Mount Istállóskő (3,146 feet [959 m]). The central core of the Bükk is a 12½-by-4½-mile (20-by-7-kilometre) limestone plateau (called Giants' Table) with a rim of white cliffs dominating the surrounding lower mountains. The Bükk is an intensely folded and faulted block range. Along fault lines south of the Bükk are volcanic tuffs and lavas and post-volcanic hot springs. The Bükk, with a continuous tree cover for the most part, is one of the most rugged areas in Hungary. It is a much-frequented resort area—once-exclusive hotels and resorts at Lillafüred, Noszvaj, Jávorkút, and Szilvásvárad are now vacation centres for workers in the Borsod heavy-industrial district. Trout fishing and hiking are summer attractions. A long snow cover (120 days) encourages winter sports. Throughout the ranges are traces of prehistoric settlement.

Bukovina, eastern European territory consisting of a segment of the northeastern Carpathian Mountains and the adjoining plain, divided in modern times (after 1947) between Romania and the Soviet Union. Settled by both Ukrainians (Ruthenians) and Romanians (Moldavians), the region became an integral part of the principality of Moldavia in the 14th century. Suceava, in the south of the territory, was the capital of Moldavia from the late 14th to the mid-16th century.

Bukovina acquired its own name and identity only in 1775, when it was ceded to Austria by the Turks, who then controlled Moldavia. Austria, which regarded Bukovina as a strategic link between Transylvania and Galicia, administered it first as a part of Galicia (1786–1849) and then as a duchy and a separate crown land. Austria also developed Bukovina's chief city, Chernovtsy (Czernowitz, Cernăuţi), into an important educational and commercial centre. The Austrians kept a balance between the various ethnic groups in Bukovina; the population was almost solidly Ukrainian in the north and Romanian in the south, while in the towns there were also a number of Germans and Poles, many of them Jews. When Romania achieved independence in 1878, it sought unification with Bukovina. It did so because Bukovina was not only the historical cradle of the Moldavian principality but also the repository of the finest examples of Romanian art and architecture, having unique painted monastic churches of the 15th and 16th centuries. Romania occupied Bukovina when Austria-Hungary collapsed in 1918. Although local Ukrainians had tried to incorporate their districts in northern Bukovina into the Western Ukrainian National Re-



Bukovina in 1775

public, Romania gained control of the whole province (Treaty of Saint-Germain; 1919) and pursued a Rumanization policy there. In June 1940 the Soviet Union occupied the northern part of Bukovina, but Romania temporarily regained this territory as Germany's ally after the latter had invaded the U.S.S.R. in 1941. Soviet troops retook the northern districts in 1944. Northern Bukovina became part of the Ukrainian Soviet Socialist Republic under the peace treaty of 1947; the ancient Moldavian capital Suceava and the surrounding area, including the most famous of the monasteries, became part of the Romanian People's Republic.

Bukuru, town, Plateau State, central Nigeria. It is located on the Jos Plateau and lies along a branch railway from Jos town (8 miles [13 km] north-northeast). It is a major tin- and columbite-mining centre on one of the highest parts (more than 4,000 feet [1,200 m]) of the plateau. The Bauchi Light Railway (closed in 1957) connected with the line to Lagos and was built in 1914 to carry tin from Bukuru to Zaria (120 mi [190 km] northwest). The present railway branch linking Port Harcourt (370 miles [595 km] south-southwest) to the Jos and Bukuru mines was completed in 1927. Minerals are now sent to Jos for smelting and then to Port Harcourt for export. Associated with the open-cast mine workings are exploitable deposits of kaolin.

Although Birom people, who originally settled the site, work in the mines and live in the town, the mineral wealth has attracted to Bukuru many outsiders, including Hausas, Ibos, Yorubas, and Europeans. Sorghum, millet, and *acha* (a grain known as hungry rice) are the chief staple crops in the area, but cash crops (potatoes, yams, corn [maize], and green vegetables) are also cultivated locally for the urban markets at Bukuru and Jos.

Bukuru is the site of the National Institute for Policy and Strategic Studies (a part of the Plateau State College of Technology), a private commercial institute, a maternity clinic, and a dispensary. Pop. (latest census) 8,450.

Bulandshahr, town, western Uttar Pradesh state, northern India. It lies about 40 miles (64 km) southeast of Delhi, on the Kālī River. Its name, which means "elevated town," refers to its location on high ground. Formerly called Baran, the town is linked with Delhi and other cities by road and rail and is a trade centre for agricultural products.

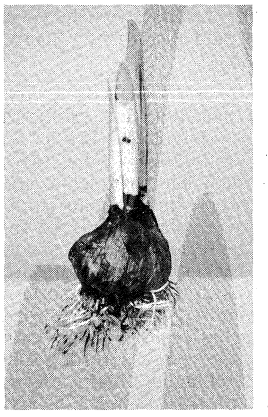
The surrounding area comprises a level region between the Ganges and Yamuna (Jumna) rivers. The intensively cultivated land is irrigated by tube wells and by two branches of the Ganges Canal. Crops include grains, cotton, and sugarcane. The area passed from a Hindu raja to Maḥmūd of Ghazna in 1018, was fought over during the 14th century, and then fell under Mughal rule. In 1805 it became part of British India. Pop. (1981) town, 103,436.

Bulawayo, the second largest city in Zimbabwe and the chief city of Matabeleland (*i.e.,* the Ndebele-dominated western third of the country). The city lies along the Matsheumlope River in the southwestern part of the country, 4,405 feet (1,341 m) above sea level in undulating savanna terrain. The original site was the kraal (headquarters) of Lobengula, king of the Ndebele, who fought a major battle against his rivals there; Bulawayo means "place of slaughter." Occupied by the British in 1893, the settlement was moved in 1894 to its present location 3 miles (5 km) south and declared a town; it became a municipality in 1897 and a city in 1943. Government House, built by Cecil John Rhodes, now occupies the original site.

The Khami Ruins, west of Bulawayo, Zimbabwe
Douglas Waugh—Peter Arnold, Inc.

Bulawayo is Zimbabwe's principal industrial centre; its major products are automobiles, tires, concrete and other building materials, radios, television sets, textiles, furniture, and food. As the headquarters of Zimbabwe railways, Bulawayo is the country's main transshipment point for goods to and from South Africa. The city is laid out on a grid and is modern in appearance, with wide streets and many new buildings. It has two teachers' colleges, one technical college, and the National Museum. Tourist attractions include Rhodes Tomb in the Rhodes Matopos National Park, 28 miles (45 km) south, and the Khami Ruins, 12 miles (19 km) west. Pop. (1982 prelim.) 413,814.

bulb, in botany, structure that is the resting stage of certain seed plants, particularly perennial monocotyledons. A bulb consists of a relatively large, usually globe-shaped, underground bud with membraneous or fleshy overlapping leaves arising from a short stem. An onion is a commonly known bulb. A bulb's fleshy leaves—which in some species are actually expanded leaf bases—function as food reserves that enable a plant to lie dormant when water is unavailable (during winter or drought) and resume its active growth when favourable conditions again prevail. There are two main types of bulbs. One type, typified by the onion, has a thin papery covering protecting its fleshy leaves. The other type, the scaly



Sprouting narcissus (*Narcissus*) bulb
John H. Gerard

bulb, as seen in true lilies, has naked storage leaves, unprotected by any papery covering, that make the bulb appear to consist of a series of angular scales. Bulbs can vary in size from insignificant pea-sized structures to those of large crinums (crinum lilies), the individual bulbs of which may weigh more than 15 pounds (7 kg).

Bulbs enable many common garden ornamentals, such as the narcissus, tulip, and hyacinth, to produce their flowers rapidly, almost precociously, in early spring when growing conditions are favourable. Other bulb-producing plants, such as the lilies, flower in the summer, while a few, such as the meadow saffron, bloom in the fall. Bulb-producing species are especially abundant in the lily and amaryllis families. A few bulb-producing species are of economic importance to humans owing to the taste and nutritive value of their fleshy leaves. Included among such species are the onion and its relatives, the shallot, garlic, and leek. Some bulbs contain poisonous compounds, such as the red squill (*Urginea*), the bulbs of which are the source of a highly effective rat poison.

In horticulture the term bulb is incorrectly applied to a number of botanical structures that have a similar food-storing function. Among these are the solid corms of the crocus and gladiolus and the elongated rhizome of some irises.

bulb rot, widespread disease that can infect all flower and crop bulbs and is caused by a variety of fungi and a few bacteria. Shoots fail to emerge or leaves are stunted, yellow to reddish or purplish, and they later wilt and die; roots, usually few, are discoloured and decayed. The rot often starts at the bulb base (root plate), progressing upward and outward. Fungal rots are usually dry to spongy or powdery and moldy; bacterial rots are commonly moist, soft to mushy, and foul-smelling. The rot often progresses rapidly during storage in warm, humid places.

The control of bulb rot includes the use of disease-free bulbs; proper planting; careful digging and rapid but thorough curing of bulbs before storage; use of varieties resistant to fungal rots; avoidance of overwatering, overcrowding, and overfertilizing; and rotation with nonbulb plants. Nurserymen frequently treat bulbs before sale, using a hot water-fungicide soak.

bulbil, also spelled BULBEL, also called BULBLET, in botany, tiny secondary bulb that forms in the angle between a leaf and stem or in place of flowers on certain plants. Bulbils, called offsets when full-sized, fall or are removed and planted to produce new plants. They are especially common among such plants as onions and lilies.

bulbocavernosus muscle, also called BULBOSPONGIOSUS, a muscle of the perineum, the area between the anus and the genitals. In the male, it surrounds the bulb (the enlarged inner end of the structure that surrounds the urethra) of the penis and can be contracted to expel the last drops of urine or semen. In the female it is divided into halves that extend from just behind the clitoris to the central tendon of the perineum and serves to constrict the vagina.

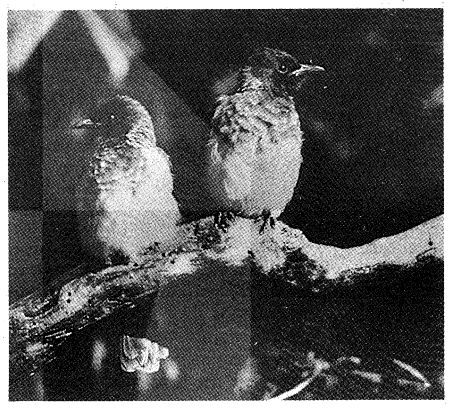
Bulbophyllum, the largest genus of orchids, family Orchidaceae, composed of more than 1,000 species of African and Asian plants with creeping rhizomes and rounded pseudobulbs (bulblike stems). Most species have a single leaf per pseudobulb.

The sepals are coloured and are larger than the petals. Many of these orchids have small flowers and an offensive odour.

bulbourethral gland, also called COWPER'S GLAND, either of two pea-shaped glands in the male, located beneath the prostate gland at the beginning of the internal portion of the penis; they add fluids to semen during the process of ejaculation (*q.v.*). The glands, which measure only about 1 cm (0.4 inch) in diameter, have ducts that empty into the urethra, the tube through which both urine and semen pass. They are composed of a network of small tubes, or tubules, and saclike structures; between the tubules are fibres of muscle and elastic tissue that give the glands struc-

tural support. Cells within the tubules and sacs contain droplets of mucus, a thick protein compound. The fluid excreted by these glands is clear and thick and acts as a lubricant; it is also thought to function as a flushing agent that washes out the urethra before the semen is ejaculated; it may also help to make the semen less watery and to provide a suitable living environment for the sperm. *See also* prostate gland; seminal vesicle.

bulbul, family name PYCNONOTIDAE, any of about 119 species of birds (order Passeriformes) of Africa and Asia, including some called greenbuls and brownbuls. Members range in size from 14 to 28 centimetres (5.5 to 11 inches) long. They are active, noisy, plain-coloured birds that sometimes cause damage in orchards. Representative of the 47 species of the genus *Pycnonotus* is the African bulbul (*P. barbatus,* including *P. xanthopygos* and *P. tricolor*), an 18-centimetre (7-inch) brownish-gray bird. Others are the red-whiskered bulbul (*P. jocosus,* sometimes *Otocompsa jocosa*), which is indigenous from India to southern China and has been introduced to Australia and southern Florida, and the red-vented bulbul (*P.,* sometimes *Molpastes, cafer*) of Pakistan to Java (natively) and the Fiji islands (by introduction). The 22 species of *Phyllastrephus* are common in tropical Africa. Finch-billed bulbuls (*Spizixos*) occur in southeastern Asia. The white-throated



Dark-capped African bulbuls (*Pycnonotus xanthropygos*)
Tony Deane—Bruce Coleman Inc.

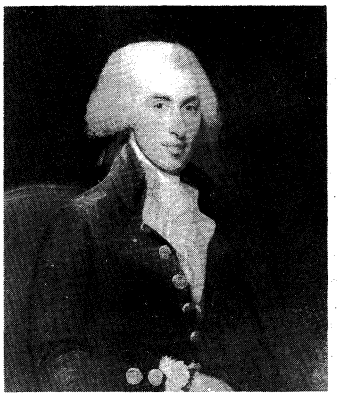
bulbul (*Criniger flaveolus*) ranges from the Himalayas to Bali. One of the larger species, 25 cm (10 in.) long, is the black bulbul (*Hypsipetes,* sometimes *Microscelis, madagascariensis*) of Madagascar, Indian Ocean islands, and southern Asia east to Taiwan; it has gray and black-and-white races.

Buldāna, also spelled BULDHANA, town, administrative headquarters of Buldāna district, Mahārāshtra state, western India, on the Penganga River in the Buldāna-Yeotmāl plateau of the Deccan, at an altitude of 2,119 ft (646 m). Its climate is considerably cooler than that of most of the other towns of the Berār region. Primarily an administrative centre with little industry, it has two colleges affiliated with the University of Nāgpur.

Buldāna district occupies an area of 3,763 sq mi (9,745 sq km). Its northern boundary lies mainly along the Sātpura Range, and the Ajanta Hills bound it in the south. In the north the Pūrna River flows westward into the Tāpti, and in the south the Penganga flows eastward into the Godāvari. The district is essentially agricultural (cotton, wheat, and peanuts [groundnuts]), and large-scale industry is limited to cotton ginning and cottonseed pressing, most of the cotton being sent to the mills at Bombay. Khāmgaon and Malkāpur are the chief market and commercial towns. Shegaon is an important religious centre that annually attracts thousands of pilgrims to its Gajānan Mahārāj temple. The Daitya Sudān temple at Lonār and the Bālājī temple at Mehkar are also important pilgrimage sites. Pop. (1981) town, 35,914; district, 1,508,777.

Buldur (Turkey): *see* Burdur.

Bulfinch, Charles (b. Aug. 8, 1763, Boston—d. April 4, 1844, Boston), first U.S. professional architect, who gained fame chiefly as a designer of government buildings.



"Portrait of Charles Bulfinch," oil on canvas by Mather Brown, 1786; in the Fogg Art Museum, Harvard University
By courtesy of the Harvard University Portrait Collection, gift of Francis V. Bulfinch

After studying at Harvard University (1778–81), Bulfinch toured Europe (1785–87) and, on the advice of Thomas Jefferson, whom he met in Paris, visited many of the major architectural works of France and Italy. In London he became acquainted with the Neoclassicism of the Scottish-born architect Robert Adam, and he was largely responsible for introducing the Adam style into the United States. Most of his works incorporate classical orders and show a mastery of proportion.

Among Bulfinch's works are the Massachusetts State House, Boston (designed 1787–88; built 1795–98; extant in the late 20th century but greatly altered); the Connecticut State House, Hartford (1792–96; now the city hall); and the Maine Capitol, Augusta (1828–31). Bulfinch was the fourth in the succession of architects of the United States Capitol, Washington, D.C. Serving in this capacity from 1817 to 1830, Bulfinch used the plans of his immediate predecessor, Benjamin Latrobe, for the wings, but he prepared a new design for the rotunda.

In 1787 Bulfinch helped to promote the first circumnavigation of the Earth by a U.S. ship (the "Columbia," commanded by Robert Gray). As a member (1791–95, 1799–1817) of the Boston board of selectmen, he directed the improvement of the local street system and of Boston Common and its surroundings.

Harold Kirker, *The Architecture of Bulfinch,* was published in 1977.

Bulgakov, Macarius, original name MIKHAIL PETROVICH BULGAKOV (b. 1816, Kursk, Russia—d. 1882, Moscow), Russian Orthodox metropolitan (archbishop) of Moscow and internationally recognized theologian and historian.

The son of a country priest, Bulgakov took the name Macarius on becoming a monk. After studying at the Ecclesiastical Academy of Kiev, he joined the faculty and taught history. Called in 1842 to the chair of theology at the Academy of St. Petersburg (now Leningrad), he became rector in 1850 and in 1854 was named to the Russian Academy of Sciences.

Consecrated bishop in 1851, Macarius headed the episcopal sees of Tambov (1857), Kharkov (1859), and Vilna in Lithuania (1868); in 1879 he was appointed metropolitan of Moscow. During his administration, he furthered historical and theological learning by expanding the academies, by his own writing, and by material and intellectual assistance to others.

Chief among Macarius' extensive works is *Orthodox Dogmatic Theology,* 6 vol. (1847–53). Condensed to three volumes and bound as a single handbook in 1868, the work became a popular student manual. Macarius was influenced by the positive, or historical, theology of Giovanni Perrone and other 19th-century Roman Catholic writers. While closely following Latin models in his methodology, he maintained the traditional dogmas of the Orthodox Church on controversial issues.

During the period 1857–82, Macarius produced his 13-volume *History of the Russian Church,* from its 10th-century origins to the Council of Moscow in 1667. Although deficient in its evaluation of historical sources, the work is notable for the previously unpublished documents it reproduced. He also left three volumes of sermons and a *History of the Russian Schism of the Old Believers,* concerning the dissident group that repudiated the liturgical and doctrinal reforms of Nikon, the 17th-century patriarch of Moscow.

Because his *Orthodox Dogmatic Theology* was translated into French and Slavic editions, Macarius' influence on Eastern Orthodox thought has been significant. Several of his specific teachings, however, have been questioned by 19th- and 20th-century Russian theologians who object to his Latin Scholastic methodology.

Bulgakov, Mikhail Afanasyevich (b. May 15 [May 3, old style], 1891, Kiev—d. March 10, 1940, Moscow), Soviet playwright, novelist, and short-story writer best known for his humour and penetrating satire.

Beginning as a doctor, Bulgakov gave up medicine for writing. His first major work was the novel *Belaya gvardiya* (*The White Guard,* 1971), serialized in 1925 but never published in book form. A realistic and sympathetic portrayal of the motives and behaviour of a group of anti-Bolshevik White officers during the civil war, it was met by a storm of official criticism for its lack of a Communist hero. Bulgakov reworked it into a play, *Dni Turbinykh* ("The Days of the Turbins"), which was staged with great success in 1926 but was subsequently banned. In 1925 he published a book of satirical fantasies, *Dyavoliada* ("Deviltries"), implicitly critical of Soviet Communist society. This work, too, was officially denounced. In the same year he wrote *Sobachye serdtse* (*Heart of a Dog,* 1968), a scathing comic satire on pseudo-science.

Because of their realism and humour, Bulgakov's works enjoyed great popularity, but their trenchant criticism of Soviet mores was increasingly unacceptable to the authorities. By 1930 he was, in effect, prohibited from publishing. His plea for permission to emigrate was rejected by Stalin. During the subsequent period of literary ostracism, which continued until his death, Bulgakov created his masterpieces. In 1932, as literary consultant to the Moscow Art Theatre staff, he wrote a tragedy on the death of Molière, *Molière.* A revised version was finally staged in 1936 and had a run of seven nights before it was banned because of its thinly disguised attack on Stalin and the Communist Party.

Bulgakov produced two more masterpieces during the 1930s. The first was his unfinished *Teatralny roman* ("A Theatrical Novel," originally titled *Zapiski pokoynika* ["Notes of a Dead Man"]), an autobiographical novel, which includes a merciless satire on Stanislavsky and the backstage life of the Moscow Art Theatre. The second was his dazzling Gogolesque fantasy, *Master i Margarita* (*The Master and Margarita,* 1967). Witty and

ribald, and at the same time a penetrating philosophical novel wrestling with profound and eternal problems of good and evil, it juxtaposes two planes of action—one set in contemporary Moscow and the other in Pontius Pilate's Judea. The central character is the Devil—disguised as Professor Woland—who descends upon Moscow with his purgative pranks that expose the corruption and hypocrisy of the cultural elite. His counterpart is the "Master," a repressed novelist who goes into a psychiatric ward for seeking to present the story of Jesus. The work oscillates between grotesque and often ribald scenes of trenchant satiric humour and powerful and moving moments of pathos and tragedy. It was published in the Soviet Union only in 1966–67, and then in an egregiously censored form.

Bulgakov's works were slow to benefit from the limited "thaw" which characterized the Soviet literary milieu following the death of Stalin. His posthumous rehabilitation began slowly in the late 1950s, and starting in 1962 several volumes of his works, including plays, novels, short stories, and his biography of Molière, have been published. The three culminating masterpieces of this artist, however, were not published in the U.S.S.R. during his lifetime.

Bulgakov, Sergey Nikolayevich (b. June 16, 1871, Livny, Russia—d. July 12, 1944, Paris), economist and Russian Orthodox theologian who brought to its fullest development the philosophical system called sophiology, which centred on problems of the creation of the world and which stressed the unity of all things.

Bulgakov began his clerical training at the seminary of Oryol, Russia, but was influenced by Marxism to break with the church and become a student of political economics. After studying in Moscow, Berlin, Paris, and London, he taught at the universities of Kiev (1901–06) and Moscow (1906–18). During this period he wrote *Capitalism and Agriculture* (1901) and *Philosophy and Economics* (1912).

Bulgakov became disillusioned with Marxist philosophy, however, and returned to the church with a group of several former Marxists that included the philosopher Nikolay Berdyayev. Bulgakov's conversion is described in his own book *The Undying Light* (1917). Ordained a priest in 1918, he was prevented by the Bolshevik government from resuming his teaching and in 1923 was expelled from the Soviet Union. After two years in Prague he was made professor of theology and dean of the Russian Orthodox Theological Institute of Paris, where he taught until his death.

Bulgakov spent the last 20 years of his life developing sophiology, a philosophical-theological system built around the concept of *sophia* (Greek: "wisdom"). This concept, frequently found in the works of medieval mystics and of modern Russian philosophers such as Vladimir Solovyov and Pavel Florensky, is used by Bulgakov to signify the link connecting God and the created world. His doctrines of divine wisdom, however, were strongly opposed by several Orthodox theologians and were condemned in 1935 by the Synod of Karlovci, Yugos., and by Patriarch Sergey of Moscow. Bulgakov's own bishop, Metropolitan Eulogius of Paris, and his colleagues at the institute supported him and protected his freedom to teach and to write. Among Bulgakov's numerous theological works are *The Unburning Bush* (1927), *The Ladder of Jacob* (1929), *The Lamb of God* (1933), and *The Comforter* (1936). A critical discussion of sophiology, outlined in Bulgakov's *Wisdom of God* (1937), may be found in V.V. Zenkovsky's *History of Russian Philosophy* (1953).

Bulganin, Nikolay Aleksandrovich (b. June 11 [May 30, Old Style], 1895, Nizhny Novgorod, Russia—d. Feb. 24, 1975, Moscow), statesman and industrial and economic administrator who was premier of the Soviet Union from 1955 to 1958.

Bulganin began his career as a Cheka (Bolshevik secret police) officer in 1918. Later, as manager of Moscow's leading electrical equipment factory, he earned a reputation as an outstanding administrator. In 1931 he was made chairman of the Moscow Soviet. Bulganin subsequently became premier of the Russian republic (1937–38), chairman of the Soviet Union's state bank (1938–41), deputy premier of the Soviet Union (1938–41), and a full member of the Central Committee of the Communist Party (1939).

After serving in Stalin's elite war cabinet, the State Defense Committee (1944), he resumed the post of deputy premier of the Soviet Union (1947), succeeded Stalin as minister of the armed forces (1947), with the rank of marshal of the Soviet Union, and became a full member of the Politburo of the Central Committee (1948). After Stalin's death (March 5, 1953) Bulganin became deputy premier and minister of defense in the government of Georgy M. Malenkov. But during the power struggle between Malenkov and Nikita S. Khrushchev, Bulganin supported Khrushchev. When Khrushchev won, Bulganin replaced Malenkov as chairman of the Council of Ministers of the U.S.S.R. (*i.e.*, as premier of the Soviet Union; Feb. 8, 1955).

Frequently appearing as a public spokesman for the government and accompanying Khrushchev on numerous state visits throughout the world, Bulganin came to be closely identified with Khrushchev. But when an "antiparty group" tried to oust Khrushchev from his position as leader of the party (June 1957), Bulganin joined them. Although the group failed and its leaders were expelled from the Central Committee and its Presidium (July 1957), Bulganin remained premier until March 27, 1958, and a member of the Presidium until Sept. 5, 1958; only at the end of 1958 was he formally associated with the "antiparty" group. He was then stripped of his marshal's rank and given an obscure party position, and in 1961 he lost his membership on the Central Committee.

Bulgar: *see* Bulgarian.

Bulgar (Russian S.F.S.R.): *see* Bolgary.

Bulgaria, officially PEOPLE'S REPUBLIC OF BULGARIA, Bulgarian NARODNA REPUBLIKA BŬLGARIYA, a Balkan country located on the Black Sea in southeastern Europe, covering an area of 42,823 square miles (110,912 square km). Its capital is Sofia. Bulgaria is separated from Romania by the Danube River along most of its northern border. The Black Sea coastline comprises its eastern border; Greece and Turkey form the southern boundary and Yugoslavia the western boundary. The population was estimated at 9,013,000 in 1988.

A brief treatment of Bulgaria follows. For full treatment, *see* MACROPAEDIA: Bulgaria.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

Bulgaria

The land. Three major physiographic regions, each with a general east-to-west orientation, define the Bulgarian landscape. The northernmost is the Danubian Plain, a fertile lowland with rolling hills, occupying nearly a third of the country. Two-thirds of it lies below 700 feet (210 m), and the entire area nowhere exceeds 2,000 feet (600 m) in elevation. The Balkan Mountains immediately south of the Danubian Plain average 2,368 feet (722 m) in elevation. Bulgaria's third major region, the Rila–Rhodope massif, is separated from the Balkan Mountains by lowlands. Generally higher and more rugged (with many snowfields and lakes of glacial origin) than the northern ranges, the Rila–Rhodope massif has the country's highest mountain, Musala Peak, at 9,596 feet (2,925 m) and some of southern Europe's most scenic countryside. While less extensive in area than the three major regions, Bulgaria's Black Sea coast, with its sandy beaches and harbours at Varna and Burgas, is among eastern Europe's favourite resort areas.

Bulgaria has two major drainage systems. The Black Sea receives more than half of the country's runoff from the tributaries of the Danube in the north (such as the Iskŭr and the Yantra rivers) and from the direct discharge from the rivers in the east. The remainder empties into the Aegean Sea through the Struma and the Mesta rivers in the southwest and the Tundzha, Maritsa (Marica), and Arda rivers in the south.

Bulgaria's climate is typical of the Balkan Peninsula: moderately continental in the north and northwest (with colder winters) and Mediterranean (with summer drought) in the southeast and in the Mesta and Struma river valleys. A transitional climate prevails in the central mountains and along the Black Sea coast. The average winter temperature is 30° F (−1° C), and the average summer temperature is about 70° F (21° C). With the exception of the highland areas, which may average more than 47 inches (1,200 mm) of annual precipitation with little seasonality, rainfall averages between 21 and 27 inches (530 and 685 mm) throughout the remainder of the country, with winter maximums in the south and summer maximums in the north.

Nearly two-fifths of Bulgaria's land is arable, and a fourth of this is irrigated (mostly in the southeast during the summer dry season). About one-fifth of the country is pastureland and one-third is forested. The greater part of the natural vegetation and wildlife is characteristic of central Europe and is mixed with a high-mountain type that blends Arctic and Alpine characteristics. Most northern types are replaced by Mediterranean species in the south.

In the early 1980s Bulgaria began developing its large copper deposits in the Sredna Mountains in the south. It also has substantial reserves of iron ore and adequate reserves of lignite and brown coal. Other mineral reserves include lead, zinc, and manganese.

The people. Ethnically, the population is fairly homogeneous, Bulgarians making up about 85 percent of the total. The Turks, Bulgaria's largest minority, live in some regions of the northeast and in the eastern Rhodope Mountain region. Gypsies and Macedonians are two other sizable minorities (though the government does not classify Macedonians as such, regarding them as ethnically Bulgarian), and there are a few thousand Armenians, Russians, and Greeks (mostly in towns) and Romanians and Tatars (mostly in the villages).

The Bulgarian language belongs to the South Slavic group, together with Serbo-Croatian, Slovene, and Macedonian (the last, however, is considered to be a dialect of Bulgarian by the government). A number of regional dialects appear in common speech.

Most Bulgarians who profess religion despite

formal discouragement by the state are Eastern Orthodox, with small numbers of Muslims, Jews, Bulgarian Catholics, and Protestants.

As a result of social and economic changes after World War II, notably the introduction of free medical care and improved working conditions, Bulgaria's death rate, and especially the infant mortality rate, dropped significantly. The birth rate has also dropped. The natural growth rate is relatively low, typical of an older population.

Urbanization continues to have an effect on the demographic structure; a large segment of the urban population is of a young working age, contributing to a relatively higher birth rate in the towns. Because relatively more older adults remain in the villages, the birth rate there continues to be lower and the mortality rate higher.

Emigration since World War II has mostly affected non-Bulgarians. Some 200,000 Turks have left the country, 155,000 of them expelled in 1949–51. Almost all Czechs and Slovaks residing in Bulgaria returned to their homelands, as did large numbers of Russians, Armenians, and Jews. Internally, the movement of population has been from rural areas to larger towns and cities. Bulgaria is now about 65 percent urban.

The economy. Bulgaria has a centrally planned economy based principally upon manufacturing and agriculture. The gross national product (GNP) per capita, which is growing faster than the population, is (though relatively low) similar to those of the developed countries.

Agriculture accounts for about one-seventh of the net material product and employs as much as one-fifth of the labour force. Cereals, mainly wheat, corn (maize), and barley, are the principal crop, occupying three-fifths of the sown land. Industrial crops are important, especially tobacco and sunflower seed. Before the early 1970s most of the country's farms were organized into large state and collective units. These were subsequently merged into vertically integrated agro-industrial complexes and then further amalgamated beginning in 1979 into administrative units known as national agro-industrial complexes. The principal livestock are sheep, pigs, and cattle. Domestic fishing is limited to Bulgaria's Black Sea coast and inland rivers and lakes, but Bulgarian fishing fleets operate in the Atlantic Ocean and Mediterranean Sea as well.

Industry accounts for almost three-fifths of the net material product and employs about one-third of the labour force. With the exception of lignite and brown coal, Bulgaria's imports include some quantity of all other minerals needed by the national economy. The principal minerals produced include coal, iron ore, quicklime, nitrogen from ammonia, kaolin clay, lead, and crude petroleum and natural gas. Manufacturing is diversified and, apart from refined petroleum products, includes cement, semifinished rolled-steel products, pig iron, soda ash, sulfuric acid, wood pulp and paper, cigarettes, and cotton fabrics. About 60 percent of the country's electricity comes from thermal plants and 30 percent from nuclear power plants; the remainder comes from hydroelectric plants. Construction generates only a small fraction of the net material product.

Tourism, concentrated on the beaches and resorts along the Black Sea coast, provides an important source of foreign exchange. Most tourists are from eastern Europe, the Soviet Union, or Turkey, but the government is attempting to attract more western Europeans.

The Bulgarian economy is modeled after that of the Soviet Union. Agriculture is operated through either cooperatives or collectivized enterprises, and all other sectors of the economy are state owned and operated. Economic development is organized through five-year plans, which have stressed industrialization. Trade unions in Bulgaria are sponsored by the state; the state appoints all leaders and strikes are banned.

Bulgaria's main exports are machinery and equipment, fuels, mineral ores and metals, and food and beverages; principal imports include petroleum, natural gas, coal, machinery, transport equipment, and food and consumer goods. The Soviet Union is Bulgaria's principal trading partner. Other eastern European countries are also major trading partners.

Government and social conditions. Bulgaria is a people's republic governed by the Bulgarian Communist Party. All of the country's political decisions are made by the 11-member Politburo, which is elected by the Communist Party's Central Committee. According to the country's 1971 constitution, the supreme state organ is the National Assembly (*Narodno Sobraniye*), which consists of 400 members selected by the party and elected without opposition for five-year terms by universal adult suffrage. The Assembly chooses a Council of Ministers (cabinet) and delegates its legislative authority to a small State Council, also selected by the party. Communist Party members occupy all the important positions in the government. In contrast with most other Communist nations, Bulgaria tolerates the existence of a minuscule second political party, the Bulgarian Agrarian People's Union (BZNS). The highest judicial entity is the Supreme Court, which is appointed by the National Assembly, not without the advice of the party. Bulgaria has a military establishment of about 150,000 personnel and a People's Militia, which is a paramilitary organization, of similar size.

Social insurance benefits go to workers for sick leave, childbirth, and retirement. Medical services and treatment are free. Health conditions are generally good; most infectious diseases have been brought under control or eradicated. Average life expectancy is 71 years. Like other eastern European countries, Bulgaria suffers a shortage of urban housing, although some new housing has been built by the government to alleviate the shortage.

Education at all levels is free, and an eight-year elementary program is compulsory. Children receive their primary instruction from schools of general education and continue in secondary general or vocational schools. Higher education in Bulgaria is concentrated in two types of schools offering either two- and three-year curriculums in teacher training or four-year university degrees.

The news media in Bulgaria are strictly controlled by the government. Newspaper journalists must be Communist Party members.

Cultural life. Bulgarian culture is rich and varied; it ranges from ancient folk traditions to the art of Socialist Realism, with its theme of building Communism. In literature, one of the most important Bulgarian figures was Ivan Vazov, author of the highly acclaimed 1894 novel *Under the Yoke.* In music, Bulgaria is best-known for its 20th-century opera singers Boris Khristov and Nikolai Ghiaourov. Folk arts, developed before and during the five centuries of Turkish rule, are still practiced in wood carving, weaving, and embroidery.

History. Evidence of human habitation in Bulgaria dates from the Middle Paleolithic Period, and agricultural settlements appeared in the Neolithic Period. The Thracians were its first inhabitants to enter recorded history. Their existence in Bulgaria can be dated from about 3500 BC, when seminomadic pastoralists from the Eurasian steppes moved southwestward to settle in the Balkan Peninsula. The first known Thracian state dates from the mid-5th century BC. Weakened by conflict with the Macedonians and Persians, the Thracian kingdom was finally absorbed by the Roman Empire after a 150-year struggle lasting into the first years of the Christian Era. Under Roman rule Bulgaria was divided between the provinces of Moesia and Thrace and lay athwart the main land route from the west to the Middle East.

Beginning in the 3rd century AD the Balkans suffered desolation brought about by successive invasions of Goths, Huns, Bulgars, and Avars. Gradually, beginning in the mid-6th century, Slavic agriculturists repopulated most of the region. During the 7th century the Bulgars rose against the Avars, crossed the Danube, and subjugated the Slavic communities to the south. In 681, following an unsuccessful war with the Bulgars, the Byzantine Empire formally recognized Bulgar control of the region between the Balkans and the Danube. This is considered to be the starting point of the Bulgarian state. The ruler Boris I adopted Orthodox Christianity in 864, and the adoption of the new religion facilitated the assimilation of the Bulgars into the more numerous Slavic population. Although the name "Bulgaria" survived, the Bulgar language and customs died out, leaving few remnants.

The First Bulgarian Empire flourished under Tsar Simeon (reigned 893–927) but was forced to accept Byzantine domination in 1018. A successful revolt led by the Asen brothers regained Bulgarian independence in 1185. The Second Bulgarian Empire, with its capital at Tŭrnovo, ruled much of the Balkan Peninsula before succumbing to internal divisions and foreign invasion. In the second half of the 14th century Bulgaria was invaded by the Ottoman Turks, and in 1396 the last vestiges of independence were lost. During the five centuries of Ottoman rule (1396–1878), the Bulgarian nobility was destroyed and the peasantry enserfed to Turkish masters. The Turks did not attempt, however, to eradicate either Christianity or the Bulgarian language.

Bulgaria lagged behind its neighbours, Serbia and Greece, in the creation of a movement for independence, but by the time of the Russo-Turkish War (1877–78) a movement known as the National Revival had brought about a widespread sense of Bulgarian identity. The Treaty of San Stefano (1878) created a practically independent Bulgaria covering almost three-fifths of the Balkan Peninsula. This was unacceptable to most of the Great Powers, and the Congress of Berlin (1879) permitted the creation of only a small, autonomous principality. Bulgaria annexed Eastern Rumelia in 1885 and declared itself an independent kingdom in 1908. Bulgaria helped to form the Balkan League (with Greece, Serbia, and Montenegro) that fought the Turks in the First Balkan War (October 1912–May 1913). In the Second Balkan War (June–August 1913), Bulgaria fought against Turkey, Romania, and Bulgaria's own former allies, and Bulgaria lost most of the territory it had gained. Bulgaria's additional defeat in the First World War led to the abdication of Ferdinand I in 1918 and the accession of his son Boris III, who ruled until his death in 1943.

Bulgaria sided with the Germans in World War II. A Communist-inspired coalition seized power on Sept. 9, 1944, in conjunction with an invasion by the Soviet Red Army. In 1946 a plebiscite abolished the monarchy and formed a people's republic. In the postwar era Bulgaria gradually achieved a predominantly urban and industrial society. It remained firmly allied to the Soviet Union and the Soviet bloc, but relations with Yugoslavia remained strained over the issue of Macedonia.

Bulgarian, also called BULGAR, member of a people known in eastern European history from the 6th century AD. The Bulgarians probably originated as a Turkic tribe of Central Asia and arrived in the European steppe west of the Volga River with the Huns *c.* AD 370; retreating with the Huns, they resettled *c.* 460 in an arc of country north and east of the

Sea of Azov. Hired by the Byzantines in 480 to fight against the Ostrogoths, the Bulgarians subsequently became attracted by the wealth of the Byzantine Empire. In the 6th century the Bulgarians continually attacked the Danubian provinces of the Byzantine Empire until, in the 560s, they were themselves threatened by the Avars, who were then advancing from Asia into central Europe. The Avars destroyed one Bulgarian tribe, but the rest saved themselves by submitting, for two decades, to another horde of Turkic newcomers, most of whom then retreated back into Asia.

Unified under a single ruler, Kurt, or Kubrat (reigned *c.* 605–*c.* 642), the Bulgarians constituted a powerful khanate known to the Byzantines as Great Bulgaria, with the Kuban River as its southern frontier. After Kurt's death his five sons split the people into five hordes. One of these five, remaining on the coast of the Sea of Azov, was absorbed into the new empire of the Khazars (*q.v.*); another migrated to central Europe and was merged with the Avars; and another disappeared into service under the Lombards in Italy. Two of the five hordes, however, had longer futures.

Kurt's son Bezmer, or Bat-Bayan, avoided the Khazars by leading his horde far to the north, where it eventually occupied an ill-defined country around the confluence of the Volga and Kama rivers. Subdivided there into three groups (probably through mergers with indigenous peoples or with other immigrants), the horde maintained itself in prosperity for some 600 years. These Volga Bulgarians formed not so much a state as a seminomadic confederation, but they had two cities, Bulgar and Suvar, which profited as transshipment points in the trade between the fur-selling Ugrians and Russians of the far north and the southern civilizations—Byzantium, the Muslim Caliphate of Baghdad, and Turkistan. The Volga Bulgarians were converted to Islām *c.* 922. In 1237 they were made subject to the Mongol Golden Horde, and though the city of Bulgar flourished for a long time afterward, the people gradually lost their identity and were mingled with the Russians.

The fifth product of the breakup of Great Bulgaria was the horde that Kurt's son Asparukh led westward across the Dnestr (Dniester) River into the southeastern Balkans. There, about 679, encroaching on Byzantine territory, they set up the so-called First Bulgarian Empire—the state from which the modern nation of Bulgaria derives its name. In the 7th century the eastern Balkans were inhabited by Vlachs (Romanized Dacians) and also very largely by recently arrived Slavs; the conquering Bulgarians were soon permeated by Vlach and, even more thoroughly, by Slavic elements. At the same time, their conquests were carrying them deeper into the ambit of Byzantine Christianity. Territorial expansion under Krum (khan 803–814) and under Pressian (836–852) was followed by the formal conversion of the Bulgarians to Christianity, under Boris I. The new church's liturgy was in a Slavic language.

Boris I's son Simeon I, who was acknowledged even by the Roman Church as tsar, or emperor, of the Bulgarians, brought the first empire to its acme as a Balkan power, even though he had to give up the lands north of the Danube to fresh invaders from the Eurasian steppe. As invasions of the Balkan Peninsula from the north continued intermittently over the next four centuries, the Turkic element in the Bulgarians' ethnic makeup was somewhat reinforced against the Slavic by strains derived from the Pechenegs, Kipchaks, and Cumans—all Turkic peoples.

After Simeon's death the First Bulgarian Empire was undermined by internal divisions and invasions of Magyars, Peshenegs, Rus, and Byzantines. In 1018 Bulgaria was incorporated into the Byzantine Empire. An anti-Byzantine revolt of the Balkan peoples in 1185 produced the Second Bulgarian Empire, and by 1241 the Bulgarian tsars of the House of Asen (1185–1280) were supreme in most of the lands from the Danube to the Aegean and from the Adriatic to the Black Sea. But Mongol attacks from the north, Serbian encroachment on the west, and internal rivalry among the successors of the Asens eroded this second empire, and in 1396 it fell to the Ottoman Turks, who were overrunning the Balkans from the south.

Throughout the long period of direct Ottoman rule (1396–1878), the Bulgarians' obstinate Christianity prevented their being merged completely with the Muslim Turks, while their retention of a Slavic language kept them from absorption by the Greeks predominant in the Eastern Orthodox Church as recognized by the Ottomans.

In 1878 an autonomous Bulgarian principality under Ottoman suzerainty was established. It was declared independent, as a tsardom or kingdom, in 1908. In the settlement after World War I, Bulgaria lost some territory. Bulgaria allied with the Germans in March 1941. A Communist-led coalition took power in September 1944 in conjunction with the invasion of the Soviet Red Army. After 1944 the Bulgarian Communist Party consolidated its power and Bulgaria was made a people's republic.

Bulgarian Agrarian National Union, also called PEASANT PARTY, Bulgarian BŬLGARSKI ZEMEDELSKI NARODEN SŬYUZ (BZNS), Bulgarian political party founded under the name Bulgarian Agrarian Union in 1899. The party controlled the government between 1919 and 1923 and introduced extensive land reforms. Originally a professional organization, it became a peasants' political party by 1901. Its popularity increased after World War I; in the parliamentary elections of August 1919, it received 31 percent of the vote. Its leader, Aleksandŭr Stamboliyski, became premier (Oct. 6, 1919) and introduced a reform program, which included the redistribution of land to poor peasants, revision of the tax structure and the judicial system, the establishment of a compulsory labour service, and a readjustment of the state's foreign policy. The party's policies had widespread popular support (it won 52 percent of the vote in the elections of 1923), but they alienated other political groups and military leaders. In June 1923 the Agrarian government was overthrown in a coup d'état, and Stamboliyski and other Agrarian leaders were murdered.

Although beset by internal factionalism, the party revived and participated in the Popular Bloc government from 1931 until the royal–military coup d'état in 1934. After World War II the Agrarian Union provided the core of the opposition to Communization. After this struggle was lost, a new leadership converted the party into a loyal partner of the Communists. In return the Agrarian Union was allowed to retain an institutional existence and is recognized as a partner in the governing of the country.

Bulgarian Catholic Church, an Eastern Catholic church of the Byzantine rite, in communion with Rome since 1859.

Christians since 864, the Bulgarians were conquered by the Byzantines early in the 11th century and subsequently followed Constantinople in the break with Rome (1054). In 1767, after more than four centuries of Ottoman rule in Bulgaria, which had placed Bulgarian Christians under the direct administration of the patriarch of Constantinople and a Greek clergy, a number of Bulgars decided to free themselves of Greek domination by seeking union with Rome. Joseph Sokolsky was consecrated the first Bulgarian Catholic prelate in 1859; and, although he was soon afterward abducted by the Russians and interned for 18 years, the Bulgarian Catholic Church grew to number 80,000 faithful. By 1872, however, 60,000 of these returned to Orthodoxy, and the number of Catholics dwindled to a few thousand in the late 20th century.

Bulgarian Horrors, atrocities committed by the forces of the Ottoman Empire in subduing the Bulgarian rebellion of 1876; the name was given currency by the British statesman W.E. Gladstone. Publicity given to the atrocities, especially in Gladstone's pamphlet "The Bulgarian Horrors and the Question of the East" (1876), served to arouse public sympathy in Europe for the Bulgarians and other southern Slavs attempting to gain independence from the Ottoman Empire.

The Bulgarian revolt was part of the eastern crisis of 1875–78. This, in turn, was one of many crises that marked the so-called Eastern Question, the problem of the power vacuum created by the decay of the Ottoman Empire, that occupied European governments through much of the 19th century. After decades of nationalistic ferment, an uprising broke out in Bosnia and Hercegovina in 1875 and spread to Bulgaria the following spring. It was cruelly suppressed by the Turks, especially the poorly disciplined irregulars known as bashi-bazouks. About 15,000 persons were said to have been massacred at Philippopoli (now Plovdiv), and many villages and some monasteries were destroyed. Isolated risings in the mountains were crushed with equal severity.

Gladstone, then in opposition and contemplating retirement from the leadership of the Liberal Party, was moved by reports of the atrocities to write his pamphlet and to campaign vigorously against the foreign policy of the Conservative prime minister, Benjamin Disraeli, which favoured supporting the Ottoman Empire as a counterweight to Russia. Despite widespread public indignation, the European powers did little to alleviate the situation, and the climate of opinion changed after Russia attacked Turkey in 1877. The crisis ended with the Congress of Berlin (*see* Berlin, Congress of) in 1878, which created a small, autonomous principality of Bulgaria, still under the sovereignty of the Ottoman Empire and confined to territory north of the Balkan Mountains.

Bulgarian language, Bulgarian BULGARSKI EZIK, South Slavic language written in the Cyrillic alphabet and spoken in Bulgaria and parts of Greece, Romania, the Moldavian S.S.R., and the Ukrainian S.S.R. Together with Macedonian, with which it is most closely related, Bulgarian contrasts sharply with the other Slavic languages in its almost complete loss of case declension in the noun and in its use of certain grammatical features found in Balkan languages that belong to other language families. For example, the definite article is placed after the noun (*e.g.*, *masa* "table," *masata* "the table"), as in Albanian and Romanian, and the infinitive form of the verb is replaced with a clause, as in modern Greek, Albanian, and Romanian. The literary language has free stress accent (with consequent reductions of unstressed vowels) that has replaced an earlier pitch accent (*i.e.*, tone).

The history of Bulgarian is divided into three periods: (1) Old Bulgarian, 9th–11th century; (2) Middle Bulgarian, 12th–16th century; and (3) Modern Bulgarian, from the 16th century to the present. Old Bulgarian, the language of the Macedonian Slavs of the 10th and 11th centuries, was the first Slavic literary language; it developed in the Macedonian part of Bulgaria after St. Clement, a pupil and disciple of the Slavic missionaries SS. Cyril and Methodius, took refuge there after having been driven out of Moravia. The loss of cases in the noun, as well as many other linguistic changes, took place during the Mid-

dle Bulgarian period, which began with the subjugation of Bulgaria by the Byzantine Empire. The modern Bulgarian written language, which stems from the language of the widely read almanacs of the 16th century, did not become fully established until the 19th century; its vocabulary contains a sizable number of Russian and Church Slavonic loanwords, although a purist movement during the period between World Wars I and II attempted to replace these words and loanwords from other languages with native Bulgarian words.

Bulgarian language, Old: *see* Old Church Slavonic language.

Bulgarian literature, body of writings in the Bulgarian language. Its origin is closely linked to Christianization of the Slavs beginning with Khan (Tsar) Boris I's adoption in 864 of the Eastern Orthodox rather than Latin faith for his court and people. This political decision, combined with geographical proximity to Byzantium, determined a key role for Bulgarian in the Balkan development of a first Slavic written language and its corpus of ecclesiastical writings known as Old Bulgarian literature.

Following this religious conversion, the pupils of Cyril and Methodius were soon to establish the first Slavic literary school (893–971), under patronage of the royal court of Preslav, capital of Tsar Simeon (died 927) and Tsar Peter (died 969), and also, arising from their mission to Devol and Ohrid, an illustrious, first Slavic "university," founded by St. Clement, patron of Bulgaria's modern Sofiiski Universitet "Kliment Ohridsky." Among monastic centres at Preslav and Ohrid were St. Panteleimon foundations. In this Golden, or Old Bulgarian, period, medieval Bulgarian culture aspired to rival even the "Imperial City" (called Tsarigrad by the Slavs), Constantinople itself, as suggested by John the Exarch in his *Shestodnev* ("Hexameron"; *i.e.,* "Six Days [of Creation]"). Tsar Simeon's own name is closely linked with work on his *Simeonov sbornik* ("Simeon's Collection [of Gospel Commentaries]") and with the *Zlatostruy* ("Golden Stream"), the first Slavic version from the Greek of St. John Chrysostom. The predominant role played in this early Slavic literature by translating from (and so Slavicizing) the Greek reflects the determination of these Bulgarian writers to promote the Slav dialect and to convey, in structure and lexicon, all the complexities and sophistication of Byzantine thought.

The 13th–14th-century Middle Bulgarian, or Silver, age of the Asen and Shishman dynasties excelled in sheer graphic virtuosity (script, layout, illumination, binding) of its manuscripts, such as the Vatican *Manasses Chronicle* of 1345 and the London *Tsar Ivan Aleksandŭr Gospel* of 1356. In content, too, Byzantine influences and translations from the Greek continued to yield, as in the Old Bulgarian period, abundant literary resources. The Asenid taste for historical and temporal themes was succeeded in the late 14th century by the mystical doctrines of Hesychasm, with its quest for "inner light." This was the doctrine of Theodosius of Turnovo (noted for his Kilifarevo monastery school) and his most celebrated pupil, Patriarch Evtimy (died *c.* 1404). Both were leading figures in the Turnovo literary school, famous for its endeavours to standardize and purify the Old Church Slavonic (OCS) tradition as closely as this could still feasibly be related to its pristine 9th–10th-century forms. The withdrawal, if not the close, of Bulgarian medieval literature features a curious genre of contemporary travelogue—the conveyance of saints' relics from Turnovo to Tsar Ivan Stratsimir's Bdin (Vidin) or farther west. Such Bulgarian scholars as Grigory Tsamblak and Konstantin of Kostenets ("the Philosopher") also migrated westward, taking with them their literary skills and tradition. With these last scions of the early and late medieval Bulgarian literatures often went, too, the actual manuscript heritage of Old Church Slavonic.

Important as this sophisticated ecclesiastical literary tradition proved to be in its Bulgarian (and wider Balkan and Slav) contexts, it never displaced the other, less refined, and certainly quite uncanonical medieval literary streams that flowed more broadly over biblical, historical, and even heathen grounds to fill Balkan legends with classical, Christian, and apocryphal themes. Such "fiction," with its moral didactic intentions, includes an early 10th-century Bulgarian short story (probably the earliest Slavic example in this prolific genre) of Simeon's credulous cavalryman's "miraculous encounter" with the Magyars ("Chudo s bulgarina") and the tales of "Mikhail the Warrior," "Teofana the Innkeeper," "Stefanit and Ihnilat," and, based probably on Boris I's daughter Praksi, "Bulgarian Queen Persika." Here also belong, very definitely outside the ecclesiastical and royal pale, the body of writings, doctrinal and apocryphal, of the Bulgarian Bogomil heresy, provoking from official quarters those lively and informative reactions of Presbyter Kozma and of Tsar Boril's synodal convocation of 1211. Finally, on ground common to both the Old Bulgarian ecclesiastical and the more popular literatures, are the accounts of St. John of Rila, the traditional patron saint of Bulgaria and founder of its first monastery. Notable here, alongside the popular versions, are Patriarch Evtimy's "Life of Our Most Blessed Father Yoan of Rila" and Vladislav Gramatik's "Rila Story: Conveyance of St. Yoan's Relics to the [Refounded] Rila Monastery."

Modern Bulgarian literature dates from the mid-19th-century awakening of national consciousness. Consonant with this was the formation of *novobulgarski,* the new (or modern) literary Bulgarian language based on the vernacular of its eastern dialects, as opposed to the medieval Church Slavonic, which until then had always been used for literary purposes. Pioneers in this were Bishop Sophrony, whose *Nedelnik* (1806; "Sunday-Book") is the first modern Bulgarian printed book; Neophyt Rilski, grammarian and founder of the first modern Bulgarian school in 1835; N. Gerov, compiler of the first major dictionary of Bulgarian; the Russian antiquary Y. Venelin; V. Aprilov; and I. Bogorov. Harbinger of this whole awakening of Bulgarian national consciousness (known as the *Vuzrazhdane*) was Father Paisy of Chilandari, whose single work, *Istoria slavyanobulgarska* (1762; "Slavo-Bulgarian History"), by its romantic evocation of Bulgaria's past and appeal to national self-respect inspired Bulgaria's renascence, including its first able modern writers. These, who often combined capacities of poet, scholar, publicist, and revolutionary, shaped through works of unequal literary merit an effective image of the resurgent nation. Conditions of the time—lack of freedom, the strength of Greek cultural domination, and strong Russian utilitarian influences—taught these writers, many of whom were educated in Odessa or Moscow, that literature should serve social and national needs. Thus inspired, D. Voynikov, I. Bluskov, and especially L. Karavelov and V. Drumev founded modern Bulgarian Realism with their narrative prose and drama taken from rural and small-town life; H. Botev, in his single-minded devotion to ideals of liberty and fatherland, wrote impassioned revolutionary poetry; Petko Slaveykov, an irrepressible journalist, Bible translator, and agitator for the Bulgarian independent exarchate, worked all his life in Bulgarian and Macedonian lands and in Stambul itself (never in emigration like Karavelov and Botev), drawing for his verse on folklore and Greek popular songs; and G. Rakovski, a typical *vuzrozhdenets* ("Renaissance figure") in his versatility and vitality, exploited often with more zeal than discretion the two main indigenous resources for Bulgarian writers then and since, an illustrious medieval past and a richly surviving folklore.

The liberation of Bulgaria in 1878 created a climate far more favourable to literary development than that of the preceding five centuries of Turkish rule. Ivan Vazov almost alone links as a writer the epochs before and after liberation. His immense output from the early 1870s to 1921, reflecting in all main genres every facet of his people's life, past and present, has earned him the title of "national poet." An epic cycle, *Epopeya na zabravenite* (1881–84; "Epic of the Forgotten"), evoked with visionary power his pantheon of heroes from the struggle for independence; a novella, *Chichovtsi* (1895; "Uncles"), was a realistic portrait gallery of Bulgarian provincial "notables" in Turkish times. Vazov's narrative gifts were at their highest in Bulgaria's "national novel" *Pod igoto* (1893; translated as *Under the Yoke,* 1894), which vividly described the Bulgarian struggle against the Turks; his short stories entertained and his travelogues of rural and historical Bulgaria informed his readers; his most popular play, *Hushové* (1894), depicting these pre-liberation expatriates' ordeals in Romania, together with his dramas of medieval Bulgaria, dominated the repertoire of the Sofia National Theatre (founded 1907).

Without equalling Vazov's powers of imagination and synthesis, Konstantin Velichkov shared his ideals. His poetic temperament was best expressed in sonnets inspired by travels to Constantinople and Italy. An exponent of Italianate influence, he contributed to the then fashionable literature of memoirs. Most notable here was Z. Stoyanov, whose *Zapiski po bulgarskite vuzstaniya* (1883–85; translated as *Notes on the Bulgarian Uprisings*) recorded eyewitness experiences of then recent history with a directness rarely equalled since in Bulgarian prose.

Writers of the new independent state, when not preoccupied with celebrating the recent or distant past, eyed critically contemporary society's more negative aspects. In satire, fable, and epigram, S. Mihaylovski with unrelenting bitterness castigated corruption in public life. His most ambitious satire, *Kniga za bulgarskia narod* (1897; "Book on the Bulgarian People"), took the form of a moral-philosophical allegory. In a lighter vein, Aleko Konstantinov created in *Bay Ganyu* (1895; subtitled "Incredible Tales of a Contemporary Bulgarian [on his European Travels and at Home]") a tragi-comic prototype of the Bulgarian peasant turned *parvenu* and demagogue. In his travelogue *Do Chicago i nazad* (1894; "To Chicago and Back"), he measured Bulgaria against cultures of Europe and the United States, not always to the latter's advantage.

By the 1890s the school of older writers began to be challenged by a younger group intent on freeing art from parochialism and socio-political militancy. Leading this was the review *Misŭl* ("Thought," 1892–1908), founded by Krŭstyo Krŭstev, the first Bulgarian critic to stress the importance of the aesthetic conscience. A member of the *Misŭl* group, Pencho Slaveykov, broadened the Romantic tradition of Bulgarian poetry and helped to create a complex poetic language. Influenced by Nietzsche, he glorified the heroism of spiritual achievement and wrote his *Epicheski pesni* (1896–98; "Epic Songs") on the giants of the human spirit he revered—Dante, Beethoven, Shelley, and Leopardi. His ideas were expressed in his essays and in his autobiographical anthology of "apocryphal" verse by fictitious poets, *Na ostrova na blazhenite* (1910; "On the Isle of the Blessed"). His narrative poems *Boyko* (1897) and *Ralitsa* (1893) interpreted folk themes psychologically, and

his greatest, though unfinished, work, *Kŭrva-va pesen* (1913; "Song of Blood"), was an epic on Bulgaria's history and destiny. Even more than Slaveykov, Petko Todorov, originator of the Bulgarian Romantic short story, believed that literature was sufficient unto itself; both in his *Idilii* (1908), prose poems inspired by folklore, and in several dramas based on Balkan mythology, notably *Zidari* (1906; "Masons"), is displayed his delicate poetic talent.

With the beginning of the 20th century, avant-garde literary currents encouraged a "modernist" phase related to the Symbolist movement in Western poetry. An anacreontic permissiveness and lyrical power distinguished the poetry of Kiril Khristov, as in *Himni na zorata* (1911; "Hymns to the Dawn"). P. Yavorov, a member of the *Misŭl* group, did most at this time to develop the musical and evocative potentialities of Bulgarian in poetry. His work closely reflected his restless spiritual development, and although his plays showed great promise, his real achievement lay in lyric poetry. Echoes of Yavorov are found in the melodious, sensuous stanzas of Dimcho Debelyanov, whose death in World War I made him a symbol of tragic frustration for intellectuals. Symbolism inspired the postwar poetry of Nikolay Liliev and Teodor Trayanov.

Meanwhile, the Realist tradition continued in the work of such writers as Anton Strashimirov and G. Stamatov, whose cynical stories denigrated Sofia's society. Strashimirov was an acute observer of the contemporary social scene; one of his best stories of peasant life was "Kochalovskata kramola" (1895; "The Kochalovo Quarrel"), and he also wrote the novels *Esenni dni* (1902; "Autumn Days"), *Krŭstopŭt* (1904; "Crossroad"), and *Sreshta* (1908; "Meeting") and the dramas *Vampir* (1902) and *Svekŭrva* (1906; "Mother-in-Law"). His contemporary Elin Pelin portrayed his native rural province with wit and humanity in *Razkazi* (1904 and 1911; "Stories") and in the tragic novellas *Geratsite* (1911; "The Gerak Family") and *Zemya* (1928; "Land"). Yordan Yovkov, novelist and playwright, excelled at describing the effects of war, the subject of his early masterpiece, *Zemlyatsi* (1915); his short stories "Staroplaninski legendi" (1927) and "Vecheri v Antimovskiya khan" (1928; "Evenings in the Antimovo Inn") display deep insight into the Bulgarian mind and a classical mastery of narrative prose.

In the aftermath of World War I the literary left was represented by a number of poets who died tragically young: Geo Milev, a convert to revolutionary Marxism; Khristo Smirnenski; and later, the young, gifted Nikola Vaptsarov, who died a martyr in the anti-Nazi resistance, but not before he had hailed the dawn of Socialism and the machine age in his poems *Motorni pesni* (1940; "Motor Songs") and *Izbrani stihotvoreniya* (1946; "Selected Verses").

Preeminent as the prose of Elin Pelin and Yovkov was between the World Wars, the younger generation brought artistic refinement to realistic portrayal of Bulgarian life, and high literary standards were maintained in such authoritative reviews as *Zlatorog* (1920–44) and the Symbolist *Hyperion* (1920–31). The mystical-fantastic evocations of medieval Bulgaria by the art historian Nikolay Raynov represented Bulgarian Neoromanticism at its best. A satisfying fusion of traditional and experimental poetry was to be found in the work of Elisaveta Bagryana.

The Communist regime set up in 1944 encouraged only writing of "Socialist Realism" as defined by Soviet "aesthetic" theory. The resulting uniformity of purpose made it difficult to evaluate the work of many writers, though the novels of D. Dimov and D. Talev received universal acclaim, especially Talev's work on 19th-century Macedonia. Moreover, the emergence of numerous young talented writers augured well for the future.

(L.B./Ed.)

BIBLIOGRAPHY. D. Shismanov, *A Survey of Bulgarian Literature* (1932); Clarence A. Manning and Roman Smal-Stocki, *The History of Modern Bulgarian Literature* (1960, reprinted 1974).

Bulgarian Orthodox Church, one of the national churches of the Eastern Orthodox communion.

Christianity was introduced to Bulgaria in 864 by Khan (Tsar) Boris I with an archbishop appointed from Constantinople. In Macedonia, the city of Ohrid became an active mission centre. St. Clement of Ohrid, a disciple of the missionary saints Cyril and Methodius, trained a large number of Slavs for the ministry, thus preparing the ground for a national church. Although Boris' son Symeon proclaimed his archbishop as patriarch, it was not until after Symeon's death (927) that Constantinople recognized a Bulgarian patriarchate in the capital of Preslav. Under Basil II Bulgaroctonus, the church became an archbishopric, Greek in character, with its centre in Ohrid.

The Bulgarian patriarchate was revived in the city of Tŭrnovo in 1235 by Tsar Ivan Asen II, but with the fall of Tŭrnovo to the Turks (1393), the last patriarch, Eftimi, was exiled and the patriarchate ceased to exist. For nearly five centuries Bulgaria was under Turkish domination, and the church was administered by the patriarch of Constantinople through a Greek clergy. The struggle for an independent Bulgarian church, begun late in the 18th century, culminated in the establishment in 1870 of a Bulgarian exarchate. But the ecumenical patriarch of Constantinople declared the newly formed church schismatic (1872) and did not recognize it until 1945; the patriarchate was revived in 1953.

In 1949 a unilateral state law on religious associations restricted church activities and submitted them to tight state control. The government also supported a "progressive" association of priests who opposed bishops. Nonetheless, the Bulgarian Orthodox Church numbers some 7,650,000 faithful, with 12 dioceses and more than 2,000 priests. A theological academy in Sofia and minor seminaries train candidates for the priesthood. The church publishes a weekly newspaper, *Tsrkoven vestnik* ("Church Herald"), and a monthly periodical, *Dukhovna kultura* ("Spiritual Culture").

Bulgarian rhythm (music): *see* aksak.

Bulgaris, Eugenius (b. Aug. 10/11, 1716, Corfu, Greece—d. probably June 10, 1806, St. Petersburg, Russia), Greek Orthodox theologian and liberal arts scholar who disseminated Western thought throughout the Eastern Orthodox world and contributed to the development of Modern Greek language and literature.

Having studied philosophy and theology at the University of Padua, Italy, a centre of Greek culture, Bulgaris taught at an academy in Ioánnina, Greece. After becoming a monk in 1749 at the Vatopedion monastery on Mt. Athos, the centre of Greek Orthodox asceticism, he resumed teaching, first at the monastic school, then at the patriarchal academy of Constantinople. Dismissed from the faculty because of doctrinal and methodological innovations, he moved to Leipzig, Ger., where his learning won the admiration of Frederick II the Great, king of Prussia, who then recommended him to the empress Catherine II of Russia. Appointed librarian and scholar in residence at St. Petersburg, Bulgaris took holy orders and in 1776 was named bishop of Kherson in the Ukraine. Because of his literary work he found it necessary to renounce his pastoral responsibilities in 1779 and retired to the monastery of St. Alexander Nevsky near Novgorod.

Esteemed for his Modern Greek translations and revisions of classical literature, Bulgaris also wrote many Greek treatises in philosophy, the sciences, and theology. His *Dogmatic Theology* (*c.* 1800) was the first Greek compendium on philosophical theology since the 14th century. Prominent also was his *Treatise on Tolerance,* written at Leipzig in 1768 to refute the right assumed by Russian ecclesiastical and civil authorities to compel the largely Roman Catholic Poles to conform to the national religion.

Bulgaris did, however, dispute Roman Catholic and Protestant tenets in his *Orthodox Confession* (1767) and in *History of the Christian Church in the First Century* (1805). Other works include tracts on logic, metaphysics, and astronomy. A major historical contribution was Bulgaris' edition of the influential 15th-century anti-Roman Catholic tracts by the Greek Orthodox Joseph Bryennios.

Bŭlgariya: *see* Bulgaria.

Bulgarus (d. on or before Jan. 1, 1167, Bologna, Italy), jurist, most renowned of the famous "four doctors" of the law school at the University of Bologna, where the medieval study of Roman law, as codified (6th century AD) under the Byzantine emperor Justinian I, reached its peak.

According to popular tradition, all four doctors (Bulgarus, Martinus Gosia, Hugo da Porta Ravennate, and Jacobus de Voragine) were pupils of Irnerius, the first of the great Bolognese legal glossators, but, although Bulgarus may have studied under Irnerius, this seems unlikely to be true of the other three. Bulgarus and Martinus Gosia headed opposing factions at Bologna; Martinus adapted the law to what his adversaries called the "equity of the purse" (*aequitas bursalis*), whereas Bulgarus adhered more closely to the letter of the law. Bulgarus and his successors, including Joannes Bassianus, Azzone, and Franciscus Accursius, ultimately prevailed, and Bulgarus himself served as adviser to the Holy Roman emperor Frederick I Barbarossa. His most important book, *De regulis iuris* ("On the Rules of Law"), is the earliest extant legal gloss from the Bolognese school.

Bulge, Battle of the, also called BATTLE OF THE ARDENNES (Dec. 16, 1944–Jan. 16, 1945), the last German offensive on the Western Front during World War II; an unsuccessful attempt to push the Allies back from German home territory. The name Battle of the Bulge was appropriated from Winston Churchill's optimistic description, in May 1940, of the resistance that he mistakenly supposed was being offered to the Germans' breakthrough in that area just before the Anglo-French collapse; the Germans were in fact overwhelmingly successful. The "bulge" refers to the wedge that the Germans drove into the Allied lines.

After their invasion of Normandy in June 1944, the Allies moved rapidly across northern France into Belgium during the summer, but lost momentum in the autumn. In mid-December, Allied commander Gen. Dwight D. Eisenhower's 48 divisions, distributed along a 600-mile front between the North Sea and Switzerland, were caught unprepared by a German counterthrust in the hilly and wooded Ardennes region of southern Belgium. While Allied aircraft were hampered by bad weather, Gen. Gerd von Rundstedt's 5th and 6th Panzer Armies launched two parallel attacks with the eventual aim of retaking the great port of Antwerp. The 5th Army under Gen. Hasso von Manteuffel, bypassing Bastogne (which was held throughout the offensive by the U.S. 101st Airborne Division), advanced by December 24 to within four miles (six kilometres) of the Meuse River. This was the

farthest point of the German drive, which was halted by Christmas by the inadequacy of supplies and by Allied resistance. Gen. George S. Patton's 3rd Army relieved Bastogne on the 26th, and on January 3 the U.S. 1st Army began a counteroffensive. The Germans made an orderly withdrawal between January 8 and 16, having used more of their resources than they could afford on this last desperate attempt to regain the initiative in the West.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

bulging, in geology, mass movement of rock material caused by heavy weights on soft rock strata that crop out in valley walls. Such material is squeezed out and deformed; it flows as a plastic, and the disturbance may extend down tens of metres. Folds and small faults may form at the foot of the slope where the rock material is under stress.

Bulgya, Aleksandr Aleksandrovich: *see* Fadeyev, Aleksandr Aleksandrovich.

Buli style, also called LONG-FACED STYLE OF BULI, African wood sculpture made by the Luba peoples (Baluba) of Zaire. Because the carvings—which were made in the village of Buli (now in Shaba region)—are almost identical to each other and differ from other Luba carvings, they were originally presumed to have been the work of a single artist, called the Master of Buli. Later, it was determined

Luba stool with male and female figures, Buli style, wood; in the Museum für Völkerkunde, West Berlin

By courtesy of the Museum fur Volkerkunde, West Berlin

that the sculptures constitute the production of a workshop rather than of one artist.

The Buli style is highly distinctive. Most examples are stools, the seats of which are supported on the heads and fingertips of figures. The elongated face of each figure has a pointed chin; a wide, rather thin-lipped mouth; a narrow nose with sharply defined nostrils; and a high, rounded forehead with prominent arches over the half-closed eyes that have protruding cheekbones below them. The hair is swept backward to an elaborate cruciform design. The limbs are thin compared with most Luba sculpture, but the hands and feet are broad and schematized. The breasts on both female and male figures are thin and pointed, those on the male being flatter than those on the female. Most examples of the style are stools supported by carved figures; the seat rests on the head and finger tips, the fingers being separated with the palms forward.

bulimia, disorder characterized by periods of binging, or extreme overindulgence in food—during which several thousand calories may be consumed within a single hour—followed by purging, including induced vomiting. Repetition of the cycle can lead to serious medical complications, such as dental decay, stomach rupture, or dehydration, and can be fatal.

Bulimia occurs predominantly among young, well-educated, middle- or upper-class women who suffer from depression, anxiety, and low self-esteem. The majority, however, are close to their proper weight. Treatment requires the cooperation of the patient and physician and may include psychotherapy. The disorder is distinct from anorexia nervosa, which involves emotional or psychological aversion to food and results in extreme emaciation.

bulk modulus, numerical constant that describes the elastic properties of a solid or fluid when it is under pressure on all surfaces. The applied pressure reduces the volume of a material, which returns to its original volume when the pressure is removed. Sometimes referred to as the incompressibility, the bulk modulus is a measure of the ability of a substance to withstand changes in volume when under compression on all sides. It is equal to the quotient of the applied pressure divided by the relative deformation.

In this case, the relative deformation, commonly called strain, is the change in volume divided by the original volume. Thus, if the original volume V_o of a material is reduced by an applied pressure p to a new volume V_n, the strain may be expressed as the change in volume, $V_o - V_n$, divided by the original volume, or $(V_o - V_n)/V_o$. The bulk modulus itself, which, by definition, is the pressure divided by the strain, may be expressed mathematically as

$$\text{bulk modulus} = \frac{\text{pressure}}{\text{strain}} = \frac{p}{(V_o - V_n)/V_o}.$$

This is a specific form of Hooke's law of elasticity.

Because the denominator, strain, is a ratio without dimensions, the dimensions of the bulk modulus are those of pressure, force per unit area. In the English system the bulk modulus may be expressed in units of pounds per square inch (usually abbreviated to psi), and in the metric system, newtons per square metre (N/m^2).

The value of the bulk modulus for steel is about 2.3×10^7 psi, or 1.6×10^{11} N/m^2, three times the value for glass. Thus, only one-third the pressure is needed to reduce a glass sphere the same amount as a steel sphere of the same initial size. Under equal pressure, the proportional decrease in volume of glass is three times that of steel. Glass, the bulk modulus of which is one-third that of steel, is three times more compressible. In fact, compressibility is defined as the reciprocal of the bulk modulus. A substance that is difficult to compress has a large bulk modulus but a small compressibility. A substance that is easy to compress has a high compressibility but a low bulk modulus.

Bulkeley, Richard (b. Dec. 26, 1717, Dublin—d. Dec. 7, 1800, Halifax, Nova Scotia), British soldier and statesman who became a political leader in Nova Scotia.

Bulkeley joined the British Dragoon Guards in 1727, rising to the rank of captain in 1741. From 1742 to 1747 he served as king's messenger at Whitehall, and in 1749 he went to Nova Scotia with the governor, Edward Cornwallis. In 1757 Bulkeley became provincial secretary, a post he held under 13 successive governors. He became editor of the *Royal Gazette* in 1758. The following year he was appointed a member of the Executive Council, and he became its clerk in 1763. For 25 years, from 1775, he served as judge of the Court of Admiralty. He was also brigadier general of the provincial militia, and in the period November 1791–May 1792 he served as acting governor of Nova Scotia.

bull, in animal husbandry, the mature, uncastrated male of domesticated cattle (*q.v.*).

bull, in Roman Catholicism, an official papal letter or document. The name is derived from the lead seal (*bulla*) traditionally affixed to such documents. Since the 12th century it has designated a letter from the pope carrying a *bulla* that shows the heads of the apostles Peter and Paul. With the introduction of papal briefs in the 15th century, for less significant communications, bulls were reserved for more important matters, such as canonizations of saints, dogmatic pronouncements, Henry VIII's dispensation to marry Catherine of Aragon (his brother's widow), the restoration of the Society of Jesus in 1814, and the announcement (Dec. 25, 1961) of the forthcoming second Vatican Council.

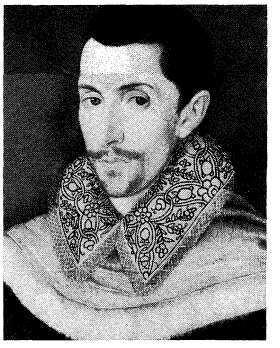
Bull (constellation): *see* Taurus.

Bull, John (English symbol): *see* John Bull.

Bull, John (b. *c.* 1562, Somerset, Eng.—d. March 12/13, 1628, Antwerp), English composer of outstanding technical ability and a keyboard virtuoso.

He was educated as a chorister of the Chapel Royal. From 1582 to 1585 Bull was organist at Hereford cathedral but then returned to the Chapel Royal, where in 1591 he succeeded William Blitheman, who may have been his teacher, as organist. Bull became a doctor of music of both Oxford and Cambridge universities.

In 1596 he was appointed by Elizabeth I to the professorship of music at the newly



John Bull, portrait by an unknown artist, 1589; in the collection of the Faculty of Music, Oxford

By courtesy of the Faculty of Music, Oxford

founded Gresham College in London. In 1601 he travelled in France, Germany, and the Netherlands, where his virtuosity as a keyboard player was much admired. On his return to England he continued in the royal service, and although he resigned his professorship in 1607 in order to marry, he was evidently highly esteemed at court, being named doctor of music to the King in 1612. In 1613, however, he left England and entered the service of the Archduke Albert in Brussels. Bull remained in the Netherlands, becoming in 1616 organist at the cathedral of Antwerp.

Little of Bull's vocal music survives, and his reputation rests on his extensive compositions for virginals and organ (some 150 extant pieces), published in *Musica Britannica* (1951). His music is distinguished less by emotional depth or freshness of invention than by an unfailing resourcefulness in devising keyboard figuration. Bull combined with an essentially conservative outlook a taste for technical experiment and the solution of unusual problems—enharmonic modulations, for example, and asymmetrical rhythmic patterns. His command of the English virginalists' technique undoubtedly had an influence on

his friend and contemporary J.P. Sweelinck, the Amsterdam organist, and through him on Samuel Scheidt and the north German school.

Bull, Olaf (Jacob Martin Luther) (b. Nov. 10, 1883, Kristiania [now Oslo]—d. June 23, 1933, Oslo), one of the greatest Norwegian poets of his generation and often referred to as the Keats of Norway.

As a young man he studied philology, then wrote for newspapers, while already

Olaf Bull
By courtesy of Norsk Telegrambyra

writing poetry. His first volume, *Digte* (1909; "Poems"), immediately led to recognition. He was influenced by the French Symbolists and by the philosophy of Henri Bergson. Besides poetry, he wrote one detective story and collaborated on a play. Throughout his work, the reader is conscious of his forceful intellect, but not until his later poems, *De hundrede år* (1928; "The Hundred Years") and *Ignis ardens* (1929), does he become less esoteric and more involved with society. This promising new development was cut short by illness and early death.

Bull, Ole Bornemann (b. Feb. 5, 1810, Bergen, Nor.—d. Aug. 17, 1880, Lysøen, near Bergen), Norwegian violinist, composer, and artistic nationalist.

He began playing the violin at the age of five, influenced by members of the Bergen Harmonic Society as well as by Norwegian peasant fiddlers. His debut as a soloist came in 1819, and by 1828 he was made conductor of the Musical Lyceum. He travelled through Europe and the U.S. during the next 14 years, concertizing, composing, and establishing his virtuosic reputation among such notables as Franz Liszt, Robert Schumann, and Felix Mendelssohn.

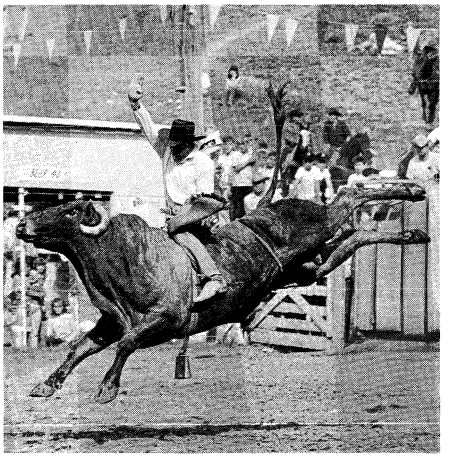
Bull used his influence to campaign for the encouragement and preservation of Norwegian culture and arts, both in Norway and abroad. In 1849 he was instrumental in the establishment of the Norwegian Theatre in Bergen. In 1852 he attempted to found an immigrant Norwegian colony in Pennsylvania, and in 1859 he helped create the Norwegian Society for the Advancement of the National Element in Art and Literature. He was a vital influence upon and patron of dramatists Henrik Ibsen and Bjørnstjerne Bjørnson and composer Edvard Grieg. In addition to accolades from musicians, Bull received tributes from writers such as George Sand, William Thackeray, and Mark Twain.

bull cult, prehistoric religious practice originating in the eastern Aegean and extending from the Indus Valley of Pakistan to the Danube in eastern Europe. The bull god's symbol was the phallus, and in the east the bull often was depicted as the partner of the great goddess of fertility, thereby representing the virile principle of generation and invincible force. Numerous pictorial and plastic representations of the bull have been uncovered, many designed to be worn as a charm or amulet; these representations were probably copies of larger statues constructed in tribal sanctuaries. The bull cult continued into historic times and was particularly important in the Indus Valley and on Crete.

bull market, in securities and commodities trading, a rising market. A bull is an investor who expects prices to rise and, on this assumption, purchases a security or commodity in hopes of reselling it later for a profit. A bullish market is one in which prices are generally expected to rise. *Compare* bear market.

Bull Moose Party, formally PROGRESSIVE PARTY, U.S. dissident political faction that nominated former president Theodore Roosevelt for the presidency in 1912; the formal name and general objectives of the party were revived 12 years later. Opposing the entrenched conservatism of the regular Republican Party, which was controlled by Pres. William Howard Taft, a National Republican Progressive League was organized in 1911 by Sen. Robert M. La Follette of Wisconsin. The group became the Progressive Party the following year and ran Theodore Roosevelt for president; it called for revision of the political nominating machinery and an aggressive program of social legislation. The party's popular nickname of Bull Moose was derived from the characteristics of strength and vigour often used by Roosevelt to describe himself. The Bull Moose ticket polled some 25 percent of the popular vote. Thus split, the Republicans lost the election to the Democrats under Woodrow Wilson. The Bull Moose Party evaporated and the Republicans were reunited four years later.

bull riding, rodeo event in which a cowboy attempts to ride a bucking bull while holding

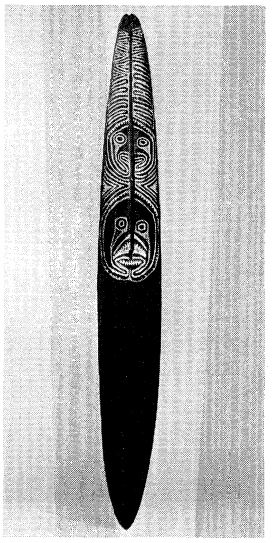


Bull riding
E.W. Marugg Photography

(with one hand only) a rope fastened about the animal's middle. No stirrups, bridle, or saddle are used. The rider is disqualified if he touches the bull with his free hand, uses sharp spurs, or is thrown from the bull within the eight-second time limit of the event. The cowboy is scored for his skill and technique, and the bull for difficulty. The two scores are combined, and the rider with the highest total is the winner.

bull-roarer, pseudomusical instrument, commonly a flat piece of wood, a few inches to a foot in length, fastened at one end to a string. When swung around in the air, it sets up sound waves, thus producing a whirring or howling sound likened to those of animals or spirits. Because the sound waves occur in unenclosed air (as opposed to an air column in a pipe), the bull-roarer is classified as a free aerophone. Its pitch is controlled by its speed.

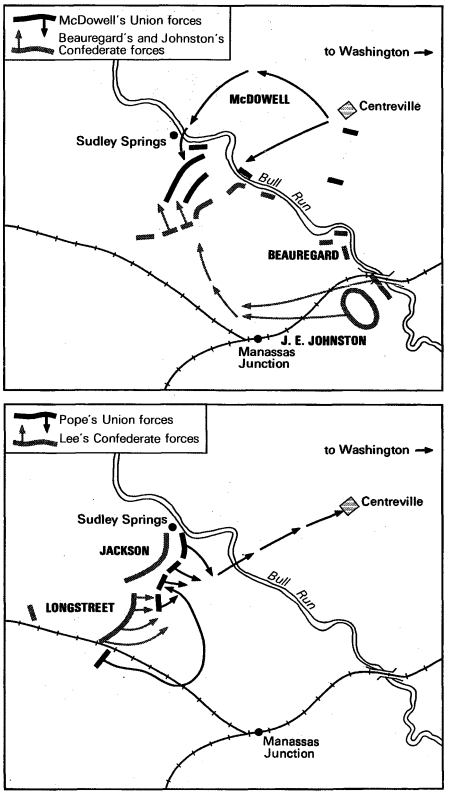
Though now used by Europeans as a toy, among many ancient or primitive peoples it



Oceanian bull-roarer, carved wood, from New Guinea; in the Metropolitan Museum of Art, New York City
By courtesy of the Metropolitan Museum of Art, New York City, gift of Mrs. John Crosby, 1909

had the highest mystic and religious significance. As the *rhombos,* it was used in the ancient Greek Dionysian mysteries. It has been observed in Australia, North and South America, and other areas where primitive societies survive. It may symbolize totemic ancestors, cause or drive away sickness, warn women and children to stay away from men's sacred ceremonies, control the weather, and promote fertility of game animals and crops.

Bull Run, battles of, also called BATTLES OF MANASSAS, OR MANASSAS JUNCTION, in the U.S. Civil War, two engagements fought in the summers of 1861 and 1862 at a small stream named Bull Run, near Manassas in northern Virginia; both battles gave military advantage



(Top) The First Battle of Bull Run, July 21, 1861, and (bottom) the Second Battle of Bull Run, Aug. 29–30, 1862 (situation about 4:00 PM, August 30)
Copyright © 1959 by Mark M. Boatner III; from the book *The Civil War Dictionary*, published by David McKay Co., Inc.

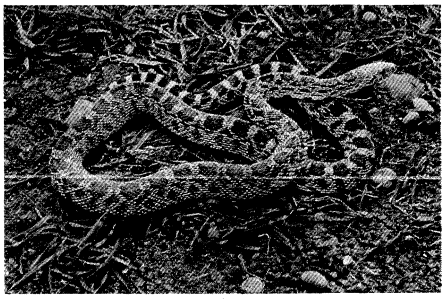
to the Confederacy. The strategic significance of the location lay in the fact that Manassas was an important railroad junction.

The First Battle of Bull Run (called First Manassas by the South) was fought on July 21, 1861. Although neither army was adequately prepared at this early stage of the war, political considerations and popular pressures caused the Federal government to order Gen. Irvin McDowell to advance southwest of Washington to Bull Run in a move against Richmond, Va. The 22,000 Confederates under Gen. P.G.T. Beauregard, after initial skirmishing, had retired behind Bull Run in defensive positions three days earlier. To counter a Union flanking movement, the Confederates swiftly moved in 10,000 additional troops from the Shenandoah under Gen. Joseph E. Johnston. On July 21 the Union Army assaulted the Confederates. The battle raged back and forth, but finally the arrival of Johnston's last brigade forced the Federals into a disorganized retreat to Washington. The victors were also exhausted and did not pursue them. From among 37,000 Northern men, casualties numbered about 3,000; of 35,000 Southern troops, between 1,700 and 2,000 were wounded or lost.

The Second Battle of Bull Run took place more than a year later on Aug. 29–30, 1862, between a Confederate army of more than 56,000 men under Gen. Robert E. Lee and a newly formed Federal force of 70,000 troops under Maj. Gen. John Pope. It had become Pope's responsibility to cover Washington until his army could be joined with the Army of the Potomac. To prevent this, Lee split his forces and ordered Gen. T.J. Jackson to march around Pope's right flank; in two days Jackson had captured Pope's supply depot at Manassas and had safely hidden his three divisions in a nearby wood. August 27–29 saw considerable manoeuvring and fighting while Lee rushed forward the main body of his army to join Jackson. On the afternoon of August 30, Confederate artillery fire prevented the success of a Union assault on Jackson's positions, after which Lee ordered his entire army forward in a grand counterattack. The Confederate victory was not complete because the Union forces withstood repeated assaults on certain defensive positions. Finally, however, Pope withdrew his defeated army across Bull Run and eventually retreated to the fortifications of the Capitol. Casualties on both sides were high: 15,000 for the North, 9,000 for the South.

bull shark, species belonging to the Carcharhinidae. *See* carcharhinid family.

bull snake (*Pituophis melanoleucus*), North American constrictor of the family Colubridae. The species is called bull snake over much of its range, but western subspecies often are called gopher snakes, and those of the east and south are known as pine snakes. The species is rather heavy-bodied and small-headed and may reach 1.5 metres (5 feet) in length. Typical coloration is yellowish-brown or creamy, with dark blotches. The nose shield is enlarged for digging.

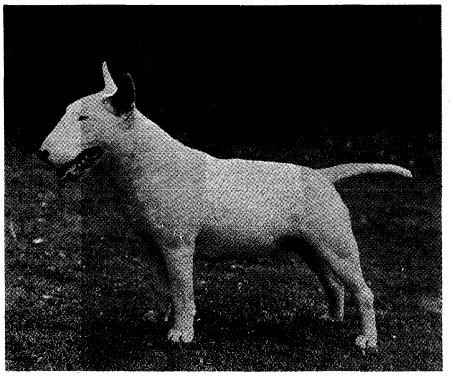


Bull snake (*Pituophis melanoleucus*)
C.G. Hampson—Annan Photo Features

Bull snakes are found in sandy, open country and in pine barrens, where they capture ground-nesting birds and burrowing mammals. In defense they hiss loudly and thrash about while vibrating the tail. They are, therefore, often mistaken for rattlesnakes. Bull snakes may bite, but they are not venomous.

bull terrier, breed of dog developed in 19th-century England from the bulldog and the white English terrier, a breed now extinct; the Spanish pointer was later bred into the line to increase its size. The bull terrier was developed as a courageous fighting dog but not an aggressive fight provoker. A muscular dog, it has a short coat, tapering tail, erect ears, and small, triangular, deep-set eyes. It stands 19 to 22 inches (48 to 56 centimetres) and weighs, ideally, about 45 to 50 pounds (20 to 22 kilograms). It is generally friendly and is considered, for its weight, the strongest of all dogs. There are two varieties: coloured, which is any colour but white, and white, which is white or white with darker head markings.

(For the breed formerly known as the pit bull terrier, *see* Staffordshire terrier.)



Bull terrier
Sally Anne Thompson—EB Inc.

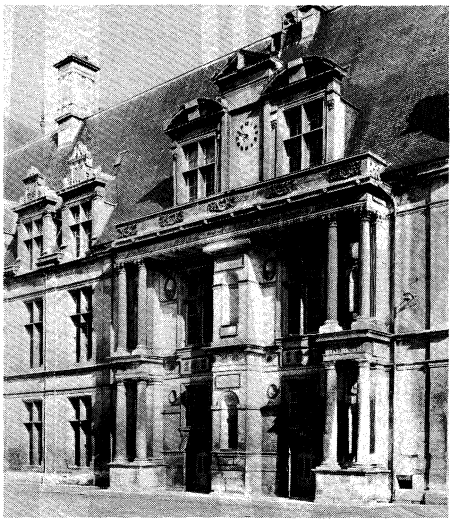
bulla, plural BULLAE, characteristic Etruscan ornamental pendant. Typically round or oval, bullae resemble a lion or satyr head.

Bullae are hollow, often with filigree or granulation decorating the edges, and they have a removable loop (from which the pendant is hung). It is thought that the loop acted as a stopper for the bulla, which may have contained a liquid, presumably perfume. The word bulla now refers to a round lead seal attached to an official document from the pope.

Bullant, Jean (b. 1520?, Écouen, Fr.—d. 1578, Écouen), a dominant figure in French architecture during the period of the Wars of Religion (1562–98), whose works represent the transition from High Renaissance to Mannerist design.

In his youth Bullant studied in Italy, and his exposure to the ancient structures had a profound influence on his later work. Returning to France in about 1540, he entered the service of the constable of Montmorency. At Écouen, Bullant worked on the constable's château, which clearly evidences the effect of Bullant's exposure to the Pantheon in Rome. At Fére-en-Tardenois (1552–62) he constructed a bridge and gallery in which he created the effect of a Roman aqueduct built across a gorge. The placement of the window over the main door, with its penetration into the pediment, represents Bullant's use of the artificiality and formalism of Mannerism. In about 1560, he built the Petit-Château for the constable of Montmorency's château at Chantilly, which also reflects Bullant's Mannerist style.

Little is known of Bullant's life and work again, until 1570, when he was appointed as Catherine de Médicis' architect. He contributed to the Chapelle des Valois and added a wing to the Tuileries, although the exact nature of his contribution is not known. His influential *Régle générale d'architecture des cinq manières de colonnes* (1564) was adopted as one of the textbooks of French architecture.



North portal of the Château d'Écouen by Jean Bullant, *c.* 1555
Jean Roubier

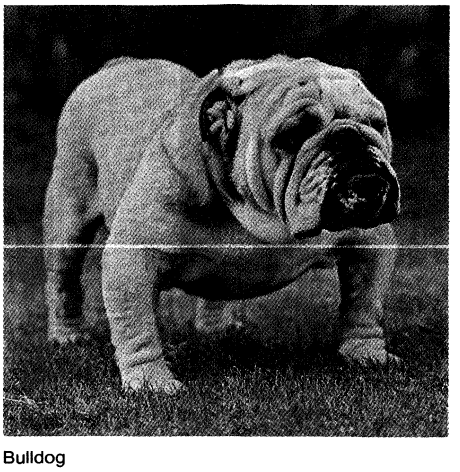
Bullard, Sir Edward (Crisp) (b. Sept. 21, 1907, Norwich, Norfolk, Eng.—d. April 3, 1980, La Jolla, Calif., U.S.), British geophysicist noted for his work in geomagnetism.

He became professor of geophysics and director of the department of geodesy and geophysics at the University of Cambridge in 1964. In his research on the structure of the Earth's crust and the Earth's internal constitution, he made valuable studies of radioactive heat generation within the Earth and of the Earth's thermal history. One of his most important contributions to the study of geomagnetism is his theory of the geomagnetic dynamo, based on convective motion within the Earth's core. Bullard was knighted in 1953.

bullbaiting: *see* bearbaiting.

bullbat, also called COMMON NIGHTHAWK, common American species of nighthawk (*q.v.*).

bulldog, also called ENGLISH BULLDOG, breed of dog developed centuries ago in Great Britain for use in fighting bulls (bullbaiting). Characteristically powerful and courageous, often vicious, and to a great extent unaware of pain, the bulldog nearly disappeared when dogfighting was outlawed in 1835. Fanciers of the breed, however, saved it and bred out its

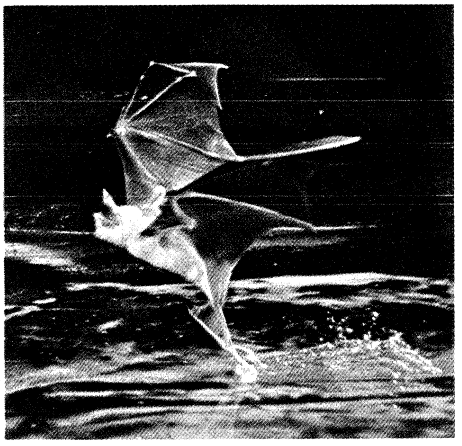


Bulldog
Sally Anne Thompson—EB Inc.

ferocity. Nicknamed the "sourmug," the bulldog is a stocky dog that moves with a rolling gait. It has a large head, folded ears, a short muzzle, a protruding lower jaw, and a loose skin that forms wrinkles on the head and face. Its short, fine coat is tan, white, reddish brown, brindle, or piebald. The bulldog stands 13 to 15 inches (34 to 38 centimetres) and weighs 40 to 50 pounds (18 to 23 kilograms). Typically gentle and reliable, it is placed in the nonsporting-dog group of the American Kennel Club.

The French bulldog, or "Frenchie," is a small dog, also of the nonsporting group, that was developed in France in the later 1800s from crosses between small native dogs and small bulldogs of a toy variety. The French bulldog is a small counterpart of the bulldog, but it has large, erect ears, rounded at the tips. Its skull is flat between the ears and domed above the eyes, and the expression is typically one of alertness, rather than moroseness as in the bulldog. A valued companion and watchdog, the French bulldog stands 11 to 12 inches (28 to 30 centimetres) and weighs about 22 pounds (10 kilograms). Its short, fine coat may be any of a number of colours, such as brindle, grayish brown (fawn), or white.

bulldog bat, also called MASTIFF BAT, or HARE-LIPPED BAT (*Noctilio*), either of two tropical Central and South American bats comprising the family Noctilionidae (suborder Microchiroptera). Bulldog bats are reddish or brown animals with long, narrow wings; full



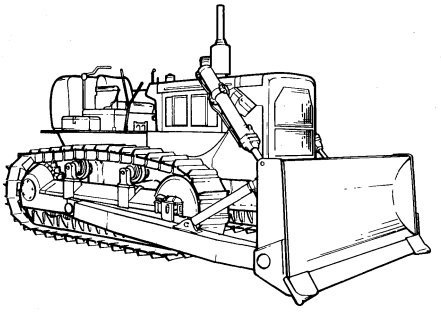
Fishing bulldog bat (*Noctilio leporinus*)
Nina Leen, *Life* © Time Inc.

lips; and long, pointed ears. The lesser bulldog bat (*N. labialis*) is about 7 centimetres (2¾ inches) long and weighs about 20 grams (⅔ ounce); the greater, or fishing, bulldog bat (*N. leporinus*) is 10–13 cm long and weighs 30–70 g. Bulldog bats roost in colonies and prey on insects. The greater bulldog bat also fishes by skimming over the water and gaffing small fishes with the large claws on its hind feet.

The name bulldog bat or mastiff bat is sometimes also given to the bats of the family Molossidae (*see* free-tailed bat).

bulldogging (rodeo): *see* steer wrestling.

bulldozer, also called DOZER, powerful machine for pushing earth or rocks, used in road building, farming, construction, and wrecking; it consists of a heavy, broad steel blade or plate mounted on the front of a tractor. Sometimes it uses a four-wheel-drive tractor, but usually a track or crawler type, mounted on continuous metal treads, is employed. The blade may be lifted and forced down by hydraulic rams. For digging, the blade is held below surface level; for transporting, it is held at the surface level; and for spreading, it is held above the surface level, as the tractor moves forward.



Bulldozer
By courtesy of Caterpillar Tractor Co.

Bulldozers are used for shallow digging and ditching; short-range transportation of material; spreading soil dumped from trucks; rough grading; removing trees, stumps, and boulders; and cleaning and levelling around loading equipment. A bulldozer alone can do many types of excavation, and it is useful in combination with other machinery in most excavation work.

Bullen, Anne (queen of England): *see* Anne Boleyn.

Buller River, river in northwestern South Island, New Zealand. Named after Charles Buller, founder of the New Zealand Company, it is the major river of the island's west coast. Rising as the Travers River on the St. Arnaud Range of the central highlands, it drains Lakes Rotoiti and Rotoroa, flows west for 110 mi (177 km), and enters the Tasman Sea at Westport. Receiving the outflow from a 2,510-sq-mi (6,500-sq-km) basin, the river may have a flood level discharge as great as 437,000 cu ft (12,400 cu m) per sec. Flowing through a generally mountainous region, the Buller crosses gravel plains at Murchison, Inangahua, and the coast. Its gorge, most scenic at Inangahua Junction, is an important tourist attraction. Other economic activities of the valley include coal mining, centred around Westport, and dairying. The river is a transportation focus: roads and rail lines to Canterbury (southeast) parallel the river from its mouth to Inangahua; the road from Westport to Nelson (north) ascends as far as Kawatiri; and the road to Blenheim (northeast) follows the valley up beyond the headwaters.

Bullet (Navajo chief): *see* Manuelito.

bullet, projectile fired by a pistol, rifle, or other small-arms piece. Although the name derives from the French *boulet,* "small ball," it is normally of cylindroconoidal shape. Most revolver bullets are of soft metal. Rifle and machine-gun bullets have hard-metal jackets over soft-metal cores. Armour-piercing bullets are made with a hardened-steel inner core. Bullets with a Teflon or similar coating have been developed to penetrate fabric body armour. Expanding bullets, used in game hunting and long outlawed in war, are made with an exposed nose of soft metal, which will push back into the jacketed portion to deform it on impact, enlarging the wound and increasing the shock of the impact.

Bulletin, The, daily newspaper published in Philadelphia from 1847 to 1982, long considered one of the most influential U.S. newspapers.

Founded by Alexander Cummings as *Cummings Telegraphic Evening Bulletin,* it became *The Daily Evening Bulletin* in 1856 and the *Evening Bulletin* in 1870. The paper was one of the first in the United States to transmit news by telegraph and was the first evening paper to succeed in Philadelphia.

In 1895, after several changes of ownership, William L. McLean bought the *Evening Bulletin* and built it in 10 years to a circulation of 200,000, Philadelphia's largest. In 1947 *The Bulletin* bought the *Philadelphia Record,* which had suspended publication rather than meet the demands of striking workers of the American Newspaper Guild (the *Record* had been first to recognize the union in a contract). The *Record* was shut down, and *The Bulletin* then introduced a Sunday edition, which reached a circulation of 500,000. Sold by the McLean family in 1980, *The Bulletin* closed in January 1982, after a lengthy strike.

bulletproof vest, protective covering worn to protect the torso against bullets or shrapnel.

The extensive use of high-explosive artillery shells during World War I resulted in a high proportion of wounds caused by shell fragments. Torso armour of both fibre and steel was issued to troops for special purposes but was generally too heavy for full acceptance. During World War II, casualties from shell fragments rose to 80 percent, and, with 70 percent of all wounds affecting the torso, it became highly desirable to produce a suitable body armour. Armour for bomber crews and ground troops was developed of steel, aluminum, and resin-bonded fibre-glass plates, as well as of heavy nylon cloth.

The body armour developed for fliers—quickly dubbed flak suits for the German *Flak* ("antiaircraft artillery")—and the anti-fragment vests used by soldiers and marines during World War II and in the Korean War contained plates made of either manganese steel or a bonded fibre glass called Doron. By 1951 both the United States Army and Navy were using semiflexible vests made of basket-weave nylon and plates. These vests gave adequate protection against fragments from bursting mortar, artillery, or antiaircraft shells but would not stop an armour-piercing bullet, although titanium plates introduced in 1967 gave improved protection.

New hard compounds appeared, such as the ceramic, boron carbide; composite vests of dual-hardness steel were used with great effect by helicopter crews subject to heavy ground fire during the Vietnam War. It was, however, the discovery that numerous layers of nylon fabric could dissipate the energy of a bullet that revolutionized the field of body armour.

The function of steel or hard plastic armour is to be impervious to a bullet. The function of ceramic armour is to slow the bullet abruptly by the hardness of the ceramic and to dissipate the bullet's energy as it destroys the armour at the point of impact; a ceramic bulletproof vest must be constructed of tiles, which have to be replaced once they have stopped a bullet. The textile vest deforms the bullet and then dissipates its energy, entangling it in the vest's many layers.

A textile bulletproof vest is fashioned of 16 to 24 layers of nylon cloth of a heavy weave, the layers stitched together like a quilt. Any ordinary pistol or submachine-gun bullet striking such a garment is immediately flattened as it hits the outermost layers, and the now mushroom-shaped slug dissipates its energy as it presses against the remaining thicknesses of the vest, unable to penetrate its overlapping layers of coarse mesh.

The wearer of such a vest is usually bruised by the impact of a bullet, but without serious consequence. Vests of 16 layers will stop regular handgun and submachine-gun bullets; those of 24 layers will stop the more powerful magnum bullets from the same weapons. Though bulky compared to a single layer of any fabric, the multi-layer nylon material can be readily fashioned into a vest or full-torso protector that can be worn undetected under regular clothing.

Apart from the obvious military applications of the fabric bulletproof vest, the rise of terrorism from about 1960 led to the increased use of body armour by police and antiterrorist troops—as well as by terrorists and other armed criminals themselves.

bullfighting, Spanish CORRIDA DE TOROS ("running of bulls"), Portuguese CORRIDA DE TOUROS, French COMBATS DE TAUREAUX ("bullfights"), spectacle popular in Spain, Portugal, southern France, and Latin America, in which a bull bred for aggressive instincts is ceremoniously fought by a matador (*q.v.*) and usually killed in an arena. *Toreros,* or professional bull men, include matadors; *banderilleros,* assistants on foot who work with the cape and also thrust *banderillas* (decorated darts) into the bull's neck or shoulders; and picadors, mounted assistants with pike poles, or lances. Six bulls usually are fought during one *corrida,* with the matadors, whose *cuadrillas,* or troupes, consist of two or three *banderilleros* and two or three picadors to each, alternating in the performance according to seniority. The major participants in Portuguese bullfighting (characterized by fighting from horseback, bull wrestling, and never killing the bull) are the *cavaleiro,* or horseman, and the *forcados,* assistants on foot who taunt the bull and amuse the audience.

Manolete executing a natural, a close *pase* with his left hand
Barnaby Conrad

Combats and spectacles with bulls were common in ancient Crete, Thessaly, and imperial Rome, and even before the Punic Wars the Celtiberian people knew the peculiarities of the wild cattle that inhabited their forests, having developed their hunting into a sport. In games held in Baetica (later the Spanish province of Andalusia), men exhibited dexterity and valour before dealing the deathblow with ax or lance to a savage beast. Later, as bullfighting grew in popularity, the crumbling Roman amphitheatres of Seville, Cordova, Toledo, Tarragona, Mérida, and Cádiz were rebuilt and embellished. Where amphitheatres did not exist, contests were held in the city square or plaza, from which all bullrings derive their names, or in open fields. By the early 1700s, bull breeding had become financially profitable, and herds were bred for specific characteristics.

After the introduction of railways, the *plazas de toros* greatly multiplied. Spain in the second half of the 20th century had about 400 of all sizes, from those of Madrid and Barcelona, seating about 20,000 spectators each, to those of the small towns, accommodating 1,500. The *plaza de toros* in Mexico City, inaugurated during the 1945–46 season, seats approximately 50,000 persons.

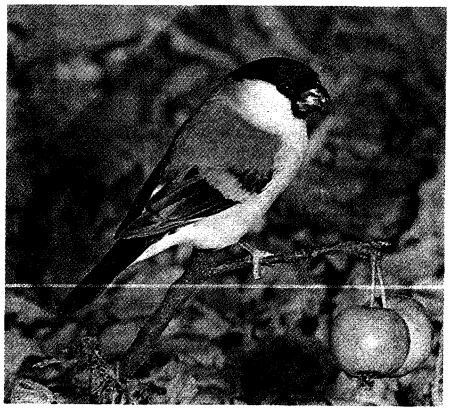
The *corrida* begins with the grand entry procession of the *cuadrillas* led by one or two mounted *alguaciles* (bailiffs in 16th-century costume). The matadors wear short jackets, waistcoats, and knee-length, skintight trousers richly embroidered in gold, silver, and silk; dress capes of embroidered satin, worn only during the entry procession; lace shirtwaists: coral-pink stockings; flat, heel-less black slippers; and *monteras,* or hats made of tiny black silk chenille balls. *Banderilleros* wear similar garments, but theirs lack the gold embroidery. Picadors wear broad-brimmed, beige-coloured hats and jackets, tightly fitting trousers of heavy cream-coloured chamois, and heavily protected chamois ankle boots.

After the procession has crossed the arena, the *presidente municipal* (the mayor or other official) throws down the key to the bull pens to one of the *alguaciles.* When the *cuadrillas* not performing with this bull have left the arena and the others have taken their respective positions, the *toril* door is opened. As the bull emerges, an attendant attaches a silken rosette made of the ranch colours into the shoulder muscles of the bull. A *banderillero* capes the bull with one hand only, so that the matador may judge whether the bull shows marked preference in the use of either horn or attacks equally from both sides. Then the matador goes into the arena and performs the initial passes—usually the basic *verónica,* a pass in which the cape is swung slowly away from the charging bull while the matador does not move his feet—working as gracefully and as close to the horns as possible. During the cape work, a bugle signals the entrance of the picadors, the beginning of the first of the three main divisions, or acts (*tercios*), that constitute the fight—the *pic*-ing, the planting of the *banderillas,* and the kill. The latter is accomplished *al volapié* ("fleet-footedly"), in which case man and bull attack each other from a standstill position, or *recibiendo,* the man standing still and receiving the bull.

After the kill the matador, if acclaimed, circles the arena with his *banderilleros* to the applause of the spectators. If the performance has been excellent, the matador receives, as a token of popular esteem, one ear of the bull. If it has been exceptional, he receives both ears. If his success should be extravagant, he receives both ears and the tail.

BIBLIOGRAPHY. Ernest Hemingway, *Death in the Afternoon* (1932); Barnaby Conrad, *Encyclopedia of Bullfighting* (1961). Kenneth Tynan, *Bull Fever,* 2nd rev. ed. (1966).

bullfinch, any of several stocky stout-billed songbirds of the family Fringillidae (order Passeriformes). Eurasia has six species of the genus *Pyrrhula,* all boldly marked. The common bullfinch (*P. pyrrhula*), 15 centimetres (6 inches) long, is black and white, and the male has a pinkish-orange underside. This species, usually found in evergreen groves and hedgerows, has a soft warbling call; it is a popular cage bird. The trumpeter bullfinch (*Rhodopechys githaginea*) of arid localities from the Canary Islands to India is a pale bird washed with pink; it has a blaring buzzy note.



Common bullfinch (*Pyrrhula pyrrhula*)
H.M. Barnfather—Bruce Coleman Ltd.

bullfrog (*Rana catesbeiana*), solitary aquatic frog (family Ranidae), named for its loud call. This largest North American frog, native to the eastern states, has been introduced into the western states and into other countries. The name is also applied to other large frogs, such as *R.,* or *Pyxicephalas, adspersa* in Africa, *R. tigrina* in India, and certain of the Leptodactylidae (*q.v.*) of South America.

Bullfrog (*Rana catesbeiana*)
Richard Parker

The bullfrog is green or brown with a white to yellowish belly and dark-barred legs. Body length is to about 20 centimetres (8 inches); hindlegs to 25 centimetres (10 inches). Large adults weigh 0.5 kilogram (one pound) or more. Bullfrogs usually live in or near bodies of still water. They breed in spring; the eggs are laid in water and hatch into dark-spotted greenish-brown tadpoles. Depending on climate, the tadpole stage lasts one to three years. Many bullfrogs are caught for food, and many are used as laboratory animals.

bullhead, also called HORNED POUT, any of several North American freshwater catfishes of the genus *Ictalurus* (*Ameiurus* of some authorities) and the family Ictaluridae. Bullheads are related to the channel catfish (*I. punctatus*) and other large North American species but have squared, rather than forked, tails and are generally less than 30 centimetres (12 inches) long. Bullheads are valued as food and sport fishes. The black bullhead (*I. melas*) is found in the Mississippi Valley, the yellow and brown bullheads (*I. natalis* and *I. nebulosus*) east of the Rocky Mountains; and the flat bullhead (*I. platycephalus*) in the coastal streams between North Carolina and Florida.

The name bullhead is sometimes also applied to sculpins and sea poachers.

bullhead shark (*Heterodontus*), any of a genus of sharks, containing fewer than 12 species, in the family Heterodontidae (order Heterodontiformes). This exclusively marine group, absent from the Atlantic, is found in the tropical reaches of the Pacific and Indian oceans and in the eastern Pacific from California to the Galápagos Islands. Bullhead sharks eat shellfish; their teeth are designed primarily for crushing and grinding. None of the species is a voracious predator or maneater. The Port Jackson shark (*H. portusjacksoni*), found in Australian Pacific waters, reaches a length of 3 metres (10 feet).

Bullinger, Heinrich (b. July 18, 1504, Bremgarten, Switz.—d. Sept. 17, 1575, Zürich), convert from Roman Catholicism who first aided and then succeeded the Swiss Reformer Huldrych Zwingli (1484–1531) and who, through his preaching and writing, became a major figure in securing Switzerland for the Reformation.

At the University of Cologne, Bullinger be-

came increasingly sympathetic to the Reformation. Barred from Roman Catholic clerical positions, he taught at the cloister school of the Cistercian order at Kappel, Switz., from 1523 to 1529.

Having known Zwingli from 1523, Bullinger gradually came to accept his theology and in

Bullinger, portrait by an unknown master, 1531; in the Zentralbibliothek, Zürich

By courtesy of the Zentralbibliothek, Zurich

1528 assisted him in theological disputations at the Bern convocation. The next year he succeeded his father as a Reformed pastor at Bremgarten. When Zwingli died in 1531, Bullinger took his place as pastor at Zürich. His influence extended to other countries through correspondence with their rulers, including Henry VIII and Edward VI of England. In order to overcome differences on the Eucharist with Luther in the interests of church unity, Bullinger helped draft the First Helvetic Confession of 1536.

This effort having failed, he subsequently reached agreement with the Reformer John Calvin in the Consensus Tigurinus (1549) and with other Evangelical-Reformed churches in his own Second Helvetic Confession (1566). His other works include *Diarium* (ed. Emil Egli, 1904), a life of Zwingli, and *Reformationsgeschichte,* 3 vol. (1838–40; "History of the Reformation").

BIBLIOGRAPHY. A. Bouvier, *Henri Bullinger* (1940); G.W. Bromiley (ed.), *Zwingli and Bullinger* (1953), vol. 24 of the "Library of Christian Classics."

bullionism, the monetary policy of mercantilism (*q.v.*), which called for national regulation of transactions in foreign exchange and in precious metals (bullion) in order to maintain a "favourable balance" in the home country.

Spain, with which the policy is most closely associated, was preeminent in developing a colonial empire and drew from the New World great quantities of gold and silver during the 16th and 17th centuries. Nations attributed Spain's greatness to its almost limitless supply of precious metals, which were thought to increase commerce and provide the sinews of war, for, with a full treasury, armies could be bought and a vigorous population could flourish. This led to the development in theory and practice of the idea of a favourable balance of trade that would increase the nation's supply of gold and silver money. Spain, however, in draining precious metals from its colonies and buying goods and services from other states, lost its treasure and failed to develop home industry. In the end Spain changed from the richest to one of the most impoverished European states.

Bullitt, William C(hristian) (b. Jan. 25, 1891, Philadelphia—d. Feb. 15, 1967, Neuilly, Fr.), U.S. diplomat, first U.S. ambassador to the Soviet Union.

Early in 1919 Bullitt was sent by Pres. Woodrow Wilson to Moscow to investigate the stability of the Bolshevik government, and he returned with a recommendation that the U.S. recognize the Soviet Union. Wilson's rejection of that proposal disaffected Bullitt; he resigned and in subsequent testimony before the U.S. Senate argued strenuously against ratification of the Treaty of Versailles. When in 1933 the U.S. recognized the Soviet Union, Bullitt was recalled from political obscurity by Pres. Franklin D. Roosevelt to serve (1934–36) as ambassador to that country. In 1936 he was named ambassador to France, remaining until the fall of France to Nazi Germany in 1940. Toward the end of the war, he served in the army of the Free French under Gen. Charles De Gaulle.

Bullock, Wynn (b. April 18, 1902, Chicago—d. Nov. 16, 1975, Monterey, Calif., U.S.), U.S. photographer, influential in portraying a psychological reality beneath the fastidious realism of his photographs.

Wynn's early work, mainly solarizations, in which the image is partly negative and partly positive, was strongly influenced by the avant-garde experiments of Moholy-Nagy (1895–1946). In 1948, however, Bullock met Edward Weston, a photographer who persuaded him that realism and tonal beauty were photography's most valuable assets. Bullock followed Weston's teachings strictly, and much of his work closely resembles Weston's. Often, however, Bullock's realistic images are meant to be viewed as "equivalents," photographic images that serve as visual metaphors. In Bullock's work, the metaphors usually refer to the passing of time and the inevitability of death. Occasionally, those themes are treated surrealistically in such prints as "Child in the Forest" (1954), one of two of Bullock's photographs that introduced "The Family of Man" exhibition.

Wynn Bullock and model, 1971

Jack D. Ward

bullous pemphigoid, also called BENIGN PEMPHIGUS, a chronic, generalized skin disorder characterized by an eruption of serum-filled vesicles (blisters). These vesicles form under the epidermis, the outermost, nonvascular layer of the skin, and have walls of stretched epidermal cells. The cause of bullous pemphigoid is not known. It occurs predominantly in elderly adults. Although debilitating, it is not fatal and responds well to treatment with corticosteroids.

bull's-eye window: *see* oeil-de-boeuf window.

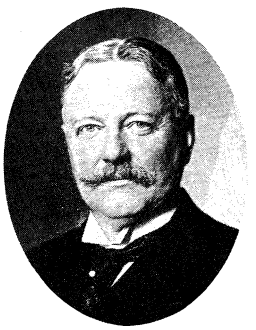
Bulnes, Manuel (b. 1799, Concepción, Chile—d. 1866, Santiago), president of Chile (1841–51) whose administration was notable for material progress and cultural activities. His military victory against the Bolivian–Peruvian Confederation in 1839 assured his election to the presidency. Although the spokesman of the Conservative oligarchy, Bulnes found posts for many liberals in his government, and social and political stability made Chile a haven for many intellectual refugees from other dictatorships. The new interest in learning produced a generation of young intellectuals who openly opposed the oligarchical domination that Bulnes represented. Faced with growing discontent, Bulnes named his successor, Manuel Montt, and had him duly elected; he was obliged, however, to resort to military action to quell a brief but bitter civil war before Montt's tenure was secured.

Bülow, Adam Heinrich Dietrich, Freiherr von (baron of) (b. 1757, Falkenberg, Prussia—d. 1808, Riga, Latvia, Russian Empire), Prussian soldier and military theorist who attempted to popularize the fighting style of the French armies of the early Revolutionary era and who exercised some influence on the French general and renowned military critic Antoine-Henri de Jomini.

Bülow entered the Prussian army in 1773 but left the service in 1790. After extensive travel and public expressions of sympathy for the French Revolution, he wrote his *Geist des neueren Kriegssystems* (1799; "Spirit of the New System of Warfare"), in which he advocated the adoption of French infantry tactics making use of columns and skirmishers. His strategic system, based on precise mathematical principles, attempted to transform warfare into an exact science. Bülow's theories had little influence on his contemporaries. Arrested by the Prussian government as insane, he was imprisoned and later transferred to Russian control; he died in prison in Riga.

Bülow, Bernhard (Heinrich Martin Karl), Fürst von (prince of) (b. May 3, 1849, Klein-Flottbek, near Altona, Ger.—d. Oct. 28, 1929, Rome), German imperial chancellor and Prussian prime minister from Oct. 17, 1900, to July 14, 1909; in cooperation with the emperor William II, he pursued a policy of German aggrandizement in the years preceding World War I.

The son of an imperial secretary of state for foreign affairs under Bismarck, Bülow studied law at Lausanne (Switz.), Berlin, and Leipzig and entered the German foreign service in 1874. He held a number of diplomatic posts, becoming German ambassador in Rome in 1893. Bülow's real rise to power occurred in June 1897, when William II appointed him state secretary for the Foreign Department. He quickly became a more potent force than



Bernhard, Fürst von Bülow, 1904

By courtesy of the Staatsbibliothek, West Berlin

the chancellor, Hohenlohe-Schillingsfürst, and after three years he succeeded to the chancellorship. Bülow was expected to satisfy the widespread desire for an aggressive foreign policy while preventing the impetuous emperor from making a fool of himself.

In his foreign policy, both as state secretary and as chancellor, Bülow, considerably influenced by Friedrich von Holstein, employed what he understood as Bismarckian *Realpolitik* to advance William II's policy of a "place in the sun" for the *Reich* among world powers. As state secretary, he scored some gains in the Pacific, acquiring Chiao-chou (Kiaochow) Bay, China; the Caroline Islands; and Samoa (1897–1900). He actively promoted building the Baghdad Railway to make Germany a power in the Middle East, and his success in compelling European acceptance of Austria-Hungary's annexation of Bosnia-Hercegovina (1908) was welcomed by Germans fearful of the *Reich*'s encirclement.

Bülow was less successful in his attempts to prevent the formation of an English–French–Russian combination against Germany. In 1898 and 1901 he and Holstein tried to negotiate an alliance entailing British guarantees for Austria-Hungary, but the British, concerned over Germany's threat to their naval supremacy, remained aloof. His conclusion of the Treaty of Björkö with Russia in 1905 did not prevent the Russians' adherence to the Anglo-French Entente (1907). The confrontation with France and Britain over Morocco (1905–06) increased international tension.

In the domestic affairs of Prussia and the *Reich,* Bülow relied on the support of the Conservatives and Centrists and, at times, the National Liberals. Though he did not repress the Social Democrats, and even introduced some cautious social measures through his state secretary, Artur Posadowsky, Bülow made sure that they gained no real political power. He evaded several urgent problems: the repeal of the Prussian three-class suffrage laws, the resolution of the dualism between Prussia and the *Reich,* the radical reform of imperial finances, and the imposition of direct taxes. Seeing the necessity of cooperating with the Reichstag, Bülow from 1905 leaned toward liberal constitutionalism.

William II's indiscreet remarks printed in *The Daily Telegraph* of London in 1908 led to Bülow's resignation in the following year. Bülow admitted that he had not read the proof of the article that the newspaper had submitted to him before publication; William believed Bülow had approved the article so that the Emperor would be humiliated.

Bülow's posthumously published memoirs, *Denkwürdigkeiten* (ed. by Franz von Stockhammern, 4 vol., 1930–31; Eng. trans., *Memoirs,* 4 vol., 1931–32), represented an attempt by Bülow to exonerate himself from any blame for the war and for Germany's collapse; in fact, they reflect his blindness to his own limitations as a statesman.

To make the best use of the Britannica, consult the INDEX *first*

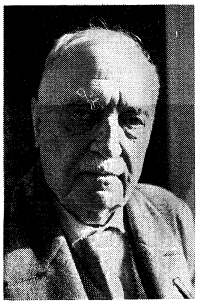
Bülow, Hans (Guido), Freiherr von (baron of) (b. Jan. 8, 1830, Dresden, Saxony—d. Feb. 12, 1894, Cairo), German pianist and conductor whose accurate, sensitive, and profoundly musical interpretations, especially of Wagner, established him as the prototype of the virtuoso conductors who flourished at a later date. He was also an astute and witty musical journalist.

As a child Bülow studied piano under Friedrich Wieck, father of Clara Schumann, and then studied law at the University of Leipzig. Later, in Berlin, he was active in democratic political groups and propagated Wagner's theories of a German national musical movement. He studied conducting under Wagner in 1850 and piano under Liszt in 1851. In 1853 he toured as a concert pianist and from 1855 to 1864 headed the piano department at the Stern Conservatory in Berlin. His repertory as a pianist is said to have included virtually every major work of his day. In 1857 he married Liszt's daughter Cosima. In 1864 he became director of music at the Munich court, where he conducted the premieres of *Tristan und Isolde* and *Die Meistersinger.* Abandoned by Cosima, for Wagner, whom she married in 1870, Bülow nonetheless continued to promote Wagner's music. He conducted at Hannover (1877–80) and at Meiningen (1880–85), where his orchestra became one of the finest in Europe. Bülow was also among the earliest interpreters of Brahms and Richard Strauss and was one of the first conductors to conduct from memory; his interpretations were noted for their integrity and emotional power.

He published critical editions of Beethoven and Cramer (now superseded by later editions), piano transcriptions of *Tristan und Isolde* and other major works, and a number of compositions for orchestra. In 1893 he went to Cairo because of his failing health.

Bulsār (India): *see* Valsād.

Bultmann, Rudolf (Karl) (b. Aug. 20, 1884, Wiefelstede, Ger.—d. July 30, 1976, Marburg, W.Ger.), leading 20th-century New Testament scholar known for his program to "demythologize" the New Testament; *i.e.,* to interpret, according to the concepts of Existentialist philosophy, the essential message of the New Testament that was expressed in mythical terms.



Bultmann
By courtesy of James M. Robinson

Early career. Bultmann, the son of a Lutheran pastor and the grandson of a missionary, always intended to follow an academic theological career, and at 19 he began his theological studies at the University of Tübingen. By 1912 he had completed his qualifying studies and was appointed a lecturer at the University of Marburg. There followed appointments at Breslau (1916) and Giessen (1920). In 1921 he was appointed professor of New Testament at Marburg, where he remained until his retirement in 1951.

In 1921 Bultmann published his *Geschichte der synoptischen Tradition* (*History of the Synoptic Tradition*), an analysis of the traditional material used by the Evangelists Matthew, Mark, and Luke and an attempt to trace its history in the tradition of the church prior to their use of it. This proved to be a seminal work, and it established Bultmann's reputation as a scholar. He followed it with a book on Jesus (*Jesus,* 1926; *Jesus and the Word,* 1934), in which the beginning of his own theological position can be traced. Between 1922 and 1928 he had as a colleague at Marburg the German Existentialist philosopher Martin Heidegger, whose *Sein und Zeit* (*Being and Time*) was published in 1927. Heidegger was enormously influential upon Bultmann, in part because Bultmann felt that he was developing, in philosophical terms, an analysis of human existence that was strikingly parallel to the understanding of human existence implied by the theologies of Paul and John, as Bultmann interpreted them.

Bultmann's theology. It was during these years of discussion with Heidegger that Bultmann developed his own theological position; namely, that Christian faith is, and should be, comparatively uninterested in the historical Jesus and centred instead on the transcendent Christ. Christian faith, he asserted, is faith in the *kērygma* ("proclamation") of the church, into which Jesus may be said to be risen (Bultmann's understanding of the Resurrection), and not faith in the historical Jesus. This view found its earliest expression in two essays, "Der Begriff der Offenbarung im Neuen Testament" ("The Concept of Revelation in the New Testament"), written in 1929, and "Die Geschichtlichkeit des Daseins und der Glaube" ("The Historicity of Man and Faith"), written in 1930. Bultmann's position was to remain constant thereafter, and all his subsequent work, including his demythologizing proposal made in 1941, developed consistently out of it.

During the Hitler years in Germany, Bultmann refused to modify his teaching in any way to suit Nazi ideology, and he supported the Confessing Church, the German Protestant movement organized to resist Nazi church policy. But, in his own words, he "never directly and actively participated in political affairs"; *i.e.,* he did not directly oppose the Nazi regime. With the resumption of contacts between the German universities and the rest of the world after World War II, Bultmann became a major international academic figure. His pupils came to occupy leading positions in German universities, and his views were the subject of discussion around the world. All New Testament scholars found themselves in dialogue with him, and among theologians his position became the point of departure for major developments in both Germany and the United States. He himself gave an extremely influential series of lectures in Britain in 1955 (*History and Eschatology: The Presence of Eternity*) and in the United States in 1958 (*Jesus Christ and Mythology*), and his demythologizing program became the subject of a multivolume series with the title *Kerygma und Mythos* (*Kerygma and Myth*).

Assessment. Bultmann was an outstanding teacher, and he encouraged independence of mind among his students. The result was two major developments within the "Bultmann school." In 1954 Ernst Käsemann raised "the question of the historical Jesus" (*i.e.,* the question of the significance of knowledge of the historical Jesus for Christian faith), and a number of Bultmann's pupils developed a position independent of their teacher's on the matter. Then Ernst Fuchs and Gerhard Ebeling, building on Bultmann's Existentialist analysis, developed a method of interpreting the New Testament that emphasized the linguistic mode of human existence. This is the so-called new hermeneutic. Bultmann himself took part in these discussions along with his pupils for as long as his health permitted, later living quietly in Marburg. (N.P.)

BIBLIOGRAPHY. There is no formal biography of Bultmann, although some discussions of his theology include a biographical sketch, and there is "Autobiographical Reflections" in C.W. Kegley (ed.), *The Theology of Rudolf Bultmann* (1966), in itself a series of dialogues between Bultmann and other scholars. Collections of essays by and about Bultmann include H.W. Bartsch (ed.), *Kerygma und Mythos,* 4th rev. ed. (1960; Eng. trans., *Kerygma and Myth I,* 1961, and. . . .*II,* 1962); and Schubert M. Ogden (ed.), *Existence and Faith* (1973), a collection of Bultmann's shorter writings. Important discussions of his theology are found in Schubert

M. Ogden, *Christ Without Myth* (1961); and W. Schmithals, *Die Theologie Rudolf Bultmanns: Eine Einführung* (1967; *An Introduction to the Theology of Rudolf Bultmann*). Popularly written are N. Perrin, *The Promise of Bultmann* (1969); J.M. Robinson, *A New Quest of the Historical Jesus* (1959; there are important changes in the German versions *Kerygma und historischer Jesus,* 1960; rev. ed. 1967); and J.M. Robinson and J.B. Cobb (eds.), *The New Hermeneutic* (1964), a detailed account of developments within the "Bultmann school."

Bulu, also spelled BOULOU, one of a number of related peoples inhabiting the hilly, forested, south-central area of Cameroon as well as mainland Equatorial Guinea and northern Gabon. These peoples are collectively called the Fang (*q.v.*). "Bulu" is a loosely defined term that designates one of the three major subdivisions of the Fang. The Bulu constitute about one-third of the Fang living in Cameroon.

The origins of the Bulu are not clear; they may have moved southward with other Fang peoples from what is now southeastern Chad because of pressure from the expansionist Fulani to the north. They were also attracted by the opportunities for trade with European colonists to the south. The southward migration of the Bulu toward the sea was halted by German colonial forces in the late 19th century, and their thrust into what is now northern Gabon was stopped by the French at about the same time.

The Bulu live in a region of equatorial forest. They grow crops of cassava and corn (maize) and supplement these with a wide variety of vegetable leaves, plantains, palm oil (and palm wine), and wild mushrooms, insects, and other gathered products. Hunting has also been a very significant pursuit among the Bulu. The Bulu live in the best cacao-producing area of Cameroon, and their income from this crop is substantial.

The Bulu's clans are determined through patrilineal descent, and religious societies and age grades provide social cohesion and identity beyond the village. In late colonial years, the Bulu founded a formal tribal union with all clans represented and efforts coordinated for social welfare. American Protestant missionaries have had a great influence, and Bulu sculpture and other arts have been redirected from religious purposes to a flourishing tourist market. Both the profits from cacao and the schools established by early missionaries have meant that the Bulu have long participated actively in the economic, political, and intellectual growth of Cameroon.

In the late 20th century the Bulu in Cameroon numbered about 660,000.

Bulwer, (William) Henry Lytton (Earle), BARON DALLING AND BULWER OF DALLING (b. Feb. 13, 1801, London—d. May 23, 1872, Naples), diplomat who, as British ambassador to the United States, negotiated the controversial Clayton–Bulwer Treaty (April 19, 1850), which concerned in part the possibility of a canal traversing Central America and was also intended to resolve (but in fact aggravated) various Anglo-American disputes in Latin America.

After studying at Harrow and at Trinity and Downing colleges, Cambridge, Bulwer joined the British Army and then, in 1829, entered the diplomatic service. In 1838 he negotiated the Ponsonby Treaty with Turkey, which secured important advantages for British trade in the Ottoman Empire. In 1843 he was appointed ambassador to Spain. Sympathetic to the cause of Spanish constitutionalism, he was expelled from the country in 1848 by the dictator Ramón Narváez.

As ambassador to the United States (1849–52), Bulwer gained considerable popularity there, which assisted his conclusion of the treaty bearing his name and that of the U.S. secretary of state, John Middleton Clayton. Although ratified by both nations, the treaty itself was unpopular in the United States because of its concessions to Great Britain.

In 1856 Bulwer played a major part in the negotiations following the Crimean War. His last diplomatic assignment was as ambassador at Constantinople (1858–65). He was raised to the peerage in 1871. He, with Evelyn Ashley, wrote a five-volume, official biography (1870–76) of Lord Palmerston. Bulwer was an older brother of the famous novelist Edward Bulwer-Lytton.

Bulwer-Lytton, Edward George Earle: *see* Lytton (of Knebworth), Edward George Earle Bulwer-Lytton, 1st Baron.

Bulwer-Lytton, (Edward) Robert: *see* Lytton, (Edward) Robert Bulwer-Lytton, 1st earl of.

Bulwer-Lytton, Victor Alexander George Robert: *see* Lytton, Victor Alexander George Robert Bulwer-Lytton, 2nd earl of.

Bumastus, genus of trilobites (extinct arthropods) found in Europe and North America as

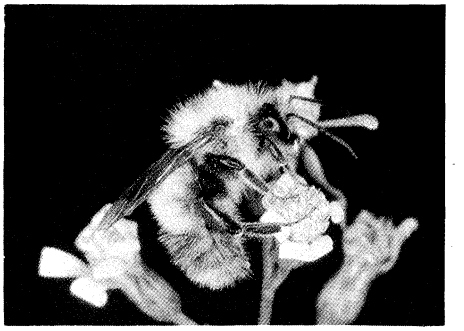
Bumastus ioxus, collected from Lockport, N.Y.

By courtesy of the Buffalo Museum of Science, Buffalo, N.Y.

fossils in rocks of Ordovician to Silurian age (between 500,000,000 and 395,000,000 years old). *Bumastus* is very distinctive in form; the head and tail regions are smooth and very large and have fused segments. Its elliptical body is flat on the bottom; the back and sides are strongly concave and arched. *Bumastus* was a bottom-dwelling form.

bumblebee, also called HUMBLE-BEE, common name for any member of the insect tribe Bombini (family Apidae, order Hymenoptera). These bees occur over much of the world but are most common in temperate climates. They are absent from most of Africa and the lowlands of India and, although not native, have been introduced to Australia and New Zealand to aid in the pollination of various flowering plants. Most authorities recognize two genera: *Bombus,* the nest-building bumblebees, and *Psithyrus,* the parasitic bumblebees. Certain species are sometimes assigned to a third genus, *Bombias.* About 19 species of *Bombus* and 6 species of *Psithyrus* occur in Great Britain. About 50 species of *Bombus,* as well as some *Psithyrus* species, are found in North America.

Bumblebees are robust and hairy, average about 1.5 to 2.5 cm (about 0.6 to 1 inch) in length, and are usually black with broad yellow or orange bands. They often nest in the ground, commonly in deserted bird or mouse nests. *Bombus* species are social bees; *i.e.,*



Bumblebee (*Bombus*)

Lilyan Simmons—EB Inc.

they live in organized groups. Each nest has a queen, drones (males), and workers. *Psithyrus* species, having no worker caste, enter *Bombus* nests to lay their eggs, which are then cared for by *Bombus* workers. The resemblance between a *Psithyrus* species and the *Bombus* species it parasitizes is often remarkable. The British species *P. vestalis* sometimes stings the *Bombus* queen to death. There are then no *Bombus* larvae produced to compete with the parasitic *Psithyrus* larvae for the attention of the workers.

The *Bombus* queen lays her eggs in the nest after spending the winter in hibernation. The first brood generally develops into four to eight worker bees. Shortly after emerging as adults these workers take over from the queen the duties of collecting pollen and caring for the hive. The queen then retires to a life of egg laying. For a while only worker progeny are produced, and the colony grows until it contains 50 to 600 bees. In late summer, with the large population of workers bringing in abundant food, males and new queens are produced. Although some males develop from unfertilized eggs laid by the queen, most hatch from eggs laid by workers. In early fall the queen stops laying eggs, and the colony, including the queen, gradually dies out. During this period the larvae of certain moths and beetles prey on the remaining eggs and larvae in the nest.

The next season's queens have developed from eggs laid late in the season. The future queens, when fully grown, leave the nest, mate, and find a sheltered place in which to hibernate for the winter. The lone queens then start new nests in the following spring.

Bumelia, genus of about 25 species of woody trees and shrubs, within the sapodilla family (Sapotaceae), native to mainly warmer regions of North and South America. The plants typically have gummy or milky sap and extremely hard wood. The branches are usually thorny, the alternate leaves entire (smooth-edged). *B. lanuginosa,* variously known as chittamwood, shittamwood, gum elastic, and false buckthorn, is sometimes cultivated as an ornamental. It grows to about 15 m (50 feet) tall. The leaves are 3.75–10 cm (1.5–4 inches) long, are dark lustrous green above and rusty beneath, and persist until late in the fall. The minute white blossoms grow in many-flowered clusters. The ellipsoid black fruit is about 1 cm (0.4 inch) long.

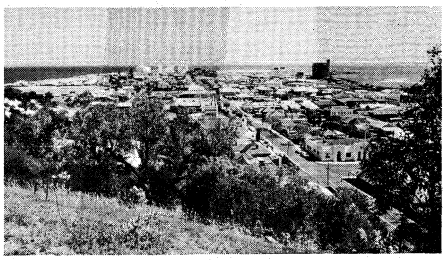
bun ochra (plant): *see* urena.

Bunau-Varilla, Philippe-Jean (b. July 26, 1859, Paris—d. May 18, 1940, Paris), French engineer and early advocate of a canal across the Isthmus of Panama.

Employed by the Compagnie Universelle du Canal Interocéanique (French Panama Canal Company) in 1884, Bunau-Varilla turned to the United States after the French project failed in 1889. He was commissioned by the U.S. government to negotiate a treaty with Colombia, of which Panama was then a part. When these negotiations failed, he helped to instigate the revolution that resulted in

Panamanian independence. The provisional government of Panama named him minister plenipotentiary, and he signed a treaty with U.S. Secretary of State John Hay, assuring the construction of a canal under U.S. control (1903).

Bunbury, town and seaport, southwestern Western Australia, south of Perth and Fremantle. It lies on the southern shore of Koombana Bay just below Leschenault Inlet, fed by the Collie and Preston rivers. Founded in 1843 and named for Lieut. Henry William St. Pierre Bunbury, who explored the area, it was by 1976 the largest urban centre in the state apart from metropolitan Perth. Bunbury is an outlet for the export of timber, wheat, wool, dairy products, and fruit of the southern farmlands, for coal from nearby Collie Field, for alumina, and for ilmenite and other heavy minerals that are extracted from beach sands.



Bunbury on Koombana Bay, Western Australia
Tor Eigeland—Black Star/EB Inc.

There are superphosphate and construction works. Wine production developed as a regional industry in the 1970s, and aluminum refineries were built to process bauxite from Mt. Saddleback (to the northeast). Port expansion followed, and a new inner harbour opened in 1976. A refinery for edible oils was opened at Bunbury in 1979.

Surfing and boating facilities have made Bunbury a popular seaside resort. St. Boniface Cathedral was the first to be consecrated (1962) in Australia in the 20th century. Pop. (1981) 21,749.

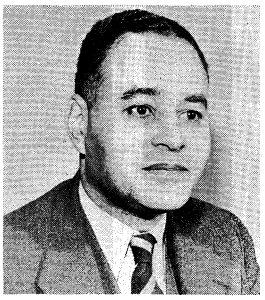
bunch pink (plant): *see* sweet William.

bunchberry, also called DWARF CORNEL (*Cornus canadensis*), creeping perennial herb of the dogwood family (Cornaceae). The small and inconspicuous yellowish flowers, grouped in heads surrounded by four large and showy white (rarely pink) petallike bracts (modified leaves), give rise to clusters of red fruits.

Bunchberry (*Cornus canadensis*)
Gretchen Garner—EB Inc.

Bunchberry is found in acid soils, bogs, and upland slopes in Asia and from Greenland to Alaska and south as far as Maryland, New Mexico, and California.

Bunche, Ralph (Johnson) (b. Aug. 7, 1904, Detroit—d. Dec. 9, 1971, New York City), U.S. diplomat, a key member of the United Nations for more than two decades, and winner of the 1950 Nobel Prize for for Peace his successful negotiation of an Arab–Israeli truce in Palestine the previous year.



Bunche
H. Roger-Viollet

Earning graduate degrees in government and international relations at Harvard University (1928, 1934), Bunche joined the faculty of Howard University, Washington, D.C., where he set up a department of political science. Meanwhile, he travelled through French West Africa on a Rosenwald field fellowship, studying the administration of French Togoland, a mandated area, and Dahomey, a colony. He later did postdoctoral research at Northwestern University, Evanston, Ill., and at the London School of Economics before returning to Africa for further studies in colonial policy. Between 1938 and 1940 he collaborated with Gunnar Myrdal, the Swedish sociologist, in the monumental study of U.S. race relations, published as *An American Dilemma* in 1944.

During World War II Bunche served in the U.S. War Department, the Office of Strategic Services, and the State Department. He was active in the preliminary planning for the United Nations at the San Francisco Conference of 1945 and in 1947 joined the permanent UN Secretariat in New York as director of the new Trusteeship Department.

Asked by Secretary General Trygve Lie to aid a UN special committee appointed to negotiate a settlement between warring Palestinian Arabs and Jews, he was thrust unexpectedly into the principal role when the chief mediator, Count Folke Bernadotte, was assassinated (1948). Bunche finally negotiated armistices between February and May 1949.

Elevated in 1955 to the post of undersecretary and two years later to undersecretary for special political affairs, Bunche became chief troubleshooter for Secretary General Dag Hammarskjöld. One task he undertook was the UN program concerning peaceful uses of atomic energy. In 1956 he supervised the deployment of a 6,000-man UN neutral force in the area of the Suez Canal following the invasion of that area by British, French, and Israeli troops. In 1960 he again found himself in charge of UN peacekeeping machinery—this time in the Congo. Finally, in 1964 he went to Cyprus to direct the 6,000 neutral troops that intervened between hostile Greek Cypriots and Turks.

Attracting some criticism for seeming to neglect the black freedom movement at home during the 1950s and 1960s, Bunche began to speak out more directly on U.S. racial discrimination. In addition, though not in the best of health, he participated in the 1965 civil rights marches in both Selma and Montgomery, Ala., and also served as a board member for the National Association for the Advancement of Colored People for 22 years.

Bund, also called JEWISH BUND, formally GENERAL UNION OF JEWISH WORKERS IN LITHUANIA, POLAND, AND RUSSIA, Russian VSEOBSHCHY YEVREYSKY RABOCHIY SOYUZ V LITVE, POLISHE, I ROSSII, Jewish Socialist political movement founded in Vilnius in 1897 by a small group of workers and intellectuals from the Jewish Pale of tsarist Russia. The Bund called for the abolition of discrimination against Jews and the reconstitution of Russia along federal lines. At the time of the founding of the Russian Social-Democratic Workers' Party (1898), the Bund was the most effective Socialist organization in the country. Its determination to be the sole representative of Jewish workers conflicted with Lenin's plans for a centralized party; in 1903 the Jewish leaders walked out of the second Congress of the Russian Social-Democratic Party. After rejoining the Social Democrats in 1906, they generally supported the Mensheviks. In April 1920 the Bund divided into two groups: the majority merged with the Communist Party while the minority, led by Rafael Abramovich, maintained its separate identity until suppressed by the Bolshevik government. The Bund was active in Poland between World War I and World War II.

Bundaberg, city and port, Queensland, Australia, on Burnett River. The centre for large sugar plantations established in the 1870s, it has sugar mills, refineries, and rum distilleries. Other industries include dairying, sawmilling, shipbuilding, and the manufacture of farm machinery. Sugar, golden syrup, and timber are exported. Named for the local Bunda tribe of Aborigines, it became a municipality in 1880, a town in 1881, and a city in 1913. Pop. (1981) 32,560.

Bundahishn (Pahlavi: Original Creation), Zoroastrian scripture giving an account of the creation, history, and duration of the world, the origin of man, and the nature of the universe. Written in Pahlavi, it dates from the 9th century AD but is based on ancient material from a lost part of the original Avesta and preserves some pre-Zoroastrian elements.

Bundelā, Rājput clan that gave its name to Bundelkhand in north central India. The Bundelās, whose origin is obscure, emerged in the 14th century. They won prominence when they resisted the emperor, Shēr Shāh of Sūr, who was killed while besieging their fortress of Kālinjar in 1545. The Bundelā Bīr Singh of Orchha, in collusion with Akbar's son, Prince Salīm (later Jahāngīr), ambushed and killed the Mughal emperor's confidant Abū-ul-Fazl in 1602.

The Bundelā territories were important because through them ran the route from the Deccan to the Yamuna–Ganges doab. But they were hilly, remote, and difficult to control. The Mughals suppressed many insurrections until the Bundelās called in the Marāthās (1729). After many vicissitudes the tract passed under British control in the early 19th century. The fortress of Kālinjar was taken in 1812.

Bundelkhand, historic region of central India, now included in northern Madhya Pradesh state, comprising the hilly Vindhyan region, cut by ravines, and the northeastern plain. Steep, isolated hills rising abruptly from the plains have provided excellent sites for castles and strongholds of Bundelkhandi mountaineers. The Dhasān, Tons, Ken, and Betwa rivers, in deep, ravine-fringed channels, are of little use for irrigation, though the Betwa River (*q.v.*) has been dammed and provides irrigation waters and hydroelectricity. Diamonds of good quality, though small in size, are found, particularly near Panna (*q.v.*). Wheat, sorghum, and cotton are the principal crops.

The Gaharwārs, the earliest recorded dynasty of Bundelkhand, or Jejākabhukti, were succeeded by the Pratihāra Rājputs (warrior caste). The latter were supplanted *c.* AD 800 by the Chandelās, who by the 11th century held sway over a large territory between the Yamuna and Narmada rivers. They were overthrown in 1182 by Pṛthvīrāja, ruler of Ajmer and Delhi. After a period of ruinous anarchy, Bundelā Rājputs (for whom the country is named) began to settle there in the 14th century, and for centuries afterward they en-

gaged in guerrilla warfare against the Muslim power of Delhi. In 1545 Shēr Shāh of Sūr, who had defeated the Mughal emperor Humāyūn, invaded Bundelkhand but lost his life while besieging the fortress of Kālinjar. In 1569 Kālinjar surrendered to the forces of the Mughal emperor Akbar. With the decline of the Mughals, the Marāṭhās extended their influence and in 1792 were acknowledged as lords of Bundelkhand. In 1803 the districts of Bānda and Hamīrpur were transferred to the British, and by the treaty of Poona (1817) the British government acquired from the Marāṭhās all territorial rights over the region.

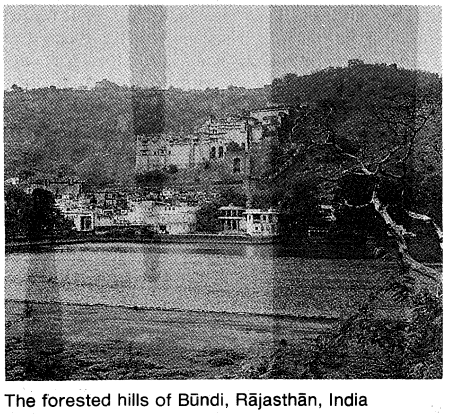
Historically, Bundelkhand included Hamīrpur, Jālaun, Jhānsi, Lalitpur, and Bānda districts, which are now in Uttar Pradesh. Prior to 1947, however, the name was restricted politically to the princely states of the Bundelkhand Agency, created in 1802 as a subagency of the British Central India Agency. In 1948 Baghelkhand and Bundelkhand merged into Vindhya Pradesh, which with several former enclaves of Uttar Pradesh merged with Madhya Pradesh in 1956. Bundelkhand thus no longer has any political identity.

Bundesrat (German: Federal Council), one of the two legislative chambers of the Federal Republic of Germany. It acts mainly in an advisory capacity, since political power resides in the popularly elected Bundestag, but its consent is required for a large number of laws and regulations as well as for constitutional amendments. It is formed from members of the *Land* (state) governments. Austria also has a Bundesrat, similar in character. The term also was applied to the federal chamber of the German Empire (1871–1918).

Bundestag (German: Federal Diet), one of the two legislative chambers of the Federal Republic of Germany. It represents the nation as a whole and is elected by direct universal suffrage for four years. The Bundestag in turn elects the chancellor (prime minister), who is the head of government. The term also was applied to the federal Diet of the German Confederation (1815–66).

Bundesverfassungsgericht (West Germany): *see* Federal Constitutional Court.

Būndi, town, administrative headquarters of Būndi district, Rājasthān state, northwestern India. An agricultural market centre, it is situated in a gorge surrounded by forested hills on which stand several palaces and forts. Būndi is said to have been named after Būnda, a 13th-century chieftain. The town served as capital of the former princely state of Būndi, and its palaces are noted for their distinctive "Būndi-style" frescoes. A college in Būndi is affiliated with the University of Rājasthān.

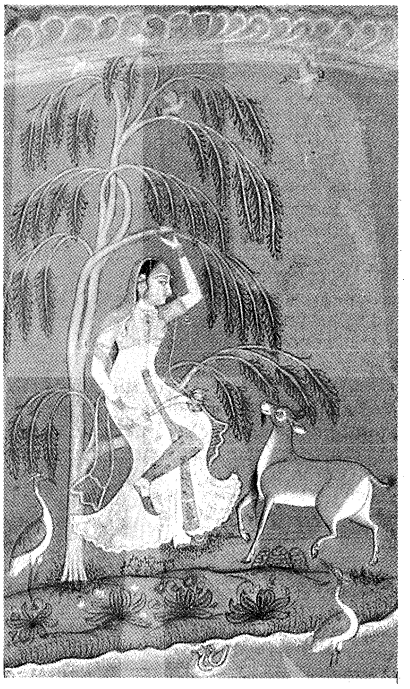


The forested hills of Būndi, Rājasthān, India
Foto Features

Būndi district (2,143 sq mi [5,550 sq km]), formerly the princely state of Būndi, comprises two plains areas divided by a central hill range. Agriculture is the economic mainstay. Corn (maize), jowar (sorghum), wheat, barley, rice, and sugarcane are the chief crops; mica and limestone deposits are worked.

The original princely state of Būndi was established in the 14th century by the Rājputs (the warrior rulers of the historic region of Rājputāna) and was known as Hārāoti. In the 17th century, Hārāoti was divided into Kota and Būndi states. It came under British paramountcy as a result of a treaty in 1818 and became part of the state of Rājasthān in 1948. Pop. (1981) town, 47,736; metropolitan area, 48,027; district, 586,982.

Būndi painting, important school of the Rājasthanī style of Indian miniature painting that developed from the 17th to the end of the 19th century in the princely state of Būndi and its neighbouring principality of Kotah (both in the present state of Rājasthān). The earliest examples (*c.* 1625) show Rājasthanī features, particularly in the depiction of men and women, but Mughal influence is exceptionally strong. In richness and brilliance Būndi painting has an affinity also with painting of the Deccan, an area with which the rulers of Būndi and Kotah were often in contact.



A lady playing with an antelope, Būndi miniature painting, late 18th century; in a private collection
P. Chandra

The Būndi school is characterized by a fondness for lush vegetation, dramatic night skies, a distinctive way of depicting water by light swirls against a dark background, and vivid movement. The school reached its peak during the first half of the 18th century but continued to flourish into the 19th century and had a brilliant phase at Kotah during the reign of Rām Singh II (1828–66). These vigorous paintings depict royal tiger hunts in the thick and hilly jungle of the region and various aspects of the life of the king.

Bundy, McGeorge (b. March 30, 1919, Boston), U.S. public official and educator who was one of the principal architects of U.S. foreign policy in the administrations of presidents John F. Kennedy and Lyndon B. Johnson.

Bundy was born of a prominent New England family; his father, Harvey H. Bundy, served as assistant secretary of state under Henry L. Stimson in the administration of Pres. Herbert Hoover. He received his B.A. from Yale in 1940 and became a junior fellow at Harvard in 1941. During World War II, he served as an intelligence officer and participated in the planning of the invasion of western Europe. After the war he worked closely with Stimson in preparing the latter's memoirs, *On Active Service in Peace and War* (1948). In 1949 he joined the department of government at Harvard, becoming dean of arts and sciences in 1953. He supported Kennedy for president in 1960 and was made special assistant for national security affairs in the new administration, a post he retained in the Johnson administration. Under Johnson he played a major role in the decision to send U.S. troops to the Dominican Republic in 1965 and was deeply involved in the formulation of U.S. policy in Vietnam, urging the 1965 bombing of North Vietnam. Later, however, after he had left government service, he advised Johnson against further escalation of the war. He resigned in early 1966 to become president of the Ford Foundation, a position he held until 1979. From 1979, he was a professor of history at New York University.

Bundy edited *Patterns of Responsibility* (1952) and is the author of *The Strength of Government* (1968).

bungalow, single-storied house with a sloping roof, usually small and often surrounded by a veranda. The name derives from an Indian word meaning "a house in the Bengali style" and came into English during the era of the British administration of India. In Great Britain the name became a derisive one because of the spread of poorly built bungalow-type houses there.

The style, however, gained popularity in housing developments of U.S. towns during the 1920s. Its general design—with high ceilings, large doors and windows, and shade-giving eaves or verandas—makes it especially well suited for hot climates, and bungalows are still frequently built as summer cottages or as homes in warm regions such as southern California.

Bunge, Nikolay Khristyanovich (b. Nov. 23 [Nov. 11, old style], 1823, Kiev, Ukraine, Russian Empire—d. June 15 [June 3, O.S.], 1895, Tsarskoe Selo, near St. Petersburg), liberal Russian economist and statesman. As minister of finance (1881–87), he implemented a number of reforms aimed at modernizing the Russian economy, notably changes in the tax laws estimated to have reduced the tax burden on the peasantry by one-fourth.

A lawyer and scholar, Bunge held various academic posts, becoming rector of the University of Kiev in 1859. His writings on serfdom and finance attracted the attention of the government, and after 1859 he served in several official positions, becoming assistant minister of finance for trade in 1878.

As finance minister, Bunge attempted to upgrade and expand the Russian railroad system, purchasing some failing private lines and urging the construction of new routes. During his tenure rolling stock was standardized, and rates and schedules were coordinated.

An administrator of Gosbank, the Russian state bank, Bunge advocated measures intended to strengthen the Russian banking system. He organized the Peasants' Land Bank in 1883 to enable peasants to purchase land. The undercapitalized bank enjoyed only marginal success, however. Bunge also implemented several labor laws, including measures restricting child labor. An opponent of Marxism, Bunge is regarded as a bourgeois reformer by Soviet historians.

Bungorō: *see* Tani Bunchō.

Bungu (people): *see* Bongo.

Bunin, Ivan Alekseyevich (b. Oct. 22 [Oct. 10, old style], 1870, Voronezh, Russia—d. Nov. 8, 1953, Paris), poet and novelist, the

first Russian to receive the Nobel Prize for Literature (1933) and one of the best of Russian stylists.

Bunin
Novosti Press Agency

While working as a journalist and clerk Bunin wrote and translated poetry; his first volume of verse was published in 1891. For his translation of Longfellow's *Hiawatha* he was awarded a Pushkin prize in 1903 by the Russian Academy, which later elected him an honorary fellow (1909). He also translated Byron's *Manfred* and *Cain.* Bunin, whose poetry has a Parnassian ring, belonged to the post-Pushkin tradition and had no use for modern avant-garde trends. He made his name as a short-story writer with such masterpieces as "Gospodin iz San-Frantsisko," the title piece in one of his collections (1916; Eng. trans. by D.H. Lawrence, S.S. Koteliansky, and Leonard Woolf, *The Gentleman from San Francisco,* 1922). His last book of stories, *Tyomnye alley* (*Dark Avenues,* 1949), was published in 1943. His longer works include *Derevnya* (1910; *The Village,* 1923), *Mitina lyubov* (1925; *Mitya's Love,* 1926), *Zhizn Arsenyeva* ("The Life of Arsenev"), a fictional autobiography (1930; *The Well of Days,* 1933) and its sequel, *Lika* (1939), and two volumes of memoirs, *Okayannye dni* (1926; "The Accursed Days") and *Vospominaniya* (1950; *Memories and Portraits,* 1951). He also wrote books on Tolstoy (*Osvobozhdeniye Tolstogo,* 1937; "Tolstoy's Liberation") and Chekhov, both of whom he knew personally. The latter book, *O Chekhove* ("On Chekhov"), remained unfinished and was published posthumously (1955).

bunion, a bulge covered by thickened skin occurring at the base of the big toe, where friction against the side of the shoe takes place. The protuberance is due to a swelling of the bursa mucosa, a closed sac filled with a clear, lubricating fluid. The bunion forces the toe toward the little toe.

Bunjin-ga (Japanese painting style): *see* Nan-ga.

Bunka-Bunsei period, also called ŌGOSHO PERIOD, in Japanese history, the era from 1804 to 1829, which witnessed an urban cultural scene unmatched since the Genroku period (1688–1704). The austere reforms and sumptuary laws passed under Matsudaira Sadanobu in the late 18th century were soon followed by a period of extravagant luxury led by the 11th Tokugawa shogun Ienari and his administration, known for its financial laxity, graft, and corruption. The lavish habits of the ruling class quickly spread to the populace and further invigorated an urban culture dominated by the flamboyant, pleasure-seeking merchant class. In contrast, the financial position of the shogunate and the domains (or *han, q.v.*) continued to decline in spite of repeated currency debasements. Famines and peasant uprisings occurred more frequently as the period progressed, while initial attempts by Western powers to establish relations with Japan were steadfastly opposed. Ienari, shogun for 50 years, resigned in 1837, but thereafter referred to as Ōgosho, or retired shogun, he continued to rule until his death in 1841.

Bunker Hill, Battle of (June 17, 1775), one of the most important colonial victories early in the U.S. War of Independence. Fought during the Siege of Boston, it lent considerable encouragement to the revolutionary cause.

Within two months after the battles of Lexington and Concord (April 19, 1775), more than 15,000 troops from Massachusetts, Connecticut, New Hampshire, and Rhode Island had assembled in the vicinity of Boston to stop the British army of 5,000 or more stationed there. Gen. Artemas Ward, commander in chief of the Massachusetts troops, served as senior New England officer. There were two obvious points from which Boston was vulnerable to artillery fire: Dorchester Heights, and two high hills, Bunker's and Breed's, in Charlestown (now part of Boston), about a quarter of a mile across the Charles River from the north shore of Boston. By the middle of June, hearing that British general Thomas Gage was about to occupy one of the hills, the colonists decided to fortify it. By the time they were discovered, Col. William Prescott and his men had completed a redoubt atop Breed's Hill (now commonly called Bunker Hill). Despite a cannonade from British men-of-war in the harbour and from a battery across the river in north Boston, the colonists continued to strengthen their position.

Gage then dispatched about 2,300 troops under Maj. Gen. William Howe against Prescott. Landing without opposition under artillery protection, the British were stopped by heavy fire from the colonial troops barricaded behind rail fences that had been stuffed with grass, hay, and brush. On the second or third advance, however, the attackers carried the redoubt and forced the surviving defenders, mostly exhausted and weaponless, to flee. Casualties numbered around 1,000 British and about 450 American soldiers.

If the British had followed this victory with an attack on Dorchester Heights to the south of Boston, it might have been worth the heavy cost. But, presumably because of their severe losses and the fighting spirit displayed by the "rebels," the British commanders abandoned or indefinitely postponed such a plan. Consequently, after Gen. George Washington, who took colonial command two weeks later, had collected enough heavy guns and ammunition to threaten Boston, he was able in March 1776 to seize and fortify Dorchester Heights and compel the British to evacuate Boston and the harbour. Also, the losses inflicted on the British in the Battle of Bunker Hill bolstered the Americans' confidence.

Bunker Island (Pacific Ocean): *see* Jarvis Island.

Bunnag, Chuang: *see* Si Suriyawong, Somdet Chao Phraya.

Bunner, Henry Cuyler (b. Aug. 3, 1855, Oswego, N.Y., U.S.—d. May 11, 1896, Nutley, N.J.), poet, novelist, and editor whose verse and fiction primarily depict the scenes and people of New York City.

Educated in New York City, Bunner served on the staff of the *Arcadian,* at 22 becoming assistant editor and later editor of *Puck* until his death. He developed *Puck* from a new, struggling comic weekly into a powerful social and political organ. Bunner's fiction, particularly *"Made in France"; French Tales Retold with a United States Twist* (1893), reflects the influence of Maupassant and other French writers.

Bunner published several novels, but these are considered inferior to his stories and sketches, which include *Short Sixes* (1890), *More Short Sixes* (1894), *In Partnership* (with Brander Matthews, 1884), *Zadoc Pine* (1891), *Love in Old Cloathes* (1896), and *Jersey Street and Jersey Lane* (1896). As a playwright he is known chiefly for *Tower of Babel* (1883). Collections of his verse, which has been praised for its technical dexterity, playfulness, and smoothness of finish, include *Airs from Arcady and Elsewhere* (1884), *Rowen* (1892), and *Poems* (1896).

Articles are alphabetized word by word, not letter by letter

bunraku, Japanese traditional puppet theatre in which nearly life-size dolls act out a chanted dramatic narrative, called *jōruri,* to the accompaniment of a small samisen (three-stringed Japanese lute).

Puppetry appeared around the 11th century with *kugutsu-mawashi* ("puppet turners"), gypsy-like wanderers whose art may have come from Central Asia. Until the end of the 17th century, the puppets were still primitive, having neither hands nor feet. Before the 18th century the puppet manipulators remained hidden; after that time they emerged to operate in the open. Dolls now range in height from one to four feet; they have heads, hands, and feet of wood and, although bodiless, are elaborately costumed. Principle dolls require three manipulators. The chief handler, wearing 18th-century dress, operates the head and right hand, moving the eyes, eyebrows, lips, and fingers. Two helpers, dressed and hooded in black to make themselves invisible, operate the left hand and the feet. The puppeteer's art requires long training to achieve perfect synchronization of movement and thoroughly lifelike actions and portrayal of emotions in the dolls. In the 18th century, *bunraku,* named for the puppet master Uemura Bunrakuken, reached its height with the plays of Chikamatsu Monzaemon. Later it declined because of the lack of excellent *jōruri* writers. One traditional *bunraku* theatre, the Asahi-za (orginally called the Bunraku-za), founded in 1837, survives in Ōsaka as one of the city's chief attractions. The troupe periodically appears in Tokyo. *See also* jōruri.

Bunsei (fl. mid-15th century, Japan), Zen Buddhist artist whose seal appears on five re-

Portrait of Yuima Koji by Bunsei (inscription not reproduced here), ink on paper, 1457; in the Museum Yamato Bunkakan, Nara, Japan
By courtesy of the International Society for Educational Information, Tokyo

markable paintings, strong evidence that he painted them. Two of the paintings are official portraits of monks associated with the Daitoku-ji in Kyōto. They were painted *c.* 1450 and are located in the temple. The other three paintings are a landscape in the Boston Museum of Fine Arts; an ink painting of the semi-legendary Indian sage Vimalakīrti, who is called Yuima Koji by the Japanese (1457; in the Yamato Bunkakan in Nara); and a boldly executed ink drawing of the legendary three monks from a Buddhist tale "The Laughers of Tiger Valley." From the late 17th century until the second half of the 20th century Bunsei was confused with the priest-painter Taikō Josetsu (late 14th and early 15th centuries); it is now widely believed that he was a priest at the Daitoku-ji and a pupil of Tenshō Shūbun, a prominent 15th-century priest-painter who also resided at the Daitoku-ji.

Bunsen, Christian Karl Josias, Freiherr von (baron of) (b. Aug. 25, 1791, Korbach, Waldeck, Ger.—d. Nov. 28, 1860, Bonn), liberal Prussian diplomat, scholar, and theologian who supported the German constitutional movement and was prominent in the ecclesiastical politics of his time.

Educated at various German universities in modern, ancient, and Oriental languages, theology, and law, Bunsen followed his mentor, Barthold Georg Niebuhr, to Rome when Niebuhr was appointed Prussian minister to the Vatican in 1816. He succeeded to this post in 1824 and, with his gifted English wife, made the Prussian legation into a centre for the German cultural circle in Rome, where he also helped to found the archaeological institute. His attempt to resolve the conflict between Prussia and the papacy over mixed marriages, however, foundered on the Pope's intransigence and he was recalled in 1838. After a short interval as minister to Switzerland (1839–41), Bunsen was appointed minister to England, the most important post in the Prussian foreign service at that time. In London he worked for closer cooperation between England and Prussia, supported a German constitution in 1848–49, tried to ease the tension between the two powers over the Schleswig-Holstein issue, and attempted to bring Prussia into the Western alliance after the outbreak of the Crimean War. Conservatives at the Prussian court opposed to an anti-Russian alliance forced his recall in 1854.

Christian Bunsen, detail from a lithograph, 1831

By courtesy of the Staatsbibliothek, West Berlin

Bunsen published a number of important scientific and religious works. His best known work, *Die Zeichen der Zeit,* 2 vol. (1855; *Signs of the Times,* 1856), defended religious and personal freedom at a time when reaction was triumphant in Europe.

Bunsen, Robert Wilhelm (b. March 31, 1811, Göttingen, Kingdom of Westphalia—d. Aug. 16, 1899, Heidelberg, Baden), German chemist who, with Gustav Kirchhoff, about 1859 observed that each element emits a light of characteristic wavelength. These studies opened the field of spectrum analysis, which became of great importance in the study of the Sun and stars, and also led Bunsen almost immediately to his discovery of two alkali-group metals, cesium and rubidium.

After taking his Ph.D. in chemistry at Göttingen (1830), Bunsen taught at the universities of Marburg and Breslau and elsewhere. As professor at Heidelberg (1852–99) he built up an excellent school of chemistry. Never married, he lived for his students, with whom he was very popular, and his laboratory. He chiefly concerned himself with experimental and analytical work.

He found an antidote to arsenic poisoning in freshly precipitated, hydrated ferric oxide (1834). In 1837 he began his only notable venture into organic chemistry with a study of the highly toxic, arsenic-containing compound cacodyl. During six years of work with it he lost the sight in one eye from an explosion and nearly killed himself from arsenic poisoning. His research led to profitable studies of organometallic compounds by his student Edward Frankland. Eventually, Bunsen barred organic research in his laboratory.

Bunsen's studies of the composition of gases given off from blast furnaces showed that 50 to 80 percent or more of the heat was wasted and led to elaboration of his methods of measuring volumes of gases in his only publication, Gasometrische Methoden (1857).

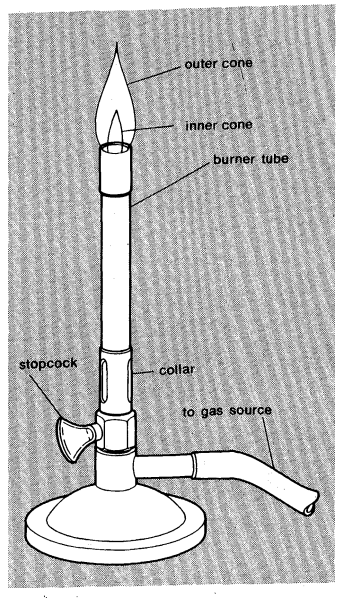
Robert Bunsen, 1896

Historia-Photo

In 1841 he invented the carbon-zinc electric cell known by his name. To measure the light produced by it, he developed the grease-spot photometer (1844). He was the first to obtain magnesium in the metallic state and study its physical and chemical properties, demonstrating the brilliance and reaction-producing (actinic) qualities of the flame when magnesium is burned in air.

Bunsen also invented the filter pump (1868), the ice calorimeter (1870), and the vapour calorimeter (1887). Though he is generally credited with the invention of the Bunsen burner, he seems to have contributed to its development only in a minor way.

Bunsen burner, device for combining a flammable gas with controlled amounts of air before ignition; it produces a hotter flame than would be possible using the ambient air and gas alone. Named for Robert Bunsen, the German chemist who introduced it in 1855 (from a design by Peter Desdega or Michael Faraday), the Bunsen burner was the forerunner of the gas-stove burner and the gas furnace. The Bunsen burner consists of a metal tube on a base with a gas inlet at the lower end of the tube, which may have an adjusting valve; openings in the sides of the tube can be regulated by a collar to admit as much air as desired. The mixture of air and gas (optimally about 1 part gas to 3 parts air) is forced by gas pressure to the top of the tube, where it is ignited with a match. It burns with a pale blue flame, the primary flame, seen as a small inner cone, and a secondary, almost colourless flame, seen as a larger, outer cone, which results when the remaining gas is completely oxidized by the surrounding air.

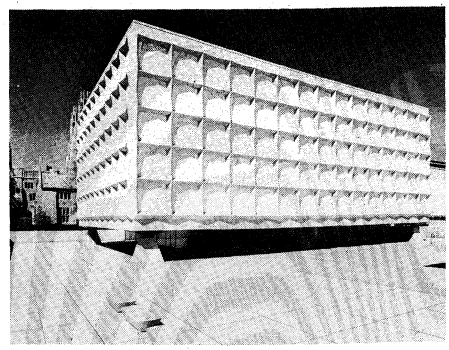


Bunsen burner

The hottest part of the Bunsen flame, which is found just above the tip of the primary flame, reaches about 1,500° C (2,700° F). With too little air, the gas mixture will not burn completely and will form tiny carbon particles that are heated to glowing, making the flame luminous. With too much air the flame may burn inside the burner tube; that is, it may strike back. The Meker and Fisher burners, variations of the original Bunsen burner, have metallic grids to increase the turbulence of the mixture and keep the flame at the top of the tube. The Fisher burner uses forced air. There is no secondary flame dependent on surrounding air, because these improvements introduce sufficient air for complete combustion, and the heat of the primary flame is augmented.

Bunshaft, Gordon (b. May 9, 1909, Buffalo), U.S. architect whose design of Lever House (New York City, 1952) exerted a strong influence in American architecture.

Educated at the Massachusetts Institute of Technology, Cambridge, Bunshaft later travelled and studied in Europe and North Africa on a fellowship. He joined the firm of Skidmore, Owings & Merrill in 1937, becoming a partner in 1949. His Lever House, showing the influence of Mies van der Rohe, applied the concept of curtain-wall construction and



Beinecke Rare Book and Manuscript Library at Yale University, designed by Bunshaft, 1963

By courtesy of Yale News Bureau, New Haven, Conn.; photograph, Alburtus

open-site planning to the tall office building. His Connecticut General Life Insurance Company headquarters (Bloomfield, 1957) is in the same style. Later buildings show a departure from the Miesian ideal, beginning with the Beinecke Rare Book & Manuscript Library, Yale University (1963), and reaching a climax with the low, horizontal travertine Lyndon Baines Johnson Library and Research Building, University of Texas (Austin, 1971). He also designed the Hirshhorn Museum and Sculpture Garden (Washington, D.C., 1974). Bunshaft's buildings outside the United States include the Banque Lambert of Brussels (1965) and the remarkable design of the Haj Terminal and Support Complex at the Jidda International Airport (Jidda, Saudi Arabia, 1981).

bunt, also called STINKING SMUT, disease of wheat, rye, and other grasses caused by the fungus *Tilletia.* Normal kernels are replaced by smut "balls" containing powdery masses of brownish-black spores having a dead-fish odour. Two forms of bunt infect wheat: dwarf bunt, caused by *Tilletia caries,* results in plants a fourth or half normal size; common bunt (*T. foetida*) normally stunts wheat only a few inches. Smut balls break open and contaminate healthy kernels during harvest. Bunt spores may remain alive in dry soil for several years. Seedling infection occurs shortly after kernels germinate in cool, fairly dry soil. At maturity, a mass of smut spores (teliospores) replaces the entire kernel. Bunt is controlled by using smut-free, fungicide-treated seed of resistant varieties. Carboxin (Vitavax) seed treatment is effective against both soil- and seed-borne bunt spores.

bunting, any of about 37 species of seed-eating birds of the Old World genus *Emberiza* and certain other birds of similar appearance. Most belong to the subfamily Emberizinae of the family Fringillidae (sometimes Emberizidae). Examples are the corn bunting (*E. calandra*) and the reed bunting (*E. schoeniclus*),

Painted bunting (*Passerina ciris*)
Donald D. Burgess from E.R. Degginger—EB Inc.

both breeding commonly in temperate Eurasia. Notably tame is the striolated, or striped, bunting (*E. striolata*), distributed from northern Africa (where it is called house bunting) to India. Most members of the genus are recognized by their strong head patterns.

Also in Emberizinae are the snow bunting (*Plectrophenax nivalis*), breeding circumpolarly in the far north, and the lark bunting (*Calamospiza melanocorys*) of the U.S. Great Plains.

The name bunting is also given in the U.S. to species of *Passerina,* a genus of the allied fringillid subfamily Cardinalinae (*q.v.*). Examples are the indigo bunting (*P. cyanea*) and the painted bunting (*P. ciris*); the male of the latter species is the gaudiest bird—red, green, and blue—breeding in the U.S. For ortolan bunting *see* ortolan; for yellow bunting *see* yellow-hammer.

Buntline, Ned: *see* Judson, E(dward) Z(ane) C(arroll).

Buñuel, Luis (b. Feb. 22, 1900, Calanda, Spain—d. July 29, 1983, Mexico City), Spanish director and filmmaker, noted especially for his early Surrealist films and for his work in the Mexican commercial cinema. He is distinguished for his highly personal style and controversial obsession with social injustice, religious excess, gratuitous cruelty, and eroticism.

Life. Buñuel was born in northeastern Spain, the eldest of seven children. From his father, Leonardo Buñuel, a businessman, who

Buñuel
Camera Press

had left home at the age of 14 to join the army and fight in Cuba in the Spanish-American War (1898), Luis inherited an adventurous spirit. He excelled at school, in Zaragoza, spending only his holidays in his hometown. He was good at sports, such as boxing, and also played the violin well. He attended a Jesuit college in Zaragoza, until at 17 he entered the University of Madrid, where he became a friend of the painter Salvador Dalí and the poet Federico García Lorca. In 1920 Buñuel founded the first Spanish movie club and wrote critiques of the films shown there.

Having discovered Freudian psychoanalysis and having broken away from religion, he went to Paris in 1925 and entered film-producing circles, feeling that film would become his true medium of expression. In 1926 he became an assistant director, and in 1928 he directed his first picture, *Un Chien andalou* (*An Andalusian Dog*), in collaboration with Dalí. It created a sensation: at a time when movies tended to be dominated by the natural and the literal, Buñuel discovered the cinema of instinct, which issued through him from the Surrealist movement.

His next two films—*L'Âge d'or* (1930; *The Golden Age*), a radically anticlerical and antibourgeois film made in France, and *Las Hurdes* (1932; *Land Without Bread*), a documentary about a particularly wretched region of Spain—asserted his concern with the freedom to dream and to imagine, his revolutionary attitude toward social problems, his aggressive sense of humour, and his rejection of traditional logic.

In Spain, Buñuel acted as producer of a number of commercial films in an attempt to build a native industry. When the Spanish Civil War began in 1936 he volunteered to the Republican government in Paris, and in 1938, he acted as a technical adviser for two Hollywood films about the Spanish Republic. In the United States, he experienced his greatest difficulties. He did some film editing and worked briefly for the Museum of Modern Art, in New York City, until it became known that he had directed the atheistic *L'Âge d'or,* and he was allegedly forced to resign. In 1947 he settled in Mexico with his wife and two sons.

There his career was reinvigorated; he directed two pictures designed to have box-office appeal, into which he introduced one or two freely creative sequences. The success of one of these, *El gran calavera* (1949; *The Great Madcap*), allowed him to make a personal film, *Los olvidados* (1950; *The Young and the Damned*). This fascinating and sympathetic study of slum youths reestablished his reputation as a director of note.

Buñuel exercised more and more freedom in allowing the "free" sequences to invade otherwise conventional films, and his own blasphemous but tender world reappeared more often. Soon all his films, even those imposed upon him by producers, such as *Robinson Crusoe* (1952), rendered the Buñuelian universe—a dreamland in which strange and unwonted happenings occur. Poetry is combined with an aggressiveness, born of tenderness, in his work. His great films from this Mexican period include *Ensayo de un crimen* (1955; *The Criminal Life of Archibaldo de la Cruz*) and *Nazarín* (1958), about an unworldly priest.

In 1960 Buñuel was allowed to return to Spain to make *Viridiana* (1961); the Spanish authorities, however, found the completed film to be anticlerical and tried to suppress it. Nonetheless, it was smuggled out to be shown at the Cannes Festival, where it was awarded the top prize. In 1962, in Mexico, he made another major work, *El ángel exterminador* (*The Exterminating Angel*), about a formal dinner party from which the guests find themselves powerless to depart; it too was interpreted as having powerful anticlerical connotations.

By then acclaimed throughout the world, Buñuel was again free to make films as he chose, as he had not been since his first period in France. His next film, *Le Journal d'une femme de chambre* (1964; *The Diary of a Chambermaid*), was his most overtly political film, wherein the turn-of-the-century story of the decadent French aristocracy is updated and transformed into a metaphor for the growth of Fascism. The 42-minute *Simón del desierto* (1965; *Simon of the Desert*), concerning the temptations of anchorite Simeon Stylites, and *Belle de jour* (1967), about the fantasies of a middle-class woman, though quite different in narrative, explore some of the central themes in Buñuel's work.

His better known, later films—including *Tristana* (1970), *Le Charme discret de la bourgeoisie* (1973; *The Discreet Charm of the Bourgeoisie*), and *Cet obscur objet du désir* (1977; *That Obscure Object of Desire*)—also reflect Buñuel's concern with dream and reality, the confusion of true and false, the untrustworthiness of the foundations of social structure, and the nature of obsession itself. His autobiography, *My Last Sigh* (originally published in French), was published in 1983.

Assessment. Probably the most controversial of filmmakers, Buñuel owed his fame to his absolute sincerity. Ignoring fashions and conventions, he pursued his career in his native Spain, in France, in the United States, and in Mexico for more than a half century, mostly working within the limitations of the film industry. Yet, no other filmmaker has been more personal, more frank in expressing his own obsessions as evidently in his first film as in his last. (A.Ky./Ed.)

MAJOR WORKS. *Un Chien andalou* (1928; *An Andalusian Dog*); *L'Âge d'or* (1930; *The Golden Age*); *Las Hurdes* (1932; *Land Without Bread*); *Los olvidados* (1950; *The Young and the Damned*); *Robinson Crusoe* (1952); *Él* (1952); *Ensayo de un crimen* (1955; *The Criminal Life of Archibaldo de la Cruz*); *Nazarín* (1958); *Viridiana* (1961); *El ángel exterminador* (1962; *The Exterminating Angel*); *Le Journal d'une femme de chambre* (1964; *The Diary of a Chambermaid*); *Simón del desierto* (1965; *Simon of the Desert*); *Belle de jour* (1967); *La Voie lactée* (1969; *The Milky Way*), *Tristana* (1970); *Le Charme discret de la bourgeoisie* (1973; *The Discreet Charm of the Bourgeoisie*); *Le Fantôme de la liberté* (1974; *The Phantom of Liberty*); *Cet obscur objet du désir* (1977; *That Obscure Object of Desire*).

BIBLIOGRAPHY. Adonis Kyrou, *Luis Buñuel,* 4th French ed. (1970; Eng. trans. 1963); Raymond Durgnat, *Buñuel* (1967; rev. and enl. ed. 1977); Freddy Buache, *Luis Buñuel* (1970; reissued 1980), in French, and *The Cinema of Luis Buñuel* (1973); Alan Lovell, *Anarchist Cinema* (1975); Francisco Aranda, *Luis Buñuel: A Critical Biography* (1975; originally published in Spanish, 1969); Joan Miller (ed.), *The World of Luis Buñuel: Essays in Criticism* (1978); Virginia Higginbotham, *Luis Buñuel* (1979). Buñuel's works have been amply studied in general publications dealing with different aspects of the cinema. His Surrealist character is analyzed by J.B. Brunius, Buñuel's assistant in the production of *L'Âge d'or,* in *En Marge du cinéma français* (1954). Adonis Kyrou, *Le Surréalisme au cinéma* (1963), places Buñuel's works in the Surrealist context of the 1920s and 1930s. Buñuel wrote fascinating film reviews in the periodical *Cahiers d'Art* in 1927, and poetical texts by him appeared in Surrealist magazines of that time: "Une Girafe," a poem in prose, in *Le Surréalisme au Service de la Révolution* (May 15, 1933), and "Réponse à une questionnaire sur l'amour," in *La Révolution Surréaliste* (Dec. 15, 1929).

bunya pine (*Araucaria bidwillii*), large evergreen conifer of the family Araucariaceae, native to Australia but used in the sapling stage as a houseplant in many areas. The thick, resinous bark covers a cream-coloured wood used for veneers, plywood, and boxes.

Bunyan, John (b. November 1628, Elstow, Bedfordshire, Eng.—d. Aug. 31, 1688, London), celebrated English minister and preacher, author of *The Pilgrim's Progress* (1678), the book that was the most characteristic expression of the Puritan religious outlook. His other works include doctrinal and controversial writings; a spiritual autobiography, *Grace Abounding* (1666); and the allegory *The Holy War* (1682).

John Bunyan, pencil drawing on vellum by Robert White; in the British Museum

By courtesy of the trustees of the British Museum

Early life. Bunyan, the son of a brazier, or travelling tinker, was brought up "among a multitude of poor plowmen's children" in the heart of the agricultural midlands. He learned to read and write at a local grammar school, but he probably left school early to learn the family trade. Bunyan's mind and imagination were formed in these early days by influences other than those of formal education. He absorbed the popular tales of adventure that appeared in chapbooks and were sold at fairs like the great one held at Stourbridge near Cambridge (it provided the inspiration for Vanity Fair in *The Pilgrim's Progress*). In these works, such as *Bevis of Hampton* and *The Seven Champions of Christendom,* the heroes of medieval romance entered the lives of the common people. He also became acquainted with the varied popular literature of the English Puritans: plain-speaking sermons, homely moral dialogues, books of melodramatic judgments and acts of divine guidance, and Foxe's *Book of Martyrs* with the fearsome woodcuts of the Elizabethan edition. Above all he steeped himself in the English Bible; the Authorized Version was but 30 years old when he was a boy of 12. As a child whose parents were "of the national church," he was not cut off by a narrow piety but brought up on the general store of country lore and tradition. He had seen the shot bird tumble headlong from the tree; his mind was stocked with proverbs: both visual experience and popular saying were to go into his later works.

Bunyan speaks in his autobiography of being troubled by terrifying dreams. It may be that there was a pathological side to the nervous intensity of these fears; in the religious crisis of his early manhood his sense of guilt took the form of delusions. But it seems to have been abnormal sensitiveness combined with the tendency to exaggeration that caused him to look back on himself in youth as "the very ringleader of all . . . that kept me company into all manner of vice and ungodliness."

In 1644 a series of misfortunes separated the country boy from his family and drove him into the world. His mother died in June, his younger sister Margaret in July; in August his father married a third wife. The Civil War had broken out, and in November he was mustered in a parliamentary levy and sent to reinforce the garrison at Newport Pagnell. The governor was Sir Samuel Luke, immortalized as the Presbyterian knight of the title in Samuel Butler's *Hudibras.* In Newport Bunyan remained until July 1647; it is likely that he saw little fighting, though once when he was "drawn out to go to such a place to besiege it" (probably Leicester), a comrade took his place and was shot, so that later he felt he had been preserved by Divine Providence.

His military service, even if uneventful, brought him in touch with the seething religious life of the left-wing sects within Cromwell's army, the preaching captains, and those Quakers, Seekers, and Ranters who were beginning to question all authority except that of the individual conscience. Luke had trouble with many such religious agitators passing through his garrison; in this atmosphere Bunyan became acquainted with the leading ideas of the Puritan sectaries, shared alike by Cromwell and his meanest trooper. They believed that the striving for religious truth meant an obstinate search, relying on free grace revealed to the individual, and condemning all forms of public organization.The devotion of the New Model Army left an indelible impression on him; it is recalled in *The Holy War* in the preaching, drilling captains of Emanuel's army, Credence and Boanerges.

Some time after his discharge from the army (in July 1647) and before 1649, Bunyan married. He says in his autobiography, *Grace Abounding,* that he and his first wife "came together as poor as poor might be, not having so much household-stuff as a dish or spoon betwixt us both." His wife came from a godly family, and she brought to him as her dowry two evangelical books, Arthur Dent's *The Plain Man's Path-Way to Heaven* and Lewis Bayly's *The Practice of Piety;* the former taught him that even a religious tract could employ racy colloquialisms and salt its precepts with homely proverbs. Their first child, a blind daughter, Mary, was baptized in July 1650. Three more children, Elizabeth, John, and Thomas, were born to Bunyan's first wife before her death in 1658. Elizabeth, too, was baptized in the parish church there in 1654, though by that time her father had been baptized by immersion as a member of the Bedford Separatist church.

Conversion and ministry. Bunyan's conversion was a gradual process in the years following his marriage (1650–55); it is dramatically described in his autobiography. After an initial period of legal conformity in which he went regularly to church and looked with awe at the "priest" and his "vestments" (probably at this period a plain Geneva gown), he gave up, slowly and grudgingly, his favourite recreations of dancing and bell ringing and sports on the village green and began to concentrate on his inner life. Then came agonizing temptations to spiritual despair lasting for several years. The "storms" of temptation, as he calls them, buffeted him with almost physical violence; voices urged him to blaspheme; the texts of Scriptures, which seemed to him to threaten damnation, took on personal shape and "did pinch him very sore." Finally one morning he believed that he had surrendered to these voices of Satan and had betrayed Christ: "Down I fell as a bird that is shot from the tree." In his psychopathic isolation he presents all the features of the divided mind of the maladjusted as they have been analyzed in the 20th century; Bunyan, however, had a contemporary psychological instrument for the diagnosis of his condition, the pastoral theology of 17th-century Calvinism, which interpreted the grim doctrine of election and predestination in terms of the real needs of souls, the evidence of spiritual progress in them, and the covenant of God's grace. Both techniques, that of the modern analyst and that of the Puritan preacher, have in common the aim of recovering the integrity of the self; and this was what Bunyan achieved as he emerged, from his period of spiritual darkness, gradually beginning to feel that his sin was "not unto death" and that there were texts to comfort as well as to terrify. He was aided in his recovery by association with the Bedford Separatist church and its dynamic leader, John Gifford. He entered into full communion in about 1655.

The Bedford community practiced adult Baptism by immersion, but unlike the strict Baptists it did not insist on this as a condition of church membership; its position was closer to that of modern Congregationalists: it was an open-communion church, admitting all who professed "faith in Christ and holiness of life."

Bunyan soon proved his talents as a lay preacher. Fresh from his own spiritual troubles, he was fitted to warn and console others: "I went myself in Chains to preach to them in Chains, and carried that Fire in my own Conscience that I persuaded them to beware of." He was also active in visiting and exhorting church members, but his main activity in 1655–60 was in controversy with the early Quakers, both in public debate up and down the market towns of Bedfordshire and in his first printed works, *Some Gospel Truths Opened* (1656) and *A Vindication of Some Gospel Truths Opened* (1657). The Quakers and the open-communion Baptists were rivals for the religious allegiance of the "mechanics", or small tradesmen and artificers, in town and country; much alike in class attitude, stress on salvation by free grace, and separation from the world, they were divided, apart from the strains of evangelical competition, by the Friends' doctrine of the inner light. Bunyan's passionate conviction was always expressed in an orthodox, objective theology with a clear frontier drawn between the realms of God and man. This explains the violence of his protest against what seemed to him the dangerously blurred and self-centred mysticism of the Quaker preacher Edward Burrough. He soon became recognized as a leader among the sectaries.

The Restoration of Charles II brought to an end the 20 years in which the separated churches had enjoyed freedom of worship and exercised some influence on government policy. On Nov. 12, 1660, at Lower Samsell in South Bedfordshire, Bunyan was brought be-

fore a local magistrate and, under an old Elizabethan act, charged with holding a service not in conformity with those of the Church of England. He refused to give an assurance that he would not repeat the offense, was condemned at the assizes in January 1661, and was imprisoned in the county jail. In spite of the courageous efforts of his second wife (he had married again in 1659) to have his case brought up at the assizes, he remained in prison for 12 years. A late 17th-century biography, added to the early editions of *Grace Abounding,* reveals that he relieved his family by making and selling "long Tagg'd laces"; prison conditions were lenient enough for him to be let out at times to visit friends and family and to address meetings.

Literary activity. During this imprisonment Bunyan wrote and published his spiritual autobiography (*Grace Abounding,* 1666). In the effort to recall the state of his soul with accuracy and honesty he achieved a remarkable prose instrument for subjective analysis. He describes his inner life in a style rich in powerful physical imagery; the text that seemed to spell out his damnation "stood like a mill-post at my back." The imaginative vitality of his subsequent work, *The Pilgrim's Progress,* springs from a blending of the musical flow of this dreamlike, introspective style with the popular sermon style of the "mechanic preacher," which draws on the common life and culture of the countryside; his comparisons always appeal to common experience.

Bunyan's release from prison came in March 1672 under Charles II's Declaration of Indulgence to the Nonconformists. The Bedford community had already chosen him as their pastor in January, "after much seeking God by prayer", and a new meetinghouse was obtained. In May he received a license to preach together with 25 other Nonconformist ministers in Bedfordshire and the surrounding counties. His nickname "Bishop Bunyan" suggests that he became the organizing genius in the area. When persecution was renewed he was again imprisoned for illegal preaching; the circumstances of this imprisonment have remained more obscure than those of the first, though it does not appear to have lasted longer than six months. A bond of surety for his release, dated June 1677, has survived, so it is likely that this second detention was in the first half of that year. Since *The Pilgrim's Progress* was published soon after this, in February 1678, it is probable that he had begun to write it not in the second imprisonment but in the first, soon after the composition of *Grace Abounding,* and when the examination of his inner life contained in that book was still strong.

The Pilgrim's Progress was published by Nathaniel Ponder in 1678. There is an intense life-or-death quality about the story of Christian's pilgrimage through danger and distraction to the Celestial City in this first part of the allegory. Personal experience has been translated into solid characters and presences, the pompous snob Worldly Wiseman, Apollyon the demon, Vanity Fair, the Valley of the Shadow of Death, the smug young man Ignorance, the Delectable Mountains where the pilgrims rest before the final crossing of the River of Death—all these creations have entered fully into the mainstream of the English imagination because they are observed from life with a sharp objective eye, as well as having been germinated in the depths of personal spiritual growth. The book was instantly popular with all classes, though it was perhaps the last great expression of the folk tradition of the common people before the divisive effects of modern enlightened education began to be felt.

Bunyan continued to tend the needs of the Bedford church and the widening group of East Anglian churches associated with it. As his fame increased with his literary reputation, he also preached in Congregational churches in London. In 1672–73 he entered into controversy with William Kiffin and other London Baptists for his open-communion principles. *The Life and Death of Mr. Badman* (1680) is more like a realistic novel than an allegory, giving an insight into the problems of money and marriage when the Puritans were settling down after the age of persecution and beginning to find their social role as an urban middle class.

The Holy War (1682), Bunyan's second allegory, has a carefully wrought epic structure and is correspondingly lacking in the spontaneous inward note of *The Pilgrim's Progress.* The town of Mansoul is besieged by the hosts of the devil, relieved by the army of Emanuel, and later undermined by further diabolic attacks and plots against his rule. The metaphor works on several levels; it represents the conversion and backslidings of the individual soul, as well as the story of mankind from the Fall through to the Redemption and the Last Judgment; there is even a more precise historical level of allegory relating to the persecution of Nonconformists under Charles II. *The Pilgrim's Progress, Second Part* (1684), tells the story of the pilgrimage of Christian's wife, Christiana, accompanied by her children. It gives on the whole a more social and humorous picture of the Christian life than the First Part, but the great concluding passage on the summoning of the pilgrims to cross the River of Death is perhaps the finest single thing in Bunyan.

In spite of his ministerial responsibilities Bunyan found time to publish a large number of doctrinal and controversial works in the last 10 years of his life. He also composed rough but workmanlike verse of religious exhortation; one of his most interesting later volumes is the children's book *A Book for Boys and Girls* (1686), vigorous poems serving as comments on emblematic pictures.

Under James II, when there was a renewal of the persecution of dissenters, Bunyan protected his family by a deed of gift transferring all his property to "my well-beloved wife, Elizabeth Bunyan" (December 1685). When the Protestant Dissenters were being wooed in order that James might obtain toleration for Roman Catholics, Bunyan shrewdly resisted the blandishments of the royal agent Lord Aylesbury, who offered him an official position; at the same time he secured seats for members of his church on the reorganized corporation of Bedford. He died in 1688, in London, after one of his preaching visits; he had ridden out of his way through heavy rain to Reading to settle a quarrel between father and son and contracted a fever. He was buried in Bunhill Fields, the Nonconformists' traditional burying ground.

Reputation. Until the decline of religious faith and the great increase in books of popular instruction in the 19th century, Bunyan, like the Bible, was to be found in every English home and was known to every ordinary reader. In literary estimation, however, he remained beyond the pale of polite literature during the 18th century, though his greatness was acknowledged by Swift and Johnson. After the Romantic movement he was recognized as a type of the natural genius and placed alongside Homer and Robert Burns. Twentieth-century scholarship has made it possible to see how much he owed to the tradition of homiletic prose and to Puritan literary genres already developed when he began to write. But the sublime tinker remains sublime, if less isolated from his fellows than was formerly thought; the genius of *The Pilgrim's Progress* remains valid. Nothing illustrates better the profound symbolic truth of this noted work than its continuing ability, even in translation, to evoke responses in readers belonging to widely separated cultural traditions.

(R.S.)

MAJOR WORKS. *Religious allegories. The Pilgrim's Progress* (1678) and *The Pilgrim's Progress, . . . The Second Part* (1684), published together in modern editions; *The Life and Death of Mr. Badman* (1680); *The Holy War . . . for . . . Mansoul* (1682).

Autobiography. Grace Abounding to the Chief of Sinners (1666); *A Relation of the Imprisonment of Mr. John Bunyan* (1765), included in later editions of *Grace Abounding.*

Theological pamphlets and devotional works. Some Gospel-truths Opened (1656); *Profitable Meditations* (1661?); *The Barren Fig-tree* (1673?); *Instruction for the Ignorant* (1675); *Come and Welcome, to Jesus Christ* (1678); *Solomon's Temple Spiritualiz'd* (1688); *Mr. John Bunyan's Last Sermon* (1689), included in later editions of *The Holy War; An Exposition of the First Ten Chapters of Genesis* (1692).

Verse. A Book for Boys and Girls (1686), retitled *Divine Emblems, or, Temporal Things Spiritualized,* 1724 onward.

BIBLIOGRAPHY. *Editions.* The first collected edition of his works was *The Works of that Eminent Servant of Christ, Mr. John Bunyan,* ed. by C. Doe (1692). Because of copyright difficulties, only vol. 1 of what was to have been a complete edition appeared; 2nd ed., 2 vol. (1736). The standard complete edition is still that by G. Offor, *The Works of John Bunyan,* 3 vol. (1853, 1862). Editions of single works include: *The Pilgrim's Progress,* ed. by J.B. Wharey, rev. by R. Sharrock (1960, rev. ed. 1968); *Grace Abounding,* ed. by R. Sharrock (1962); *The Life and Death of Mr. Badman,* ed. by G.B. Harrison (1928); *The Holy War,* ed. by J.F. Forrest (1967).

Bibliography. F.M.Harrison, *A Bibliography of the Works of John Bunyan,* suppl. to the *Transactions of the Bibliographical Society,* no. 6 (1932).

Biography and criticism. Lord Macaulay in *Critical and Historical Essays,* vol. 1 (1843), a general and biographical essay; J. Brown, *John Bunyan, His Life, Times and Work* (1885; rev. by F.M. Harrison, 1928), a heavily documented life; W.Y. Tindall, *John Bunyan, Mechanick Preacher* (1934), on the background of the sects; H.A. Talon, *John Bunyan (1628–1688) l'homme et l'oeuvre* (1948; Eng. trans. 1951), a French critic's view; R. Greaves, *John Bunyan* (1969), on Bunyan's theology; R. Sharrock, *John Bunyan,* rev. ed. (1968), a concise critical account; R.M. Frye, *God, Man and Satan* (1960), theological comparison of Milton and Bunyan. O.E. Winslow, *John Bunyan* (1961), a straightforward and readable biography; R. Sharrock, *John Bunyan: "The Pilgrim's Progress"* (1966), a critical study.

Bunyan, Paul, giant lumberjack, mythical hero of the lumber camps in the United States, a symbol of bigness, strength, and vitality. The tales and anecdotes that form the Paul Bunyan legend are typical of the tradition of frontier tall tales. Paul and his companions,

Paul Bunyan, illustration by Rockwell Kent from Esther Shephard's *Paul Bunyan,* 1924

From Esther Shephard, *Paul Bunyan* (1924), Harcourt Brace & Co.

Babe the Blue Ox and Johnny Inkslinger, are undismayed by rains that last for months, giant mosquitoes, or adverse geography. The tales describe how Paul, who fashions lakes and rivers at will, created Puget Sound, the Grand Canyon, and the Black Hills. They celebrate the lumbermen's prodigious appetites. Paul's camp stove covers an acre, and his hotcake griddle is so large that it is greased by men using sides of bacon for skates.

A few anecdotes of Paul Bunyan recorded from oral folklore suggest that he was known to lumbermen in Pennsylvania, Wisconsin, and the Northwest before the first Bunyan stories were published by James MacGillivray in "The Round River Drive" (*Detroit News-Tribune,* July 24, 1910). Within 15 years, through popularization by professional writers, Bunyan was transformed from an occupational folk figure into a national legend. Paul was first introduced to a general audience by W.B. Laughead, a Minnesota advertising man, in a series of pamphlets (1914–44) used to publicize the products of the Red River Lumber Company. These influenced Esther Shephard, who wrote of the mythic hero in *Paul Bunyan* (1924). James Stevens, also a lumber publicist, mixed tradition and invention in his version of the story, *Paul Bunyan* (1925). These books restyled Paul's image for a wide popular audience; their humour centred on Paul's gigantism rather than on knowledge of lumbering techniques. The Bunyan legend was further popularized by numerous children's books and by civic festivals held to attract tourists to "Bunyan-land."

Paul Bunyan is the subject of poems by the American poets Robert Frost, Carl Sandburg, and Richard Wilbur and of an operetta by the Anglo-American poet W.H. Auden and the English composer Benjamin Britten.

The pattern of his legend has been imitated to create other occupational prodigies and pseudo folk heroes, such as the Hungarian steelworker Joe Magarac and the pioneer Nebraska wheat farmer Febold Feboldson.

Bunyoro, East African kingdom that flourished from the 16th to the 19th century west of Lake Victoria, in present-day Uganda; it was established by invaders from the north. As cattle keepers the immigrants constituted a privileged caste ruling over the Bantu-speaking agricultural peasantry. The kingdom continued to expand under its priest-kings until about 1800, when it started to lose territory to its neighbour, Buganda. Bunyoro's last ruler, Kabarega, was deposed in 1894 by the British, who favoured Buganda; the kingdom was absorbed into the British protectorate in 1896.

Buol-Schauenstein, Karl Ferdinand, Graf von (count of) (b. May 17, 1797, Regensburg, Ger.—d. Oct. 28, 1865, Vienna), foreign minister (1852–59) of the Habsburg Empire, whose policies led to the estrangement of Russia and the disintegration of the conservative Holy Alliance among Austria, Prussia, and Russia.

Entering the diplomatic service in 1816, Buol was minister ambassador to Baden (1828), Württemberg (1838), Piedmont (1844), Russia (1848), and Great Britain (1851). Following the death of Prime Minister Felix, Fürst zu Schwarzenberg (April 1852), he was appointed minister of foreign affairs and chairman of the council of ministers for the empire. "Sharp, but neither broad nor deep" in the view of Metternich (the leading statesman of an earlier generation), Buol little understood the rising Prussian threat to Austria's supremacy within the German confederation. Determined to sever the "unnatural" Holy Alliance ties with both Prussia and Russia, he attempted to reach an understanding with the two western powers, France and England.

During the Crimean War (1853–56), Buol successfully effected Austrian military occupation of the Danubian principalities (Moldavia and Walachia)—traditionally a Russian sphere of influence—but, failing to persuade the Emperor to enter the conflict against Russia, he had to content himself with an official policy of neutrality. Having secured little more than Austrian political isolation with his approach to the western powers, he was forced from office in May 1859, shortly after the opening of hostilities in Austria's ill-fated war against Piedmont and France.

Buon Me Thuot, also spelled BAN ME THUOT, formerly LAC GIAO, largest city in the central highlands and provincial seat, Dac Lac *tinh* (province), west central Vietnam. At an elevation of 1,759 ft (536 m), it lies at the southern end of the Cao Nguyen (plateau) Dac Lac, 55 mi (89 km) north-northwest of Da Lat. It has teacher-training and vocational schools, hospitals, and a commercial airport. There are coffee, tea, and rubber plantations in the surrounding area. Rice is grown in the Ea (river) Krong valley to the west. The region is dominated by the Cham-speaking Rhade, whom the government began converting to settled farming in the late 1970s.

Buon Me Thuot is linked by highway to Pleiku in the northern central highlands and to Nha Trang on the coast. In 1975 the city was the site of the opening attack of the offensive that resulted in the capitulation of the South Vietnamese government at its capital, Saigon (now Ho Chi Minh City). Pop. (1971 est.) 64,585.

Buonaparte FAMILY: *see* Bonaparte family.

Buonaparte, Carlo Maria (b. March 29, 1746, Ajaccio, Corsica—d. Feb. 24, 1785, Montpellier, Fr.), father of Napoleon I.

Buonaparte took a law degree at the University of Pisa and, after the French conquest of Corsica in 1769, became assessor to the royal court for Ajaccio and the neighbouring districts. His restless and dissatisfied nature led him to press or intrigue for other posts and to embark in risky business enterprises that compromised the fortune of his family for many years to come. In 1764 he married Letizia Ramolino.

Consult the INDEX *first*

Buonaparte, (Maria) Letizia, *née* RAMOLINO, byname MADAME MÈRE (Madam Mother) (b. Aug. 24, 1750, Ajaccio, Corsica—d. Feb. 2, 1836, Rome), mother of Napoleon I by Carlo Maria Buonaparte, whom she married in 1764. Simple and frugal in her tastes and devout in thought, she helped to bind her children to the life of Corsica.

Although she was endowed with immense wealth and distinguished by the title of Madame Mère during Napoleon's years of power, Letizia continued to live mainly in retirement and always in the exercise of a strict domestic economy. After the events of 1814, she joined Napoleon in his exile on the island of Elba. In 1815 she returned with him to Paris during the Hundred Days. After Waterloo she took up her residence at Rome under the protection of Pope Pius VII, who treated her with great kindness. In 1818 she addressed a pathetic letter to the Allies at the congress of Aix-la-Chapelle, petitioning for Napoleon's release on the ground that his mortal illness had removed any possibility of his ever again threatening the world's peace, but the letter remained unanswered. Afterward, saddened by the death of Napoleon, of her daughters Pauline and Élisa, and of several grandchildren, she lived in seclusion.

Buoncompagni, Ugo (pope): *see* Gregory XIII.

Bononcini, Giovanni: *see* Bononcini, Giovanni.

Buontalenti, Bernardo, byname BERNARDO DELLE GIRANDOLE (Fireworks) (b. 1536?, Florence—d. June 25/26, 1608, Florence), Florentine stage designer and theatre architect.

He entered the service of the Medici as a youth and remained there the rest of his life. In the Uffizi Palace, Florence, he built a great court stage, where, during the winter of 1585–86, splendid fetes were produced under his direction. For the Medici extravaganzas, he designed costumes of allegorical characters—nymphs, the planets, gods, dragons, cherubs; he constructed elaborate stage machinery for breathtaking effects; and he arranged spectacular firework displays. Buontalenti also designed palaces, gardens, fortresses, and villas, and practiced military engineering. Important to scenic history are his extant drawings and engravings for intermezzi (*i.e.,* interludes composed of pantomimes with madrigals) in 1589. A brilliant stage technician, he was one of the original innovators of the Baroque theatre and decorative arts.

buoy, floating object anchored at a definite location to guide or warn mariners, to mark positions of submerged objects, or to moor vessels in lieu of anchoring. When used without a descriptive adjective, the term generally denotes a mark for mariners. Special-purpose buoys are designed for a variety of uses, such as cable buoys, anchor buoys, or race buoys. A mooring buoy differs from other types in not being an aid to navigation but a point to which vessels may be tied up. Secured to a permanent group of anchors by a heavy chain, such a buoy serves as a connecting link between the vessel and the anchors. Mooring buoys conserve space in crowded harbours because a moored vessel requires less room to swing with the wind and tide than does a vessel at anchor.

buoyancy, law of (physics): *see* Archimedes' principle.

Buqayq (Saudi Arabia): *see* Abqaiq.

bur cucumber, common name for several tropical climbing plants in the genus *Sicyos,* of the gourd family (Cucurbitaceae). One species (*S. angulatus*), known also as star cucumber, is native to North America. A bur cucumber has sharply lobed leaves, forked tendrils, clusters of five-petalled white flowers that are borne at the ends of long stalks that arise from the leaf axils, and clusters of oval, prickly, single-seeded fruits.

Bur cucumber (*Sicyos*)
Shunji Watari—EB Inc.

The vine is sometimes grown as a screen but can become weedy.

bur gherkin (plant): *see* gherkin.

bur oak, also spelled BURR OAK, also called MOSSY CUP OAK (*Quercus macrocarpa*), North American timber tree belonging to the white oak group of the genus *Quercus* in the beech family (Fagaceae), distributed primarily

throughout the central United States. Often 25 metres (80 feet) tall, the tree may reach 50 m. Its leaves, about 25 centimetres (10 inches) long, are dark green and shiny above, dull and whitish beneath; the wide upper half of each leaf is separated from the narrow lower part by two deep sinuses. Bur oak is also called mossy-cup oak for its heavily fringed acorn cups. It has become a popular ornamental and shade tree in urban areas because of its resistance to insect and fungal attack, drought, and air pollution.

Būr Sa'īd (Egypt): *see* Port Said.

Būr Sūdān (The Sudan): *see* Port Sudan.

burakumin (Japanese: "hamlet people"), also called ETA ("pollution abundant"), outcaste, or "untouchable," Japanese minority, occupying the lowest level of the traditional Japanese social system. The Japanese term *eta* is highly pejorative, but prejudice has tended even to tarnish the otherwise neutral term *burakumin* itself.

Although the class was officially abolished in 1871 (under the Emancipation Act of the Meiji period), vast numbers of *burakumin* continue to live in ghetto-like communities throughout Japan, and many are still relegated to unskilled and poorly paid occupations. Identification as a *burakumin* is often sufficient to prevent or void participation in a marriage, a contract, or employment in any non-*burakumin* occupation. No official census exists, but about 6,000 segregated communities of *burakumin* contain a total population variously estimated at between 1,000,000 and 3,000,000.

Several fanciful theories about their "foreign" origins were once popular; the scholarly consensus is now that the original *burakumin* were simply impoverished Japanese who had drifted into beggary or lowly occupations, especially occupations tabooed by orthodox Shintō and Buddhism (such as leather making) involving the taking of life. During the Tokugawa (Edo) period, beginning in 1603, feudal laws cast the *burakumin* officially into segregated communities and occupations and, by the early 18th century, had forced on them certain badges of status—the wearing of special clothing and hair styles, the avoidance of other households, the observance of curfews, and prostration before their betters.

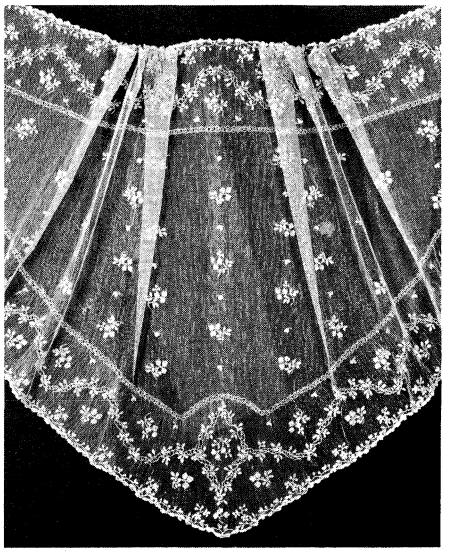
Although the *burakumin* were "freed" in 1871, little was done to implement their freedom (no more, perhaps, than was done for U.S. blacks after the American Civil War). Not until the 20th century did groups of *burakumin* begin organizing for their cause; in 1922 a national organization, Suiheisha (Organization of Levelers), was created, and it engaged in various school boycotts, tax revolts, and other protests until its disbandment in 1941. After World War II, in 1946, a more militant and politically active organization was formed: the Buraku Kaihō Zenkoku Iinkai (All-Japan Committee for Buraku Liberation), which in 1955 was renamed Buraku Kaihō Dōmei (Buraku Liberation League). Its leftist orientation, however, alienated more conservative *burakumin* leaders. Thus in 1960 a rival national organization, Dōwakai (Society for Integration), was founded; it came to be led by Liberal Democratic politicians, some of whom were elected to the national Diet. A third organization, the Zenkoku Buraku Kaihō Undō (All-Japan Buraku Liberation Movement), was formed in 1976.

buran: *see* blizzard.

Buranello, Il (composer): *see* Galuppi, Baldassare.

Burano, northeastern suburb of Venice, Venezia province, northeastern Italy, comprising four islets in the Laguna Veneta (Venice Lagoon). The settlement is thought to have been founded in the 5th century by refugees from nearby Altino, fleeing in the path of Attila. The 16th-century church of S. Martino has paintings by Giovanni Battista Tiepolo. In the 16th century, lacemaking was fostered there, and Venetian point laces, especially the lace known as Punto di Burano, were produced until the late 18th century, when the industry died out. A lacemaking school was founded in 1872 to revive the industry and to combat local poverty, and Burano is now one of the last surviving centres of hand lacemaking. Fishing is also an important economic factor. Pop. (1971) 5,747.

Burano lace, lace made on the island of Burano, near Venice. Until the early 19th century, there had been a Burano lace industry producing copies of 18th-century French lace.

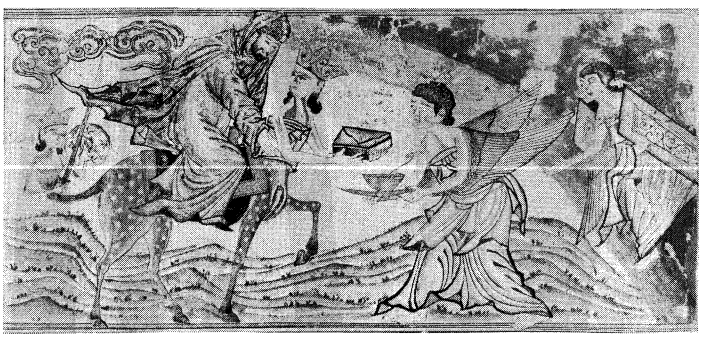


Detail of a Burano lace shawl from the island of Burano, Italy, *c.* 1790–1800
By courtesy of the Rijksmuseum, Amsterdam

By midcentury it was virtually extinct. When in 1872 attempts were made to revive the lace industry to provide relief to the islanders after a ruinous winter, one elderly inhabitant was found who remembered the technique. On this foundation, well supported by patronage, a flourishing lace school was started and successfully copied from the antique. The lace, sold in Venice, is widely exported.

Burāq, in Islāmic tradition, a creature said to have transported the Prophet Muḥammad to heaven. Described as "a white animal, half-mule, half-donkey, with wings on its sides . . . ," Burāq was originally introduced into the story of Muḥammad's night journey (*isrā'*) from Mecca to Jerusalem and back, thus explaining how the journey between the cities could have been completed in a single night. In some traditions he became a steed with the head of a woman and the tail of a peacock. As the tale of the night journey (*isrā'*) became connected with that of Muḥammad's ascension to heaven (*mi'rāj*), Burāq replaced the ladder as Muḥammad's means of access into heaven.

From at least the 14th century, the Burāq myth, visualized on the basis of ancient depictions of griffins, sphinxes, and centaurs, became a favourite subject of Persian miniature painting.



Muḥammad on Burāq, miniature from the *Jāmi 'at-tawārīkh'*; in the University of Edinburgh Library (Arabic MS. 20, fol. 55B)
By courtesy of Edinburgh University Library

Buraydah, town and capital of al-Qaṣīm *minṭaqah* (province), Najd (Central) region, north central Saudi Arabia. It has long been a commercial rival of 'Unayzah to the south, at one time controlling the export of Arab horses and monopolizing the camel caravan trade of Arabia. Now a principal oasis and agricultural centre, it has extensive date, lemon, and orange groves; other fruits are grown, and cattle and sheep are reared on large experimental farms. Pop. (1974) 69,940.

Burbage, Richard (b. *c.* 1567, London—d. March 9/13, 1619, London), English actor, first player of Shakespeare's Richard III, Romeo, Henry V, Hamlet, Macbeth, Othello, and Lear.

The son of the actor and theatre manager and owner James Burbage, Richard had attained wide popularity as an actor by age 20. He was a member of the Earl of Leicester's company and remained with it through its evolution into the King's Men in 1603. He also prospered as a major shareholder in the Globe and Blackfriars theatres, both of which were built by his father. Excelling in

Burbage, oil painting by an unknown artist
By courtesy of the Governors of Dulwich College Picture Gallery, London

tragedy, Burbage was much in demand on the stage and performed in works by Thomas Kyd, Ben Jonson, and John Webster, as well as by Shakespeare. Although short and stout, Burbage was apparently an impressive figure, and there are numerous praises of him in contemporary prose, verse, and plays. Burbage was a painter as well; a painting of a woman at Dulwich College, London, is undoubtedly by him, and the Chandos portrait of Shakespeare has sometimes been attributed to him. Shakespeare was closely associated with him during his career in London and in his will left Burbage a token remembrance.

Burbank, city, Los Angeles County, California, U.S., in the San Fernando Valley. Part of Rancho San Rafael and La Providencia, it was laid out in 1887 by the Providencia Land, Water and Development Company and named for David Burbank, a Los Angeles dentist who had established a sheep ranch there in 1867. An early truck-manufacturing and motion-picture centre, its growth was rapid during the 1940s with the urban expansion of the Los Angeles Metropolitan Area and the development of the Lockheed aircraft and aerospace industries. Walt Disney Productions, Warner Brothers, Columbia Pictures, and the National Broadcasting Company maintain television and movie studios in Burbank. Inc. city, 1911. Pop. (1980) 84,625.

Burbank, Luther (b. March 7, 1849, Lancaster, Mass., U.S.—d. April 11, 1926, Santa Rosa, Calif.), U.S. plant breeder whose prodigious production of useful varieties of fruits,

Burbank

By courtesy of the Hunt Biological Library, Carnegie-Mellon University, Pittsburgh

flowers, vegetables, grains, and grasses encouraged the development of plant breeding into a modern science that has lent valuable assistance to the study of genetics.

Reared on a farm, Burbank received little more than a high school education, but he was profoundly influenced by the books of Charles Darwin, especially *The Variation of Animals and Plants Under Domestication.* At the age of 21 he purchased a 17-acre (7-hectare) tract near Lunenberg, Mass., and began a 55-year plant-breeding career that almost immediately saw the development of the Burbank potato. Selling the rights to the potato for travel fare to California, he settled in Santa Rosa, where he established a nursery garden, greenhouse, and experimental farms that were to become famous throughout the world.

Burbank's breeding methods effected multiple crosses of foreign and native strains in a favourable environment in order to obtain seedlings that he grafted onto fully developed plants for relatively quick appraisal of hybrid characteristics. At all stages of the process he demonstrated an ability for extremely keen observation and the immediate recognition of desirable characteristics, which enabled him to select useful varieties. So profound was this ability that he took the apparent "molding effect" he exercised on his plants as evidence supporting his belief in inheritance of acquired characteristics, even after the publication of Gregor Mendel's principles of heredity in 1901 and the subsequent creation of the science of genetics.

Burbank developed more than 800 new strains and varieties of plants, including 113 varieties of plums and prunes, 20 of which are still commercially important, especially in California and South Africa; 10 commercial varieties of berries; and more than 50 varieties of lilies. He wrote *Luther Burbank, His Methods and Discoveries and Their Practical Applications,* 12 vol. (1914–15); *How Plants Are Trained to Work for Man,* 8 vol., (1921); and a series of descriptive catalogs, *New Creations* (1893–1901). With Wilbur Hall he wrote an autobiography, *Harvest of the Years* (1927).

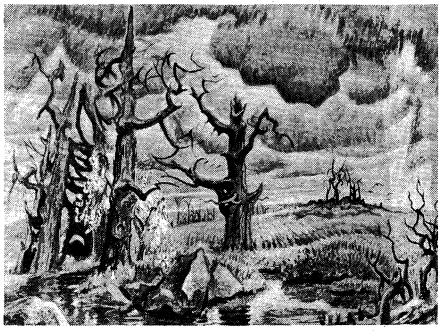
Burbidge, (Eleanor) Margaret, *née* PEACHEY (b. *c.* 1925, Davenport, Cheshire, Eng.), English astronomer and first woman to be appointed director of the Royal Greenwich Observatory. She made notable contributions to the theory of quasars (quasi-stellar sources) and to the understanding of how the elements are formed in the depths of stars through nuclear fusion.

Burbidge served as assistant director (1948–50) and acting director (1950–51) of the Observatory of the University of London. In 1955 her husband, Geoffrey Burbidge, obtained a Carnegie fellowship for astronomical research at the Mount Wilson Observatory, near Pasadena, Calif. Because women were then ineligible for such an appointment, she was forced to accept a minor research post at the California Institute of Technology, Pasadena. In 1957 she became Shirley Farr fellow and, later, associate professor at Yerkes Observatory, Williams Bay, Wis. She served as research astronomer (1962–64) and since then as professor of astronomy at the University of California, San Diego, taking a leave of absence to serve as director of the Royal Greenwich Observatory (1972–73).

Burbidge carried out stellar-spectra research that served as the foundation of the B^2FH theory named for the formulators: the Burbidges, William A. Fowler of the U.S., and Sir Fred Hoyle of Great Britain. This theory provides a revolutionary explanation of the origin of the elements. Her publications include *Quasi-Stellar Objects* (1967), with Geoffrey Burbidge. She was elected a fellow of the Royal Society of London in 1964.

burbot (*Lota lota*), elongated fish of the cod family, Gadidae, and the only member of the family found in freshwater. The burbot lives in cold rivers and lakes of Europe, Asia, and North America. A bottom dweller, it descends as deep as 210 metres (700 feet). A mottled, greenish or brown fish, it may grow about 1.1 metres long. It has very small, embedded scales; a chin barbel; a long anal fin; and two dorsal fins. The burbot is valued as food in some areas.

Burchfield, Charles (Ephraim) (b. April 9, 1893, Ashtabula Harbor, Ohio, U.S.—d. Jan. 10, 1967, Gardenville, N.Y.), U.S. painter known initially for his realistic watercolours of the American scene, and later for his mystically poetic landscapes. From 1912 to 1916 he attended the Cleveland School of Art. He returned to his home in Salem, Ohio, where



"An April Mood," watercolour painting by Charles Burchfield, 1946–55; in the Whitney Museum of American Art, New York City

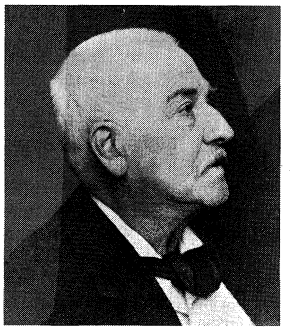
By courtesy of the Whitney Museum of American Art, New York City, gift of Mr. and Mrs. Lawrence A. Fleischman

he had an industrial job and in his spare time painted imaginative watercolours of nature. Following service in World War I, he worked as a wallpaper designer in Buffalo until 1929, when he was able to devote his time to art.

During the 1920s and 1930s Burchfield's work was closely associated with that of the painter Edward Hopper in its stress on the loneliness and harshness of American small towns and cities. In "November Evening" (1931–34; Metropolitan Museum of Art, New York City), for example, weather-beaten buildings convey a mood of stark realism.

After 1940 Burchfield's style changed, and by the mid-1940s he abandoned realism, returning to his early interest in the personal interpretation of nature. His painting emphasized awe and wonder at the colour, movement, and forms of nature, particularly as associated with the seasons. A notable example of his later style was "The Sphinx and the Milky Way" (1946; Munson-Williams-Proctor Institute, Utica, N.Y.).

Burckhardt, Jacob (Christopher), Jacob Christopher also spelled JAKOB CHRISTOPH (b. May 25, 1818, Basel, Switz.—d. Aug. 8, 1897, Basel), one of the first great historians of art and culture, whose *Die Kultur der Renaissance in Italien* (1860; *The Civilization of the*



Jacob Burckhardt, 1892

By courtesy of the Universitats-Bibliothek Basel

Renaissance in Italy, 1878, reprinted 1945) became a model for the treatment of cultural history in general.

Life. Burckhardt was the son of a Protestant clergyman. The thriving Burckhardt family was among the most respected in town. For three centuries some of its members had earned wealth in international trade and the manufacture of silk and with their wealth had gained political power, while others had served the community as professors and pastors. Basel's excellent grammar school provided Burckhardt with a humanistic education. His first studies at the University of Basel, supplemented by a stay in Neuchâtel, were dominated by a devotion to Greek. But, before the philological and increasingly historical orientation of his interests could fully assert itself, Burckhardt spent three years in the study of formal theology. Although he never regretted this concession to the professional traditions of his father and grandfather, Burckhardt took up divinity without a calling and after a prolonged crisis abandoned it, together with the explicit profession of Christian faith. Henceforth, he was always to avoid clarification of his religious position, which may be described as a kind of pantheism. Markedly romantic at first, in later years Burckhardt's religious ideas revealed their classical inspiration and, evincing a profound respect for human destiny, came to underlie his concept of history.

From 1839 to 1843 Burckhardt studied at the University of Berlin, where his talents were acknowledged by two eminent teachers of ancient history, August Boeckh and Johann Gustav Droysen. But it was under the influence of two other professors—Franz Kugler and Leopold von Ranke—that his appreciation of ancient and modern history came into balance in his efforts to comprehend the past as a whole. Art and architecture had fasci-

nated Burckhardt from childhood. Now Franz Kugler provided a formal introduction to the fledgling discipline of art history, which profoundly appealed to the German Romantics. The achievements of painters and architects not only directed Burckhardt's attention toward Italy and the Renaissance; they also helped to reduce law, politics, and diplomacy to a somewhat inferior status in his concept of the past. At Berlin, Burckhardt's developing priorities accounted for an ambiguous relationship with the most famous among all his teachers, Leopold von Ranke. Ranke, the master of diplomatic history, assigned an autonomous and exalted function to statehood and nationhood and consequently cast his lot with Prussian and German nationalism, forces that Burckhardt would later denounce with growing violence. Since Ranke and Burckhardt are often used to illustrate diametrically different approaches to historiography, it is important to note that Burckhardt respected the scholarly achievements of his great teacher, and Ranke recognized and commended the ability of his student. Burckhardt was later offered a chair at Berlin, but he declined it.

After two Berlin winters, Burckhardt spent a summer term at the young and modest University of Bonn, where he passed many of his most romantic and imaginative hours among the circle that met in the home of Gottfried Kinkel, a fellow art historian who had in the past, like Burckhardt, given up theology but would, unlike his Swiss friend, become a leader in the unsuccessful liberal revolution that erupted in Germany in 1848–49, by which time their friendship had cooled completely. Burckhardt's political creed is as hard to define as his religious one. The spirit of his hometown and upbringing was democratic, although tempered with patrician arrogance. His love of freedom was supreme, but he soon came to despise the aspirations of political liberalism in Switzerland and Germany. For Burckhardt 1848–49 was a turning point. Romantic indulgence and political hopes were now dead; his German friends were almost forgotten. With complete concentration he turned to his studies and his teaching. He was a conservative by now, but his conservatism was cultural rather than political. His own time was, he thought, hopelessly superficial. He felt increasingly out of touch with it and concentrated all his energies on reclaiming a past that seemed incomparably deeper and richer. Also in 1849, Margarethe Stehlin, the only woman for whom he ever seems to have had any deep affection, married a Basel banker. He suppressed his feelings without too much difficulty and never again considered marriage, stating that he had no wish to beget children "who would be tutored by a proletarian."

The University of Basel awarded Burckhardt the degree of Ph.D. in absentia, and after his return from Berlin in 1843 he was quickly authorized to give private lectures. Lecture he did, but for two years he had to earn his living as the editor of the *Basler Zeitung,* a conservative daily. In 1846–47 he returned to Berlin to prepare, in conjunction with his friend and teacher Kugler, substantially enlarged new editions of Kugler's two textbooks of art history. The winter of 1847–48 was spent in Rome. Thereafter he resumed his teaching at Basel. The university was small and, on the whole, undistinguished. Burckhardt's lectures, by far the largest component of his life's work and also the most accomplished, were normally delivered before a mere handful of students. Never did his academic audience reach 50; only when he addressed the Basel public at large, as he often did with series of evening lectures, was the attendance more substantial. In 1855 Burckhardt left Basel to teach art history at the newly founded Federal Institute of Technology in Zürich, but in 1858 he returned to his home university and henceforward occupied Basel's only chair of history. For another 20 years, however, he also had to teach in his former grammar school. Only from 1874 could he divide his time evenly between his university lectures in history and art history. From 1886 until his retirement in 1893 he taught art history exclusively. In his courses he covered the entire range of European civilization from ancient Greece to the French Revolution.

Burckhardt, who had learned Italian, in 1837 first crossed the southern frontier of his country, hiking all the way from Basel and back. In the following summer he returned for a month-long tour of northern and central Italy. Thereafter and until 1883, travel in Italy and elsewhere was a regular feature of Burckhardt's bachelor life.

Works. Burckhardt's most successful books are unthinkable without his familiarity with the historical sites and art treasures of Europe. His first important work, however, like the last, attested to his deep interest in ancient civilization. In *Die Zeit Konstantins des Grossen* (1853; *The Age of Constantine the Great,* 1949) Burckhardt presented a picture of a transitional age, unhealthy and immoral but teeming with religious and cultural activity. While he recognized that the rise of Christianity was inevitable and that it was necessary for the development of an original culture during the Middle Ages, his sympathies lay clearly with the waning forces of the ancient world. *Der Cicerone* (1855; *The Cicerone,* 1873) is a comprehensive study of Italian art, geographically arranged in the form of a travel guide. It went through many editions, but Burckhardt reacted to the popularity of his work with growing aloofness.

Burckhardt's next book, *Die Kultur der Renaissance in Italien* (1860), is the major source of his fame. Using programmatic subheadings (the discovery of world and man; the development of individuality; the state as a work of art; the modern sense of humour), Burckhardt deftly analyzed the daily life of Renaissance Italy, its political climate, and the thought of its outstanding minds. His sources—often contemporary chronicles and tales—were in print and readily available yet frequently ignored by historians. He approached them with newly conceived questions in mind. Although Burckhardt emphasized many contrasts between the Middle Ages and the Renaissance, he did not underrate medieval achievements. His concept of history left no room for the idea that the Renaissance or any other period was characterized by general progress over the preceding epoch. If Raphael's art presented the Renaissance at its best, the ingenious and ruthless mechanism of Renaissance politics reminded Burckhardt of "the works of a clock." Here he perceived the beginnings of the modern state, a precision instrument of mass control, without consideration for the creative freedom of individuals and minorities.

Art was to Burckhardt the saving grace of the Renaissance, but in his *Die Kultur* this vital subject was not treated. Burckhardt hoped to cover it in a separate monograph, but that hope found only partial fulfillment in *Die Geschichte der Renaissance in Italien* (1867; "History of the Renaissance in Italy"), which deals with architecture only. If eventually Burckhardt's study of the Renaissance provided a basic model for the treatment of cultural history in general, the implications for art history were best realized by his pupil and successor, Heinrich Wölfflin. Styles of art followed one another as did historical periods. They were determined by common features derived from the general character of a period and in turn helped to define the period's culture. Among Burckhardt's minor publications, a small but precious collection of poetry in the Alemannic dialect may be noted: *E Hämpfeli Lieder* (1853; "The Jumping Jack Songs").

Friends edited his last great work, four volumes of an uncompleted survey of Greek civilization—*Griechische Kulturgeschichte* (1898–1902; abridgment in Eng. trans., *History of Greek Culture,* 1963)—and some essays in art history: *Erinnerungen aus Rubens* (1898; "Suggestions on Rubens"), *Beiträge zur Kunstgeschichte von Italien* (1898; "Contributions to the Art History of Italy"). Of particular significance are two later posthumous publications. *Weltgeschichtliche Betrachtungen* (1905; *Force and Freedom: Reflections on History,* 1943) epitomizes his philosophy of history. *Historische Fragmente* ("Historical Fragments," 1929 in *Gesamtausgabe; Judgments on History and Historians,* 1958) selects highlights from his lecture manuscripts and demonstrates impressively Burckhardt's gift for visualizing history as a whole. Both books contain passages that can be interpreted as prophetic visions of the violent totalitarian states of the 20th century; but more important than Burckhardt's prophecies of the future is his vision of the past, which offers, he said, "experience to make us, not shrewder (for the next time), but wiser (for ever)." (P.G.B.)

BIBLIOGRAPHY. A critical edition of Burckhardt's collected works, *Gesamtausgabe,* 14 vol., ed. by E. Durr *et al.* (1929–34), is now being followed by a critical edition of his letters, *Briefe,* ed. by Max Burckhardt, 8 of a projected 10 vol. (1949–74). See also Werner Kaegi, *Jacob Burckhardt, eine Biographie,* 4 vol. (1947–67); Wallace K. Ferguson, *The Renaissance in Historical Thought* (1948); and *Jacob Burckhardt and the Renaissance, 100 Years After* (1960), papers read at a meeting of the Central Renaissance Conference.

Burckhardt, Johann Ludwig, also called IBRĀHĪM IBN ʿABD ALLĀH (b. Nov. 24, 1784, Lausanne, Switz.—d. Oct. 15, 1817, Cairo), the first European in modern times to visit the ancient city of Petra and to arrive at the great Egyptian temple at Abu Simbel (or Abū Sunbul).

Burckhardt went to England in 1806 and studied in London and at Cambridge University. In 1809, under the auspices of the

Johann Ludwig Burckhardt, engraving
By courtesy of the Bibliotheque Nationale Suisse, Bern

Association for Promoting the Discovery of the Interior Parts of Africa, he visited Syria to learn Arabic and to accustom himself to Muslim life. According to instructions from the London association, he was then to journey to the regions south of the Sahara, via Fezzan, now the southwestern sector of Libya. In 1812, en route from Syria to Cairo, he discovered the important archaeological site at Petra, in modern Jordan. Upon his arrival in Cairo he found no immediate prospect for a reliable caravan to Fezzan; hence he decided to travel up the Nile. In so doing he dis-

covered the temple at Abu Simbel, generally thought to be among the most imposing of all rock temples. Next he travelled through Arabia, visiting Mecca. He then returned to Cairo where he died, still waiting for a chance to cross the Sahara.

Burckhardt, who took a Muslim name and often wore Muslim dress, left his large collection of Arabic manuscripts to Cambridge University. His writings include *Travels in Nubia* (1819), *Travels in Syria and the Holy Land* (1822), and *Travels in Arabia* (1829).

Burdekin River, coastal river of eastern Queensland, Australia, rising on the western slopes of the Seaview Range, 45 mi (72 km) from the Pacific, and flowing 440 mi southeast and north through the Leichhardt Range to the ocean at Upstart Bay. Its chief tributaries are the Suttor, Star, and Bowen. Total catchment is 50,400 sq mi (130,500 sq km). A 3,619-ft (1,103-m) high-level bridge spans its mouth to link Ayr and Home Hill. The Upper Burdekin flows through Charters Towers and a region devoted mostly to cattle raising. Sugarcane is the principal crop along its lower course. The river was explored in 1845 by Friedrich Ludwig Leichhardt and was named for the wife of Thomas Burdekin, who helped finance his expedition.

Burdett, Sir Francis, 5TH BARONET (b. Jan. 25, 1770, Wiltshire, Eng.—d. Jan. 23, 1844, London), English politician and a zealous and courageous advocate of reform who more than once endured imprisonment for his radical views; he later lost interest in uprooting abuses and allied himself with the Conservative Party.

His marriage to a wealthy woman enabled Burdett to buy a seat in the House of Commons in 1796. Influenced by French Revolutionary ideals, he denounced Great Britain's war with France and attacked various wartime antiradical measures, especially the suspension of the Habeas Corpus Act (1794–1801). He lost his seat in the Commons in 1806 because of an election dispute, but he was returned the next year by Westminster voters in what is said to be the first unquestioned radical (reform) victory in a British parliamentary election. In 1810 his speech against the imprisonment of another radical by the House of Commons was published in William Cobbett's radical *Weekly Register,* and Burdett himself was jailed for this alleged breach of parliamentary privilege. (It was against the law to publish parliamentary speeches.) In 1820 he was heavily fined and again imprisoned for censuring the government's action at St. Peter's Fields, Manchester, the "Peterloo (Manchester) Massacre" of a crowd assembled to hear speakers in favour of parliamentary reform, Aug. 16, 1819.

Burdett's enthusiasm for reform waned long before the Reform Bill of 1832 was enacted. From 1837 he represented a Wiltshire constituency rather than Westminster in the House of Commons, where he voted with the Conservatives and worked with the party's leaders.

Burdett-Coutts, Angela Georgina Burdett-Coutts, Baroness, original name ANGELA GEORGINA BURDETT (b. April 21, 1814, London—d. Dec. 30, 1906, London), English philanthropist who, largely under the influence of Charles Dickens, spent much of an inherited fortune on projects for the education and housing of the poor. The youngest daughter of the radical politician Sir Francis Burdett, she took the name of Coutts in 1837 when she inherited the fortune of the banker Thomas Coutts, her grandfather. In addition to her social welfare activities, she founded churches and church schools and endowed the bishoprics of Cape Town and Adelaide (1847) and British Columbia (1857). In 1871 she was made a peeress in her own right. Her philanthropic ventures were curtailed when her marriage forced the surrender of much of her fortune, but her good works and generosity were not forgotten. She was buried in Westminster Abbey.

Burdigalian Stage, major division of lower Miocene rocks and time (the Miocene Epoch began about 26,000,000 years ago and lasted about 19,000,000 years). The Burdigalian Stage follows the Aquitanian Stage and precedes the Helvetian Stage. In France the Burdigalian Stage is represented by rocks, especially shell beds, produced by a continuing transgression of the sea across low-lying land areas in the region of Bordeaux (ancient Burdigala). The Burdigalian is primarily represented by marine beds, and continental deposits are absent even though brackish-water sediments are known to occur.

Burdur, also called BULDUR, city, capital of Burdur *il* (province), southwestern Turkey, near the eastern shore of Burdur Gölü (lake). Called Polydorion in the Middle Ages, it fell to the Seljuq Turks in the 12th century and came under Ottoman domination in the 15th. Its size and economy expanded after World War II; industries now include textiles, the preparation of attar of roses, and copper manufacture. Burdur is linked by rail with Afyon Karahisar and Eskişehir and lies on the Antalya–Afyon Karahisar highway. An archaeological museum contains objects found at nearby sites, notably those from Hacılar, where excavations have revealed nine stages of habitation ranging from the Chalcolithic to the Neolithic Period.

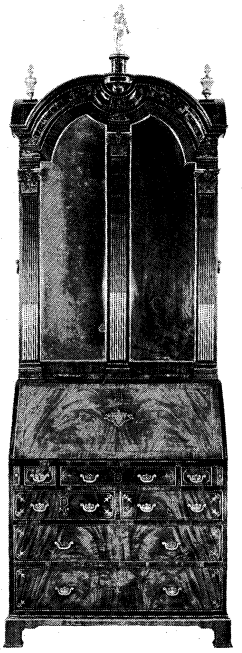
Burdur *il,* 2,881 sq mi (7,461 sq km) in area, lies between the Mediterranean Sea and central Anatolia, with its southern part in the Taurus Mountains. Agricultural products include vegetables, and grapes and other fruits in irrigated areas and wheat, barley, and potatoes in dry-farming areas. Pop. (1980) city, 44,630; (1983 est.) *il,* 241,800.

Burdwān, also called BARDHAMĀN, town, administrative headquarters of Burdwān district, West Bengal state, northeastern India. The town is a major communications centre lying astride the Banka River just north of the Dāmodar. Rice and oilseed milling and hosiery, cutlery, and tool manufacturing are the chief industries. Of historic interest are the Rājbarī (the maharaja's palace and gardens), several ancient Muslim tombs, and 108 Śiva *liṅga,* or phallic, 18th-century temples. The Rājbarī houses the University of Burdwān, founded in 1960, with four affiliated colleges in the town. The town was constituted a municipality in 1865.

Burdwān district (2,715 sq mi [7,028 sq km]), constituted in 1885, comprises two distinct regions. The eastern part is a low alluvial plain, densely populated and often waterlogged and swampy. The western region is one of the busiest industrial tracts in West Bengal, with rich coal, fireclay, and iron-ore deposits, especially in the Rānīganj coalfield area. The Bhāgīrathi, Dāmodar, Rūpnārāyan (*qq.v.*), and Ajay are the principal rivers. The Dāmodar Valley Corporation provides irrigation, industrial power supply, and flood control. Rice, corn (maize), legumes, and oilseeds are the chief crops in the east. Pop. (1981) town, 167,364; district, 4,835,388.

bureau, in the U.S., a chest of drawers; in Europe a writing desk, usually with a hinged writing flap that rests at a sloping angle when closed and, when opened, reveals a tier of pigeonholes, small drawers, and sometimes a small cupboard. The bureau (French: "office"). first appeared in France at the beginning of the 17th century as just a flat table with drawers below the top, the *bureau plat.* By Louis XIV's reign, a kneehole type was in use, with a tier of drawers on each side and a single drawer in the centre above a space for the knees.

In England the bureau did not appear until after the end of Charles II's reign, and even



Bureau with tortoiseshell marquetry and engraved brass inlay, English, *c.* 1720–30; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

then the term was ill defined. As late as 1803 Thomas Sheraton stated, in *The Cabinet Dictionary,* that it had "generally been applied to common desks with drawers under them, such as are made very frequently in country towns." In the early 18th century one form of bureau consisted of a bank of drawers below a sloping writing flap, the whole piece resting on cabriole legs. Many bureaus of this period and earlier were surmounted by a bookcase with one or two doors, which were sometimes glazed. The Dutch were quick to copy this idea, and thus the bureau-bookcase, often fitted with an ingenious combination of drawers and compartments, spread to other parts of Europe.

About 1730, under the influence of Palladian architecture, the central compartment of the large bureau-bookcase was designed to project, while compartments at the sides formed wings. In *The Gentleman and Cabinetmaker's Director* (1754), Thomas Chippendale illustrated bureau-bookcases with Rococo and chinoiserie (Chinese-style) decoration, the upper portions glazed within ornate framing.

Two forms of bureau were used specifically in bedrooms. One was combined with a tallboy (one chest of drawers on top of another), one of the drawers pulling out and the front lowering to serve as a writing surface. The other, a bureau-dressing table, was surmounted by a mirror. *See also* secretary.

bureaucracy, a professional corps of officials organized in a pyramidal hierarchy and functioning under impersonal, uniform rules and procedures. In the social sciences, the term usually does not carry the pejorative associations of popular usage.

Weber's theories. The characteristics of bureaucracy were first formulated in a systematic manner by the German sociologist Max Weber (1864–1920), whose definition and theories set the foundations for all subsequent work on the subject. They refer to (1) the division of labour in the organization, (2) its authority structure, (3) the position and role

of the individual member, and (4) the type of rules that regulate the relations between organizational members.

A highly developed division of labour and specialization of tasks is one of the most fundamental features of bureaucracy. This is achieved by a precise and detailed definition of the duties and responsibilities of each position or office. The allocation of a limited number of tasks to each office operates according to the principle of fixed jurisdictional areas that are determined by administrative regulations.

The bureaucratic organization is characterized by a "rational" and impersonal regulation of inferior–superior relationships. In traditional types of administration (feudal, patrimonial), the inferior–superior relationship is personal, and the legitimation of authority is based on a belief in the sacredness of tradition. In a bureaucracy, on the other hand, authority is legitimized by a belief in the correctness of the process by which administrative rules were enacted; and the loyalty of the bureaucrat is oriented to an impersonal order, to a superior position, not to the specific person who holds it.

When one shifts the focus of attention from the organization as a whole to the role and status of the individual member, the following features characterize the bureaucrat's position. Starting with the mode of recruitment, the bureaucrat is not selected on the basis of such considerations as family position or political loyalties. His recruitment is based on formal qualifications (diplomas, university degrees) that testify that the applicant has the necessary knowledge to accomplish effectively his specialized duties. Once a candidate enters the bureaucratic organization, his office is his sole—or at least his primary—occupation. It constitutes a "career." That is to say, it is not accepted on an honorary or short-term basis; it implies stability and continuity, a "life's work." Moreover, there is usually an elaborate system of promotion based on the principles of both seniority and achievement.

Insofar as the mode of remuneration is concerned, the bureaucrat usually receives a salary based not so much on his productivity performance as on the status of his position. Contrary to some forms of traditional administration, in the bureaucratic case the civil servant cannot sell his position or pass it on to his sons. There is a clear-cut separation between the private and the public sphere of the bureaucrat's life. His private property is sharply distinguished from the "means of administration" that do not belong to him.

The most important and pervasive characteristic of bureaucracy (one that to some extent explains all the others) is the existence of a system of control based on rational rules—that is, rules meant to design and regulate the whole organization on the basis of technical knowledge and with the aim of achieving maximum efficiency. According to Max Weber, "Bureaucratic administration means fundamentally the exercise of control on the basis of knowledge. This is the feature of it which makes it specifically rational" (*The Theory of Social and Economic Organization,* 1947, p. 339).

These are briefly the major features of Weber's ideal type of bureaucracy. The type is "ideal" in the sense that the characteristics included in it are not to be found, in their extreme form, in all concrete bureaucracies. Real organizations can be more or less bureaucratic according to their degree of proximity to their ideal formulation.

Oligarchic theories. If for Weber bureaucracy was an efficient tool in the hands of whoever knows how to control it, subsequent writers, impressed by the increasing bureaucratization of modern society and by the rise of totalitarian regimes in the East and the West, have often seen bureaucracy as an oligarchic system of political domination: bureaucracy ceases to be a tool; it becomes the master, the politically dominant group in a new type of society that is neither capitalist nor socialist. If for Weber the political domination of bureaucracy was problematic, for the German sociologist Robert Michels (1876–1936) and other writers having a similar orientation it became an inevitable outcome, inherent in the internal dynamics of bureaucracy.

Michels was one of the first theorists who tried systematically to link increasing bureaucratization with the oligarchic tendencies in modern society. He focussed his attention primarily on the internal political structure of large-scale organizations. His main thesis, the famous "iron law of oligarchy," postulates that with the increasing complexity and bureaucratization of modern organizations all power is concentrated at the top, in the hands of an organizational elite that rules in a dictatorial manner. This is so even if oligarchy, as in the German Socialist party, which he extensively studied, runs against the ideals and intentions of both rulers and ruled.

In fact, the increasing size of modern organizations and the increasing complexity of the problems with which they have to deal makes technically impossible the participation of the rank and file in the making of decisions. Moreover, given the ensuing apathy of the members and the increasing concentration of the means of communication at the top, the power position of the leader becomes impregnable. Not only can the leader manipulate information and use the communication network against any potential rival but also, by the exercise of his functions, he acquires specialized knowledge and political skills that make him almost irreplaceable to the organization. In this way both the structural position of the rulers and the ruled lead to a political system that perpetuates the leadership of the person in power and alienates the rank and file from the political process.

Once in control, according to Michels, the organizational oligarchy always has as its primary aim the consolidation of its own power position. Whenever this aim clashes with the more general aims of the rank and file, the elite will sacrifice the latter rather than jeopardize its own privileges. It is in this way that Michels explains the decline in radicalism of the established Socialist parties whose bureaucratic conservatism serves more the interests of the leaders and less the masses whose interests they are supposed to represent.

Finally, for Michels, organizational oligarchy brings societal oligarchy. If the political systems of such voluntary organizations as trade unions and political parties cannot work democratically, then the democratic institutions of the whole society are undermined at their very roots. Indeed, a society dominated by large-scale oligarchic organizations eventually develops an oligarchic political regime. Organizational elites, together with other social elites, having a common interest in the maintenance of the status quo, form a strong power group determined to oppose any demand for change coming from the masses.

Michels' theory focussed mainly on the bureaucratization of "voluntary" organizations, such as political parties. Other theorists, sharing his pessimism about the future of democracy, point more to the increasing size and bureaucratization of the state administration or of the capitalist enterprise as the main threats to the parliamentary institutions of Western societies.

On the one hand, such liberal German economists as Ludwig von Mises and Friedrich von Hayek have been alarmed at the proportions of the state bureaucracy and its increasing intervention in the economic sphere. For them, it is the government's "levelling" tendencies, its insatiable appetite for expansion that gradually destroys free enterprise and undermines democratic institutions.

Bureaucratic collectivism. Whereas Lenin and other Soviet writers could not admit that bureaucracy had a permanent and "organic" position in the Soviet system, other Marxists have thought that it was at its centre and that it defined more than anything else the very nature of the regime. From their point of view, bureaucracy is not only a privileged oppressive group but a new exploiting class, a class characterized by a new type of oligarchic regime that is neither socialist nor capitalist and that is rapidly spreading both in the East and in the West.

The first systematic elaboration of this position was attempted by the Italian Marxist Bruno Rizzi in *The Bureaucratisation of the World* (1939). For Rizzi the Soviet bureaucracy constituted a new ruling class that exploited the proletariat as much as the capitalists had in the past. It differed from capitalism only in that the new type of domination was based not on individual but on group ownership of the means of production. In fact, in the Soviet system the means of production represent not "socialism" but "stateism." They do not belong to the whole collectivity but to the state and to the bureaucrats who control it. In the last analysis, it is these bureaucrats—the technicians, directors, and specialists holding key positions in the party and state administration—who exploit the proletarians and steal the surplus value of work. According to Rizzi this new type of regime, which he called bureaucratic collectivism, was not limited to the Soviet Union. Similar tendencies could be discerned in fascist countries and even in the "welfare state" type of capitalist democracies. The Yugoslav Communist Milovan Djilas in *The New Class* (1957), a later criticism of the Yugoslav Socialist regime, used arguments similar to Rizzi's.

The American philosopher and critic James Burnham proposed a theory of the "managerial revolution" that was more or less an elaboration of Rizzi's ideas. According to his theory, technological progress and the growth of large-scale economic as well as political bureaucracies deprived the old capitalist class of the control of the means of production. The effective control of the economy and of political power had passed to the managers—that is, to the production executives and to the administrators of the state bureaucracy. He predicted that at a later stage of development, private ownership would be abolished and the bureaucrats would appropriate collectively, through the state, the means of production. Thus, according to Burnham, both in the East and the West the managers would impose a new type of oligarchic order.

Dysfunctional aspects of bureaucracy. The American Robert K. Merton was among the first sociologists to emphasize systematically the now-familiar side of the bureaucratic picture—its red tape and inefficiency. According to Merton, if, as Weber thought, the predominance of rational rules and their close control of all actions favours the reliability and predictability of the bureaucrat's behaviour, it also accounts for his lack of flexibility and his tendency to turn means into ends. Indeed, the emphasis on conformity and strict observance of the rules induces the individual to internalize them. Instead of simply means, procedural rules become ends in themselves. Thus a kind of "goal displacement" occurs. The instrumental and formalistic aspect of the bureaucratic role becomes more important than the substantive one, the achievement of the main organizational goals. According to Merton, when one leaves the sphere of the ideal and studies a real organization, one can see that a certain bureaucratic characteristic (such as strict control by rules) can both promote and hinder organizational efficiency; it can

have both functional effects (predictability, precision) and dysfunctional effects (rigidity).

Conflict theories. A group of theorists have rejected the functional approach and contended that organizations must be seen as configurations of antagonistic groups that aim, through various strategies, to promote their conflicting interests. Although these theorists do view the organization "as a whole," they see that the parts of the whole are not institutional norms but instead are groups that, according to their power position, can influence policies.

Thus the American sociologist Melville Dalton, in a book based on his long experience as a participant and observer in six business firms (*Men Who Manage,* 1959), offered a revealing picture of organizational structure in terms of conflicting cliques and their interminable struggles for gaining more power and ensuring a greater share of organizational rewards. Even if sometimes exaggerated, this analysis showed in a striking way to what extent organizational members and groups can be primarily interested in the pursuit of their narrow interests and the consolidation and improvement of their own power position, even at the expense of wider organizational interests. Moreover, it showed the pervasiveness of the ensuing struggles and their impact on every aspect of organizational life. It showed, too, how this intense political activity can be scrupulously and skillfully camouflaged so that the resulting policies appear to be in harmony with the official ideology.

The French sociologist Michel Crozier's study of two French government agencies (*The Bureaucratic Phenomenon,* 1963; Eng. trans. 1964) was another important step in the analysis of organizational power and conflict. In Crozier's analysis, the social structure consists of highly cohesive occupational groups, each presenting a unified and rather hostile front toward the others. (Contrary to Dalton, Crozier ignores the existence of cliques within and across these occupational groupings.) Each group's strategy consists in manipulating the rules in order to enhance its own prerogatives and secure its independence from every direct and arbitrary interference by those higher up. Because rules obviously can never cover everything, "areas of uncertainty" always emerge that constitute the focal points around which collective conflicts become acute and instances of direct dominance and subordination develop. The group that, by its position in the occupational structure, can control the "unregulated" area, has a great strategic advantage that it naturally uses in order to improve its power position and to ensure a greater share of organizational rewards.

Conflict studies, as illustrated by the work of Dalton and Crozier, point to the central importance of an organization's political structure and thus open a new perspective in the analysis of bureaucracy. To the image of the organization man as a person of sentiments seeking friendship and emotional security and to the image of the problem solver and decision maker is added the new image of a "political man" primarily interested in the collective and individual pursuit of power for the promotion of his own interests. So long as it is not followed single-mindedly, this new dimension should contribute to a more inclusive and realistic approach to the study of organizations.

burette, also spelled BURET, laboratory apparatus used in quantitative chemical analysis to measure the volume of a liquid or a gas. It consists of a graduated glass tube with a stopcock (turning plug, or spigot) at one end. On a liquid burette, the stopcock is at the bottom, and the precise volume of the liquid dispensed can be determined by reading the graduations marked on the glass tube at the liquid level before and after dispensing it. In a gas burette, the stopcock is at the top; the tube of the burette is filled with a fluid, such as water, oil, or mercury, and the bottom of the tube is attached to a reservoir of the fluid. Gas is collected by displacing fluid from the burette, and the amount of gas is measured by the volume of fluid displaced.

Burford and Upton and Signet, parish (town), West Oxfordshire, county of Oxfordshire, England, on the River Windrush, in the Cotswolds. The town was acquired by Robert FitzHamon, earl of Gloucester, who granted it a market in 1088 and England's earliest datable merchant guild. Sir Lawrence Tanfield, a local landowner, successfully challenged the town's civic privileges in 1621 and also built a priory, which was later bought by William Lenthall, speaker (chairman) of the English Long Parliament (1640). The priory is now an Anglican convent. In 1649, during the English Civil War, the Levellers, a republican and democratic party of influence within the Parliamentarian army, were crushed at Burford by the lord protector Oliver Cromwell. The town's grammar school was founded in 1571; the Church of St. John the Baptist, originally Norman, has a delicate spire (14th–15th century) and a separate 13th-century chapel of St. Mary. Pop. (1971) 1,255.

burga: *see* blizzard.

burgage, in England and Scotland, an ancient form of tenure that applied to property within the boundaries of boroughs, or burghs. In England land or tenements within a borough were held by payment of rent to the king or some other lord; the terms varied in different boroughs. Among English feudal tenures, burgage ranked as a form of socage, the holding of land in return for agricultural or economic services. In Scotland the landlord was always the king; and in feudal times tenures were held in return for military service in the burgh garrison. In Scotland burgage remained a distinctive tenure until modern times, requiring a particular form for the transference of titles until 1874.

Burgas, port and chief town of Burgas *okrŭg* (province), southeastern Bulgaria, on the Gulf of Burgas, an inlet of the Black Sea. Founded in the 17th century as a fishing village on the site of medieval Pyrgos, it developed after Bulgaria's liberation (1878), mainly with the arrival of the railway from Sofia (1890) and harbour improvements (1904). It now rivals Varna to the north as the nation's chief port, claiming much of Bulgaria's Black Sea trade. With the small neighbouring port of Sozopol, Burgas also handles most of the Bulgarian fish catch. Food processing (flour, sugar, and fish), engineering, and oil refining augment its port activities; copper, lignite, and salt are mined locally. Burgas, Nesebŭr, Pomorie, and Sozopol form part of the developing Black Sea Riviera. Pop. (1981 est.) town, 173,078; (1982 est.) *okrŭg,* 435,274.

burgauté (lacquer ware): *see* laque burgauté.

Burgenland, *Bundesland* (federal province), eastern Austria, bordering Hungary on the east, and *Bundesländer* Niederösterreich (Lower Austria) on the northwest and Steiermark (Styria) on the southwest. It has an area of 1,531 sq mi (3,966 sq km). Derived from parts of the four former west Hungarian *comitat*s (counties) of Pressburg (Bratislava), Wieselburg (Moson), Ödenburg (Sopron), and Eisenburg (Vasvár), it became an Austrian *Bundesland* in 1921. The low-lying parts of northern Burgenland belong to the Pannonian Basin, which is linked with the southern Vienna basin by two gateways situated north and south of the Leithagebirge (Leitha Mountains); the area is characterized by steppe and saline-heath vegetation, and its most striking feature is the Neusiedl Lake (*q.v.*). The crystalline Rosaliengebirge (mountain range), linked with the Alps lies between northern and middle Burgenland. The latter is the most mountainous part of the state, subsiding eastward to the Pannonian Basin and rising westward to the Landsee and Bernsteiner Gebirge and southward to the Günser Gebirge. Southern Burgenland is hill country, drained from northwest to southeast by streams accompanied by systems of terraces.

A site of continuous human habitation since prehistoric times, the southwestern part belonged to the Celtic kingdom of Noricum in the Iron Age. The region was later part of the Roman province of Pannonia. Occupied in turn by Teutonic tribes, Avars, and Slavs, it was settled by Germans in the 8th century. Although part of Hungary, it became a focus of German settlement under a largely Magyar ruling class. Burgenland's early history is linked to that of Hungary and after 1529 to the Habsburg empire. After World War I the predominantly German parts of western Hungary were ceded to Austria and became Burgenland, but Hungary retained control of the Sopron (Ödenburg) area after a plebiscite in 1921. The loss of Sopron robbed Burgenland of its natural capital and severed communication lines from north to south. Eisenstadt (*q.v.*) became the capital in 1925. Burgenland regained its status as a *Bundesland* in 1945 after having been divided between the *Reichsgaue* (Reich's provinces) Niederdonau and Steiermark of greater Germany during the *Anschluss,* or incorporation of Austria into the Reich (1938–45).

Although predominantly German, Burgenland has the highest percentage (15 percent) of non-German minorities—Croats and Magyars—in Austria. More than 85 percent of the people are Roman Catholic; Burgenland became a diocese in 1960. Because of its basically agricultural economy, characterized by extreme fragmentation of holdings, a low standard of living, underemployment, and seasonal migration, Burgenland for years has lost population, both to other parts of Austria and to Germany and overseas. Despite industrial growth since World War II, its towns are few, and only Eisenstadt has a population greater than 10,000. Nearly 60 percent of the land surface is arable, and about 28 percent is forested. A large surplus of grain, including corn (maize), and root crops is produced. In the northern part, crops include vines, fruits and vegetables, some tobacco, hemp, and, experimentally, rice (on the lake shores at Weiden). Livestock raising is extensive, but the use of cows as draft animals on small holdings makes the milk yield one of the lowest in Austria. There is lumbering and reed production along the shores of Neusiedl Lake. Leithagebirge limestone, an excellent building stone, and basalt, used in road construction, are quarried. China clay is produced near Stoob, and there are a number of clay pits for brick works. Antimony and brown coal (lignite) are mined, and there are veins of chalk and semiprecious serpentine (used for jewelry and vases). Industries, limited mainly to small plants, include sugar refining, food processing, textile manufacturing, sawmilling, and furniture making. Considerable improvement is needed in road and rail transportation, since the siting of communication routes was determined by the Burgenland's former location within Hungary. There is no rail line linking the north to the south except through Hungarian territory (Sopron). Pop. (1982 est.) 270,083.

Burger, Die (Afrikaans: "The Citizen"), daily newspaper published in Cape Town, S.Af., the largest of the country's newspapers written in Afrikaans. *Die Burger* is known both for its

generally balanced presentation of the news and for its support of policies of the South African government. It firmly supports the ruling Nationalist Party. It is published mornings except Sundays. In the early 1980s, *Die Burger* had a weekday circulation exceeding 69,000, and its weekend edition stood at about 84,000.

Bürger, Gottfried August (b. Dec. 31, 1747, Molmerswende bei Halberstadt, Brandenburg—d. June 8, 1794, Göttingen, Hanover), one of the founders of German Romantic ballad literature whose style reflects the renewed interest in folk song (*Volkspoesie*) in Europe during the late 1700s.

Bürger was educated in theology at the University of Halle and in law at the University of Göttingen. It was in Göttingen that he first came into contact with a group of Sturm und Drang poets known as the Göttinger Hain, who drew inspiration from folk ballads. In 1773 Bürger published the bizarre ballad "Lenore," a spectral romance in which a ghostly rider, posing as Lenore's dead lover, carries her away on a macabre night ride through an eerie landscape illuminated by flashes of lightning. It culminates in a revelation of the rider as Death himself—a skeleton with scythe and hourglass. The poem's use of refrain and its simple and naïve language, as well as its sensational theme, had a profound effect upon the subsequent development of Romanticism throughout Europe.

Bürger's unbalanced temperament and largely impoverished circumstances prevented him from ever achieving lasting happiness. In 1774 he married Dorette Leonhard but soon fell passionately in love with her sister, the "Molly" of his sonnets. His wife's death, in 1784, freed him to marry "Molly," but she died soon afterward, in childbirth. In 1789 he was appointed extraordinary professor at Göttingen, though without a stipend, leaving him in poverty for the remainder of his life. A third marriage, in 1790, was a disaster and was dissolved in 1792.

In addition to a number of Petrarchan sonnets, which had a considerable influence upon later German poets, Bürger is also noted for his translations from the English, especially for his renderings of the influential collection of English and Scottish traditional ballads, Thomas Percy's *Reliques of Ancient English Poetry.*

Burger, Warren E(arl) (b. Sept. 17, 1907, St. Paul, Minn., U.S.), 15th chief justice of the United States (1969–86).

After graduating from St. Paul (now William Mitchell) College of Law in 1931, Burger joined a prominent law firm there and gradually became active in Republican Party politics. In 1953 he was appointed an assistant U.S. attorney general, and in 1955 he was nominated by Pres. Dwight D. Eisenhower to the U.S. Court of Appeals for the District of Columbia. Burger's generally conservative approach during his 13-year service (1956–69) on the nation's second highest court commended him to Pres. Richard M. Nixon, who in 1969 named Burger to succeed Earl Warren as chief justice of the Supreme Court. He was quickly confirmed and in June 1969 was sworn in as the nation's chief justice.

Contrary to some popular expectations, Burger and his three fellow Nixon-appointed justices did not try to reverse the tide of activist decision making on civil rights issues and criminal law that was the Warren court's chief legacy. The court upheld the 1966 Miranda decision, which required that a criminal suspect under arrest be informed of his rights, and the court also upheld busing as a permissible means of racially desegregating public schools and the use of racial quotas in the distribution of federal grants and contracts to minorities. Under Burger's leadership the court did dilute several minor Warren-era decisions protecting the rights of criminal defendants, but the core of the Warren court's legal precedents in this and other fields survived almost untouched. Burger voted with the majority in the court's landmark 1973 decision (*Roe* v. *Wade*) that established women's constitutional right to have abortions.

Burger himself took a pragmatic and accommodating stance toward controversial legal issues, and his opinions were not particularly noted either for their intellectual consistency or for their comprehensive and systematic application of legal principles. He instead became deeply involved in the administrative functions of his office, and he worked strenuously to improve the efficiency of the entire judicial system, including both the state and the federal courts. His reiterated proposals for the creation of a new level of appellate courts that would take over some of the Supreme Court's massive workload failed to win significant support, though.

bürgermeister: *see* burgomaster.

Burgers, Thomas François (b. April 15, 1834, near Graaff-Reinet, Cape Colony—d. Dec. 9, 1881, Richmond, Transvaal), theologian and controversial president of the Transvaal who in 1877 allowed the British to annex the republic.

After graduating as a doctor of theology from the University of Utrecht, Burgers returned to Cape Colony in 1859, where he became the minister of the Dutch Reformed Church in Hanover. His unorthodox views, in which he questioned the literal truth of the Bible, led to his suspension by the Cape synod (1862). The decision was reversed by higher courts, and those judgments were upheld by the British Privy Council (1867).

Burgers' eloquence and culture recommended him to influential Transvaalers seeking a successor to Pres. Marthinus W. Pretorius, who had resigned in 1871. Elected by a large majority, Burgers took office in July 1872, but his sophisticated ideas in government, education, and religion soon antagonized the Boers. To further his scheme to link the Transvaal by rail to Delagoa Bay, on the Indian Ocean, he traveled to Europe in 1875 to raise money. The now unpopular Burgers returned to engage in a disastrous war with the Pedi chief, Sekhukhune, whose lands lay athwart the proposed railway. Insolvent and on the verge of anarchy, the Transvaal was annexed by a British government anxious to promote federation in South Africa. After delivering a feeble protest, a dispirited Burgers surrendered the republic to Sir Theophilus Shepstone and his annexing force of 25 policemen representing the British crown. Burgers then retired into obscurity.

Burges, William (b. Dec. 2, 1827, London—d. April 20, 1881, London), one of England's most notable Gothic Revival architects, critic, and an arbiter of Victorian taste.

During his apprenticeship he studied medieval architecture, visiting the Continent to gain firsthand impressions. In 1856 he received the first award in an international competition for the Cathedral of Lille, Fr. He designed the Cathedral of Brisbane, Australia, in 1859 and in 1862 St. Finbar's Cathedral of the Church of Ireland in Cork. In 1865 he started an extensive restoration of Cardiff Castle, where he made many extensions to the existing residential apartments and directed an elaborate scheme of interior decoration. Ten years later he began a similar project at nearby Castle Coch. Burges adopted the Victorian Gothic style for his own home (Tower House) in London (1875–80). A fellow of the Royal Institute of British Architects and an associate of the Royal Academy, he wrote architectural treatises and published (1870) his drawings.

Burgess, Anthony, also called JOSEPH KELL, original name JOHN ANTHONY BURGESS WILSON (b. Feb. 25, 1917, Manchester), English novelist, critic, and man of letters, whose fictional explorations of modern dilemmas combine wit, moral earnestness, and a note of the bizarre.

Trained in English literature and phonetics, Burgess taught in the extramural department of Birmingham University (1946–50), worked for the Ministry of Education (1948–50), and was English master at Banbury Grammar School (1950–54). He then served as education officer in Malaya and Borneo (1954–59), where he wrote three novels with a Malayan setting. Back in England and faced with the necessity of writing for his livelihood, he became a full-time and prolific professional writer. Under the pseudonym Anthony Burgess he wrote the novels *The Wanting Seed* (1962), an anti-utopian view of an overpopulated world, and *Honey for the Bears* (1963). As Joseph Kell he wrote *One Hand Clapping* (1961) and *Inside Mr. Enderby* (1963).

A Clockwork Orange (1962; filmed 1971) made Burgess' reputation as a novelist of comic and mordant power. Written in an inventive teenage argot of the future, the novel examines society's unsuccessful attempt to psychologically "rehabilitate" an incurably violent juvenile delinquent. Other novels include *The Eve of Saint Venus* (1964), *Enderby Outside* (1968), and a concluding sequel, *The Clockwork Testament; or Enderby's End* (1974). His later works include *Man of Nazareth* (1979), *Earthly Powers* (1980), and *The End of the World News* (1983). His combination of linguistic ingenuity and witty erudition with picaresque plots and bizarre, outlandish story premises was disturbing or disconcerting to some critics.

Burgess, Ernest Watson (b. May 16, 1886, Tilbury, Ont., Can.—d. Dec. 27, 1966, Chicago), American sociologist known for his research into the family as social unit.

Burgess received his B.A. (1908) from Kingfisher College (Okla.) and his Ph.D. from the University of Chicago (1913). He taught at the universities of Toledo, Kansas, and Ohio State before beginning a long career at the University of Chicago (1916–66), becoming professor emeritus in 1951.

Burgess' scientific inquiry into the nature of the family led him to investigate marriage stability and the possibility of predicting success or failure in marriage. He theorized that the quality of adjustment depended on the gradual coalescence of attitudes and social characteristics of the husband and wife. From his findings, Burgess developed his marriage success chart for predicting marital stability.

His findings on the family are published in many works, including *Predicting Success or Failure in Marriage* (with Leonard Cottrell, 1939) and *The Family: From Institution to Companionship* (with others, 1945; rev. ed. 1960). Burgess began to study the elderly, editing *Aging in Western Societies* (1960), a work that studied the effects of retirement and the efficacy of government programs for the aged. One of Burgess' most important works was *Introduction to the Science of Sociology* (with Robert Park, 1921; reprinted 1929), a text that became a classic and steered new directions in sociology.

Burgess, Guy; and Maclean, Donald (Duart) (respectively b. 1911, Devonport, Hampshire, Eng.—d. Aug. 30, 1963, Moscow; b. May 25, 1913, London—d. March 11, 1983, Moscow), British diplomats who spied for the Soviet Union in World War II and early in the Cold War period.

At Cambridge University in the 1930s Burgess and Maclean were part of a group of relatively privileged young men who shared a fashionable disdain for capitalist democracy.

Recruited as agents by Soviet intelligence operatives, they began supplying great quantities of information from their respective posts, Burgess as a BBC correspondent, member of the MI-6 intelligence agency in 1939–41, and member of the Foreign Office from 1944, and Maclean as a member of the Foreign Office from 1934.

Maclean's work was the more damaging. As first secretary and then head of chancery in the British embassy in Washington, D.C., he gained the post of secretary of the Combined Policy Committee on Atomic Development and was privy to highly classified information in that field. He also supplied the Soviet Union with secret material relating to the formation of the North Atlantic Treaty Organization (NATO). Later, as head of the American department at the Foreign Office in 1950, he helped formulate Anglo-American policy for the Korean War.

In 1951 Burgess was recalled from his post as second secretary of embassy in Washington and asked to resign because of the growing disorderliness of his life. In May 1951 both men were warned that a counterintelligence investigation by British and American agencies was closing in on Maclean. They fled England and mysteriously vanished. No trace of them appeared until 1956, when they surfaced in Moscow and announced their long-standing allegiance to Communism. In 1963 they were joined by Kim Philby (*q.v.*), another Cambridge and Foreign Office colleague who, it was revealed, had given them the warning in 1951. Not until 1979 was it revealed that the inferred "fourth man" in the spy ring was Sir Anthony Blunt (*see* Blunt, Anthony) a respected art historian and member of the Queen's household. It had been Blunt, yet another Cambridge colleague, who had contacted Soviet agents to arrange for their escape from England.

Burgess, Hugh (b. *c.* 1825, Reading, Berkshire, Eng.—d. Feb. 23, 1892, Atlantic City, N.J., U.S.), British-born U.S. inventor who, with Charles Watt, developed the soda process used to turn wood pulp into paper.

Little is known of his early life. In 1851 he and Watt developed a process in which pulpwood was cut into small chips, boiled in a solution of caustic alkali at high temperature and pressure in a closed container, and then washed with water and, if desired, bleached. From the resulting pulp, the inventors produced white paper at a mill in Boxmoor, Hertfordshire, and proved the practical usefulness of the paper by having part of an edition of the weekly *London Journal* printed on it.

When their invention aroused little interest in England, Burgess and Watt emigrated to the United States, established a mill on the Schuylkill River near Philadelphia, and received a U.S. patent on the soda process in 1854. Subsequent experiments with straw, cornstalks, bamboo, and cane demonstrated that wood was still the best basic ingredient for papermaking. After a struggle to gain acceptance for his process, Burgess, with Morris L.Keen, founded the American Wood Paper Company at Royersford, Pa., in 1863, serving as manager until his death. Although this firm eventually went bankrupt, it established the soda process in the paper industry.

Burgesses, House of, representative assembly in colonial Virginia; the first elective governing body in a British overseas possession. The assembly was one division of the legislature established by Gov. George Yeardley at Jamestown, July 30, 1619; the other included the governor himself and a council, all appointed by the colonial proprietor (the Virginia Company). Because each Virginia settlement was entitled to elect two burgesses (delegates), the original membership of the house was 22.

Burgh FAMILY, also spelled BOURKE, BURKE, BURGO, a historic Anglo-Irish family associated with Connaught. Its founder was William de Burgh, of a knightly family from eastern England; he and his descendants were granted much of Connaught in the late 12th century, and his grandson Walter was also granted Ulster. Although Walter's great-grandson, William, left no male heir, his kinsmen succeeded in holding the bulk of the Burgh lands and, adopting Irish names, became virtually native chieftains. Their two main branches, those of "MacWilliam Iochtar" and "MacWilliam Uachtar" acquired respectively the earldom of Clanricarde and the viscountcy of Mayo.

Burgh, Hubert de (d. 1243, Banstead, Surrey, Eng.), justiciar for young King Henry III of England (ruled 1216–72) who restored royal

Burgh, miniature by Matthew Paris from *Historia Anglorum*, mid-13th century; in the British Library (Royal MS. 14 c VII)

By courtesy of the trustees of the British Library

authority after a major baronial uprising. Hubert became chamberlain to King John (ruled 1199–1216) in 1197, and in June 1215 he was made justiciar.

When recalcitrant barons rebelled against John late in 1215, Hubert scored several important military victories for the royal cause. By 1217, a year after the accession of the nine-year-old Henry III, the insurrection was suppressed. Burgh became the dominant figure in the government upon the death of the regent, William Marshal, earl of Pembroke, in 1219, and in 1228 he was created justiciar for life. Nevertheless, Henry had already (1227) declared himself a monarch of full age; it was only a matter of time before he would throw off Hubert's tutelage. In 1229 Henry unjustly blamed him for the failure of an expedition against France, and in 1231 the justiciar's bitterest enemy, Peter des Roches, returned from a crusade and won the King's favour. Henry then dismissed Hubert (July 1232) and imprisoned him on charges of treason. In 1234 he was pardoned and reconciled with the King. Hubert de Burgh's career is recounted in Clarence Ellis' *Hubert de Burgh* (1952).

Burgh, Richard de: *see* Ulster, Richard de Burgh, 2nd earl of.

Burgh, Ulick de: *see* Clanricarde, Ulick de Burgh, marquess and 5th earl of.

Burghley, William Cecil, 1st Baron: *see* Cecil, William.

Bürgi, Joost, Joost also spelled JOBST (b. Feb. 28, 1552, Lichtensteig, Switz.—d. Jan. 31, 1632, Kassel, Hesse-Kassel), mathematician who invented logarithms independently of the contemporary Scottish mathematician John Napier.

Bürgi served as court watchmaker to Duke Wilhelm IV of Hesse-Kassel from 1579 to 1592 and worked in the royal observatory at Kassel, where he developed geometrical and astronomical instruments. Word of his exceptional instruments reached Prague, where Holy Roman Emperor Rudolf II was trying to establish a science centre, and in about 1603 Bürgi journeyed to Prague to take up the post of imperial clockmaker. Later he also became assistant to the German astronomer Johannes Kepler.

Bürgi was a major contributor to the development of decimal fractions and exponential notation, but his most notable contribution was published in 1620 as a table of antilogarithms. He may have developed the idea for logarithms as early as 1588, but he certainly had compiled his table before his journey to Prague, more than 10 years before Napier published his own logarithm table in 1614.

Burgkmair, Hans, THE ELDER (b. 1473, Augsburg, Ger.—d. *c.* 1531), painter and woodcut artist, one of the first German artists to show the influence of the Italian Renaissance.

The son of a painter, he became a member of the painters' guild in Strasbourg in 1490 and in Augsburg in 1498. Some 700 woodcuts are ascribed to him, including his principal work, a series of 135 prints celebrating the triumphs of the emperor Maximilian I. His works include some of the first chiaroscuro woodcuts, produced from two or more blocks inked with different tones to give gradations of light and shade. His son Hans Burgkmair the Younger (*c.* 1500–59) collaborated with him to produce a *Turnierbuch* (Tournament Book) of 52 illustrations. An accomplished fresco painter, the elder Burgkmair decorated the facade of the merchant Jakob Fugger's

"The Emperor Maximilian in the Painter's Studio," self-portrait woodcut by Hans Burgkmair, the Elder, *c.* 1515

By courtesy of the Osterreichisches Nationalbibliothek, Vienna

house in Augsburg, renowned as the first Italian Renaissance palace in Germany, but the paintings have disappeared. Other Burgkmair frescoes survive in the galleries of Munich and Vienna.

burglary, in criminal law, the breaking and entering of the premises of another with an intent to commit a felony within. Burglary is one of the specific crimes included in the general category of theft (*q.v.*).

Burgo FAMILY: *see* Burgh Family.

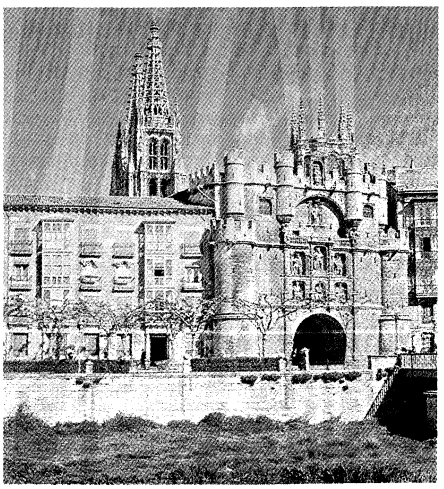
burgomaster, German BÜRGERMEISTER ("town master"), mayor or chief magistrate of a German town, city, or rural commune. The title is also used in such countries as Belgium

(*bourgmeistre*) and The Netherlands (*burgemeester*). Most German towns have a burgomaster, but larger cities may have several, one being the chief burgomaster (*oberbürgermeister*). Burgomasters may be elected by the voters or by a council, and their power varies from place to place. The burgomaster may be chairman of the city council, or he may preside over an administrative board elected by the city council, or he may preside over a city council but have limited powers. In addition to his municipal duties, a burgomaster is a state official. He assists the state's attorney's office and attends to other state functions that are not assigned to other state officials. Burgomasters today are often trained public administrators, much like city managers in the United States.

Burgos, province, in the Castile-León *comunidad autónoma* ("autonomous community"), north-central Spain. Created in 1833, it has an area of 5,525 square miles (14,309 square km) and includes the enclave of Treviño, which is administratively part of Álava province. Burgos is crossed by the Ebro (north) and the Duero (south) rivers, neither of which is navigable. Burgos is one of the great forested provinces of Spain, with more than 300,000 acres (120,000 hectares) of pine, oak, and beech under state management.

The province's wide ranges of almost uninhabited upland serve as pasture for flocks of sheep. Lambs are exported to Bilbao and Madrid, and goats, cattle, horses, mules, and swine are also raised. The cultivation of wheat and other cereals, however, is the main agricultural activity, and the central and southern portions of the province form part of Spain's best granary. The Duero and Arlanza valleys produce wine, have good communications, and are agriculturally important because of their relatively equable climate and irrigation works. Soft coal (used for briquettes), mica, china clay, and salt are obtained in small quantities, and there are oil fields at Ayoluengo, northwest of Burgos (*q.v.*) city, the provincial capital. A major nuclear power plant was opened at Caroña in 1971. The industries of the province are on a small scale, the ancient woolen, linen, and hemp manufactures surviving in small factories and as cottage industries. The most important urban centre is Burgos city, but modern developments have expanded Miranda de Ebro and Aranda de Duero. Pop. (1986 est.) 366,148.

Burgos, city, capital of Burgos province, in the Castile-León *comunidad autónoma* ("autonomous community"), northern Spain. It is located on the lower slopes of a castle-crowned hill overlooking the Arlanzón River, about 2,600 feet (800 m) above sea level. Founded in 884 as an eastern outpost of the Asturian kingdom by the Castilian count Diego Rodríguez Porcelos, it became the capital of the county and, later, of the kingdom of Castile. In 1494 all foreign trade of Castile, particularly in fine wool, was put under the jurisdiction of the Burgos Guild, the shipping department of which became the model for the famous Casa de Contratación (House of Trade) at Seville. Burgos enjoyed the prestige of a capital city until the reign of Philip II (1556–98); then it sank to political insignificance after 1560, when Madrid (150 miles [241 km] south) was declared the *única corte* ("only court"). With the decline of Castilian trade, Burgos languished until its revival in the 18th century under Charles III. In the Peninsular War the French, in 1808, defeated the Spaniards at Burgos. The French, in turn, were besieged in the city in 1812 by the British, who eventually captured it in 1813. In July 1936 conservative Burgos became the official seat of General Francisco Franco's Nationalist government during the Spanish Civil War and was a base for campaigns toward Madrid and the Basque states.



The Arco de Santa Maria, an ancient gate, with the spires of the cathedral in the background, Burgos, Spain

J. Allan Cash—Ostman Agency

The city is the see of an archbishopric that comprises the dioceses of León, Santo Domingo, and Santander. The city's cathedral, founded in 1221 by Ferdinand III of Castile and the English bishop Maurice of Burgos, is a fine example of florid Gothic (completed 1567) and has 15 chapels. The bones of the 11th-century hero Rodrigo Díaz de Vivar, known as El Cid (who was born *c.* 1043 at nearby Vivar del Cid), and of his wife, Jimena, have rested there since 1919, and there are numerous relics of El Cid and other treasures. In the aisleless Gothic church of Santa Agueda, or Santa Gadea, tradition relates that El Cid compelled Alfonso VI of León, before his accession to the throne of Castile in 1072, to swear that he was innocent of the murder of Sancho, his brother and predecessor on the throne. Other historic landmarks include the Gothic churches of San Nicolás (1505) and San Esteban (1280–1350); the monastery of Santa María la Real de las Huelgas, which was originally a summer palace of the kings of Castile and was transformed into a Cistercian convent in 1187 by Alfonso VIII; and numerous convents and monasteries in the environs of the city.

Burgos is an agricultural centre; its manufactures include liquor, flour, woolen and leather goods, chemical fertilizers, chocolate, and paper. It has a large tourist trade, as well as one of the first public camping grounds to be established in Spain and an extensive sports centre. Pop. (1986 est.) 160,116.

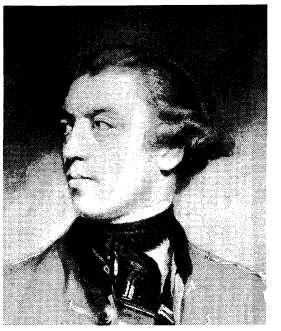
Burgos, José (b. Feb. 9, 1837, Vigan, Phil.—d. Feb. 17, 1872, Manila), Roman Catholic priest who advocated the reform of Spanish rule in the Philippines. His execution made him a martyr of the period preceding the Philippine Revolution.

Burgos studied at San Juan de Letran College and the University of Santo Tomás in Manila, earning a doctorate of philosophy and a licentiate in canon law. His scholarship and ability enabled him to rise quickly within the Philippine hierarchy, serving both in the university cathedral at Manila and as university chaplain. He was dismayed, however, by the apathetic and reactionary attitudes of the clergy, who supported the most oppressive aspects of Spanish rule. In "To the Spanish People," an open letter of 1871, he appealed for reform and a greater measure of self-determination for the Filipinos and attacked the power and privilege of the church. When 200 Filipino soldiers and workers mutinied at Cavite, a town across the bay from Manila, the Spanish authorities, as a retaliatory measure, arrested Burgos, although he was in no way associated with the revolt. On Feb. 17, 1872, he and two other priests, Mariano Gómez and Jacinto Zamora, were publicly executed in Manila.

Burgos' death, in convincing many Filipinos that Spanish rule was an intolerable evil, sparked a movement that was to culminate in the expulsion of the Spanish 24 years later. José Rizal, the great reformer and novelist, acknowledged Burgos' contribution by dedicating his masterpiece *El filibusterismo* to him in 1891.

Burgoyne, John (b. 1722, Sutton, Bedfordshire, Eng.—d. June 4, 1792, London), British general, best-remembered for his defeat by superior American forces in the Saratoga (N.Y.) campaign of 1777, during the U.S. War of Independence.

After serving with distinction in the Seven Years' War (1756–63), Burgoyne was elected



Burgoyne, detail of a painting by Sir Joshua Reynolds, 1766; in the Frick Collection, New York

© the Frick Collection, New York

to the House of Commons in 1761 and again in 1768. Assigned to Canada in 1776 as a major general, he entered into an offensive in which British armies from the north (Burgoyne's troops), south (General Sir William Howe's), and west (Colonel Barry St. Leger's) would unite at Albany, N.Y., isolating New England from the other rebellious colonies. Burgoyne's force captured Fort Ticonderoga, N.Y., on July 6, 1777, but, after reaching the Hudson River, was fought to a standstill by a much larger army commanded successively by General Philip Schuyler and General Horatio Gates, who were brilliantly assisted by Brigadier General Benedict Arnold. Exhausting his food and ammunition and receiving no aid from Howe (who chose to fight in Pennsylvania) or St. Leger (who was defeated at Oriskany, N.Y., and withdrew westward), Burgoyne had to surrender to Gates north of Saratoga Springs on Oct. 17, 1777. Paroled along with his troops, he returned to England, where he had to face severe criticism. For a short time (1782–83) he was commander in chief in Ireland, but he retired increasingly to private life, in which he was a leader of London society and fashion. He also wrote several plays, of which the most successful was *The Heiress* (1786).

burgrave, feminine BURGRAVINE, German BURGGRAF, or BURGRÄFIN, in medieval Germany, one appointed to command a burg (fortified town) with the rank of count (*Graf* or *comes*). Later the title became hereditary and was associated with a domain.

Burgred (d. *c.* 874/875), king of Mercia (from 852) who was driven out by the Danes and went to Rome.

In 852 or 853 he called upon Aethelwulf of Wessex to aid him in subduing the North Welsh. The request was granted and the campaign proved successful, the alliance being sealed by the marriage of Burgred to Aethelswith, daughter of Aethelwulf. In 868 the Mercian king appealed to Aethelred and Alfred

for assistance against the Danes, who were in possession of Nottingham. The armies of Wessex and Mercia did no serious fighting, and the Danes were allowed to remain through the winter. In 874 the march of the Danes from Lindsey to Repton drove Burgred from his kingdom. He retired to Rome and died there.

Burgundian Romanesque style, architectural and sculptural style (*c.* 1075–*c.* 1125) that emerged in the duchy of Burgundy in eastern France and marked some of the highest achievements of Romanesque art (*q.v.*). The designation "school" is misleading, as there was no central authority or universal style, but a similarity of approach can be identified in a number of influential works.

The architecture of the Burgundian school arose from the great abbey church at Cluny, called Cluny III because it was the third abbey church to be built on the site. As constructed from 1088 to about 1130, Cluny III was the largest church built during the Middle Ages, a huge elaboration of the Early Christian basilica plan (longitudinal with side aisles and an apse, or semicircular projection of the eastern, sanctuary end of the centre aisle, or nave). It had five aisles; pointed barrel vaulting over the nave, which was raised to admit light through windows in its upper walls (clerestory); large transepts (transverse aisle separating the sanctuary from the main body of the church); an ambulatory (arcaded walkway) and radiating chapels around the sanctuary apse; and seven towers, including two attached to the western facade and one over the crossing of the nave and transepts. Its length was immense, and its proportions were unusually tall for the Romanesque period. Cluny III was influential in the development of French Romanesque architecture; it served as a close model for the other great Cluniac churches of Burgundy: La Madeleine at Vézelay (*c.* 1104), Paray-le-Monial (*c.* 1109), Saulieu (*c.* 1119), Beaune (*c.* 1120–40), and Autun (*c.* 1130–40). Variations of its plan were also adopted for great Romanesque pilgrimage churches built at Santiago de Compostela, Spain. The Cistercian churches were similar in plan but much more modest; by the end of the 12th century, even the use of towers was proscribed. Certain features that appeared at Cluny III and at some other Burgundian churches, notably Vézelay—tall proportions, the use of pointed arches in the barrel vaults instead of the rounded arch characteristic of the Romanesque, grouped piers, and embryonic forms of rib vaulting and flying (free-standing) buttresses—constituted some of the basic structural elements of Gothic architecture, without, however, the Gothic aesthetic (*see* Gothic art). The design of these churches does show, however, a certain concern with the expressive effects of height that was to become an essential ingredient of Gothic architecture.

Sculpture of the Burgundian school was produced entirely under the direction of the Cluniac order, because the Cistercians forbade architectural decoration. In high relief and largely confined to the capitals of columns and to the tympana (semicircular wall spaces between the horizontal lintels and the surrounding arches) of the great western doors of churches, the sculpture is among the finest in the history of art. Its subject matter is typically Romanesque; the Last Judgment, the Apocalypse, and other metaphysical subjects were favoured over themes of narrative or pathos. The distinctive characteristic of Burgundian sculpture is its calm, majestic severity, achieved through extreme elongation and angularity, drastic flattening, and hierarchical size of figures and through the swirling lines of endless flattened pleats of drapery. The capitals of Cluny III, Vézelay, and Autun and the tympana of Vézelay, Autun, and Conques are the principal examples of Burgundian sculpture. *See also* Cistercian style.

Nave of La Madeleine at Vézelay, Fr., Burgundian style, c. 1104

Lauros—Giraudon from Art Resource/EB Inc.

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Burgundian school, dominant musical style of Europe during most of the 15th century. In the 14th and 15th centuries, when the Burgundian domain came to include most of present-day Netherlands, Belgium, Luxembourg, and Lorraine (now part of France), the prosperous and powerful dukes, particularly Philip the Good and Charles the Bold maintained large chapels of musicians, including composers, singers, and instrumentalists. Among the chapel members in the 15th century were Nicolas Grenon, Jacques Vide, Gilles Binchois, Pierre Fontaine, Robert Morton, Hayne van Ghizeghem, and Antoine Busnois. Although Guillaume Dufay (*q.v.*), the most illustrious Burgundian composer, was probably never a regular member of the chapel, he was associated with the ducal court at Dijon as a musician and chaplain.

Despite Dufay's developments in the mass as a musical genre, the polyphonic chanson, or secular song, is the most characteristic expression of the Burgundian school. Its clear musical structure is based on the stanza patterns of the ballade, rondeau, and virelai, written in the traditional fixed forms of French poetry. Early in the 15th century, composers shifted their attention from the intricate and lengthy ballade to the simpler and more concise rondeau. This shift reflects the general tendency toward greater simplicity, brevity, and naturalness in the Burgundian chanson. Typically, the chanson is dominated by the vocal top part, in which the melodic interest is greatest. Of the two lower parts, the instrumental tenor is the most important, for it provides the main harmonic support for the soprano. In several Dufay chansons the tenor also has a text and a share of the melodic interest. Gilles Binchois (*c.* 1400–60) was the consummate master of the chanson; he composed more than 50 examples, most of them rondeaux. By organizing the chanson around a series of tonally related cadences (points of repose), Binchois established a hierarchy of structure and new unity within a small form.

The Burgundian composers synthesized French form and polyphony with the English predilection for full sonority, which was brought to their awareness largely through the music of English composers (such as John Dunstable; *q.v.*), several of whom spent time on the Continent. With this synthesis the Burgundians created a refined, courtly art in the early Renaissance.

Burgundy, French BOURGOGNE, planning region (French *région de programme*), encompassing the central French *départements* of Côte-d'Or, Saône-et-Loire, Nièvre, and Yonne and coextensive with the historic province of Burgundy. The capital is Dijon. The region has an area of 12,198 sq mi (31,592 sq km) and is bounded by the *départements* of Seine-et-Marne, Aube, and Haute-Marne to the north, Haute-Saône, Jura, and Ain to the east, Rhône, Loire, and Allier to the south, and Cher and Loiret to the west.

The following article summarizes the political history, geography, demographic patterns, and economy of modern Burgundy; for additional treatment of its geography and history, *see* MACROPAEDIA: France.

The original Burgundians migrated southward from the shores of the Baltic and, in the 5th century AD, established a powerful kingdom, extending to the Rhine, within the rapidly deteriorating Western (Roman) Empire. The kingdom fell to the Franks in 534. Burgundy became prominent in the 15th century when its Valois dukes ruled over a large state that included both the medieval county and duchy of Burgundy together with the Low Countries. The territory of Burgundy eventually was annexed by the French crown—the duchy, or province, of Burgundy west of the Saône River in 1477 and Franche-Comté, or free county of Burgundy, in 1678. After the French Revolution Burgundy was divided into *départements*.

The Paris Basin extends into northwestern Burgundy; the Massif Central rises to the south. Burgundy is sparsely populated. The process of rural depopulation that characterized France in the 19th and early 20th centuries was quite pronounced in Burgundy. The population declined by more than 23 percent between 1872 and 1946, and, like the more mountainous areas elsewhere in France, has subsequently increased at a rate well below the national average. Emigration to Paris and to the Rhône-Alps and Franche-Comté regions has depleted the work force. Emigration from the countryside has resulted in the consolidation of farms, which are larger than the national average. The plain of Bresse in Saône-et-Loire continues to be densely populated.

Viticulture is widespread in Côte-d'Or and Yonne and along the Loire River. The wines of Gevrey-Chambertin, Morey, Chambolle-Musigny, Vougeot, and Nuits-Saint-Georges are produced around Dijon. The wines of Aloxe-Corton, Pernand, Beaune, Pommard, Volnay, and Meursault come from vineyards around Beaune. The wines of Rully, Mercurey, Givry, and Montagny are produced around Chalon-sur-Saône. Beef cattle are raised in the Massif Central. Forestry is an important industry.

Industries are concentrated in Saône-et-Loire and Côte-d'Or. Coal is mined at Blanzy in Saône-et-Loire and has led to the development of heavy industries in nearby Creusot. Mechanical equipment is built in Dijon, Mâcon, and Chalon-sur-Saône and is the region's most important manufacture. Pop. (1982) 1,596,-054.

Burgundy wine, any of numerous wines of the region of Burgundy in east central France. Beginning with the Chablis district, the region's vineyards include those of the Côtes de Nuits just south of Dijon, the area around

Beaune and Mâcon, and end in Beaujolais just north of Lyons. Burgundy is a region of varied wines, rather than of a type. Its white wines are usually dry, its reds velvety and full-bodied. Burgundy-type wines made in other countries such as Italy, Spain, Chile, or in California imitate, with varying success, some wine of the region of Burgundy.

The best Burgundy wines are codified under the *Appellations d'Origine.* The use of the names of the districts, as Côtes de Beaune, is controlled, as well as the names of communes, villages, and individual vineyards. The last produce the finest wines; wines bottled on their properties are known as estate-bottled, the counterpart of château-bottled in Bordeaux.

Burgundy wines were known by the Romans and have a continuous history. The planting of some vineyards is ascribed to Charlemagne. By the 12th century great areas were planted and had found a market.

Wine properties in Burgundy are small, and until the 20th century the tendency had been for growers to turn over their production for shippers to bottle. In the 1930s a classification of Burgundy wines was undertaken; the resulting application of an *Appellation d'Origine* promoted a tendency for growers to bottle their own wine under a protected label showing their name and property.

Yonne. This district produces mainly white wines. The famous Chablis is a very dry wine, light and with subtle bouquet; only wines from delimited areas in Yonne are allowed the name Chablis.

Côtes-d'Or. This district is divided in two parts, the Côte de Nuits just south of Dijon and the Côte de Beaune farther south. In the Côte de Nuits red wines are produced almost exclusively. Villages that have given their names to famous wines are Gevrey-Chambertin, Morey-St. Denis, Chambolle-Musigny, Vougeot, Vosne-Romanée, and Nuits-St. Georges. Formerly these villages were simply Gevrey, Morey, Chambolle, etc.; but as their wines, such as Chambertin from Gevrey, became celebrated the villages adopted hyphenated names, the former village name first and the wine name last. Wines labeled with such hyphenated names are not the same as the original, though; the wine Gevrey-Chambertin is not the same as Chambertin. Well-known are the Chambertins, Clos St. Denis, Clos de la Roche, Musigny, Clos de Vougeot, Les Grands Echêzeaux, Romanée-Conti, Les Richebourg, Nuits-St. Georges.

In Côte de Beaune both red and white wines, including most of the best white Burgundies, are produced. The important communes are Aloxe-Corton, Savigny, Beaune, Pommard, Volnay, Meursault, Puligny-Montrachet, Chassagne-Montrachet, and Santeny.

Saône-et-Loire. In this district are prolific but less distinguished vineyards. Mercurey and Givry are esteemed red wines. Around Mâcon are whites of good quality, notably Rully, Montagny, and also Pouilly-Fuissé, a dry, heady wine with much bouquet.

Rhône. Beaujolais, a tasty and fruity wine, is notable. It is made from the Gamay grape, which in other areas produces a large but low-quality yield. It is drunk young.

The vintage wines of Juliénas, Fleurie, and Moulin-à-Vent have also the quality of aging well.

Burhānpur, town, East Nimār district, Madhya Pradesh state, central India, just north of the Tāpti River. Founded in AD 1399 by Naṣīr Khān, the first independent prince of the Fārūqī dynasty of Khāndesh, it was annexed by the Mughal emperor Akbar in 1601. Surrounded by a wall with massive gates, it served as the Deccan headquarters of the Mughals until Aurangzeb moved the capital to Aurangābād in 1636. For many years the scene of Marāṭhā–Mughal conflicts, it was captured in 1803 by Maj. Gen. Arthur Wellesley, later 1st duke of Wellington. It was restored to the Sindhias in 1805 and ceded to the British in 1861.

Buildings of historic interest include the ruined citadel and palace (Bādshāhī Qalʿah; *c.* 1400), the Mosque of the Lady (*c.* 1585), and the Jāmiʿ Masjid, or Great Mosque (1588). Burhānpur developed an extensive trade in muslin, gold and silver brocade, and lace, which declined during the 18th century, though such industries still continue on a small scale. A major rail junction, it is also a centre of cotton textile manufacturing and of trade. Its four colleges, one a government college, are affiliated with the University of Saugar. Pop. (1981) 140,986.

burhead, any of the annual or perennial herbs of the genus *Echinodorus,* named for their round, bristly fruit. The plants grow mostly in warm regions in shallow ponds and swamps. They are slender and are seldom more than 25 centimetres (10 inches) tall. The leaves are spear shaped or ovate.

Burhead (*Echinodorus grandiflorus*)
Walter Dawn

E. cordifolius, which has a creeping stem and large, ovate leaves, occurs in southern North America. *E. tenellus* has spear-shaped leaves about 5 cm long and occurs throughout eastern and southwestern North America, the West Indies, and South America. A number of species are cultivated as aquarium plants.

burial, the disposal of human remains by depositing in the earth, a grave, or a tomb, by consigning to the water, or by exposing to the elements or carrion animals. Geography, religion, and the social system all influence burial practices. Climate and topography determine whether the body is buried under the ground, placed in water, burned, or exposed to the air; religious and social attitudes determine how elaborate the burials should be. Rank may determine whether the body is placed in the shallow trench of a simple burial or in an underground chamber of impressive dimensions and construction; whether the body is thrown into a lake, river, or ocean or launched on a raft or in a ship; whether bonfires or vast pyres are lighted to roast the flesh from the bones and reduce them to ash (*see* cremation); whether the body is left on the ground to be consumed by scavengers or weathered by sun, rain, and wind or placed on scaffolds or high towers. In modern Tibet, for example, where four methods are used, water disposal is considered adequate for the members of the lowest classes; burial in the earth and exposure to the air are for the middle ranks; and cremation is reserved for the most exalted.

The burials of kings and religious leaders have almost universally been characterized by lavish display. From ancient Sumer to modern England, the rites accorded temporal or spiritual rulers have been sumptuous and their tombs costly—whether provided by admiring followers or designed by the lofty themselves. Often the rites have involved great sacrifice of life in addition to wealth. Until recently, when an Ashanti king died—and members of that African tribe kept secret the fact that he was dead—an attendant would be killed at each stage in the preparations so that in death the ruler would have someone with him to perform the services of bathing, dressing, and feeding. To ensure him of company, a number of handsomely garbed and jewelled wives were also dispatched; and a year after death, when the coffin was finally placed in the royal mausoleum, an entourage of wives, cooks, and other servants was entombed with the king.

Modern heads of state are not guaranteed such postmortem attention, but even in the most democratic countries their burial is usually marked by elaborate and costly ceremonies. A rare exception was the modest burial of Pres. Charles de Gaulle, retired president of France, in 1970. At his request he was buried with utmost simplicity in the small cemetery of Colombey-les-Deux-Églises in a plain wooden coffin made by the village carpenter and with only his family, a few close friends, and his neighbours in attendance. When the burden of caring for the dead becomes intolerable or excessive, reaction has often occurred, led by religious or by secular authorities and resulting in sumptuary laws limiting expenditures, enacted by such diverse peoples as the ancient Romans, Renaissance English, and the Puritans in the United States.

Inhumation. Burial in the ground by hollowing out a trench in the earth for the body or covering it with rocks or dirt dates back at least to Middle Paleolithic times. Inhumation is the most universal method of burial, as well as being one of the oldest; indeed, some animals employ it. Inhumation of various kinds may be simple or elaborate. Some Eskimo people cover the corpse with a pile of stones or, if stones are not available, with a small ice igloo; the old Norse people built barrows that sometimes reached enormous heights. Similarly, graves may be mere shallow pits, or they may be intricate and beautifully fashioned subterranean palaces sunk deep into the earth and spacious enough to accommodate vast numbers of persons. Excavations of the royal graves of Ur (dating back to *c.* 3000 BC) revealed, in an inner chamber of one, the body of a ruler with a few intimate attendants and, in surrounding chambers, servants, ministers, dancing girls, charioteers with vehicles and animals, and other persons who had been slain to provide service in death. Skeletons of Bronze Age heroes who had been buried together were found in the royal graves at Mycenae. Recent discoveries in Peru revealed that the Paraca burial chambers, hewn out of solid rock 18 feet (about five metres) below the surface of the ground, were large enough to accommodate as many as 400 corpses with all of the belongings it was thought they would need in the afterworld. Customarily, however, graves have been planned for the burial of individuals.

Caves, a natural refuge of man, have also been used for the dead. The ancient Hebrews used natural single-chamber caves and hewed oblong recesses lengthwise into the walls to accommodate the dead, a custom that encouraged the building of mausoleums. At first regarded as sacred places, they came to be considered unclean; by the time of Christ they were coated with lime so that they could be recognized and avoided—the literal origin of the metaphoric "whited sepulchres." Among many people, however, sepulchral caves con-

tinued to be regarded as sacred and eventually became places of worship. Among them are thousands of rock temples in western India and in Sri Lanka (Ceylon), some of which received elaborate architectural and sculptural treatment. In Egypt, rock temples were sometimes fronted with an open-air exterior building; an example is Abu Simbel, which extended 180 feet (55 metres) into the rock formation. Both caves and earth graves encouraged the development of other burial practices: the use of coffins and rich graveclothes and burial goods.

Even the positioning of the body came to acquire significance, generally of a religious nature, though involving other considerations. Customarily the body is placed in an extended position, in or out of a coffin, as if in sleep. Bodies of Muslims are laid so that the right side faces Mecca; those of Buddhists are laid with the head to the north. The bodies of ancient Egyptians were placed to face toward the west, perhaps as an indication of the importance of the land of the dead. The Dagari (Dagaba) people of Africa base distinctions on sex. According to one scholar, in death, men are laid on their right side facing east so that the rising sun will tell them to prepare for hunting or farming, and women are laid facing west so that the setting sun will warn them the time has come to prepare the evening meal. Not all groups prefer the sleeping position. Early cultures buried their dead in a crouching or squatting position. In Babylon and Sumer, the sleeping position was reserved for the more exalted; servants killed and buried with their rulers were placed in a crouching position so that they would be ready to serve at royal command. Indians of the Americas often bury their dead in a fetal position, sometimes in a basket or clay urn, with knees under the chin and the body neatly tied into a death bundle. Upright burial has been favoured by other people, particularly for warriors; in Vienna in 1970, it was reported that a club for the "Vertically Buried Loved Ones" was enjoying popularity; burial was being effected in a plastic tube placed upright in a deep hole.

Water burial. The association between water and immortality is reflected in the myths of many cultures, myths that often centre around a god-hero who sails away from his people in death with the promise to return again. The bodies of chiefs and heroes, therefore, have often been set adrift on rivers and oceans in death ships. Among the Norse, even those who were interred were sometimes given such a bier—a custom that was widespread from Iceland to England during the 7th and 8th centuries AD. Perhaps the most famous of such ship burials that have been excavated was that at Sutton Hoo in Suffolk, England. In one mound, archaeologists found the remains of a wooden boat for 38 rowers, 85 feet (26 metres) long, that had been dragged a half mile (about one kilometre) from the river and lowered into the ground. Even women were so honoured, as revealed by excavations at Oseberg in Norway of an impressive Viking ship that had been used as a grave for two women.

Water burials have been common in other cultures. In the South Pacific it was customary to place the dead in a canoe and launch that on the water. Not all water burial involves a ship or raft, however. In the Solomon Islands, bodies are simply laid on a reef to be eaten by sharks; in other places they are wrapped and weighted with stones. In Tibet the bodies of the poor, as well as those of beggars, lepers, and babies, are sometimes thrown into rivers and streams. No special preparations are made in some places; in others, weights are attached before bodies are thrown in; in still others, they are dismembered before being put in the water. In Western cultures, water burial is still employed on occasion when people die during a sea voyage. Recently, there has been a growth in the practice of scattering the ashes on water after cremation—particularly along the Pacific coast of the United States. That custom obtains also in various parts of Asia. In Laos the ashes of the cremated are often strewn at sea; in India a bone-throwing ceremony concludes the Hindu death observances. Within a year after death the remains are taken to the Ganges and thrown into the sacred water; if it is not possible to do that, they are thrown into another river or stream with the hope that they will eventually make their way to the Ganges.

Exposure. Placing the body where it may be eaten by scavenging birds and animals or weathered to its essential elements has been held by many groups to be the most desirable form of disposal for spiritual as well as material reasons. The Zoroastrians have been perhaps the most widely known practitioners of this type of burial, which developed out of the belief that the corpse is so unclean that to inter or to cremate it would contaminate the "pure elements" of earth, fire, and water. Since the 6th century BC it has been their custom to leave bodies on mountains or hills at a distance from the community. In Bombay the Parsis (as the Indian descendants of the Persian refugees are called) maintain "towers of silence," high circular structures. The dead are carried to them, and funeral servants place them on stone beds surrounding a central pit. After the hovering vultures have stripped the flesh from the bones—usually within a few hours—the bones are gathered and dropped into the central pit. In Tibet, where cremation, water, and ground burial are also employed despite difficulties, exposure is common, partly because of the religious belief that bodies without souls have no significance. The Mongolian nomads, who consider it honourable as well as expedient to die "on the plain," practice several types of exposure. Whenever possible, the sick and the infirm are taken from the tents before the moment of death. Usually, the body is left to be eaten by scavengers. Bodies of infants and children are sometimes placed in a sack and abandoned at a crossroad; the first Mongol thereafter to pass the spot is obliged to open the sack so that the spirit may take flight into the afterlife. A number of people who expose the dead use trees and platforms (tree burial). Among them are the primitive Balinese, the Nāga tribes of India, the tribes of central Australia, and the Sioux and other North American Indian groups. Commonly, the Sioux robed the dead in their best clothing, sewed them into a deerskin or buffalo shroud, and carried them to a platform about eight feet (2.5 metres) high. Various possessions and gifts were placed on the scaffold, and the body was allowed to remain there for a year; at the end of that time it was taken down and given an earth burial.

Second burial. Among many people, particularly in primitive cultures, a period of waiting occurs between the first and a second burial that often coincides with the duration of decomposition. The origin of this practice is considered to be the different concept of death held by these peoples. In modern societies, death is regarded as instantaneous; it is not so in many nonliterate societies, where it is held to involve a slow change, a passage from the visible society of the living to the invisible one of the dead. During the period of decomposition the corpse is sometimes treated as if it were alive, provided with food and drink, and surrounded by company. Often the dead were kept at home with the living; among the Dayak people of Borneo, chiefs and social leaders were kept in the longhouse with the entire village—a practice to which Dutch officials objected so strenuously that temporary houses were built for the dead. Some groups, the Indonesians, for example, attached mystical importance to the disintegration of the body, collecting and carefully disposing of the liquids produced by decomposition—sometimes mixing them with rice to ingest them. In some cultures the body is mummified or given earth burial or exposed to air during the interval before final burial, as mentioned above. In Bali, where the soul is believed to have left completely by the 42nd day after death, the body, which has been mummified or given earth burial, is cremated. Among Australian Bushmen the bones are allowed to bleach in the sun for several months, after which they are cleaned, painted, and placed in a hollow pole, which has been elaborately decorated with the totem symbols of the dead warrior. In Romania it was the custom to disinter the dead at fixed intervals—three years after burial for a child, five for a youth, and seven for an older person. Then the bones were washed with wine and water, put into a linen bag, and taken to the church for a second burial. The final burial, which was widely believed to mark the entrance of the soul into the land of the dead, was characterized by ceremony and often involved the whole community. A funeral feast was customarily served, and at the end of the affair, the mourners re-entered society.

In some rare instances the second burial is a collective one. Every 10 or 12 years the Hurons of North America held a "feast of souls," a major festival during which the remains of the dead were gathered up and deposited in the communal burial place. Another type of secondary burial also occurs, but it is one that has to do with cemetery space. In a number of South American and European countries where space is relatively scarce, people often lease a grave. At the end of three or five years the body is exhumed, and the bones are put into a niche in an ossuary or disposed of in a common grave.

Western burials in the 20th century have become fairly standardized. The dead are interred in cloth-lined and simply ornamented coffins called caskets, and after ceremonies of eulogy and farewell the assemblage is lowered into a rectangular hole, usually dug six feet deep into the soil, which is then filled up with earth. Beginning in the 19th century, burials increasingly took place in cemeteries, which are special areas distinct from churchyards set aside as sites for graves. *See* cemetery.

burial mound, artificial hill of stones and earth built over the remains of the dead. In England the equivalent term is barrow; in Scotland, cairn; and in Europe, tumulus. Although it still appears on some survey maps, the term tumulus is becoming obsolete.

In western Europe and the British Isles burial cairns and barrows date primarily from the Neolithic Period and Early Bronze Age. The burial chambers in Britain, unlike those of similar structures in the Mediterranean region, were seldom excavated in the soil beneath the barrow but were enclosed within the structure itself. In England long barrows were prominent in the Neolithic Period, while round structures became characteristic in the Early Bronze Age. Both types continued to be used until late pre-Christian times and are most common in Wiltshire. Other regional variations in shape include horned, double horned, or claw-shaped (as in Donegal or Sligo, Ire., where the horns curve around a forecourt); long, often pear-shaped, and higher at one end; ring-shaped (as in Scotland); coffin-shaped (called cists); wedge-shaped (also called Paris cists, found chiefly in northern France and in Cornwall); or heel-shaped and chambered.

In North America burial mounds were characteristic of eastern Indian cultures from 1000 BC to AD 700. The most numerous and grandly conceived, found in the Ohio and Mississippi valleys, were large conical or pyra-

midal (sometimes truncated) mounds. Along the upper Mississippi and the Great Lakes, some of the later examples are in the shape of animals and other forms.

Mound burial is still used in various parts of the world, particularly where the soil is difficult to excavate or where wild animals might disturb the body.

Burian, Emil František (b. June 11, 1904, Plzen, Czech.—d. Aug. 9, 1959, Prague), Czech author, composer, playwright, and theatre and film director best known outside Czechoslovakia for his eclectic theatre productions that drew upon a wide variety of art forms and technologies for their effects.

His father and uncle were both outstanding singers, so it was not surprising that the young Burian's training was in music. At the age of 19, while still a student, he completed the music for the first of his six operas, *Alladine and Pallomides,* based on the play by Maurice Maeterlinck (1923). Burian continued his studies in musical composition under Josef Foerster at the Prague Conservatory, leaving in 1927 to work with various unconventional cabarets and music groups, including an avant-garde ensemble devoted to choral reading of poetry, the Voice Band, which toured Italy in 1928. During this period Burian's interest in diverse musical traditions, including contemporary Russian music as well as jazz and American Negro dance rhythms, became principal influences upon his work.

In 1929 Burian's wide-ranging performing-arts interests led him to accept a one-year appointment as literary adviser to the Modern Studio of Prague and, later on, positions as director at theatres in Brno and Olomouc. His theatrical apprenticeship completed, Burian returned to Prague in 1933 to open his own theatre, D34. That theatre (the name would change annually to reflect the current year) made Burian internationally famous. Albeit a small concert hall seating only 383 persons and with a stage but 20 feet wide and 12 feet deep, D34 and its successors saw Burian mount productions by contemporary Czechs and Europeans, as well as reworkings of classics by such authors as Shakespeare, Molière, Pushkin, Goethe, Dostoyevsky, and Beaumarchais. The productions combined dance, film, song, live instrumental music, acting, projections, signboards, phonograph recordings, choral reading, and stage machinery in a manner similar to the multimedia work of Erwin Piscator and N.P. Akimov. Burian, however, with the assistance of his chief designer, Miroslav Kouril, fused and integrated all the elements, whereas others simply juxtaposed them one to the other.

Though broken in health after being committed to a concentration camp by the Nazis (1941–45), Burian returned to Prague after the war to reopen D46 and extend his activities to journalism and politics. He was elected to Parliament in 1948. In 1951, D51 was renamed the Army Theatre of Art, and Burian was made a colonel. He was declared a national artist of Czechoslovakia in 1954. In addition to more than 300 songs, innumerable poems, and a novel, his recollections of his incarceration were published under the title *Eight from There.* D34 established the traditions for Czech theatre practice best exemplified today by the work of Josef Svoboda.

Buriat (people): *see* Buryat.

Buriat Autonomous Soviet Socialist Republic: *see* Buryat Autonomous Soviet Socialist Republic.

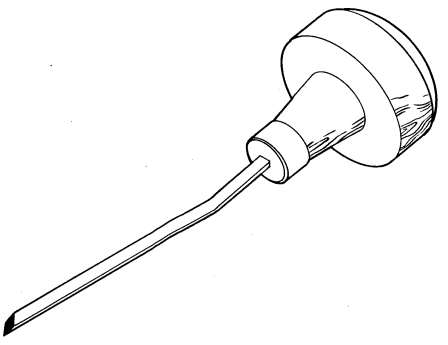
Buridan, Jean, Latin JOANNES BURIDANUS (b. 1300, probably at Béthune, County of Artois—d. 1358), Aristotelian philosopher, logician, and scientific theorist in optics and mechanics.

After studies in philosophy at the University of Paris under the nominalist thinker William of Ockham, Buridan was appointed professor of philosophy there. He served as university rector in 1328 and in 1340, the year he condemned Ockham's views, an act sometimes called the first seed of theological skepticism. Buridan's own works were condemned and placed on the *Index of Forbidden Books* from 1474 to 1481 by partisans of Ockham.

A defender of the principle of causality, Buridan asserted a modified version of traditional moral determinism, declaring that men must will what presents itself as the greater good, but that the will is free to delay the reason's judgment by suggesting a more thorough inquiry into the value of motives. The dilemma of a particular kind of moral choice, between two evidently identical items, is illustrated by the celebrated allegory of "Buridan's ass," though the animal mentioned in Buridan's commentary on Aristotle's *De caelo* ("On the Heavens") is actually a dog, not an ass. His discussion centres on the method by which the dog chooses between two equal amounts of food placed before him. Discerning both a symmetry of information and a symmetry of preference about the two items, he concludes that the dog must choose at random; this outcome leads to the investigation of theories of probability.

Among Buridan's achievements in mechanics was his revision of Aristotle's theory of motion, which had maintained that a thing is kept moving by the air surrounding it. Buridan developed a theory of impetus by which the mover imparts to the moved a power, proportional to the speed and mass, which keeps it moving. In addition, he correctly theorized that resistance of the air progressively reduces the impetus, and that weight can add or detract from speed. His studies of optical images prefigured modern developments in cinematics. In logic he explicated doctrines of Aristotle, Ockham, and Peter of Spain. In addition to commentaries on Aristotle's *Organon, Physics, De anima, Metaphysics,* and *Economics,* his works include *Summula de dialecta* (1487) and *Consequentie* (1493).

burin, also called GRAVER, engraving tool with a metal shaft, cut or ground diagonally downward to form a diamond-shaped point at the tip. The angle of the point of a particular tool affects the width and depth of the engraved lines. The shaft of the tool is fixed in a flat handle that can be held close to the working surface; it has a wide rounded end



Burin

for bracing against the palm of the hand. The point of the tool is guided by thumb and forefinger.

Buriram, town and *changwat* (province) in the Northeastern region of Thailand, on the Khorat Plateau. Buriram town, the provincial capital, and Lam Plai Mat are commercial centres on the Bangkok–Nakhon Ratchasima–Ubon Ratchathani railway. The province stretches from the Mae Nam (river) Mun on the north to the Phanom Dongrak border range with Kampuchea (Cambodia) on the south. It has an area of 3,985 sq mi (10,322 sq km) and is drained by the Huai Lam (river) Plai Mat. The vegetation is primarily savanna; and cattle, timber, and rice are the chief products. The province's inhabitants are mainly of Kampuchean stock. Pop. (1980) town, 23,502; (1983 est.) 1,209,464.

Buritanika Kokusai Daihyakka-jiten, English BRITANNICA INTERNATIONAL ENCYCLOPÆDIA, first major encyclopaedia of international scope written in the Japanese language. The first volumes of the 28-volume set were released in June 1972, and the last in 1975. The set is organized as follows: 20 volumes of comprehensive articles, 6 volumes that constitute a Reference Guide (designed to give the reader essential details in brief form), one volume devoted to the comprehensive General Index, and a one-volume Reader's Guide devoted to bibliographies arranged according to subject and to selected reading lists and instructions for individual study. The *Buritanika Kokusai Daihyakka-jiten* makes extensive use of the materials in *Encyclopædia Britannica,* supplementing these with articles of specifically Japanese interest.

Burke FAMILY: *see* Burgh Family.

Burke, Edmund (b. Jan. 12? [Jan. 1, old style], 1729, Dublin—d. July 9, 1797, Beaconsfield, Buckinghamshire, Eng.), British statesman and political thinker prominent from

Edmund Burke, detail of an oil painting from the studio of Sir Joshua Reynolds, 1771; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

1765 to about 1795 and important in the history of political theory. He appeared as a champion of conservatism in opposition to Jacobinism in *Reflections on the Revolution in France* (1790).

Early life. Burke, the son of a solicitor, entered Trinity College, Dublin, in 1744 and moved to London in 1750 to begin his studies at the Middle Temple. There follows an obscure period in which Burke lost interest in his legal studies, was estranged from his father, and spent some time wandering about England and France. A contribution to aesthetic theory, *A Philosophical Enquiry into the Origin of Our Ideas of the Sublime and Beautiful,* which appeared in 1757, gave him some reputation in England and was noticed abroad, among others by Denis Diderot, Immanuel Kant, and G.E. Lessing. In agreement with the publisher Robert Dodsley, Burke initiated *The Annual Register* as a yearly survey of world affairs; the first volume appeared in 1758 under his (unacknowledged) editorship, and he retained this connection for about 30 years.

In 1757 Burke married Jane Nugent. From this period also date his numerous literary and artistic friendships, including those with Dr. Samuel Johnson, Oliver Goldsmith, Sir Joshua Reynolds, and David Garrick.

Political life. After a first unsuccessful venture into politics, Burke was appointed secretary, in 1765, to the Marquess of Rockingham, leader of one of the Whig groups, the largely liberal faction in Parliament, and entered the House of Commons . Burke remained Rockingham's secretary until the latter's death in 1782.

Burke soon took an active part in the domestic constitutional controversy of George III's reign. The King was seeking to reassert a more active role for the crown—which had lost some influence in the reigns of the first two Georges—without infringing on the limitations of the royal prerogative set by the revolution settlement. Burke's chief comment on this issue is his pamphlet "Thoughts on the Cause of the Present Discontents" (1770). He argued that George's actions were against not the letter but the spirit of the constitution. The pamphlet includes Burke's famous, and new, justification of party, defined as a body of men united on public principle, which could act as a constitutional link between king and Parliament, providing consistency and strength in administration, or principled criticism in opposition.

In 1774 Burke was elected a member of Parliament for Bristol, then the second city of the kingdom and an open constituency requiring a genuine election contest. He held this seat for six years but failed to retain the confidence of his constituents. For the rest of his parliamentary career he was member for Malton, a pocket borough of Lord Rockingham's. It was at Bristol that Burke made the well-known statement on the role of the member of Parliament. The elected member should be representative, not delegate. The electors are capable of judging his integrity, and he should attend to their interest; but, more importantly, he must address himself to the general good of the whole community, acting according to his own judgment and conscience, unfettered by mandates or prior instructions from those he represents.

Burke gave only qualified support to the parliamentary reform movements, his main concern being curtailment of the crown's powers. However, he accepted the possibility of widening political participation, provided that there was evidence of rationality, restraint of aggressive partiality, and dedication to the common good; he rejected any doctrine of mere rule of numbers. Apart from holding general principles on this subject, Burke made a practical attempt to reduce the influence of the crown as one of the leaders of the movement for economic reform, which pressed for parliamentary control of royal patronage and expenditure. When the Rockingham Whigs took office in 1782, bills were passed reducing pensions and emoluments of offices, including Burke's own. Burke was specifically connected with an act regulating the civil list, the amount voted by Parliament for the personal and household expenses of the sovereign.

A second great issue that confronted Burke in 1765 was the quarrel with the American colonies. The imposition of the Stamp Act in 1765, along with other measures, provoked unrest and opposition, which soon swelled into disobedience, conflict, and secession. English policy was vacillating; determination to maintain imperial control ended in coercion, repression, and unsuccessful war. Opposed to the tactics of coercion, the Rockingham group in their short administration of 1765–66, repealed the Stamp Act but asserted the imperial right to impose taxation by the Declaratory Act.

Burke's best known statements on this issue are two parliamentary speeches, "On American Taxation" (1774) and "On Moving His Resolutions for Conciliation with the Colonies" (1775), and "A Letter to . . . the Sheriffs of Bristol, on the Affairs of America" (1777). British policy, he argued, had been both imprudent and inconsistent, but above all legalistic and intransigent, in the assertion of imperial rights. Authority must be exercised with respect for the temper of those subject to it, if there was not to be collision of power and opinion. This truth was being ignored in the imperial quarrel; it was absurd to treat universal disobedience as criminal: the revolt of a whole people argued serious misgovernment. Burke made a wide historical survey of the growth of the Colonies, the special traditions and circumstances that had formed their character, the revolutionary changes in the recent past, and their economic problems. In the place of narrow legalism he called for "legislative reason," an imaginative reinterpretation of the values enshrined in the imperial relation in the light of these new factors.

In view of the magnitude of the problem, the adequacy of Burke's specific remedies is questionable, but the principles on which he was basing his argument were the same as those underlying his "Present Discontents": government should ideally be a cooperative, mutually restraining relation of rulers and subjects; there must be attachment to tradition and the ways of the past, wherever possible, but equally, recognition of the fact of change and the need for a comprehensive and discriminating response to it, reaffirming the values embodied in tradition in new circumstances.

Ireland was a special problem in imperial regulation. It was in strict political dependency on England and internally subject to the ascendancy of an Anglo-Irish Protestant minority, owning the bulk of the land. Roman Catholics were excluded by a penal code from political participation and public office. To these oppressions were added widespread rural poverty and a backward economic life aggravated by commercial restrictions resulting from English commercial jealousy. Burke was always concerned to ease the burdens of his native country. He consistently advocated relaxation of the economic and penal regulations, and steps toward legislative independence, at the cost of alienating his Bristol constituents and of incurring suspicions of Catholicism and charges of partiality.

The remaining imperial issue, to which he devoted many years, and which he ranked as the most worthy of his labours, was that of India. The commercial activities of a chartered trading concern, the British East India Company, had created an extensive empire. Burke in the 1760s and 1770s opposed interference by the English government in the company's affairs as a violation of chartered rights. However, he learned a great deal about the state of the company's government as the most active member of a select committee that was appointed in 1781 to investigate the administration of justice in India but which soon widened its field to that of a general inquiry. Burke concluded that the corrupt state of Indian government could be remedied only if the vast patronage it was bound to dispose of was in the hands neither of a company nor of the crown. He drafted the East India Bill of 1783 (of which the Whig statesman Charles James Fox was the nominal author), which proposed that India be governed by a board of independent commissioners in London. After the defeat of the bill, Burke's indignation came to centre on Warren Hastings, governor general of Bengal from 1772 to 1785. It was at Burke's instigation that Hastings was impeached in 1787, and he challenged Hastings' claim that it was impossible to apply Western standards of authority and legality to government in the East. He appealed to the concept of the Law of Nature, the moral principles rooted in the universal order of things, to which all conditions and races of men were subject.

The impeachment, generally regarded as an injustice to Hastings (who was ultimately acquitted), is the most conspicuous illustration of the failings to which Burke was liable throughout his public life, including his brief periods in office as paymaster general of the forces in 1782 and 1783. His political positions were sometimes marred by gross distortions and errors of judgment. His Indian speeches fall at times into a violence of emotion and abuse, lacking restraint and proportion. His reliance on the opinions of Sir Philip Francis, one of Hastings' most pertinacious enemies, illustrates his inability to accurately judge personality. His parliamentary activities were at times irresponsible or factious.

Nor did Burke escape the charge, in Indian affairs, of personal interest. Throughout his career he was associated financially and politically with his brother Richard and a putative kinsman, William Burke, both doubtful characters known to be unsuccessfully speculating in East India stock. The Burkes' joint finances were indeed always in a precarious state, and as Edmund was ever eager to forward his kinsmen's political fortunes it is understandable that he appeared in some hostile eyes as hardly more than one of a clan of Irish adventurers. It has not been shown that he himself was a speculator in company stock; it seems rather that he was rendered blind or oblivious to the nature of his relatives' proceedings by family partiality. Nor do his political lapses, even at their worst, appear to spring from self-interest or unworthy motives but from his failure to control and balance his unusually sensitive and powerful emotional nature.

The outbreak of the French Revolution in 1789 was initially greeted in England with much enthusiasm. Burke, after a brief suspension of judgment, was both hostile to it and alarmed by this favourable English reaction. He was provoked into writing his *Reflections on the Revolution in France* (1790) by a sermon of the Protestant dissenter Richard Price welcoming the Revolution. Burke's deeply felt antagonism to the new movement propelled him to the plane of general political thought; it provoked a host of English replies, of which the best known is Thomas Paine's *The Rights of Man* (1791–92).

In the first instance Burke discussed the actual course of the Revolution, examining the personalities, motives, and policies of its leaders. More profoundly, he attempted to analyze the fundamental ideas animating the movement and, fastening on the Revolutionary concepts of "the rights of man" and popular sovereignty, emphasized the dangers of democracy in the abstract and the mere rule of numbers when unrestrained and unguided by the responsible leadership of a hereditary aristocracy. Further, he challenged the whole rationalist and idealist temper of the movement. It was not merely that the old social order was being pulled down. He argued, further, that the moral fervour of the Revolution, and its vast speculative schemes of political reconstruction, were causing a devaluation of tradition and inherited values and a thoughtless destruction of the painfully acquired material and spiritual resources of society. Against all this, he appealed to the example and the virtues of the English constitution: its concern for continuity and unorganized growth; its respect for traditional wisdom and usage rather than speculative innovation, for prescriptive, rather than abstract, rights; its acceptance of a hierarchy of rank and property; its religious consecration of secular authority and recognition of the radical imperfection of all human contrivances.

As an analysis and prediction of the course of the movement, Burke's French writings, though frequently intemperate and uncontrolled, were in some ways strikingly acute; but his lack of sympathy with its positive ide-

als concealed from him its more fruitful and permanent potentialities. It is for the criticism and affirmation of fundamental political attitudes that the *Reflections* and *An Appeal from the New to the Old Whigs* (1791) retain their freshness, relevance, and force.

Burke opposed the French Revolution to the end of his life, demanding war against the new state and gaining a European reputation and influence. But his hostility to the Revolution went beyond that of most of his party and in particular was challenged by Fox. Burke's long friendship with Fox came to a dramatic end in a parliamentary debate (May 1791). Ultimately the majority of the party passed with Burke into support of William Pitt's government. In 1794, at the conclusion of Hastings' impeachment, Burke retired from Parliament. His last years were clouded by the death of his only son, on whom his political ambitions had come to centre. He continued to write, defending himself from his critics, deploring the condition of Ireland, and opposing any recognition of the French government (notably in "Three Letters Addressed to a Member of the Present Parliament on the Proposals for Peace, with the Regicide Directory of France" [1796–97]).

Burke's thought and influence. Burke's writings on France, though the most profound of his works, cannot be read as a complete statement of his views on politics. Burke, in fact, never gave a systematic exposition of his fundamental beliefs but appealed to them always in relation to specific issues. His consistency during his political career has therefore been debated. He himself repudiated the charge of inconsistency, and it is possible to regard his writings as an integrated whole in terms of constant principles underlying his practical positions.

Burke conceives the life of feeling and the spiritual life of man as a harmony within the larger order of the universe. Natural impulse, that is, contains within itself self-restraint and self-criticism; the moral and spiritual life is continuous with it, generated from it and essentially sympathetic to it. It follows that society and state make possible the full realization of human potentiality, embody a common good, and represent a tacit or explicit agreement on norms and ends. The political community acts ideally as a unity. Political participation will naturally differ from one part of society to another, and from period to period, but it should always exclude aggressive self-interest and allow expression of rational self-interest compatible with the good of the whole.

This interpretation of nature and the natural order implies deep respect for the historical process and the usages and social achievements built up in time. Therefore, social change is not merely possible but also inevitable and desirable. But the scope and the role of thought operating as a reforming instrument on society as a whole is limited. It should act under the promptings of specific tensions or specific possiblities, in close union with the detailed process of change, rather than in large speculative schemes involving extensive interference with the stable, habitual life of society. Also, it ought not to place excessive emphasis on some ends at the expense of others. Burke's hope, in effect, is not a realization of particular ends, such as the "liberty" and "equality" of the French Revolution, but an intensification and reconciliation of the multifarious elements of the good life that community exists to forward.

In his own day, Burke's writings on France were an important inspiration to German and French counterrevolutionary thought. His influence in England has been more diffuse, more balanced, and more durable. He stands as the original exponent of long-lived constitutional conventions, the idea of party, and the role of the member of Parliament as free representative, not delegate. More generally, his remains the most persuasive statement of certain inarticulate political and social principles long and widely held in England: the validity of status and hierarchy and the limited role of politics in the life of society.

(C.W.Pa./Ed.)

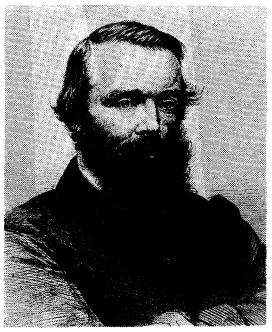
BIBLIOGRAPHY. A standard edition of *Reflections* is that of Conor C. O'Brien (1969). Carl B. Cone, *Burke and the Nature of Politics*, 2 vol. (1957–64) is a detailed biography. Alice P. Miller, *Edmund Burke and His World* (1979), is a popular introduction. Discussions of Burke's thought, or phases of it, in relation to the political issues of his career include John Morley, *Edmund Burke: A Historical Study* (1867, reprinted 1979); Gerald W. Chapman, *Edmund Burke: The Practical Imagination* (1967); Harvey C. Mansfield, Jr., *Statesmanship and Party Government: A Study of Burke and Bolingbroke* (1965); and R.R. Fennessy, *Burke, Paine, and the Rights of Man* (1963). Attempts to restate Burke's ideas as a systematic political philosophy include Charles W. Parkin, *The Moral Basis of Burke's Political Thought* (1956, reprinted 1968); Peter J. Stanlis, *Edmund Burke and the Natural Law* (1958); Francis P. Canavan, *The Political Reason of Edmund Burke* (1960); and Michael Freeman, *Edmund Burke and the Critique of Political Radicalism* (1980). Alfred Cobban, *Edmund Burke and the Revolt Against the Eighteenth Century* (1929; 2nd ed. 1960; 1st ed. reprinted 1978), is an interpretation of Burke's place in intellectual history. James T. Boulton, *The Language of Politics in the Age of Wilkes and Burke* (1963, reprinted 1975), is a study analyzing the relation of style and content in the political writings of Burke and his contemporaries.

Burke, Kenneth (Duva) (b. May 5, 1897, Pittsburgh), U.S. literary critic best known for his psychologically based analyses of the nature of knowledge and his views of literature as "symbolic action." He became one of the leading U.S. critics in the second half of the 20th century.

Burke attended universities briefly—Ohio State University (Columbus, 1916–17) and Columbia University (New York City, 1917–18)—but never took a degree. He wrote poems (*Collected Poems, 1915–67* [1968]), novels (*Towards a Better Life: A Series of Epistles or Declarations* [1932; rev. ed., [1966]), and short stories (*The Complete White Oxen: Collected Shorter Fiction* [1966]), and translated such German writers as Thomas Mann, Arthur Schnitzler, Otto Spengler, Hugo von Hofmannsthal, and Emil Ludwig. He was the music critic of the *Dial* (1927–29; winning the *Dial* literary award in 1928) and of *The Nation* (1934–36). After music criticism he turned to literary criticism, lecturing on this subject at the University of Chicago (1938; 1949–50). He taught at Bennington College (Vermont) from 1943 through 1961; he also held visiting professorships and lectured at schools throughout the United States and in Europe.

His chief aim as a literary critic was to integrate all human knowledge into a workable frame. Among his books are: *Counter-Statement* (1931; rev. ed., 1968); *The Philosophy of Literary Form* (1941; rev. ed., 1967); *Permanence and Change: An Anatomy of Purpose* (1935; rev. ed., 1959); *Attitudes Toward History*, 2 vol. (1937; rev. ed., 1959); *A Grammar of Motives* (1945); *The Rhetoric of Religion: Studies in Logology* (1961); and *Language as Symbolic Action* (1966). As his views were modified, Burke continually revised his earlier works. In addition to his books, Burke produced a steady stream of articles for journals, so that his corpus of work was among the largest critical ones since that of Samuel Taylor Coleridge in the first half of the 19th century. Burke influenced a number of critics as well as poets and novelists, especially by his views on language.

Burke, Robert O'Hara (b. May 6? 1820/21, St. Clerah's, County Galway, Ire.—d. June 28?, 1861, Australia), explorer who led the first expedition known to cross Australia from south to north. Sponsored by the Royal Society of Victoria, he left Melbourne with a party of 18 in August 1860. The plan was to



Robert Burke
BBC Hulton Picture Library

establish bases from which an advance party would leave to prepare for those with bulkier supplies. But about midway, at the Barcoo River (Coopers Creek), the impatient Burke decided to make the rest of the trip accompanied only by his second in command, William John Wills, and by George Grey and John King. The four reached northern Australia in February 1861 but could not penetrate the swamps and jungle scrub that lay between them and the Gulf of Carpentaria.

Grey died of exhaustion on the return trip. On arriving at the Barcoo camp, Burke found it deserted. The rear party, instructed to remain three months, had waited for more than four, but it had left the morning of the same day on which Burke, Wills, and King returned. Food sufficient to get them to the nearest town was left at a marked spot, but Burke and King imprudently decided to head for Adelaide on the southern coast. Burke died two days later of exhaustion. King, who returned to camp and found Wills dead, was eventually rescued by a search party. A statue to Burke and King was erected in Melbourne. Wills's journal, found with his body, is an account of the venture.

Burke, Ulick de: *see* Clanricarde, Ulick de Burgh, marquess and 5th earl of.

Burke, William, and Hare, William (respectively b. 1792, Orrery, Ire.—d. Jan. 28, 1829, Edinburgh; b. Londonderry, Ire., fl. 1820s), infamous murderers for profit, who killed their victims and sold the corpses to an anatomist for purposes of scientific dissection.

William Hare, immigrating to Scotland from Ireland, wandered through several occupations before becoming keeper of the Log's lodging house, Tanner's Close, Edinburgh. There, William Burke, also Irish-born, arrived in 1827. On November 29 an old pensioner died in the house, and, instead of having the corpse buried, Burke and Hare sold it to one Robert Knox, a surgeon, for £7.10s. Such profit led the two men over the following months to entice at least 15 unknown wayfarers into the lodging house, get them drunk, kill them by smothering (in order to leave no trace of violence), and sell the corpses to Knox's school of anatomy. Burke and Hare were finally exposed when neighbours and police discovered their murder of a local woman on Oct. 31, 1828.

Hare turned king's evidence and was eventually released, never to be heard from again. Burke was tried for murder, found guilty, and hanged. In his confession, Burke exonerated Knox of all knowledge of the crimes, but some years passed before Knox lived down the condemnations of public and press.

Burke's Peerage, in full BURKE'S GENEALOGICAL AND HERALDIC HISTORY OF THE PEERAGE, BARONETAGE, AND KNIGHTAGE, peerage of Great Britain and Ireland first published at London by John Burke (1826), the only currently published peerage to supply full lineage. An editorial decision implemented for publication of the 105th edition (1970) resulted in the insertion of more human interest in the entries and more biographical details about a person's life. For instance, literary as well as military or political accomplishments are described. Contents include, in addition to new or revised coats of arms, biographies of the royal family and the royal lineage, royal warrant holders, the spiritual lords (archbishops and bishops), the knightage, tables of precedence, and extinct titles. Special articles discuss the origins of the English peerage, Irish peers and the House of Lords, abeyance, and a defense of hereditary peers.

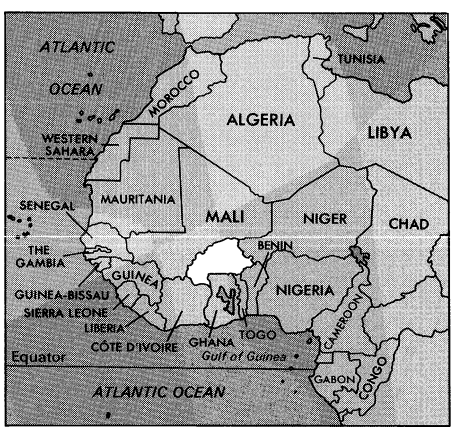
Burkhardt, Georg: *see* Spalatin, Georg.

Burkina Faso, byname BURKINA, formerly REPUBLIC OF UPPER VOLTA, French RÉPUBLIQUE DE HAUTE-VOLTA, landlocked country of western Africa, covering an area of 105,869 square miles (274,200 square km). The capital is Ouagadougou. Lying south of the Sahara (desert), Burkina Faso is bounded on the north and west by Mali, on the south by Côte d'Ivoire (Ivory Coast), Ghana, and Togo, and on the east by Benin and Niger. The population in 1988 was estimated to be 8,530,000.

A brief treatment of Burkina Faso follows. For full treatment, *see* MACROPAEDIA: Western Africa.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. The country consists of an extensive plateau that is covered by a lateritic layer of rock. In the west there are sandstone plateaus bordered by the Banfora Escarpment, which rises abruptly to elevations of about 500



Burkina Faso

feet (150 m) above sea level. In the north and northeast, rocky hills rise above stretches of sand. The plateau, slightly inclined toward the south, is notched by the valleys of the country's principal rivers, the Black Volta, White Volta, and Red Volta; the Sourou River, a major tributary, joins them in the north as they flow southward into Ghana, where they converge to form the Volta River.

The climate is generally sunny, hot, and dry. In the north it is Sahelian, characterized by three to five months of erratic rainfall annually. To the south a tropical savanna climate prevails. Annual rainfall varies from about 40 inches (1,000 mm) in the south to less than 10 inches (250 mm) in the north. Burkina Faso has a dry and cool season from mid-November to mid-February; a hot season from mid-February to June, with maximum temperatures of about 104° F (40° C) in the shade; and a rainy season from June to September. The northern savanna region is mainly grassland in the rainy season and semidesert in the period of the harmattan, a hot, seasonal northeastern wind. In the south, prickly shrubs give way to scattered forests. Animal life includes buffalo, antelope, lion, hippopotamus, elephant, various monkeys, and crocodile. The tsetse fly, which spreads sleeping sickness, and the simulium fly, which spreads river blindness (onchocerciasis), are widespread and limit the habitation of the areas along the Volta rivers. Only about one-tenth of Burkina Faso's land is arable, and about one-third is under pasture.

The people. There are two principal ethnic groups living in Burkina Faso, one speaking Voltaic languages and another using the languages of the Mande language family. Moré, the Voltaic language of the Mossi people (numerically composing about one-half of the country's total population), is spoken by a great majority of the population, and Diula is the language of commerce. French is the official language. Nearly one-half of the population practice tribal religions; a similar proportion are Muslims, and about one-eighth are Christians, mainly Roman Catholics.

More than 90 percent of the population of Burkina Faso is rural. The country has a young population: almost one-half is younger than 15 years of age. The birth rate is high by world standards but about average for African countries, and the death rate is high by both African and world standards. The annual rate of population growth is just below that of Africa as a whole.

The economy. Burkina Faso has a developing mixed economy based largely on agriculture. Recurring and severe drought conditions, combined with a general lack of resources, has resulted in economic stagnation. Productive employment has not expanded with the population, and there is substantial migration to Côte d'Ivoire and Ghana each year. The gross national product (GNP) per capita, which has not increased as rapidly as the population, is one of the lowest in the world.

Agriculture accounts for two-fifths of the GNP but employs about nine-tenths of the work force. Production consists largely of foodstuffs grown primarily for subsistence, with the surplus sold as cash crops. There has been considerable government investment in exports of raw cotton (providing nearly one-half of the country's export earnings), sugar, and peanuts (groundnuts), but the scope of development is generally limited by lack of water and by infertile soils. The chief food crops are sorghum, millet, corn (maize), rice, cassava, and sweet potatoes. Livestock raising provides a small portion of the country's export earnings and includes cattle, goats, and sheep.

Gold-bearing quartz is exploited at Poura by the Société de Recherche Minière, in which the government has a majority share. Continued exploitation of major manganese reserves at Tambao and of significant limestone deposits at Tin Hrassan hinges on the further development of mine facilities, and this depends largely on foreign investment.

Industry accounts for only about one-seventh of the GNP and employs approximately one-eighth of the work force. Manufacturing has expanded very slowly and is dominated by agricultural processing. The country's electricity is generated almost entirely from imported petroleum.

Services account for about two-fifths of the GNP and employ about one-twentieth of the work force. Communications are, in general, inadequate. Road improvement has been financed almost entirely by the European Development Fund.

Burkina Faso suffers a chronic and substantial trade deficit. Exports of livestock and agricultural crops were hit hard by drought, while imports of foodstuffs, consumer goods, machinery, and fuels continued to be high. Remittances from emigrants abroad alleviate the situation somewhat, but Burkina Faso remains heavily dependent on foreign assistance to maintain equilibrium in its balance of payments.

Government and social conditions. The republic of Burkina Faso is ruled by a military group, the Popular Front. Supreme political authority rests with the chairman of this group, who also serves as the chief of the armed forces. This group was the latest to take power in a succession of coups in the 1980s. The new military leaders vowed to increase the role of the private sector in the economy and to give high priority to achieving self-sufficiency in food production.

Health and sanitary conditions in Burkina Faso are extremely poor. Malnutrition among children is widespread, and a significant number of people suffer from such diseases as leprosy, meningitis, trachoma, and schistosomiasis. Because the country has very few doctors, many of the sick receive little or no medical care. The infant mortality rate is extremely high, and life expectancy stands at only 44 years for men and 47 years for women.

Education is officially compulsory, but only about one-fourth of all primary-school-age children attend classes—one of the lowest such figures on the continent. The country's only institution of higher learning is the University of Ouagadougou (founded in 1974). The news media in Burkina Faso are under the strict control of the government.

Burkina Faso's folklore is rich, reflecting the country's ethnic diversity. On national occasions each region is represented in the capital by its own folkloric group. The major cultural institution is the country's National Museum in Ouagadougou. The exhibits there emphasize the traditional Voltaic way of life.

History. The earliest known inhabitants of what is now Burkina Faso were the Bobo, Lobi, and Gourounsi peoples. Around the 14th century AD the Mossi and Gourma peoples established themselves in the east and central areas of modern Burkina Faso. The Mossi kingdoms of Yatenga and Ouagadougou were still in existence in the early 20th century. France obtained a protectorate over Yatenga in 1895 and the Gourma region in 1897 and annexed the lands of the Bobo and Lobi, although the Lobi, armed with poisoned arrows, were not subdued until 1903. The French divided the country into administrative districts but let the tribal chiefs maintain their traditional seats. In 1947 Upper Volta was established as an overseas territory of the French Union after having been attached to French Sudan (1904–20); it was made a separate colony in 1919 and was partitioned between Côte d'Ivoire, Niger, and French Sudan in 1932.

In 1957 Upper Volta's assembly received the right to elect an executive council of government for the territory that subsequently became an autonomous republic within the French community in 1958. Independence was attained in 1960 with a new constitution under the first president, Maurice Yaméogo, who was overthrown in 1966 by a military coup led by Lieutenant Colonel (later President) Sangoulé Lamizana. A new constitution was adopted in 1970. Lamizana eventually dissolved his military government and formed a new Cabinet with a civilian majority in 1976. A new constitution was approved in 1977, and free and multiparty elections were held in 1978, promising a return to parliamentary democracy. Lamizana was reelected but was overthrown in 1980 in a bloodless coup led by Colonel Saye Zerbo. Zerbo's military government was then toppled by another coup in 1982, which installed a People's Pro-

visional Salvation Council. In August 1983 Captain Thomas Sankara, who had been premier earlier in the year, mounted a successful coup and set up the National Revolutionary Council under his presidency. Upper Volta was renamed Burkina Faso by Sankara's government in 1984. Sankara, who was a popular and dynamic leader, was executed in the aftermath of a successful coup undertaken against him by Captain Blaise Compaoré in October 1987.

Burle Marx, Roberto (b. Aug. 4, 1909, São Paulo, Braz.), Brazilian landscape architect whose outstanding gardens, associated with many important modern buildings, made a significant contribution to the visual environment of Brazil.

In 1928 Burle Marx traveled to Germany, where he attended art classes and acquired an interest in plants, which he studied at the Dahlem Botanical Gardens. He was particularly impressed by the Brazilian flora. After his return to Brazil in 1930 he entered the National Academy of Fine Arts, Rio de Janeiro, where he studied painting.

Burle Marx designed his first garden for a house being built by Lúcio Costa, who was later one of the architects of the Ministry of Education and Health building (1937–43) in Rio de Janeiro. For the ministry building, Burle Marx designed roof and ground-level gardens, using Brazilian flora exclusively. Commissions for many important gardens followed, perhaps most notably the gardens for the Odette Monteiro Houses near Rio de Janeiro, which strikingly integrated the distant mountain landscape with the garden. He designed the garden of the Brazilian pavilion at the Brussels International Exposition of 1958, and in 1959 he started work on the Parque del Este of Caracas, Venez. In 1962 he worked

Roberto Burle Marx, 1954
Rollie McKenna

out the master plan for the immense stretch of reclaimed land along Rio de Janeiro's waterfront. He did landscaping for the UNESCO Building, Paris (1963), the U.S. Embassy, Brasília (1967, 1972), the Iranian Embassy, Brasília (1971), and the International Airport, Rio de Janeiro (1978). Burle Marx was also active as a painter and a designer of jewelry, fabrics, and stage sets.

Burleigh, Harry Thacker (b. Dec. 2, 1866, Erie, Pa., U.S.—d. Sept. 12, 1949, Stamford, Conn.), American baritone and composer, a noted arranger of Negro spirituals.

Burleigh studied under Antonín Dvořák at the National Conservatory of Music, New York City, and through his singing acquainted Dvořák with the traditional black vocal music of the United States. He was a soloist in New York City at St. George's Church (1894–1946) and at Temple Emanuel (1900–25). He composed more than 200 songs and became widely known for such arrangements as that for "Deep River." In 1916 he was awarded the Spingarn Medal for his achievement.

Burleigh, William Cecil, 1st Baron: *see* Cecil, William.

burlesque, in literature, comic imitation of a serious literary or artistic form that relies on an extravagant incongruity between a subject and its treatment. In burlesque the serious is treated lightly and the frivolous seriously; genuine emotion is sentimentalized, and trivial emotions are elevated to a dignified plane. Burlesque is closely related to parody, in which the language and style of a particular author, poem, or other work is mimicked, although burlesque is generally broader and coarser.

The long history of burlesque includes such early examples in Greece as *Batrachomyomachia* (*The Battle of the Frogs and Mice*), an anonymous burlesque of Homer, and the comedies of Aristophanes (5th–4th century BC). The long-winded medieval romance is satirized in Chaucer's 14th-century "Tale of Sir Thopas"; the Charlemagne story and the whole theme of chivalry is mocked in the epic-style *Morgante* by Luigi Pulci. Italian burlesque of the 15th century attacked the concept of chivalry as a dying aristocratic notion lacking in common sense, and it thus anticipates Cervantes' novel *Don Quixote,* which is, however, of a size and seriousness that takes it out of the reach of burlesque. In the France of Louis XIV, burlesque was used by the "moderns" in their quarrel with the "ancients" and vice versa. The *Virgile Travesty* (1648–53) of Paul Scarron is one of the best-known of many burlesque or antiheroic epics on classical or even sacred themes.

English burlesque is chiefly dramatic, notable exceptions being Samuel Butler's satiric poem *Hudibras* (1663–78), an indictment of Puritan hypocrisy; the mock heroic couplets of Dryden and Pope; and the prose burlesques of Swift and Fielding. George Villiers' (2nd duke of Buckingham's) play *The Rehearsal* (1671), which mocks the Restoration drama of Dryden and Thomas Otway; John Gay's *Beggar's Opera* (1728); Henry Fielding's *Tom Thumb* (1730); Richard Brinsley Sheridan's *Critic* (1779); and Henry Carey's "most tragical tragedy" *Chrononhotonthologos* (1734) are the outstanding survivals from an age when burlesque was cruelly satirical and often defamatory. The heroic Bombardinion's lines in the following fragment from Carey's play resemble the more kindly, punning Victorian burlesque, however:

> Go call a coach, and let a coach be called;
> And let the man who calls it be the caller;
> And in his calling, let him nothing call,
> But coach! coach! coach! Oh! for a coach,
> ye gods!

Authors of Victorian burlesque—light entertainment with music, the plots of which were frivolously modeled on those of history, literature, or classical mythology—included H.J. Byron, J.R. Planché, and W.S. Gilbert (before his partnership with Sullivan). Before the end of the 19th century, burlesque yielded in popular favour to musical comedy in Britain and had become almost exclusively identified with vaudeville humour in the United States.

burlesque show, stage entertainment, developed in the United States, that came to be designed for exclusively male patronage, compounded of slapstick sketches, dirty jokes, chorus numbers, and solo dances usually billed as "daring," or "sensational," in their female nudity.

Introduced in the United States in 1868 by a company of English chorus girls, Lydia Thompson's British Blondes, the burlesque show of the 19th century was patterned after the popular minstrel show. It consisted of three parts: first, a series of songs, coarsely humorous sketches or bits, and comic monologues usually by baggy-pants comics; second, the olio, an assortment of variety acts—*e.g.,* acrobats, magicians, and instrumental and vocal soloists; third, chorus numbers and occasionally a take-off, or burlesque, on politics or a current play. The usual finale was a performance by an exotic dancer or a wrestling or boxing match. Burlesque shows, with their show of exposed legs and bawdy and often obscene entertainment, were not considered respectable, and raids by the local police were often prompted by offended citizens.

Lydia Thompson and her burlesque company performing in *Blue Beard* at the Charing Cross Theatre, London, engraving, 1874
By courtesy of the Mander and Mitchenson Theatre Collection, London

By the early 20th century two national circuits of burlesque shows, as well as resident companies in New York City, such as Minsky's at the Winter Garden, were thriving. W.C. Fields, Al Jolson, Fannie Brice, Bert Lahr, and Phil Silvers were among the comedians who served their apprenticeship before the rowdy burlesque audiences. The addition of striptease dancing, the illogical conclusion of a process that had begun with the belly dancing of Little Egypt at the World's Columbian Exposition in Chicago (1893), established such stars as Ann Corio, Gypsy Rose Lee, Margie Hart, and Georgia Southern. Censorship and "clean-up" policies, and then the competition of motion pictures, led to the decline of burlesque. By the early 1960s few burlesque houses remained, and these usually provided no more than striptease performers, a motion picture, and a comic who told his jokes with an air of defeatism to an audience waiting for the next display of feminine anatomy. By the 1970s, when topless—and bottomless—dancers of both sexes appeared in drinking establishments, American burlesque was virtually dead.

Burley, city, Cassia and Minidoka counties, seat (1918) of Cassia county, southern Idaho, U.S., on the Snake River. Founded by ranchmen in 1902 and named for D.R. Burley, an agent of the Oregon Short Line Railroad, it developed as a marketing and processing centre (potatoes, sugar beets, alfalfa, peas, and livestock) for the Minidoka Irrigation Project (begun 1903). Immediately to the south is the Minidoka Division of the Sawtooth National Forest (with the Pomerelle Ski Area) and bizarre stone formations known as the City of Rocks. Inc. village, 1906; city, 1918. Pop. (1984 est.) 9,171.

Burlingame, Anson (b. Nov. 14, 1820, New Berlin, N.Y., U.S.—d. Feb. 23, 1870, St. Petersburg [now Leningrad]), U.S. minister to China (1861–67) who helped assure that country's territorial integrity; he later represented China itself in international negotiations.

Burlingame entered public life as a Mas-

sachusetts state senator (1853–54) and member of the U.S. House of Representatives (1855–61). At first a member of the Know-Nothing Party, he helped found the Republican Party in the mid-1850s. When sent to China by Pres. Abraham Lincoln, he found that country in a critical situation, with a weak central government, strong anti-foreign feeling, and alien business interests vying for trade privileges. Burlingame fostered a policy of cooperation between the Western powers and China, intended to secure settlement of disputes by diplomacy rather than by force and to further modernize China. He also persuaded the Western powers to relinquish claims for special privileges and further territorial cessions in China.

Burlingame, detail of an engraving by Perine & Giles, late 19th century

By courtesy of the Library of Congress, Washington, D.C.

Burlingame so impressed the Chinese government that in November 1867, upon his resignation from his U.S. post, he was named Imperial envoy charged with the conduct of China's international relations. The following February, with two Chinese colleagues and an entourage of 30, he began a tour of Western capitals. The mission made a triumphal progress across the United States, in the course of which Burlingame—a brilliant orator—conveyed an optimistic impression of China's receptivity to Western influence. In Washington, D.C., he negotiated with Secretary of State William H. Seward the Burlingame Treaty, guaranteeing most-favoured-nation treatment to each country's residents or visitors in the other nation, and putting on record the traditional U.S. policy of respect for China's territorial integrity.

Burlingame's mission was successful in London but less so on the Continent; he became ill in Russia and died there.

Burlington, city, Regional Municipality of Halton, southeastern Ontario, Canada, at the western end of Lake Ontario, opposite Hamilton, from which it is separated by Hamilton Harbour (Burlington Bay). Settled in about 1810, the town served as a beach resort and fruit-growing centre until it developed after 1950 with the spread from the northeast of the Toronto metropolitan areas. Burlington has become primarily a lakefront residential city with some industry, including the manufacture of metal tubing, brushes, and chemicals.

The Burlington Bay Skyway, a toll bridge (nearly 4 mi [6.5 km] long) completed in 1958, links the town with Hamilton. Inc. village, 1873; town, 1914; city,1974. Pop. (1981) 114,853.

Burlington, city, seat (1836) of Des Moines County, southeastern Iowa, U.S., port on the Mississippi River (there bridged to Illinois), 78 mi (126 km) south-southwest of Davenport. The site, known to the Indians as Sho-quoquon (Flint Hills), was settled in 1833 and was named (1834) for Burlington, Vt. The only adequate steamboat landing on the western riverbank for 80 mi, it served as a land office, as a port of entry, and briefly (1837) as the Wisconsin Territorial capital and (1838–42) as the Iowa Territorial capital. A marker stands at the site of the Old Zion Church, which served as the legislative building. The Burlington and Missouri River Railroad began operations in 1856 and made the town a bustling railroad centre. An early lumber economy gave way to manufacturing, which includes a large ordnance plant (1941). Southeastern Community College (1920) is in the city. Geode State Park is 6 mi west. The annual (June) Burlington Steamboat Days and Dixieland Jazz Festival attract jazz musicians from all over the country. Inc. 1836. Pop. (1980) 29,529.

Burlington, city, Burlington County, western New Jersey, U.S., on the Delaware River (bridged), opposite Bristol, Pa. Settled (1677) by Quakers, it was known as New Beverly, then Bridlington (after a village in Yorkshire, Eng.), and later Burlington (an alternate spelling of Bridlington). In 1681 it became the capital of the Province of West Jersey, and it alternated with Perth Amboy as the capital of West and East Jersey from 1702 until 1790, when Trenton became the capital of the state of New Jersey. In 1776 the Provincial Congress met there and adopted the state constitution. Steamboat service (1788) and the railroad (1834) opened up trade outlets for the city, which developed as a trade and shipping centre for nearby farms and later acquired diversified manufactures (textiles, shoes, food and metal products).

The Thomas Revel House (1685) is the city's oldest building. St. Mary's Hall-Doane Academy, a private (Episcopal) preparatory school, was founded in 1837. The Burlington County Historical Society is housed in the birthplace of novelist James Fenimore Cooper. Next door is the house (1781) of Capt. James Lawrence, a naval hero of the War of 1812. Old St. Mary's Church (1703) was endowed by Queen Anne. The first colonial money was printed (1726) in Burlington by Benjamin Franklin, and the state's first newspaper was printed there in 1777. Burlington (Matinicunk) Island, in the Delaware River, was ceded to the city in 1682 with the stipulation that its revenue be used for public schooling. Inc. 1733. Pop. (1980) 10,246.

Burlington, city, Alamance County, central North Carolina, U.S. Shops of the North Carolina Railroad were erected on the site in 1855, and the town of Company Shops was incorporated in 1866; it was rechartered in 1887 as Burlington. An economic crisis occurred in 1896 when the shops were moved to Spencer, but the introduction of small manufacturing plants brought recovery. Its economy is now based on textiles augmented by diversified manufactures including electronic equipment, furniture, and chemicals. A coffin factory, one of the first in the South (1884), is the oldest industry. Nearby is the Alamance Battleground State Park, the site of the defeat (May 16, 1771) of the Regulators, a group of dissident colonists, by militia dispatched by the royal governor. Elon College (1889) is nearby. Inc. 1893. Pop. (1980) city, 37,266; metropolitan area (SMSA), 99,136.

Burlington, city, seat (1787) of Chittenden County, Vt., U.S., on a hillside sloping toward Lake Champlain and the Adirondacks (west), with the Green Mountains to the east. It is the largest city of the state, a port of entry, and with South Burlington and Winooski towns, and Essex Junction village forms a metropolitan complex.

Burlington was chartered by Gov. Benning Wentworth of New Hampshire in 1763 and named for the Burling family, whose members were pioneer landowners. Settlement began in 1773 with the opening of a lumberyard and shipbuilding business. Burlington was a military post, and during the War of 1812, Battery Park was the scene of several engagements between land batteries and British warships on the lake; it is now famous for sunset views.

Industries include the manufacture of aircraft armaments, computer components, business machines, structural steel, concrete products, high-temperature wires, ovens, furniture and other lumber products, and maple syrup.

Burlington is the seat of the University of Vermont (1791), of Champlain (junior) College (1878), and of Trinity College (1925). Shelburne Museum (1947), a 45-ac (18-ha) reconstruction of early American life, is 7 mi (11 km) south. Burlington was the home (1787–89) of Ethan Allen, Revolutionary War hero, and is the site of his grave. The Unitarian Church (1816) has a bell cast by Paul Revere, the American patriot. Inc. 1865. Pop. (1980) city, 37,712; metropolitan area (SMSA), 114,070.

Burlington, Richard Boyle, 3rd earl of (b. April 25, 1694, London—d. Dec. 3, 1753, London), English architect who was one of the originators of the Neo-Palladian style of the 18th century.

He began studying architecture in 1717, specifically the works of Inigo Jones and Andrea Palladio, and began practice upon returning to London from Vicenza, Italy, in 1719. He advocated a revival of Palladio's and Jones's interpretation of classical tenets and assembled a collection, the largest to that time, of their drawings (now in the Royal Institute of British Architects, London), from which most of his own buildings are derived.

In 1721 Burlington emerged as an important architect; his villa at Chiswick (now in the outer London borough of Hounslow) was one of the most influential Neo-Palladian buildings in England. Considered the culmination of his art are the Assembly Rooms at York with the Egyptian Hall (1731–32).

Burlington Industries, Inc., major U.S. textile manufacturer, producing finished and unfinished fabrics, yarns, rugs, upholstery fabrics, and linens and other home accessories. Headquarters are in Greensboro, N.C.

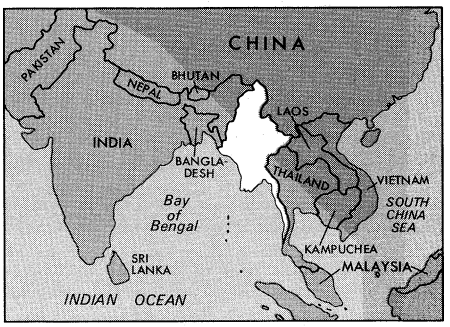
The company was incorporated as Burlington Mills, Inc., in 1923 when J. Spencer Love acquired 30 textile mills in the Burlington, N.C., area. His company grew rapidly. In 1934 he added five other companies, and in 1937 the corporate name was changed to Burlington Mills Corporation. In 1955 the name was changed to Burlington Industries to reflect the company's more diversified product line. In 1960 Burlington entered the carpet industry and in 1966 added furniture to its products. Further diversification followed.

The company's growth has always been dependent on changing fashions, and, to some extent, has paralleled the development of synthetic fabrics. When the company was founded, cotton fabrics were becoming less fashionable. Burlington moved quickly to begin production of the synthetic fabric rayon, and the company soon dominated the rayon market. By 1974, however, production of synthetics had fallen because of the worldwide shortage of the petroleum-based materials needed to make them. Burlington capitalized on the situation by shifting to the manufacture of polyester-cotton fabrics, blends of synthetic and natural fibres.

The company has diversified broadly since its founding. It sells both fabric and finished products, including clothes, towels, sheets, and draperies. Burlington produces more carpets and draperies, more spun and textured yarns, and more polyester-cotton blend fabric than any other company. It is a major clothing and home furnishing supplier for such retailers as Sears, Roebuck and Company and J.C. Penney Company, and it produces its own lines of furniture and lighting fixtures.

Burlington Northern, Inc., company formed by the merger of the Great Northern Railway Company, the Northern Pacific Railway Company, and the Chicago, Burlington and Quincy Railroad Company (*qq.v.*) in 1970. In 1980 the Saint Louis–San Francisco Railway Company merged with Burlington Northern. Its railway system, the largest in the United States, extends from Chicago south to the Gulf of Mexico and west to the Pacific Northwest. It is headquartered in St. Paul, Minn.

Burma, officially SOCIALIST REPUBLIC OF THE UNION OF BURMA, Burmese (Bama Pyei) PYEIDAUNGZU SOCIALIST THAMMADA MYANMA NAINGNGANDAW, country lying along the eastern coasts of the Bay of Bengal and the Andaman Sea in southeast Asia, covering an area of 261,228 square miles (676,577 square km). The capital is Rangoon. The country is about 1,300 miles (2,100 km) long from north to south—including its 400-mile (640-kilometre) neck along the Malay Peninsula—and about 575 miles (925 km) from east to west at its widest extent. Burma is bordered



Burma

on the southeast by Thailand and Laos, on the northeast by China, and on the northwest by Bangladesh and the Indian states of Arunachal Pradesh, Nāgāland, Manipur, and Mizoram. Its coastline, on the south and southwest, borders the Bay of Bengal, the Gulf of Martaban, and the Andaman Sea. The population in 1988 was estimated at 39,983,000.

A brief treatment of Burma follows. For full treatment, *see* MACROPAEDIA: Burma.

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Burma can be divided into four main physiographic regions: the northern mountains, the western mountains, the central lowlands, and the Shan Plateau in the east. Northern Burma is dominated by the Kumon Range, which descends to the south from the country's highest peak, Mount Hkakabo (19,578 feet [5,967 m] above sea level) on Burma's extreme northern border with China. The western mountains, a lesser but major highland region, extend southward from the easternmost Himalayas to form the Chin Hills, whose peaks rise to 10,000 feet (3,000 m), and, farther south, the sparsely populated and densely forested Arakan Range. The central lowlands, lying between the Arakan Range and the Shan Plateau, consist of the narrow coastal plains of Arakan (fronting the Bay of Bengal) and Tenasserim (fronting the Andaman Sea) and the densely populated delta regions of the Irrawaddy and Sittang rivers. The country's fourth major region, the deeply dissected Shan Plateau, is its easternmost and rises abruptly out of the central lowlands, often 2,000 feet (600 m) in a single step; the plateau's average elevation is 3,000 feet (900 m), and some peaks exceed 8,500 feet (2,600 m). Southward, the plateau merges into the Tenasserim Mountain range.

The north–south orientation of Burma's mountains defines the courses of its major rivers, the Irrawaddy and the Salween. The Irrawaddy is navigable for nearly 900 miles (1,450 km) of its 1,300-mile (2,100-kilometre) length and drains about two-thirds of the country's surface. The Salween basin lies to the east of the Irrawaddy, draining the Shan Plateau region and emptying into the Gulf of Martaban.

Burma's tropical climate is influenced greatly by the monsoons of southern Asia. There are three seasons, a cool dry period from October to February, a hot dry period from March to the middle of May, and the monsoon season from May to October. Annual rainfall ranges from 200 inches (5,100 mm) along the coastal plains and mountains to 100 inches (2,500 mm) within the delta regions and 35 inches (900 mm) for the central basin around Mandalay. Nearly all of it (85–95 percent) comes during the monsoons. Average daily maximum temperatures for the coolest and warmest months range between 73° and 89° F (23° and 32° C) in the highlands of the Shan Plateau and between 85° and 97° F (29° and 36° C) at Rangoon in the south.

Only about one-sixth of Burma's extremely mountainous land is considered arable; about a tenth of that is irrigated, mostly for rice production. Hardly any of the land is useful as pasture, and nearly half of the country is forested. In Burma's lowlands, the natural vegetation varies with precipitation. Where there is more than 80 inches (2,000 mm) of rainfall, evergreen tropical forests predominate (the delta areas support lush mangrove stands); regions with between 40 and 80 inches have plentiful hardwood monsoon forests (including teak); at less than 40 inches (1,000 mm), the forests are gradually replaced by scrubland. In the highlands, forests of oak and pine are found above the frost line (3,000 feet). Animal life is abundant, with the rain forests supporting a variety of birds, mammals, and snakes of various kinds, including gibbons, monkeys, and pythons. The elephant and the tiger are also important though endangered species.

Burma possesses a range of commercially exploitable mineral resources, including silver, copper, lead, and zinc deposits in the Shan Plateau, alluvial deposits of tungsten and tin in the Tenasserim coastal area, and petroleum and natural gas. High-quality jade is also mined in the northern mountains.

The people. The entire Irrawaddy Valley and the coastal strips hold three-fourths of the population. In the western hills of the Chindwin River are the various Chin tribes, and the upper Irrawaddy Valley and the northern hills are occupied by Kachin tribal groups. The Shan people occupy the Shan Plateau; the Wa and the Palaung are usually classified with the Shan. The Karen are found on the deltas, in the Pegu Mountains, and along the lower Salween River. The Kayahs inhabit the southern edge of the Shan Plateau. Approximately nine-tenths of the population is Buddhist. Most of the rest are either Christians, Muslims, or animists; a few Hindus are also found.

More than 100 indigenous languages—as distinct from mere dialects—are spoken in Burma, but the common and official language is Burmese, spoken by both the people of the plains and the hill peoples. During the British colonial period (1885–1948), English became the official language, but after independence from the British Empire, English was abandoned as the official language. An elementary knowledge of English is still required in schools and colleges, however, and in 1981 the teaching of English was restored to the school curriculum.

Burma is one of the least densely populated countries in Asia, and the rugged, forested portion of its terrain is still only lightly settled. It is a land of villages, where fewer than one-fourth of the people live in urban areas. The annual rate of growth of the population is somewhat high by world standards but is about average for Southeast Asia. The relatively high infant mortality rate has decreased considerably since the 1950s. The largest cities are Rangoon on the Irrawaddy delta and Mandalay in the interior.

The economy. Burma has a centrally planned, developing socialist economy that is largely nationalized and is based principally upon agriculture and trade. The gross national product (GNP) per capita, which is growing more rapidly than the population, is nonetheless one of the lowest in the world.

About half of the GNP originates from agriculture, hunting, forestry, and fishing, followed by services and manufacturing.

Rice is the most important crop; it dominates the economy by providing the major source of employment and is the country's principal export. Other important crops include corn (maize), peanuts (groundnuts), pulses, and cotton. Vegetables, melons, and fruits are also grown.

Although there is little pastureland in Burma, much livestock is raised there, including cattle (about one-tenth for dairy purposes). The cattle are raised mostly in the higher-lying dry zone. Other livestock include pigs, water buffalo, and goats. Forests produce teak, an important component of foreign trade.

Fish is second only to rice as a staple in the Burmese diet; most of the total catch is marine. European carp and tilapia from Thailand have been successfully introduced for fish farming.

Manufacturing is underdeveloped and accounts for only about one-tenth of the GNP. The principal manufactures include refined petroleum products, cement, brown and raw sugar, peanut oil, tinned fish, nitrogenous fertilizer, crude steel, cotton fabric, and cigarettes. Nearly half of the country's electrical production is generated by hydroelectric power stations, and the remainder from gas and steam thermal plants.

Trade unions are not permitted; workers' councils and local conciliation committees mediate labour disputes. Cooperatives are permitted, and a great number have been established in Burma.

The government's overall economic objective is the establishment of a fully socialized state. All large industrial enterprises, the banking system, insurance, foreign trade, domestic wholesale trade, and nine-tenths of the retail trade were nationalized in the early 1960s. Limited foreign investment was permitted to resume in 1973.

About two-fifths of the government's budgetary revenue originates from general sales and value-added taxes, one-fourth from income from state enterprises, and most of the remainder from taxes on international trade and transactions, administrative fees, and grants. By the late 20th century foreign aid began to figure prominently as a source of revenue as well, accounting for nearly one-fifth of the total revenue in some years. Expenditures are for defense; agriculture, forestry, and fishing; general public services; education; and health, social security, and welfare.

The country's railways are operated by the state-owned Burma Railways Corporation. The heavily used road network is only about one-sixth paved. There are also extensive inland waterways of which about one-fourth are navigable by large vessels. Rangoon is the chief port, and there are several other major ports. The merchant fleet contains a large number of vessels, many of more than 100 gross tons. International air service is through Mingaladon Airport, near Rangoon.

Burma's exports are dominated by rice and rice products (about two-fifths of the total by value), followed by teak and then by metallic

ores and gems. Since the mid-1970s the value of Burma's imports has exceeded its exports. Imports consist primarily of capital goods (one-half of the total), mostly machinery and transport equipment; raw materials and spare parts; and consumer goods. Principal trading partners are Japan, Singapore, West Germany, and Indonesia.

Government and social conditions. Burma is a socialist one-party republic governed by the Burma Socialist Program Party (BSPP). The country's constitution vests supreme state authority in the unicameral People's Assembly (Pyithu Hluttaw), whose members are nominated by the BSPP, then formally elected to four-year terms by the people. It chooses a prime minister, a cabinet, and a 29-member state council. The council, in turn, elects a chairman, who also serves as president and head of state. The highest judicial authority in Burma is the Council of People's Justices.

All citizens of Burma are entitled to state pensions and free health treatment. The country suffers, however, from generally poor health conditions and from diseases such as malaria, cholera, tuberculosis, hepatitis, plague, dengue fever, encephalitis, polio, and dysentery. Deficiency of important vitamins, particularly vitamin A, has resulted in a high incidence of blindness among children. These health problems have been aggravated by a shortage of trained medical personnel. Burma's health-service facilities are well developed only in the cities; life expectancy is 52 years for men and 55 for women.

Education is organized and administered by the Ministry of Education; the main emphasis is on primary education. School attendance for children between the ages of five and nine has been compulsory since 1975. The study of science is given priority in the school curriculum. The country's overall literacy rate is about 80 percent. There is an arts and sciences university both in Rangoon and in Mandalay.

The news media in Burma are owned and operated by the government. The country's constitution prohibits censorship, but in practice the media may not discuss national issues without praising Burmese socialism.

Cultural life. Burmese culture is essentially a blend of folk culture and Buddhism; the latter has been part of Burmese life since the 11th century. U Pon Nya, the great Burmese writer, poet, and dramatist of the 19th century, and U Kyin U, another important 19th-century writer, devoted much of their work to Buddhist themes. Most early sculptors in Burma concentrated their creative energies on making statues of Buddha. By the early 20th century, the leading cultural figure was Ledi Sayadaw, a monk who wrote more than 50 works on matters of religious concern.

History. The first human settlements in Burma appeared some 5,000 years ago in the middle Irrawaddy valley. A group of Tibeto-Burmese people known as the Pyus appeared in the upper Irrawaddy valley *c.* 500 BC. Two centuries later, an Austro-Asiatic people known as the Mons reached the Sittang valley and established a port capital at Thaton. The Mon state flourished, as did the Pyu, which had its capital at Prome (Pye). In the 9th century, the Pyu capital fell to the Tai-Shan of the Nanchao kingdom in southern China. The Burmese, a subject people of the Pyu, assumed leadership of the Tibeto-Burmese peoples and established their capital at Pagan.

In 1044, Anawratha assumed the throne at Pagan and, in a matter of years, united the whole of Burma into a single kingdom and founded the first Burmese empire. A Mongol invasion in 1287 devastated the empire and resulted in its breakup.

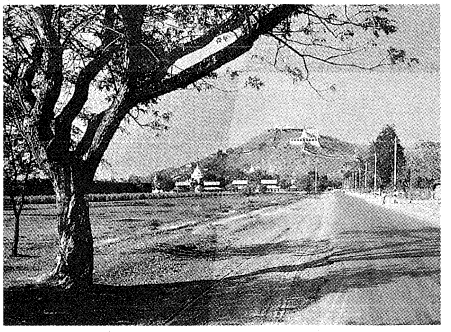
Reunification first occurred in the 16th century under the Toungoo dynasty, which lasted fitfully until 1752, when Mon control of Burma resumed. Burmese resistance rallied behind the popular leader Alaugpaya, who, by 1757, had secured all of Burma and founded its last dynasty.

The expansionist policies of the Alaugpaya kingdom alarmed its neighbours, particularly the British with regard to Burma's designs on Assam. Two Anglo-Burmese wars (1824–26 and 1852) followed Burma's occupation of Assam and cost it not only Assam but also Manipur, Arakan, Tenasserim, and eventually Pegu. The rest of Burma fell to the British in 1885 after the third Anglo-Burmese War.

Under British control, Burma became a province of India. The Burmese resented Britain's refusal to continue state patronage of Buddhism. Furthermore, British laissez-faire economic policies impoverished much of the population. This led to a peasant uprising in 1931, and, in 1937, the British separated Burma from India. World War II brought Japanese occupation; British governance resumed until early 1948, when Burma became independent.

A coup in 1962 established a revolutionary council intent on creating a socialist Burma. The state continued to be isolationist after the adoption of a new constitution (1973) and the creation of the Socialist Republic of the Union of Burma. Civil unrest continued into the late 20th century from dissident minorities, particularly the Karens and the Kachins.

Burma Road, highway linking Lashio, eastern Burma, with K'un-ming, Yunnan province, China, a distance of 717 miles (1,154 km). The Chinese began construction of the road after the outbreak of the Sino-Japanese War in 1937 and the occupation of the seacoast of



Burma Road near Mandalay
Harrison Forman

China by the Japanese. Completed in 1939, it functioned for three years as a vital supply route to the interior of China from the outside world, carrying war goods transported by sea to Rangoon and then by train to the Lashio railhead. In April 1942, however, the Japanese overran Burma, seized Lashio, and thus closed the road at its source. In 1944, as Allied forces from Assam in eastern India advanced into northern Burma, they constructed a supply road from Ledo, India, which finally connected with the Burma Road at a point still in Chinese hands. This road, known as the Stilwell Road (*q.v.*), or (until its completion) the Ledo Road, was opened in January 1945. Although the importance of the Burma Road diminished after World War II with the growth of Burmese isolationism, it remains a link in a 2,100-mile (3,400-kilometre) road system extending from Rangoon to Chungking, China.

Burmese, breed of domestic cat, presumably of Asian origin. The Burmese is a compactly built cat with a small, rounded head and wide-set, round, yellow or golden eyes. The short, finely textured, and glossy coat darkens from a milk-chocolate colour in the kitten to a rich sable brown in the adult. The underside is paler than the coat; the ears, face, legs, and tail may be darker. The tail is slightly tapered and may be either straight or kinked near the tip.

Burmese language, the official language of Burma, spoken as a native language by the majority of Burmese and as a second language by most native speakers of other languages in the country. Burmese and the closely related Lolo dialects belong, together with the Kachinish and Kukish languages of Burma and neighbouring countries, to the Tibeto-Burman group of the Sino-Tibetan language family. Modern standard Burmese has undergone more changes from Old Burmese than have most of the dialects; the Arakanese dialect is especially conservative.

The earliest extant Burmese writing dates from the middle of the 11th century and is written in an alphabet derived from that of the Pāli language of India and Ceylon. Old Burmese, the language of these writings, is not as conservative as Old Tibetan, to which it is related.

To make the best use of the Britannica, consult the INDEX *first*

Burmese literature, the body of writings in the Burmese language. The stone inscription is the oldest form of Burmese literature; the date of the earliest extant specimen is 1113. During the next 250 years more than 500 dedicatory inscriptions similar in pattern but more developed in style were engraved on stone. Many contain eloquent prayers and poems composed by royal ladies. Later inscriptions from the 14th to the 19th century were in a similar vein. Imaginative literature scratched on a palm leaf with a stylus or written on folded paper in steatite pencil originated under the auspices of Buddhist monarchs in Burma and flourished from the 14th century until after printing became prevalent in the 19th century. The authors were Buddhist monks, monastery-trained courtiers, and a few court poetesses. This literature's most notable features were Buddhist piety and a courtly refinement of language. Historical ballads, panegyric odes, metrical versions of Buddhist stories, and various other types of poetic forms, along with exhortatory letters, constitute this literature. Prose works during this long period are comparatively few.

The introduction of printing into Lower Burma led to a change in the trend of Burmese literature. From 1875 onward the owners of printing presses began to publish popular works such as stage plays, complete with songs and stage directions. The tragic dramas of U Ku were extremely popular and dominated the period between 1875 and 1885. In 1904 the first Burmese novels appeared, marking the beginning of modern Burmese fiction. Both of these forms decayed from their promising origins and became overcharged with sentiment and sensationalism, however, and it was only the founding of Rangoon University in 1920 that gave Burmese literature a fresh impetus. The creation of the Union of Burma in 1948 also stimulated interest in the national culture, and Burmese began to replace English as both the official language and the language of instruction.

Burmese writing system: *see* Indic writing systems.

burn, damage caused to the body by contact with heat, chemicals, electricity, or radiation. Burns caused by hot water or steam are sometimes called scalds.

A brief treatment of burns follows. For full treatment, *see* MACROPAEDIA: Burns.

Surgeons measure a burn's severity by its area and by the depth of skin damage. They recognize three degrees of depth. A first-degree burn damages only the outside layer of the skin, which becomes red, painful, and tender;

most cases of sunburn are first-degree burns. Second-degree damage penetrates deeper into the skin, which may blister; bad scalds are usually second-degree burns. Third-degree burns destroy the full thickness of the skin and often the underlying body tissues.

Surgeons measure the area of a burn as a percentage of the body's total skin area. The commonest technique they use is the "rule of nines." The skin area on each arm is roughly 9 percent of the body total, as is the skin covering the head and neck. The percentage on each leg is 18, and the percentage on the trunk is 18 on the front and 18 on the back. The percentage of damaged skin affects the chances of survival. Most people can survive a second-degree burn affecting 70 percent of their body area, but few can survive a third-degree burn affecting 50 percent. If the area is down to 20 percent, most people can be saved, though elderly people and infants may fail to survive a 15 percent skin loss.

Severe burns cause immediate nervous shock. The victim grows pale and is confused, anxious, and frightened by the pain and may faint. Much more dangerous is the secondary shock that comes a few hours later. Its chief features are a dramatic fall in blood pressure that leads to pallor, cold extremities, and eventual collapse. This secondary shock is precipitated by loss of fluid from the circulation, not just the fluid lost in the destroyed tissue but fluid that leaks from the damaged area that has lost its protective covering of skin.

Burns kill not just by damaging tissue but by allowing this leakage of fluid and salts. If more than a fifth of the blood volume is lost to the circulation, insufficient blood returns to the heart for it to maintain blood pressure. And the loss of salts, particularly sodium and potassium salts, not only disturbs their balance in the body, critical in the case of potassium, but changes the osmotic balance of the blood and body fluids. The significance of these physiological changes was understood in 1905, but not until the 1930s were doctors able to correct them with transfusions of blood or plasma. This technique of replacing lost fluid and salts with intravenous infusion was refined during World War II, when it saved the lives of many burned casualties.

The first priority in treating severe burns is to correct the fluid and salt imbalance with transfusion. The burn itself, if it is not too large, can be covered with a soothing sterile dressing; but if it is extensive, it may heal more quickly if it is left open to the air in a warm sterile room. Doctors give painkilling drugs to make the patient more comfortable and antibiotics to prevent the burns from becoming infected, particularly if they are deep and extensive. To reduce fluid and salt loss, surgeons may cover the burn with a plastic film or a graft of sterilized animal skin, usually from a pig.

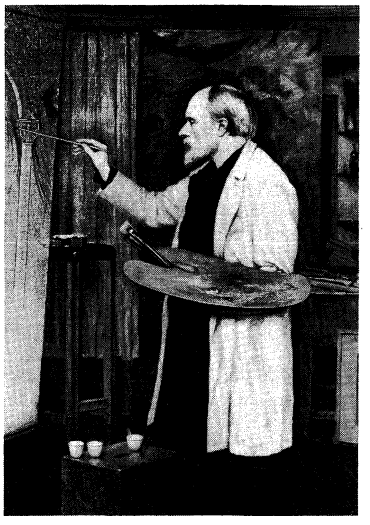
Surgeons also use grafts of the patient's own skin to encourage healing. When the full thickness of the skin is destroyed, the skin can replace itself only by growing inward from the edge of the burn. In a burn more than an inch wide, this growth takes a long time and leads to ugly scarring. Surgeons now try to avoid this scarring by removing the damaged tissue and covering the surface with one or more skin grafts. If scarring still occurs, it can often, once the burn has healed, be disguised by plastic surgery.

An electrical flash burns the skin surface; an electrical current passing through the skin and other tissues may produce a burn in which the deep injury is out of proportion to the surface injury. Corrosive chemicals cause burns similar to those produced by heat. Overexposure to radiation produces severe burns that develop insidiously, may not show up until a week after exposure, and are at their worst three weeks after. Radiation burns penetrate much deeper than do others and are very difficult to heal because they are surrounded by so much dead tissue.

Burnaby, district municipality forming an eastern suburb of metropolitan Vancouver, southwestern British Columbia, Canada; it lies between the Burrard Inlet and the North Arm of the Fraser River and borders on Port Moody (northeast) and New Westminster (southeast). The settlement developed with Vancouver in the late 19th century and was named for Robert Burnaby (1828–78), a prominent local businessman. Crossed by several major railroads and highways and serving as the western terminus for an oil and gas pipeline from Alberta, the district (area 40 sq mi [100 sq km]) is one of the province's chief commercial and industrial centres. It has important trucking, warehousing, and petroleum-distribution facilities, as well as forest industries; steel fabrication and the manufacture of electronic, electrical, and transportation equipment are also significant. Simon Fraser University (1963) is in Burnaby. Inc. 1892. Pop. (1981) 136,494.

Burne-Jones, Sir Edward Coley, 1ST BARONET, original name EDWARD COLEY BURNE JONES (b. Aug. 28, 1833, Birmingham, Eng.—d. June 17, 1898, Fulham, London), one of the leading painters and designers of late 19th-century England, whose romantic paintings using medieval imagery were among the last manifestations of the Pre-Raphaelite style. More long-lasting is his influence as a pioneer of the revival of the ideal of the "artist-craftsman," so influential to the development of 20th-century industrial design. He was educated at Exeter College, Oxford, where he met his future collaborator, the artist-poet William Morris, then a fellow divinity student. His meeting with the artist Dante Gabriel Rossetti in 1856 marked a turning point in his career, and he left Oxford without graduating. Morris and he then settled in London, working under Rossetti's guidance.

Burne-Jones's vivid imagination delighted in the stories of medieval chivalry, as is seen in his "King Cophetua and the Beggar Maid" (1884; Tate Gallery, London) and "Merlin and Nimue" (1858–59; Victoria and Albert Museum, London). Stylistically, such works owe much to Rossetti's illustrations, but more often his own dreamworld drew inspiration from the melancholy, attenuated figures of the 15th-century Italian painters Filippino Lippi and Sandro Botticelli, suffusing them with a mood of romantic mysticism. His first big success came with an exhibition in 1877, which included oils such as "Days of Creation," "The Beguiling of Merlin" (1872–77), and "The Mirror of Venus" (1867–77). From that date until his death, he was increasingly considered to be among the great painters of England. In 1894 he received a baronetcy.



Burne-Jones, oil portrait by Sir Philip Burne-Jones, 1898; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

After his death, Burne-Jones's influence was felt far less in painting than in the field of decorative design, particularly in that of ecclesiastical stained glass. He executed reliefs in metals, tiles, and gesso, decorations for pianos and organs, and cartoons for tapestries. Among the latter may be noted the "Adoration of the Magi" (Exeter College Chapel, Oxford). Besides several illustrations to other books printed by William Morris' prestigious Kelmscott Press, he made 87 designs for the Kelmscott *Chaucer* of 1896, considered to be among the world's finest printed books.

Burnes, Sir Alexander (b. May 16, 1805, Montrose, Forfarshire, Scot.—d. Nov. 2, 1841, Kābul, Afg.), British explorer and diplomat (of the same family as the poet Robert Burns) who gained renown for his explorations in what are now Pakistan, Afghanistan, the Soviet Union, and Iran. For his accomplishments he was knighted in 1839.

Burnes, detail from an engraving by E. Finden

BBC Hulton Picture Library

Burnes became interested in the geography of Afghanistan and Central Asia while serving as an officer in the northwestern Indian state of Kutch (1823–29); he travelled in 1831 up the Indus River from Sind (Pakistan), delivering gifts to the local rulers, exploring the regions he visited, and eventually reaching the Punjab city of Lahore, now in Pakistan. The following year he began a journey that took him across Afghanistan, the Hindu Kush mountains, and Russian Turkistan to the city of Bukhara; his Persian travels led him to Meshed, Tehrān, and Bushire. The fame of his adventures preceded his return to London (1833) and earned him many honours, including a private audience with King William IV. In 1834 he published his *Map of Central Asia* and *Travels into Bokhara.* As a result of a political mission to Kābul (1836) he encouraged British India to support Dōst Moḥammed Khān on the Afghanistan throne. The government, however, chose to support the unpopular Shāh Shojā"s claim to the throne (1839) and needed Burnes to help reinstate him. Burnes was assassinated during the conflicts that followed.

burnet, any hardy, perennial, herbaceous (*i.e.,* nonwoody) plant of the genus *Sanguisorba* (also called *Poterium*), within the rose family (Rosaceae). About 35 species are known, all occurring in the North Temperate Zone. *Sanguisorba* species are not widely cultivated. The alternate, pinnately compound (feather-

formed) leaves of some species—*e.g., S. minor* (or *P. sanguisorba*)—are sometimes eaten in salads or used as an ingredient in French fines herbes. The small flowers lack petals and are crowded into a dense head or spike. The dried leaves are also used to make tea.

Burnet, Sir (Frank) Macfarlane (b. Sept. 3, 1899, Traralgon, Australia—d. Aug. 31, 1985, Melbourne), Australian physician, virologist, and recipient, with Sir Peter Medawar, of the 1960 Nobel Prize for Physiology or Medicine for the discovery of acquired immunological tolerance to tissue transplants.

Burnet received his medical degree in 1923 from the University of Melbourne and was a research fellow (1926–27) at the Lister Institute of Preventive Medicine, London. He became assistant director of the Walter and Eliza Hall Institute of Medical Research at Royal Melbourne Hospital in 1928 and later (1944–65) was its director and professor of experimental medicine at the University of Melbourne. He was knighted in 1951.

Burnet, in addition to his work on human transplants, discovered a method for identifying bacteria by the viruses (bacteriophages) that attack them, and he developed a technique—now standard laboratory practice—of culturing viruses in living chick embryos. He increased knowledge of the way influenza viruses cause infection and did significant work on such diseases as myxomatosis, Murray Valley (now known as Australian Arboencephalitis) fever, and Q fever. He isolated the causal organism of Q fever, *Rickettsia burneti* (*Coxiella burneti*).

Among his publications are *Viruses and Man* (1953), *Principles of Animal Virology* (1955), *The Clonal Selection Theory of Acquired Immunity* (1959), *Immunological Surveillance* (1970), and *Credo and Comment: A Scientist Reflects* (1979).

Burnett, Chester Arthur, byname HOWLIN' WOLF (b. June 20, 1910, West Point, Miss., U.S.—d. Jan. 10, 1976, Hines, Ill.), American blues singer and composer who was one of the principal exponents of the urban blues style of Chicago.

Burnett was brought up on a cotton plantation; the music he heard was the traditional tunes of the region. He started singing professionally when quite young and in the 1920s and '30s performed throughout Mississippi, playing in small clubs. He was influenced by the music of Blind Lemon Jefferson, Sonny Boy Williamson, and Charley Patton. In the 1940s he went to Arkansas, where there was a flourishing blues tradition, and formed his own group, which included James Cotton and Little Jr. Parker, both of whom became noted blues performers in their own right. Burnett accompanied himself on guitar and harmonica, but his main instrument was his guttural and emotionally suggestive voice, which gave his songs power and authenticity. After his first record, "Moanin' at Midnight" (1951), became a hit, Burnett moved to Chicago, where he, along with Muddy Waters, made the city a centre for the transformation of the (acoustic) Mississippi Delta blues style into an electrically amplified style for urban audiences. His work was known only to blues audiences until the Rolling Stones and other British and American rock stars of the 1960s and '70s acknowledged his influence. Burnett was noted for his brooding lyrics and his earthy, aggressive stage presence.

Burnett, Frances Eliza, *née* HODGSON (b. Nov. 24, 1849, Manchester—d. Oct. 29, 1924, Plandome, N.Y., U.S.), American playwright and author who wrote the popular novel *Little Lord Fauntleroy.*

She moved to Knoxville, Tenn., in 1865 and in 1873 married S.M. Burnett, whom she divorced in 1898. She first gained recognition for *That Lass o' Lowrie's,* a tale of the Lancashire coal mines. Her novel *Through One Administration* (1883) had as its theme corruption in Washington, D.C.

Little Lord Fauntleroy (1886) is the story of an American boy who becomes heir to an English earldom. Very successful both as a novel and as a play, it established the main character's long curls (based on her son Vivian's) and velvet suit with lace collar (based on Oscar Wilde's attire) as a mother's model for small boys, who generally hated it. *Sara Crewe* (1888), dramatized as *The Little Princess* (1905), and *The Secret Garden* (1909) were also written for children. *The Lady of Quality* (1896) has been considered the best of her other plays. These, like most of her 40-odd novels, stress sentimental, romantic themes.

Burnett, James, LORD MONBODDO: *see* Monboddo, James Burnett, Lord.

Burnett, Leo (b. Oct. 21, 1891, St. Johns, Mich., U.S.—d. June 7, 1971, Lake Zurich, Ill.), pioneer American advertising executive who founded a worldwide agency that ranks among the giants of the industry.

Burnett was a journalism major at the University of Michigan, who got his first job as a reporter on the *Peoria* (Ill.) *Journal.* He then wrote advertising copy for two auto manufacturers and for two advertising agencies before starting his own firm in 1935. By 1948 the firm's billings (*i.e.,* commissionable advertising expenditures by its clients) exceeded $10,000,000 and a decade later, $90,000,000.

Burnett was one of the developers of what has been called the "Chicago school of advertising." Its objective was to build an advertisement around the inherent importance or appeal of a product itself rather than around clever copy or a catchy slogan. He detested "slick" advertising that he felt was typical of New York agencies or "opportunistic" copy from—as he saw it—the U.S. West Coast. He occasionally scrapped an advertising campaign that had been accepted by a client because he was not satisfied with its quality.

It was Burnett's antagonism toward slickness that moved him to employ models who looked like ordinary people instead of movie stars, and this approach led him in 1954 to the cowboys in Marlboro cigarette ads for the Philip Morris Company, a campaign that turned a minor cigarette with a feminine image into a major brand with a rugged male image. Burnett also served at various times as a director and as chairman of the Advertising Council.

Burnett River, river in southeastern Queensland, Australia, rising on the western slope of the Burnett Range, east of the Eastern Highlands. The river flows southwest to Eidsvold and turns east at Mundubbera and then northeast through Gayndah and Bundaberg to enter the Pacific Ocean at Burnett Heads, after a course of 270 mi (435 km). It has a catchment area of 12,440 sq mi (32,220 sq km). The chief tributaries are the Auburn and Boyne rivers and Barambah Creek. Its upper reaches water beef-cattle country, whereas further downstream sugarcane and dairy farms predominate. Navigability is limited to the 10 mi below Bundaberg. The river was named after the surveyor J.C. Burnett, who explored it in 1847.

Burney, Charles (b. April 7, 1726, Shrewsbury, Shropshire, Eng.—d. April 12, 1814, Chelsea, Middlesex), organist, composer, and the foremost music historian of his time in England.

After attending Chester Free School (1739–42), Burney returned to Shrewsbury, assisted his half-brother, a church organist, and learned violin and French. In 1744 he began a musical apprenticeship at Drury Lane, in London, where he later collaborated with David Garrick. He married Esther Sleepe in June 1749 (one of their daughters was Fanny Burney, the English novelist), became organist at St. Dionis' Backchurch in October, and that winter succeeded John Stanley as organist and harpsichordist of the concerts at the King's Arms, Cornhill.

He was elected to the Royal Society of Arts in 1764, was appointed to positions in the king's

Charles Burney, portrait by Sir Joshua Reynolds, 1781; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

musical establishment in 1767 and 1774, took his D. Mus. at Oxford in 1769, and became a Fellow of the Royal Society in 1773.

Burney toured France and Italy collecting materials for a projected history of music in 1770 and visited the Netherlands, Germany, and Austria in 1772. His first success as a writer came with the publication of his travel journals, *The Present State of Music in France and Italy* . . . (1771) and *The Present State of Music in Germany, the Netherlands and the United Provinces* . . . (1773). On his return he devoted every moment he could spare from teaching to his *General History of Music,* published between 1776 and 1789 in four volumes.

His final appointment was as organist at Chelsea Hospital from 1783. His *Memoirs of the Life and Writings of the Abate Metastasio* appeared in 1796. Between 1801 and 1805 Burney wrote the music articles for Abraham Rees's *Cyclopaedia* and was handsomely rewarded with a fee of £1,000. Burney virtually retired in 1805. He was granted a king's pension in 1806 and in 1810 became a correspondent of the Institut de France. He was also an amateur astronomer.

Burney's *General History of Music* established him as the foremost writer on music in the country. It was not an antiquarian's history but a readable account catering to amateurs as well as professionals. What most interested Burney—and his subscribers—was contemporary music; he was an enthusiastic champion of Haydn and devoted a long chapter to Italian opera in England. Burney also wrote sympathetically on the music of the Renaissance; nevertheless, it is principally for its insight into fashionable musical taste in 18th-century London that Burney's *History* is indispensable.

Burney, Fanny, byname of FRANCES D'ARBLAY, *née* BURNEY (b. June 13, 1752, King's Lynn, Norfolk, Eng.—d. Jan. 6, 1840, London), English novelist and letter writer, daughter of the musician Charles Burney, and author of *Evelina,* a landmark in the development of the novel of manners.

Fanny educated herself by omnivorous reading at home. Her literary apprenticeship was much influenced by her father's friend Samuel Crisp, a disappointed author living in retirement. It was to "Daddy" Crisp that she addressed her first journal letters, lively accounts of the musical evenings at the Burneys' London house where the elite among European performers entertained informally for gatherings that might include David Garrick,

Dr. Johnson, Edmund Burke, and Richard Sheridan. Considered the least promising of the clever Burney children, Fanny moved unnoticed in the circles of the great, confiding her observations to Crisp.

Her practice of observing and recording society led eventually to her novel *Evelina, or The History of a Young Lady's Entrance Into the World. Evelina* revealed its author to be a keen social commentator with an attentive ear for dialect and the differentiation of London speech. It concerns the development of a young girl, unsure of herself in society and subject to errors of manners and judgment. The plot terminates with Evelina's marriage after the mistakes stemming from her untutored girlhood have been surmounted. A novel treating contemporary manners in an elegant and decorous way and depending for the development of its plot upon the erring and uncertain conduct of the heroine was an innovation that pointed the way for the novels of Jane Austen. Published anonymously in 1778, *Evelina* took London by storm. No one guessed it was by shy Fanny Burney, then 26.

When the secret was out, Fanny's debut into literary society was launched by the fashionable hostess Mrs. Thrale. Once the young girl overcame her shyness she could match wits with Dr. Johnson himself, who was very kind to her between 1779 and 1783 when they both made long visits to the Thrales. Fanny's

Fanny Burney, detail of an oil painting by her brother, E.F. Burney; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

journals from this period have been prized for their vignettes of contemporary scenes and celebrities and for Fanny's own secretly expressed delight in being famous.

Her next novel, *Cecilia, or Memoirs of an Heiress,* 5 vol. (1782), incorporated morally didactic themes along with the social satire of Burney's first novel into a more complex plot. Though lacking the freshness and spontaneity of *Evelina,* this novel was equally well received, but Fanny's success was shadowed by the death of Henry Thrale in 1781, of Crisp in 1783, and of Dr. Johnson in 1784. These years also brought a disappointment in love, when the ambiguous attentions of a young clergyman came to nothing.

In 1785 Fanny was presented to Queen Charlotte and King George III and in 1786 was invited to court as second keeper of the robes, where she remained for five unhappy years. Eventually her health suffered and she was allowed to resign in 1791. Her journals of the period loyally repress court gossip of the years of the King's madness (1788–89) but contain interesting accounts of public events like the trial of Warren Hastings.

In 1793, when she was 41, Fanny married Alexandre d'Arblay, a former adjutant general to Lafayette, then a penniless French émigré living in England. They had one son. In 1796 Fanny wrote a potboiler, *Camilla: or a Picture of Youth,* and on its proceeds the d'Arblays built a house in Surrey, where they moved in 1797. While on a visit to France with her husband and son in 1802, she was forced by the renewal of the Napoleonic Wars to stay for 10 years. After Waterloo (1815) the d'Arblays returned and settled at Bath, where d'Arblay died in 1818. Mme d'Arblay then retired to London, where she devoted her attention to her son's career and to the publication of her father's *Memoirs* (1832). An edition of her journals and letters in eight volumes was published 1972–80.

Burnham, Daniel H(udson) (b. Sept. 4, 1846, Henderson, N.Y., U.S.—d. June 1, 1912, Heidelberg, Ger.), American architect and city planner whose plan for Chicago anticipated by 30 years the need for planning and development on a metropolitan area basis. He was a pioneer with his partner, John Wellborn Root, in the development of Chicago commercial architecture, which emphasized steel frame construction; later he became identified with academic eclecticism.

When Burnham was nine, his family moved to Chicago. After his high school education, he was apprenticed to the Chicago architectural firm Carter, Drake and Wight. There he met Root, and in 1873 they became partners. Three of their Chicago buildings were designated landmarks in 1962: the Rookery (1886) and the Reliance Building (1890), both using skeleton frame construction, and the Monadnock Building (1891), the last and tallest (16-story) American masonry skyscraper.

Burnham's forte was organization and administration. He was the businessman of the firm, of which Root was the designer. When Burnham became chief of construction for the World's Columbian Exposition (Chicago, 1893), Root was appointed chief consulting architect. When Root died in 1891, that position also went to Burnham, who selected as principal architects firms from the eastern United States working in academic eclecticism—the antithesis of the New Chicago school of commercial architecture. The "White City" that resulted, with its boulevards, gardens, and

The Rookery Building, Chicago, designed by Burnham and Root, 1886

Chicago Architectural Photographing Co.

buildings with classical facades, influenced planning in the United States. Among his other commissions were the Flatiron Building, New York (1901); Union Station, Washington, D.C. (1909); Selfridge's Store, London (1909); and Filene's Store, Boston (1912).

He served as president of the American Institute of Architects in 1894 and was asked to prepare plans for several cities, including Cleveland, San Francisco, and Baltimore. In 1905, on the request of the U.S. government, he drew up plans for cities in the Philippines, including Manila. His Plan for Chicago (1907–09), prepared with Edward H. Bennett, and popularly referred to as the Burnham Plan, is a classic example of American city planning. Farsighted in many ways, it provided for a ring of forest preserves in outlying areas and along the city's lakefront to ensure a future green belt against an anticipated population explosion. The Burnham Plan was used for many years as the basis for city planning in Chicago.

Thomas S. Hines, *Burnham of Chicago, Architect and Planner,* was published in 1974.

Burnham (of Hall Barn, Beaconsfield), Edward Levy-Lawson, 1st Baron, original name EDWARD LEVY, also called (1892–1903) SIR EDWARD LEVY-LAWSON, 1ST BARONET (b. Dec. 28, 1833, London—d. Jan. 9, 1916, London), English newspaper proprietor who virtually created the *London Daily Telegraph.*

He was educated at University College school. His father, Joseph Moses Levy (*q.v.*), acquired the *Daily Telegraph and Courier* in 1855, a few months after it had been founded by Colonel Sleigh. Aided by his son, Levy soon raised it to a leading position and made it the pioneer London penny paper. Edward Levy (he took the added name of Lawson under his uncle's will in 1875) acted as editor of the *Daily Telegraph* until his father's death and then became its managing proprietor and sole controller until 1903, when he was made a baron and passed over these duties to his son. He had received a baronetcy in 1892.

For many years Lawson was one of the outstanding figures in English journalism. No one in Great Britain did more to brighten and humanize the daily newspaper and transform it from a plain chronicle of the day's events into a readable and entertaining presentation of the world's news. The abolition of the last of the paper duties (1861), in which Lawson himself bore an active part, called into being a host of new readers among the middle classes, which welcomed the popular features of the new journalism. His conception of a popular daily paper was that it should be a faithful mirror of the times and appeal to the feeling of its readers.

Under his direction the *Daily Telegraph* raised large funds for national, patriotic, and charitable objects, dispatched missions of exploration to Central Africa and elsewhere, and started novel features, such as popular correspondences on live topics of the day, which later became the established commonplace of journalism. For many years the *Daily Telegraph* warmly supported the Liberal Party, but it strongly dissented from Prime Minister William Gladstone's anti-Turkish policy, and the final severance came on his Irish policy of Irish Home Rule. Lawson was strongly attached to the idea of the British Empire. Edward VII, as prince of Wales and later as king, frequently visited his home.

Burnham served as president of the Institute of Journalists (1892–93) and the Newspaper Press Fund (1908–16), and in 1909 he presided over the first Imperial Press Conference in London.

Burnham, (Linden) Forbes (Sampson) (b. Feb. 20, 1923, Kitty, British Guiana—d. Aug. 6, 1985, Georgetown, Guyana), prime minister of Guyana (until 1966, British Guiana) from 1964 to 1980 and president from 1980 to 1985.

Burnham received a law degree from the University of London in 1947, returned home

in 1949, and formed the People's Progressive Party the following year together with Cheddi Jagan, the left-wing labour leader. Burnham split with him in 1955 to form the more moderate People's National Congress. After Jagan's party won control of the colonial legislature in two successive elections (1957 and 1961), the British, acting to halt the leftward momentum of the government under Jagan, changed the constitution in 1964 so that Burnham could form a coalition government with a small right-wing party. When Guyana became an independent nation in May 1966, Burnham was well established as the new state's first head of government.

Until 1970, Burnham steered a moderate course, seeking foreign investment and keeping his distance from Cuba and the Socialist countries. In 1970, however, he veered sharply to the left, declaring Guyana a "Cooperative Republic," establishing diplomatic relations with Cuba, the Soviet Union, and other Communist countries, and seeking a position of leadership among Third World nations. Between 1971 and 1976 he nationalized Canadian- and American-owned bauxite mines and British-owned sugar plantations and refineries. By 1979 his policies of nationalization had reduced the private sector's share in the economy to 10 percent. In a referendum held in July 1978 and with electoral results widely believed to have been fraudulent, Burnham sought to strengthen his party's nearly total control of the government.

In 1980 a constitutional change replaced the premiership with a more powerful presidency, and Burnham was declared the winner of the presidential election of 1980 (which was also internationally condemned as fraudulent). Burnham's quasi-Socialist policies led in the 1980s to economic stagnation, with the country unable to export sufficient amounts of sugar, bauxite, and rice to earn the foreign exchange needed for vital imports. Burnham died while undergoing a throat operation in a Georgetown hospital.

Burnham-on-Crouch, parish (town), Maldon district, county of Essex, England. The parish lies on the left bank of the Crouch, 5 mi (8 km) inland from the North Sea. There are many oyster beds in the Crouch Estuary, which opens out just below Burnham-on-Crouch. A shellfish research laboratory was established there in 1953. The community is one of the best known yachting centres in Britain; boatbuilding and sail making also take place there. The Church of St. Mary dates mainly from the 14th century. Pop. (1981) 6,308.

Burnie, town and port, northern Tasmania, Australia. Burnie is situated on Emu Bay at the mouth of the Emu River. Established in 1829 by the Van Diemen's Land Company as Emu Bay Settlement, the settlement was renamed to honour a company director, William Burnie, and was declared a town in 1866. In the 1870s it served as the outport for the tin mine at Mt. Bischoff, and it was constituted a municipality in 1908. Burnie lies on the Bass Highway to Launceston (92 mi [148 km] east) at the junction of the main western and west coast rail lines. It is the northernmost port served by the Sydney–Tasmania ferry and is the commercial centre for northwestern Tasmania. Its deepwater harbour, the facilities of which were increased in the 1960s after the completion of the West Coast Outlet Road, handles containerized cargo, copper, lead, zinc, and tin concentrates and the cereals, potatoes, and livestock produced in the area. Other industries include the manufacture of pulp, paper, hardboard, and titanium-oxide pigments, as well as freezing and canning works. The town hosts a New Years' Day sports carnival, one of the largest of its kind in Australia. Pop. (1981) including Somerset, 20,368.

burning bush, any of several plants so called for their striking fall foliage, brilliant flower display, or emission of a volatile flammable vapour (*see* gas plant). The popular burning bush planted for fall colour is *Euonymus atropurpureus,* also called wahoo. This shrub, or small tree, up to 8 metres (26 feet) in height, is native to the eastern and north central United States. It bears small purplish flowers and small scarlet fruits. The western burning bush (*E. occidentalis*), up to 5.5 m, is found along the western coastal United States. The winged spindle tree, or winged euonymus (*E. alata*), is often called burning bush; a shrub growing to a height of 2.5 m, it has several cultivated varieties, including a dwarf, compact branching form, which is much used in landscaping.

Red summer cypress, or firebush (*Kochia scoparia trichophylla*), is also called burning bush (*see* Kochia), as is *Combretum microphyllum,* the flame creeper of Mozambique, a rambling shrub with hairy scarlet flower spikes.

Burnley, district (borough), county of Lancashire, England, north of Greater Manchester, at the junction of the Rivers Burn and Calder. It has an area of 52 sq mi (134 sq km).

In common with other towns of Lancashire, Burnley grew rapidly from the end of the 18th century with the development of the cotton textile industry. The building of the Leeds and Liverpool Canal and the presence of coal were factors helping its development. By the early 19th century cotton weaving was the dominant industry. Today the economy of the district has diversified, and light engineering is now important. The central area has been redeveloped. Towneley Hall, mainly 17th century, is the borough's art gallery and museum and is set in parkland. Pop. (1981) town, 77,127; (1984 est.) district, 90,600.

Burns, city, seat of Harney County, east central Oregon, U.S., situated on the Silvies River. Built on a former cattle ranch, the settlement was named for the poet Robert Burns. As the capital of a vast cattle empire, Burns became the administrative headquarters for grazing lands retained in public ownership until the Taylor Grazing Act of 1934. The remote city serves as the trading centre for surrounding rangelands and is the site of an experimental station of Oregon State University. The nearby Malheur and Ochoco national forests and Malheur and Harney lakes have recreational facilities. The Malheur National Wildlife Refuge is to the south. Inc. 1899. Pop. (1982 est.) 3,102.

Burns, George; and Allen, Gracie, original names NATHAN BIRNBAUM and GRACE ETHEL CECILE ROSALIE ALLEN (respectively, b. Jan. 20, 1896, New York City; b. July 26, 1905, San Francisco—d. Aug. 27, 1964, Hollywood), American husband-and-wife comedy team popular for more than three decades in vaudeville, radio, motion pictures, and television.

Both came from theatrical backgrounds. Burns, one of 12 children, began his career at the age of 13 as a singer in the PeeWee Quartet, later performing as a dancer, skater, and comic. Allen joined her sisters in a vaudeville act at the age of 14 but had elected to abandon the stage to become a stenographer when she met Burns in the early 1920s and their partnership was formed. Married in 1926 and eventually the parents of a son and a daughter, they headlined their own show on American radio for 17 years. Relying on clever domestic humour—with Burns as the wry, cigar-brandishing straight man to Gracie's malaprop-prone chatterbox—the couple made 13 feature films together, including *The Big Broadcast* (1932), *International House* (1932), *Love in Bloom* (1935), *College Swing* (1938), and *Two Girls and a Sailor* (1944). Allen also appeared without Burns in *The Gracie Allen Murder Case* (1939) and *Mr. and Mrs. North* (1941) and in 1940 ran for U.S. president on the Surprise Party ticket. On television, *The George Burns and Gracie Allen Show* (1950–58), a situation comedy about the private lives of a show business couple, featured Burns as the stage manager of each episode, interrupting the plot with asides, commentary, and explanations to the viewing audience of which he alone was aware.

Burns returned from the semiretirement that began with his wife's death to costar in *The Sunshine Boys* (1975), for which he received an Academy Award for best supporting actor. He then went on to star in such films as *Oh, God!* (1977), *Going in Style* (1979), *Just You and Me, Kid* (1979), *Oh, God! Book II* (1980), and *Oh, God! You Devil* (1984). Burns was highly regarded for his dry wit, comic timing, and rapid-fire delivery. He was the author of several volumes of memoirs describing his long career in show business.

Burns, John Elliot (b. Oct. 20, 1858, London—d. Jan. 24, 1943, London), British labour leader and Socialist, the first person of working-class origin to enter a British Cabinet (1905).

Having begun work at the age of 10, Burns attended night school and read extensively. In 1883 he joined the Social Democratic Federation (SDF), which was at that time the only avowedly Socialist body in England, and in 1885 he unsuccessfully sought election to Parliament as a member of the SDF. Burns was tried for sedition in 1886 and was imprisoned in 1888 for his part in the "Bloody Sunday" riot that had taken place in London's Trafalgar Square the preceding November.

With Benjamin Tillett and Tom Mann, Burns was a dominant figure in the great London dock strike of August–September 1889, which brought casual and unskilled labourers into trade unions. In 1892 he was elected chairman of the Trades Union Congress and a Socialist member of the House of Commons. The following year the Independent Labour Party (a forerunner of the modern Labour Party) was founded, and, although he was active in the new party, he did not claim to represent it in Parliament.

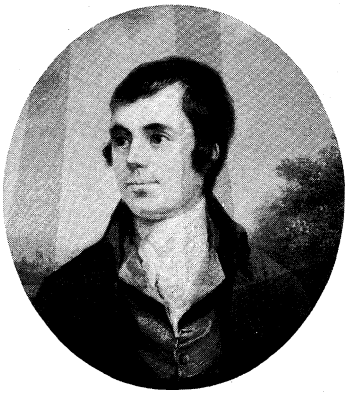
On Dec. 10, 1905, he entered Sir Henry Campbell-Bannerman's Liberal Cabinet as president of the Local Government Board; but as a Cabinet officer he was a disappointment, for he was largely ineffectual. Growing less radical, he thereafter remained aloof from the newly formed Labour Party. In 1909 he secured passage of the first British town-planning statute, and in 1911 he was the principal conciliator in a London dock and transport strike. Transferred to the presidency of the Board of Trade on Feb. 11, 1914, Burns resigned in August to protest Great Britain's entry into World War I. He left Parliament in 1918 and for his last 25 years took no further part in public life.

Burns, Robert (b. Jan. 25, 1759, Alloway, Ayrshire, Scot.—d. July 21, 1796, Dumfries, Dumfriesshire), national poet of Scotland, who wrote lyrics and songs in the Scottish dialect of English. He was also famous for his amours and his rebellion against orthodox religion and morality.

Life. Burns's father had come to Ayrshire from Kincardineshire in an endeavour to improve his fortunes, but, though he worked immensely hard first on the farm of Mount Oliphant, which he leased in 1766, and then on that of Lochlea, which he took in 1777, ill luck dogged him, and he died in 1784, worn out and bankrupt. It was watching his father being thus beaten down that helped to make Robert both a rebel against the social order of his day and a bitter satirist of all

forms of religious and political thought that condoned or perpetuated inhumanity. He received some formal schooling from a teacher as well as sporadically from other sources. He acquired a superficial reading knowledge of French and a bare smattering of Latin, and he read most of the important 18th-century English writers as well as Shakespeare, Milton, and Dryden. His knowledge of Scottish literature was confined in his childhood to orally transmitted folk songs and folk tales together with a modernization of the late 15th-century poem "Wallace." His religion throughout his adult life seems to have been a humanitarian deism.

Proud, restless, and full of a nameless ambition, the young Burns did his share of hard work on the farm. His father's death made him tenant of the farm of Mossgiel to which the family moved and freed him to seek male and female companionship where he would. He took sides against the dominant extreme Calvinist wing of the church in Ayrshire and championed a local gentleman, Gavin Hamilton, who had got into trouble with the Kirk Session for sabbath breaking. He had an affair with a servant girl at the farm, Elizabeth Paton, who in 1785 bore his first illegitimate child, and on the child's birth he welcomed it with a lively poem.



Robert Burns, detail of an oil painting by Alexander Nasmyth; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Burns developed rapidly throughout 1784 and 1785 as an "occasional" poet who more and more turned to verse to express his emotions of love, friendship, or amusement or his ironical contemplation of the social scene. But these were not spontaneous effusions by an almost-illiterate peasant. Burns was a conscious craftsman; his entries in the commonplace book that he had begun in 1783 reveal that from the beginning he was interested in the technical problems of versification.

Though he wrote poetry for his own amusement and that of his friends, Burns remained restless and dissatisfied. He won the reputation of being a dangerous rebel against orthodox religion, and, when in 1786 he fell in love with Jean Armour, her father refused to allow her to marry Burns even though a child was on the way and under Scots law mutual consent followed by consummation constituted a legal marriage. Jean was persuaded by her father to go back on her promise; Robert, hurt and enraged, took up with another girl, Mary Campbell, who died soon after; on September 3 Jean bore him twins out of wedlock. Meanwhile, the farm was not prospering, and Burns, harassed by insoluble problems, thought of emigrating. But he first wanted to show his country what he could do. In the midst of his troubles he went ahead with his plans for publishing a volume of his poems at the nearby town of Kilmarnock. It was entitled *Poems, Chiefly in the Scottish Dialect* and appeared on July 31, 1786. Its success was immediate and overwhelming. Simple country folk and sophisticated Edinburgh critics alike hailed it, and the upshot was that Burns set out for Edinburgh on Nov. 27, 1786, to be lionized, patronized, and showered with well-meant but dangerous advice.

The Kilmarnock volume was a remarkable mixture. It included a handful of first-rate Scots poems: "The Twa Dogs," "Scotch Drink," "The Holy Fair," "An Address to the Deil," "The Death and Dying Words of Poor Maillie," "To a Mouse," "To a Louse," and some others, including a number of verse letters addressed to various friends. There were also a few Scots poems in which he was unable to sustain his inspiration or that are spoiled by a confused purpose. In addition, there were six gloomy and histrionic poems in English, four songs, of which only one, "It Was Upon a Lammas Night," showed promise of his future greatness as a song writer, and what to contemporary reviewers seemed the stars of the volume, "The Cotter's Saturday Night" and "To a Mountain Daisy."

Burns selected his Kilmarnock poems with care: he was anxious to impress a genteel Edinburgh audience. In his preface he played up to contemporary sentimental views about the natural man and the noble peasant, exaggerated his lack of education, pretended to a lack of natural resources and in general acted a part. The trouble was that he was only half acting. He was uncertain enough about the genteel tradition to accept much of it at its face value, and though, to his ultimate glory, he kept returning to what his own instincts told him was the true path for him to follow, far too many of his poems are marred by a naïve and sentimental moralizing.

Edinburgh unsettled Burns, and, after a number of amorous and other adventures there and several trips to other parts of Scotland, he settled in the summer of 1788 at a farm in Ellisland, Dumfriesshire. At Edinburgh, too, he arranged for a new and enlarged edition (1787) of his poems, but little of significance was added to the Kilmarnock selection. He found farming at Ellisland difficult, though he was helped by Jean Armour, with whom he had been reconciled and whom he finally married in 1788.

In Edinburgh Burns had met James Johnson, a keen collector of Scottish songs who was bringing out a series of volumes of songs with the music and who enlisted Burns's help in finding, editing, improving, and rewriting items. Burns was enthusiastic and soon became virtual editor of Johnson's *Scots Musical Museum.* Later, he became involved with a similar project for George Thomson, but Thomson was a more consciously genteel person than Johnson, and Burns had to fight with him to prevent him from "refining" words and music and so ruining their character. Johnson's *Scots Musical Museum* (1787–1803) and Thomson's *Select Collection of Original Scotish Airs for the Voice* (1793–1818) contain the bulk of Burns's songs. Burns spent the latter part of his life in assiduously collecting and writing songs to provide words for traditional Scottish airs. He regarded his work as service to Scotland and quixotically refused payment. The only poem he wrote after his Edinburgh visit that showed a hitherto unsuspected side of his poetic genius was *Tam o'Shanter,* a spirited, narrative poem in brilliantly handled eight-syllable couplets based on a folk legend.

Meanwhile, Burns corresponded with and visited on terms of equality a great variety of literary and other people who were considerably "above" him socially. He was an admirable letter writer and a brilliant talker, and he could hold his own in any company. At the same time, he was still a struggling tenant farmer, and the attempt to keep himself going in two different social and intellectual capacities was wearing him down. After trying for a long time, he finally obtained a post in the excise service in 1789 and moved to Dumfries in 1791, where he lived until his death. His life at Dumfries was active. He wrote numerous "occasional" poems and did an immense amount of work for the two song collections, in addition to carrying out his duties as exciseman. The outbreak of the French Revolution excited him, and some indiscreet outbursts nearly lost him his job, but his reputation as a good exciseman and a politic but humiliating recantation saved him.

Assessment. Burns was a man of great intellectual energy and force of character who, in a class-ridden society, never found an environment in which he could fully exercise his personality. The fact is that Scottish culture in his day could provide no intellectual background that might replace the Calvinism that Burns rejected. The Edinburgh literati of Burns's day were second raters, but the problem was more than one of personalities. The only substitute for the rejected Calvinism seemed to be a sentimental deism, a facile belief in the good heart as all, and this was not a creed rich or complex enough to nourish great poetry. That Burns in spite of this produced so much fine poetry shows the strength of his unique genius, and that he has become the Scottish national poet is a tribute to his hold on the popular imagination.

Burns perhaps exhibited his greatest poetic powers in his satires. There is also a remarkable craftsmanship in his verse letters, which display a most adroit counterpointing of the colloquial and the formal. But it is by his songs that Burns is best known, and it is his songs that have carried his reputation round the world. Burns is without doubt the greatest songwriter Great Britain has produced.

Burns wrote all his songs to known tunes, sometimes writing several sets of words to the same air in an endeavour to find the most apt poem for a given melody. Many songs which, it is clear from a variety of evidence, must have been substantially written by Burns he never claimed as his. He never claimed "Auld Lang Syne," for example, which he described simply as an old fragment he had discovered, but the song we have is almost certainly his, though the chorus and probably the first stanza are old. (Burns wrote it for a simple and moving old air that is *not* the tune to which it is now sung, as Thomson set it to another tune.) The full extent of Burns's work on Scottish song will probably never be known.

It is positively miraculous that Burns was able to enter into the spirit of older folk song and re-create, out of an old chorus, such songs as "I'm O'er Young to Marry Yet," "Green Grow the Rashes, O," and a host of others. It is this uncanny ability to speak with the great anonymous voice of the Scottish people that explains the special feeling that Burns arouses, feelings that manifest themselves in the "Burns cult." (D.Da./Ed.)

MAJOR WORKS. Burns's first collection of *Poems, Chiefly in the Scottish Dialect* (July 1786; "the Kilmarnock edition"), contains 44 of Burns's best known poems. The Edinburgh edition of April 1787 adds 22 poems, including "Address to the Unco Guid, or the Rigidly Righteous," "The Brigs of Ayr," and "Tam o' Shanter." The last edition to be supervised by Burns, 2 vol. (February 1793), adds another 19. James Johnson's collection, *The Scots Musical Museum,* 6 vol. (1787–1803), includes some 200 songs and fragments, with some airs, written, revised, or collected by Burns. More than 70 songs are included in George Thomson's *A Select Collection of Original Scotish Airs for the Voice,* 8 pt. (1793–1818).

BIBLIOGRAPHY. J.W. Egerer, *A Bibliography of Robert Burns* (1964), is a complete listing of Burns's poetical and prose works appearing between 1786 and 1802 and of all "formal" editions (including translations) up to the date of publica-

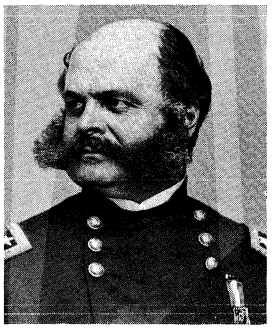
tion. James Kinsley (ed.), *The Poems and Songs of Robert Burns,* 3 vol. (1968; abridged ed., 1969), is a full and definitive text of the poems and songs acknowledged by Burns as his and now thought to be his work. The standard edition of Burns's letters is John De Lancey Ferguson (ed.), *The Letters of Robert Burns,* 2 vol. (1931). Franklyn B. Snyder, *The Life of Robert Burns* (1932, reissued 1968), is a standard modern biography; although Robert T. Fitzhugh, *Robert Burns: The Man and the Poet* (1970), adds some factual details and is very full. Ferguson's *Pride and Passion: Robert Burns, 1759–1796* (1939, reissued 1964), is an admirable portrait of Burns the man. David Daiches, *Robert Burns,* rev. ed. (1966), gives a full account of both the man and the poetry, while his *Robert Burns and His World* (1971), sets the man and his work clearly in the context of his time and place. Thomas Crawford, *Burns: A Study of the Poems and Songs,* 2nd ed. (1965), is a critical and scholarly study. See also John M. Lindsay, *Robert Burns: The Man, His Life, the Legend,* 2nd ed. (1968, reissued 1979).

Burns, Tommy, byname of NOAH BRUSSO (b. June 17, 1881, Hanover, Ont., Can.—d. May 10, 1955, Vancouver, B.C.), Canadian holder of the world heavyweight boxing championship from Feb. 23, 1906, when he won a 20-round decision over Marvin Hart in Los Angeles, until Dec. 26, 1908, when he lost to Jack Johnson in 14 rounds in Sydney. He successfully defended the title 11 times.

From 1900 to 1920 he had 60 bouts, winning 45, 35 by knockouts. Late in his life (1948) he became an ordained minister.

Burnside, Ambrose Everett (b. May 23, 1824, Liberty, Ind., U.S.—d. Sept. 13, 1881, Bristol, R.I.), Union general in the U.S. Civil War and originator in the United States of the fashion of side whiskers (later known as sideburns).

Burnside, a graduate of the U.S. Military Academy at West Point, N.Y. (1847), resigned



Burnside, photograph by Mathew Brady

By courtesy of the Library of Congress, Washington, D.C.

his commission in 1853 and for the next five years manufactured firearms at Bristol, R.I. During this period he invented a breech-loading carbine. Soon after the Civil War broke out, Burnside took command of a Rhode Island militia regiment. He was later commissioned a brigadier general in the Union Army and fought in the North Carolina coast campaign. Promoted to major general (1862), he was transferred to the Virginia theatre of war. In command of Gen. George McClellan's left wing at Antietam, Md. (September), he was criticized for his ineffectiveness.

When McClellan was removed from the command of the Army of the Potomac (Nov. 7, 1862), Burnside (over his own protests) was chosen to replace him. After a crushing defeat at the Battle of Fredericksburg (December), Burnside was replaced by Gen. Joseph Hooker (Jan. 26, 1863). Transferred to Ohio, Burnside helped to crush Gen. John Morgan's Ohio raid in July. He then marched into Tennessee, taking Knoxville and holding it against a siege by Confederate troops under Gen. James Longstreet. Returning to the Eastern theatre in 1864, he led his old corps under Gen. Ulysses S. Grant in the Wilderness campaign. In Virginia the fiasco of the "Burnside mine" at Petersburg—a mine was exploded under part of the Confederate line, but the assaulting troops were repulsed with heavy losses because of mismanagement—brought about Burnside's resignation. After the war he served as governor of Rhode Island (1866–69) and as U.S. senator from 1875 until his death.

Burpee, W(ashington) Atlee (b. April 5, 1858, Sheffield, N.B., Can.—d. Nov. 26, 1915, Doylestown, Pa., U.S.), U.S. seedsman who founded what became the world's largest mail-order seed company.

After completing two years at the University of Pennsylvania, Burpee set up a seed business with two partners in 1876, but two years later he struck out on his own and founded the company that continued to bear his name, W. Atlee Burpee & Co. He sold his seeds through the mail, and as his firm grew, he extended his holdings to three seed farms located in Bucks County, Pa., Gloucester County, N.J., and Santa Barbara County, Calif. Much of his company's success resulted from his work in developing new hybrids and strains of flowers and vegetables.

Burr, Aaron (b. Feb. 6, 1756, Newark, N.J.—d. Sept. 14, 1836, Port Richmond, N.Y., U.S.), third vice president of the United States (1801–05), who killed his political rival, Alexander Hamilton, in a duel (1804) and whose turbulent political career ended with his arrest for treason in 1807.

Burr came from a prominent New Jersey family and was a grandson of the theologian Jonathan Edwards. He studied law and served on Gen. George Washington's staff during the Revolutionary War (1775–83) but was transferred after antagonizing Washington.

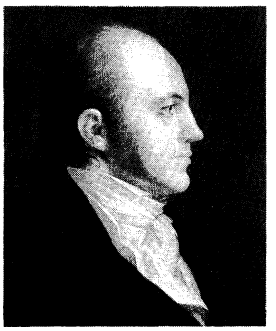
In 1782 he was admitted to the New York bar. His practice in New York City soon flourished, and his mansion at Richmond Hill was the scene of brilliant social gatherings. In 1784 and 1785 he was elected to the state assembly, and in 1789 he was appointed attorney general by Gov. George Clinton. By 1791 he had built a successful political coalition against Gen. Philip Schuyler, father-in-law of Alexander Hamilton (then serving as U.S. secretary of the treasury), and won election to the U.S. Senate, incurring the enmity of Hamilton. Burr failed to be reelected in 1797 and spent the next two years in state politics.

In 1800 Burr won the vice presidential nomination on the Republican (Jeffersonian) ticket. He carried New York state and thus helped bring about a national victory for his party. Under the procedures then prevailing, the electors had cast their votes for both Thomas Jefferson and Aaron Burr without indicating which should be president and which vice president. In the contest that followed, Hamilton's determined opposition to Burr finally resulted in Jefferson's election.

In February 1804 Burr's friends in the New York legislature nominated him for the governorship. Again Hamilton and his supporters helped to bring about Burr's defeat, and shortly thereafter George Clinton replaced him as the Republican vice presidential candidate. Once again Burr felt himself to be the political victim of Hamilton's animosity, and when he learned that Hamilton had made specific charges denigrating his character, he and his rival fought a duel (July 11, 1804) at Weehawken, N.J., in which Hamilton was killed.

With warrants out for his arrest in two states, Burr fled to Philadelphia, where he contacted his friend Gen. James Wilkinson, a U.S. Army officer secretly in the pay of Spain. Expecting war to break out between the U.S. and Spain over boundary disputes, Wilkinson and Burr planned an invasion of Mexico in order to establish an independent government there. Possibly—the record is inconclusive—they also discussed a plan to foment a secessionist movement in the West and, joining it to Mexico, to found an empire on the Napoleonic model. In any event, Wilkinson became alarmed and betrayed Burr to President Jefferson. Trying to escape to Spanish territory, Burr was arrested and returned for trial at Richmond, Va. (May 1807), before Chief Justice John Marshall.

Though the evidence showed only that Burr had planned an illegal attack upon Spanish territory, he was tried for treason, and although he was acquitted, he remained under a cloud of suspicion and distrust. He soon left for Europe, where he tried in vain to enlist the aid of Napoleon in a plan to conquer Florida. Burr remained abroad for four years, living



Aaron Burr, oil painting by John Vanderlyn, 1802; in the collection of the New-York Historical Society

By courtesy of the New-York Historical Society

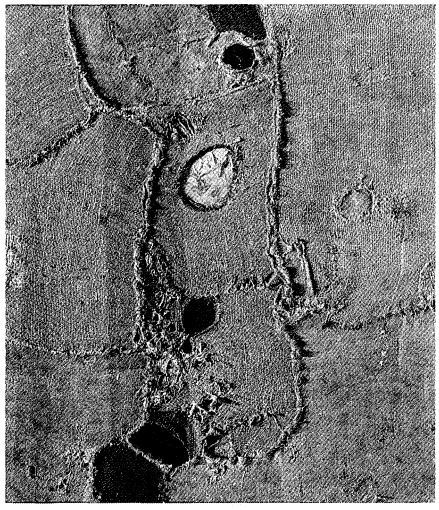
in penury. Bereft and lonely, he returned to New York in 1812 and practiced law until his death.

Burragorang, Lake, major reservoir for Sydney, east central New South Wales, Australia, filling Burragorang Valley, a gorge carved by the Coxs and Wollondilly rivers, which merge there to form the Warragamba, a tributary of the Hawkesbury. With a surface area of about 34 sq mi (88 sq km) and an average depth of 76 ft (23 m), the lake holds 1,696,000 ac-ft (2,092,000,000 cu m) of water. It is contained behind Warragamba Dam (completed 1960), 15 mi upstream from Penrith and 20 mi west of Sydney, a concrete structure 449 ft high and 1,152 ft along its crest. The lake also serves to produce hydroelectricity and control floods.

Burrard Inlet, eastern arm of the Strait of Georgia, extending 23 mi (37 km) in an easterly direction into southeastern British Columbia, Canada. It varies from 1 to 4 mi in width and forms Vancouver Harbour, one of the best natural harbours on the Pacific coast of North America. Vancouver lies on its south shore, North Vancouver on its north, and Port Moody and Ioco near its eastern end. The inlet was explored in 1792 by the British navigator George Vancouver and was named for Sir Harry Burrard, who had served with him in the West Indies in 1785.

Burri, Alberto (b. 1915, Città di Castello, Italy), Italian artist known for his adventurous use of new materials.

Burri was trained as a physician and began to paint only in 1944, while in a prisoner-of-war camp in Texas. In 1945 he moved to Rome and began to paint seriously. His early works—rags splashed in red paint to simulate blood-soaked bandages—grew directly out of his experiences as a doctor in the Italian army. He then began to produce works grouped into series according to the material used. The works of the earliest series (*c.* 1953) were made of coarse cloth stitched together. After 1956 he employed thin pieces



"Sacco B," oil, vinavil, and canvas by Alberto Burri, 1953; in the collection of the artist, Rome

By courtesy of Alberto Burri

of burned wood and layers of polyethylene in which holes were burned, creating a rich spatial network within the layers of plastic. The humble and sometimes crude materials used in these works contrast effectively with their elegant designs, and the easily destroyed materials form a perforated network over an impinging background field. In his series of metal works done after 1959, however, the solid material completely encloses the background field, although the metal is hammered from behind as if the imprisoned field were trying to break out.

Burritt, Elihu (b. Dec. 8, 1810, New Britain, Conn., U.S.—d. March 6, 1879, New Britain), U.S. crusader for peace and a code of international law, perhaps the first to strive to convince the entire public (as opposed to a minority of intellectuals and moralists) of the necessity for peace.

Burritt came to be known as "the learned blacksmith" in reference to his early trade. Teaching himself 50 languages by the age of 30, he acquired an awareness of comparative philology and the interdependence of languages, that partially inspired his belief in the interdependence of peoples and the irrationality of war. He supported the plan of William Ladd, founder of the American Peace Society (1828), for a congress of nations to formulate international law and for a court of nations to interpret that law. From 1848 he organized peace congresses in Brussels, Paris, Frankfurt am Main, London, and other cities. For several years he wrote, for insertion in European newspapers, a succession of single pages called *Olive Leaves,* presenting pacifist arguments with emphasis on an international law code.

burro: *see* donkey.

burro-fat, also called BLADDERBUSH (*Cleome isomeris*), shrub or small tree, of the caper family (Capparaceae), native to southwestern North America, with showy spikes of yellow flowers and gray-green foliage. Burro-fat, up to 3 metres (10 feet) tall, has three-parted, ill-smelling leaves and flowers with four long petals and short green sepals. The flowers begin blooming from the bottom of the spike and produce inflated gray-green capsules that enclose the seeds. Similar woody species are found in Latin America.

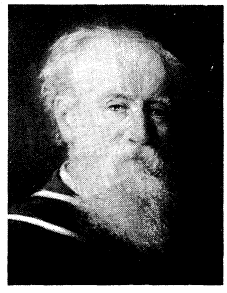
Burroughs, Edgar Rice (b. Sept. 1, 1875, Chicago—d. March 19, 1950, Encino, Calif., U.S.), U.S. novelist whose Tarzan stories created a folk hero known around the world.

After numerous unsuccessful jobs, Burroughs turned to writing about life on Mars and in the jungle. The first Tarzan story appeared in 1912, followed in 1914 by *Tarzan of the Apes,* the first of 25 such books about the son of an English nobleman abandoned in the jungle during infancy and brought up by the apes. Burroughs created in Tarzan a figure that instantly captured the popular fancy, as did his many tales set on Mars. The Tarzan stories were translated into more than 56 languages and were also popular in comic-strip, motion-picture, television, and radio versions. Two towns—one in California and one in Texas—were named after his most famous literary creation.

Burroughs witnessed the Pearl Harbor Attack in 1941; he became a correspondent for the *Los Angeles Times* and, at age 66, was the oldest correspondent covering the South Pacific during World War II.

Burroughs, John (b. April 3, 1837, near Roxbury, N.Y., U.S.—d. March 29, 1921, en route from California to New York), U.S. essayist and naturalist who lived and wrote after the manner of Thoreau, studying and celebrating nature.

In his earlier years Burroughs worked as a teacher, a journalist, and a farmer and for nine years as a clerk in the Treasury Department, Washington, D.C. In 1867 he paid tribute to his friend Walt Whitman in the book *Notes on Walt Whitman as Poet and Person.* In 1871 *Wake-Robin,* the first of his books on birds, flowers, and rural scenes, was published. Two years later he moved to a farm in the Hudson River valley and from various retreats wrote for half a century on nature subjects. His later writings showed a more philosophic mood and a greater disposition toward literary or meditative allusion than did his earlier work. His chief books, in addition to *Wake-Robin,* are *Birds and Poets* (1877), *Locusts and Wild Honey* (1879), *Signs and Seasons* (1886), and *Ways of Nature* (1905). He also wrote a volume of poems, *Bird and Bough* (1906). Burroughs travelled extensively, camping out with such friends as the naturalist John Muir and Theodore Roosevelt and accompanying an expedition to Alaska. *Winter Sunshine* (1875) and *Fresh Fields* (1884) are sketches of travel in England and France. His *Whitman: A Study* was published in 1896. Other collections of his essays are *Time and Change* (1912), *The Summit of the Years* (1913), *The Breath of Life* (1915), *Under the Apple Trees* (1916), and *Field and Study* (1919). The John Burroughs Memorial Association, a society to encourage writing in natural science, was established in his memory.



John Burroughs, detail of a portrait by Orlando Rouland; in the Yale University Art Gallery

By courtesy of Yale University Art Gallery, gift of the artist

Burroughs, William Seward (b. Jan. 28, 1855, Auburn, N.Y., U.S.—d. Sept. 15, 1898, Citronelle, Ala.), U.S. inventor of the first recording adding machine and pioneer of its manufacture.

After a brief education Burroughs supported himself from the age of 15. In 1881 he began working in his father's shop in St. Louis, Mo., constructing models for castings and working on new inventions. At that time he decided to construct a machine for solving arithmetical problems and, with financial help from an acquaintance, Thomas B. Metcalfe, completed (1885) his first calculating machine, which, however, proved to be commercially impractical. But with Metcalfe and two other St. Louis businessmen he organized the American Arithmometer Company in 1886; after much trial and error he patented a practical model in 1892. Although the machine was a commercial success, he died before receiving much money from it. A year before his death he received the John Scott Medal of the Franklin Institute as an award for his invention. In 1905 the Burroughs Adding Machine Company was organized in Michigan as successor to the American Arithmometer Company.

Burroughs, William S(eward) (b. Feb. 5, 1914, St. Louis, Mo., U.S.), U.S. writer of experimental novels that evoke, in deliberately erratic prose, a nightmarish, sometimes wildly humorous world. His sexual explicitness and the frankness with which he dealt with his own experiences as a drug addict won him the admiration of the writers of the Beat movement (*q.v.*). A frequently employed technique he used in writing was the "fold-in," in which two different texts are folded in half vertically, placed side by side, and the writer selects from the odd juxtapositions that occur.

He was the grandson of the inventor of the Burroughs adding machine and grew up in St. Louis in comfortable circumstances, graduating from Harvard in 1936 and continuing study there in archaeology and ethnology. Having tired of the academic world, he then held a variety of jobs. He served for a while with the U.S. Army during World War II. Becoming addicted to drugs in New York City in 1944, he moved with his wife to Mexico, where he shot and killed her in a tragic accident. He wandered through the Amazon region of South America, continuing his experiments with drugs, a period of his life detailed in *The Yage Letters,* his correspondence with Allen Ginsberg written in 1953 but not published until 1963. Between travels he lived in London, Paris, and Tangiers.

He used the pen name William Lee in his first published book, *Junkie: Confessions of an Unredeemed Drug Addict* (1953, reissued 1977), an account of the addict's life. *Naked Lunch* (Paris, 1959; New York City, 1962), was completed after his treatment for drug addiction. All forms of addiction, according to Burroughs, are counterproductive for writing, and the only gain to his own work from his 15 years as an addict came from the knowledge he garnered about the bizarre, carnival milieu in which the drug taker is preyed upon as victim. The grotesqueness of this world is vividly satirized in *Naked Lunch,* which also is much preoccupied with homosexuality and police persecution. In the novels that followed—notably, *The Soft Machine* (1961), *The Ticket That Exploded* (1962), *Nova Express* (1964), *The Wild Boys* (1971), *Exterminator!* (1973), *The Last Words of Dutch Schultz* (1975), *Cities of the Red Night* (1981), and *The Place of Dead Roads* (1983)—Burroughs further experimented with the structure of the novel.

Burroughs (1983), by filmmaker Howard Brookner, is a documentary on the artist's life.

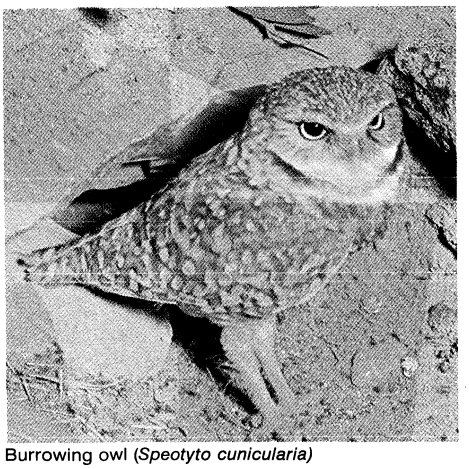
burrower bug, any insect of the approximately 600 species of the family Cydnidae (order Heteroptera). These insects are 7 millimetres (0.3 inch) or less in size; their oval bodies are brown or black in colour; and they have spines on the tibia (part of the upper leg). These insects burrow underground around clumps of grass, in sandy places, or beneath ground litter.

Sometimes the subfamily Cormelaninae (Theyreocorinae) is elevated to the family level (Corymelanidae). Its members, slightly smaller than the members of the burrower-bug sub-

family Cydninae, are commonly called negro bugs. They are found on vegetation, flowers, and fruits, especially raspberries. Negro bugs are usually shiny black in colour, although some are tinged with green or blue; they emit a disagreeable odour. *Thyrecoris pulicarius,* a celery pest, is 3 mm long and has white stripes on each side of its body.

burrowing, locomotion of a type found in both terrestrial and aquatic animal groups. Some fossorial animals dig short permanent burrows in which they live; others tunnel extensively and nearly continuously. In relatively soft substrates, such as soil, burrowers tend to be limbless (lizards, snakes) or equipped with powerful forelimbs (moles, badgers, mole crickets). In either group the animal's exterior is usually relatively smooth; burrowing lizards and snakes are especially smooth-scaled, and moles have short, velvety fur. The eyes of burrowing animals tend to be reduced or absent, and the ears often lack external openings.

burrowing owl (*Speotyto cunicularia*), small owl of the family Strigidae (order Strigiformes) that inhabits prairie lands of the Western Hemisphere from southwestern Canada to Tierra del Fuego. Burrowing owls live in holes abandoned by other animals. They eat mainly insects and small rodents. Slender, rather long-legged owls only about 20 centimetres (8

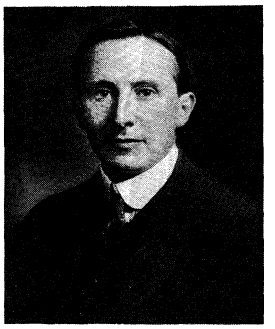


Burrowing owl (*Speotyto cunicularia*)
Cy LaTour

inches) long, they are brown with small white spots, white face and brows, and yellow eyes. During the day, burrowing owls may stand by the burrow or on a post. When approached by man, they bob up and down as if in acknowledgment, and then fly a short distance away.

Burrows, Ronald Montagu (b. Aug. 16, 1867, Rugby, Warwickshire, Eng.—d. May 14, 1920, London), British archaeologist whose excavations (1895–96) in western Greece, at Pílos (ancient Pylos, on the Coryphasium promontory) and the nearby island of Sfaktiría (Sphacteria), were important in verifying Thucydides' historical accuracy.

As professor of Greek at University College, Cardiff, Glamorgan, Wales (1898–1908), he conducted further Greek excavations that helped to systematize the archaeology of the ancient district of Boeotia. His *Discoveries in Crete* (1907) was the first general account of Sir Arthur Evans' discovery of Minoan civilization at Knossos, Crete. He taught at the University of Manchester (1908–13) and was principal of King's College, London, from 1913 to 1920, the period when he devoted much time to modern Greek affairs. His plan for bringing Greece into World War I was adopted by the British Cabinet in 1915. A confidant and adviser to the Greek statesman



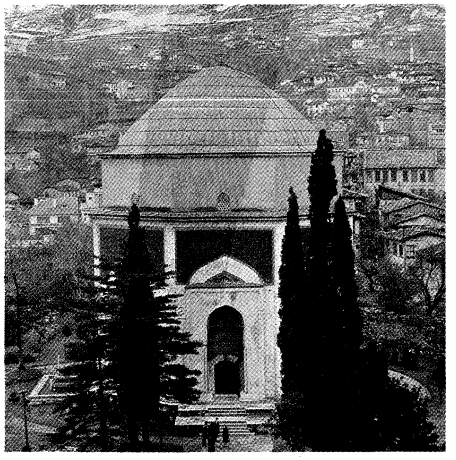
Burrows
By courtesy of the University of London, King's College

Eleuthérios Venizélos, he was chosen to be the Greek provisional government's semi-official representative in London (1916).

Burrus, Sextus Afranius (d. AD 62), praetorian prefect (51–62) and, with Seneca, the chief adviser of the Roman emperor Nero (ruled 54–68).

Burrus came from Gallia Narbonensis and held commissions in the Roman army and posts in the households of Livia (widow of Augustus) and the emperors Tiberius and Claudius. Made prefect of the Praetorian Guard in 51, he owed his promotion to Claudius' wife, Agrippina, who had become the dominant influence on her husband. Agrippina doubtless counted on Burrus' continuing support, but after the accession of the 16-year-old Nero, Burrus, in concert with Seneca, managed to subvert her power. It is reasonable to suppose that until Burrus' death in 62, he and Seneca were responsible for imperial policy and administration. The ancient allegation that Nero poisoned Burrus can be neither proved nor refuted.

Bursa, formerly BRUSA, original name PRUSA, city, capital of Bursa *il* (province), northwestern Turkey, along the northern foothills of Ulu Dağ (the ancient Mysian Olympus). Probably founded by a Bithynian king in the 3rd century BC, it prospered during Byzantine times after the emperor Justinian I (reigned AD 527–565) built a palace there. The city first fell to the Seljuq Turks at the end of the 11th century, but, beginning with the First Crusade in 1096, it changed hands several times. After the sack of Constantinople by



Yeşil Türbe (Green Mausoleum), Bursa, Tur., built by Sultan Mehmed I, 1421
Gianni Tortoli—Photo Researchers

crusaders in 1204, it served as a centre of Byzantine resistance. The Ottomans took it in the 1320s and made it their first great capital; but Timur (Tamerlane) sacked the city in 1402, and when the Ottomans recovered their territory they relocated their capital, first to Edirne (1413) and later to Istanbul (1458). Bursa, nevertheless, expanded and prospered under Ottoman rule.

Set among orchards watered by plentiful mountain streams, Bursa is a city of brightly coloured houses and winding streets dotted with fountains. It retains its Ottoman flavour and contains some of the outstanding examples of Ottoman architecture. Among its mosques, Ulu Cami (Great Mosque; 1421) is a vast building with 20 domes, noted for the variety and fineness of its calligraphic ornamentation. Yeşil Cami (Green Mosque; 1421) marked the beginning of a purely Turkish style; it includes a theological college, library, and ablution fountain. Nearby is the Yeşil Türbe (Green Mausoleum), containing the tomb of Sultan Mehmed I. The Muradiye Cami (15th century) is surrounded by the tombs of sultans and their families. On a terrace overlooking the city are the tombs of Osman I, founder of the Ottoman dynasty, and his son Orhan. A 15th-century theological school houses the city's archaeological museum. Bursa's several baths, fed by thermal springs famous in Roman times, include medieval structures that incorporated material from Justinian's imperial baths from the 6th century.

Bursa's silk industry has a long heritage; the city was a centre of silk trade in the 15th century and by the 17th century was famous in Europe and Asia for its silk textiles, which are still produced. Other industries include cotton and woollen textiles, canned foods and dairy products, and machinery. Bursa is the site of Bursa University (1975) and is linked by air with Istanbul. It has long been a favourite tourist centre.

Bursa *il,* 4,427 sq mi (11,466 sq km) in area, was called Khodavendikyar until the 1920s. It is bordered on the northwest by the Sea of Marmara. Mudanya, with a daily steamer service to Istanbul, is the chief port and has road and rail links with Bursa city. İznik (the ancient Nicaea), once capital of ancient Bithynia, was renowned during the Ottoman period for its manufacture of magnificent faience tiles. Ulu Dağ ranks as the foremost Turkish winter-sport centre. Agricultural products include tobacco, raisins, rice, and merino sheep; minerals include chromium, copper, and mercury. Pop. (1980) city, 445,113; (1983 est.) *il,* 1,264,700.

bursa, plural BURSAS, or BURSAE, any small pouch or sac within the mammalian body between tendons, muscles, or skin and bony prominences, at points of friction or stress. The bursas are classified by type as adventitious, subcutaneous, or synovial. Adventitious, or accidental, bursas arise in soft tissues as a result of repeated subjections to unusual shearing stresses, particularly over bony prominences. Subcutaneous bursas ordinarily are ill-defined clefts at the junction of subcutaneous tissue and deep fasciae (sheets of fibrous tissue); these bursas acquire a distinct wall only when they become abnormal, and they are classified as adventitious by some authorities. Synovial bursas are thin-walled sacs that are interposed between tissues such as tendons, muscles, and bones and are lined with synovial membrane, so called because it exudes synovia, a lubricating fluid. In the human body a majority of synovial bursas are located near the large joints of the arms and legs.

A bunion is an adventitious bursa that develops on the inner side of the base of the great toe in association with hallux valgus (deviation of the first toe so that it lies on top of or below the other toes). Wearing narrow, pointed shoes is a major contributory factor. Mild cases are relieved by use of proper shoes and care of the feet, but surgery may be necessary for correction of severe deformities.

Any type of inflammation of the bursas is called bursitis. The cause of most cases of bursitis appears to be one or another local me-

chanical irritation, although bursas may also be involved along with the joints and tendon sheaths in rheumatoid arthritis and gout. Diseases of the bursa also occur in domestic animals. Capped elbow and capped hock are examples of chronic bursitis in horses, resulting from lying on hard floors, kicks, and similar injuries.

Burschenschaft (German: "Youth Association"), student organization at the German universities that started as an expression of the new nationalism prevalent in post-Napoleonic Europe. The first Burschenschaft was founded in 1815 at the University of Jena, and the movement spread from there to every part of Germany. The early groups were egalitarian and liberal and in favour of the political unification of Germany.

After joint student demonstrations at the Wartburg Festival in October 1817 and the assassination of August von Kotzebue (a German writer who served the Russian tsar) by the nationalistic Burschenschafter Karl Sand in March 1819, the alarmed German governments passed the Carlsbad Decrees (*q.v.;* 1819), which in part provided for the official suppression of the Burschenschaften.

Thereafter, the clubs went underground until 1848, when they actively participated in the German Revolution; after German unification (1871), they adopted a new and aggressive nationalism that led many of them to subscribe to anti-Semitism and Pan-Germanism. Suppressed under Hitler, the Burschenschaften were revived in West Germany after World War II but no longer played a significant role in German politics.

Burseraceae, the myrrh family of flowering plants, in the rue order (Rutales), composed of about 20 genera of resinous trees and shrubs. They are native primarily to tropical America, but a few species occur in Africa and Asia. Members of the family have leaves that alternate along the stem and are com-

Gumbo-limbo (*Bursera simaruba*)
Walter Dawn

posed of many leaflets, solitary or clustered flowers, and fleshy fruits. The gumbo-limbo, or incense tree (*Bursera simaruba*), has light, reddish brown wood that is used for fishing floats; its fragrant resin is used in incense. The oleo-gum resin from several species of the genus *Boswellia,* called frankincense, was used in biblical times in incense, in medicine, and for embalming. Myrrh is the resin from plants of the genus *Commiphora.* Elemi resins are obtained from other genera of the family, and species such as *Aucomea klaineana* produce useful timber.

bursitis, an inflammation of a synovial bursa, the lubricating sac located over a joint or between tendons and muscles or bones. Bursitis may be caused by infection or injury, by secondary involvement from arthritis or gout, by calcium deposition along a tendon or joint, and by minor, usually repetitive, irritation. These are common: "housemaid's knee," "soldier's heel," "tennis elbow," and "weaver's bottom"—all types of bursitis—of the knee, of the Achilles tendon at the back of the ankle, of the elbow, and of the bottom of the pelvis, respectively. Most common is bursitis in the shoulder, caused by calcium deposits and inflammation of the rotator tendon in the upper arm, spreading into the bursa above the shoulder joint. Bursitis of the shoulder occurs most often in persons who do little physical labour, particularly in middle-aged women; it may be extremely painful, making it impossible to raise the affected arm. Treatment includes rest, heat, mild exercise, and medication to relieve inflammation and remove calcium deposits.

Burt, Sir Cyril (Lodowic) (b. March 3, 1883, Stratford-upon-Avon, Warwickshire, Eng.—d. Oct. 10, 1971, London), British psychologist known for his development of factor analysis in psychological testing and for his studies of the effect of heredity on intelligence and behaviour.

Burt studied at Oxford and Würzburg universities before becoming the first educational psychologist appointed by a governmental body in Britain, in 1913, a position that led to the first child-guidance clinic in England. He joined the faculty of the University of London in 1924 and served as professor of psychology at University College, London, from 1931 until his retirement in 1950. He continued to do research after his retirement, and he was knighted in 1946 (the first psychologist to be so honoured).

In 1909 Burt published his experimental tests on general intelligence in which he used factor analysis to define the kinds of factors at play in psychological testing (factor analysis involves the extraction of small numbers of independent factors from a large group of intercorrelated measurements). His method of factor analysis was fully presented in *The Factors of the Mind* (1940).

Burt's studies of general intelligence convinced him that intelligence was chiefly hereditary in origin, although social and environmental factors could play a secondary role in intellectual development. From the 1940s on he published studies showing that levels of intelligence could be correlated with occupational levels among large groups of test subjects and that such intelligence levels were transmitted to these subjects' offspring. His data seemed to show that occupational levels (and hence social class) are determined mainly by innate, hereditary levels of intelligence.

After Burt's death in 1971, striking anomalies in some of his test data led researchers to examine his statistical test results more closely. It became clear that Burt had actually falsified or even invented those IQ-test results that most convincingly supported his theories concerning transmitted intelligence and social class. His reputation declined catastrophically, though the soundness of his earlier work justifies his reputation as the foremost pioneer of educational psychology in Britain.

Burton, Harold H(itz) (b. June 22, 1888, Jamaica Plain, Mass., U.S.—d. Oct. 28, 1964, Washington, D.C.), associate justice of the United States Supreme Court (1945–58).

Burton practiced law in Cleveland until his election to the Ohio state legislature in 1929. He was also active in municipal planning and politics and was in 1935 elected on a reform platform to the first of his three terms as mayor of Cleveland. His many reforms helped win him election in 1940 to the U.S. Senate, in which he sponsored legislation to create an international arbitration and peace-keeping organization. A liberal Republican, he was appointed to the U.S. Supreme Court in 1945 by President Harry S. Truman, a Democrat but long-time friend.

Burton was a strict constructionist and sometimes opposed the executive on economic and commerce issues. Although he generally voted with the liberal majority on questions of civil rights in the 1950s, he dissented more and more frequently on other issues. He retired from the court in 1958 owing to poor health.

Burton, Richard, original name RICHARD WALTER JENKINS, JR., (b. Nov. 10, 1925, Pontrhydfen, Wales—d. Aug. 5, 1984, Geneva, Switz.), British stage and motion-picture actor.

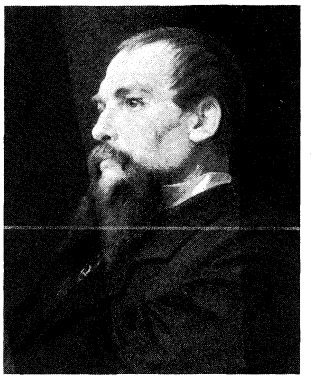
He was the son of a coal miner and was the 12th of 13 children. In gratitude to Philip Burton, the schoolmaster who aided him in obtaining a scholarship to the University of Oxford, he assumed the professional name Burton. His first stage appearance was in 1943, but subsequent service as a Royal Air Force navigator delayed his career. In 1948 he resumed his stage performances and had his first role in a motion picture, *The Last Days of Dolwyn.* He scored his first real stage triumph in 1949 in *The Lady's Not for Burning.*

His initial Hollywood film role was in *My Cousin Rachel* (1952). Throughout the remainder of the 1950s Burton specialized in historical roles in motion pictures, including the leading role in the first wide-screen CinemaScope production, *The Robe* (1953), and the title role in *Alexander the Great* (1956). Burton rose to superstar status during the filming of *Cleopatra* (1963), and he became one of the first actors to command a million dollars or more for a single picture. Burton's subsequent films include *Becket* and *The Night of the Iguana* (both 1964), *The Spy Who Came in from the Cold* (1965), *Who's Afraid of Virginia Woolf?* (1966), *The Comedians* and *The Taming of the Shrew* (both 1967), and *Equus* (1977).

Burton also received critical acclaim for his theatre performances. He toured both Great Britain and the United States during the 1950s and 1960s in Shakespearean productions and gave a memorable portrayal of King Arthur in the Broadway musical *Camelot* in 1960 and 1980. He was twice married to the actress Elizabeth Taylor (1964–74, 1975–76).

Burton, Sir Richard (Francis) (b. March 19, 1821, Torquay, Devonshire, Eng.—d. Oct. 20, 1890, Trieste, Austria-Hungary [now in Italy]), English scholar-explorer and Orientalist who was the first European to discover Lake Tanganyika and to penetrate hitherto forbidden Muslim cities. He published 43 volumes on his explorations and almost 30 volumes of translations, including an unexpurgated translation of *The Arabian Nights.*

Early life and career. Burton was of mixed English, Irish, and possibly French ancestry. His father, retiring early from an unsuccessful



Sir Richard Burton, detail of an oil painting by Lord Leighton, 1876; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

army career, chose to raise his two sons and daughter in France and Italy, where young Richard developed his astonishing talent for languages to such an extent that before matriculating at Trinity College, Oxford, in 1840, he had become fluent in French, Italian, and the Béarnais and Neapolitan dialects, as well as in Greek and Latin. But his continental upbringing left him ambivalent about his national identity. He called himself "a waif, a stray . . . a blaze of light, without a focus," and complained that "England is the only country where I never feel at home."

Expelled from Oxford in 1842 because of a minor breach of discipline, he went to India as subaltern officer in the 18th Regiment of Bombay Native Infantry during England's war with the Sind (now a province of Pakistan). He mastered Arabic and Hindi and during his eight-year stay became proficient also in Marathi, Sindhi, Punjabi, Telugu, Pashto, and Miltani. Eventually in his travels over the world he learned 25 languages, with dialects that brought the number to 40.

As a favoured intelligence officer of Sir Charles James Napier, commander of the English forces in the Sind, Captain Burton went in disguise as a Muslim merchant in the bazaars, bringing back detailed reports. Napier in 1845 asked him to investigate the homosexual brothels in Karāchi; his explicit study resulted in their destruction; it also resulted, after Napier's departure, in the destruction of Burton's promising career, when the report was forwarded to Bombay by an unfriendly officer who hoped to see Burton dismissed in disgrace. Though the effort failed, Burton realized his reputation was irreparably clouded and returned, ill and disconsolate, to England.

From his 29th to his 32nd year he lived with his mother and sister in Boulogne, Fr., where he wrote four books on India, including *Sindh, and the Races That Inhabit the Valley of the Indus* (1851), a brilliant ethnological study, published before the new science of ethnology had a proper tradition against which its merits could be evaluated. Meanwhile he perfected his long-cherished plans for going to Mecca.

Exploration in Arabia. Disguising himself as a Pathan, an Afghanistan Muslim, in 1853 he went to Cairo, Suez, and Medina, then travelled the bandit-ridden route to the sacred city of Mecca, where at great risk he measured and sketched the mosque and holy Muslim shrine, the Ka'bah. Though not the first non-Muslim to penetrate and describe the "mother of cities," Burton was the most sophisticated and the most accurate. His *Pilgrimage to El-Medinah and Mecca* (1855–56) was not only a great adventure narrative but also a classic commentary on Muslim life and manners, especially on the annual pilgrimage. Instead of returning to London to enjoy his sudden fame, however, he organized a new expedition in 1854 to the equally forbidden East African city of Harar (Harer) and became the first European to enter this Muslim citadel without being executed. He described his adventures in *First Footsteps in East Africa* (1856).

By this time Burton had become fascinated by the idea of discovering the source of the White Nile and in 1855 planned an expedition with three officers of the British East India Company, including John Hanning Speke, intending to push across Somaliland. Africans attacked the party near Berbera, however, killing one member of the party and seriously wounding Speke. Burton himself had a javelin hurled through his jaw and was forced to return to England. After recovery, in July 1855, he went to the Crimea to volunteer in the war against Russia. At the Dardanelles he helped train Turkish irregulars but saw no action at the front.

The Crimean War over, he turned again to the Nile search, leading an expedition inland from Zanzibar with John Speke in 1857–58. They suffered almost every kind of hardship Africa could inflict. When they finally arrived on the shores of Lake Tanganyika, Burton was so ill from malaria he could not walk, and Speke was virtually blind. Ailing, and disappointed by native information that the Rusizi River to the north poured into rather than out of the lake, Burton wished to return and prepare a new expedition. Speke, however, who had recovered more quickly, pushed on alone to the northeast and discovered Lake Victoria, which he was convinced was the true Nile source. Burton's unwillingness to accept this theory without further exploration led to quarrels with Speke and their eventual estrangement.

Speke was the first to return to London, where he was lionized and given funds to return to Africa. Burton, largely ignored and denied financing for a new exploration of his own, felt betrayed. His *Lake Regions of Central Africa* (1860) attacked Speke's claims and exacerbated their by now public feud.

In 1860 Burton went off unexpectedly to the United States, where he travelled by stagecoach to the Mormon capital, Salt Lake City. The resulting volume, *City of the Saints* (1861), showed that he could write with sophistication about the nature of the Mormon Church, compose a vivid portrait of its leader, Brigham Young, and also be dispassionate about the Mormon practice of polygamy, which was then outraging most Americans. Shortly after his return from the United States, in January 1861, he and Isabel Arundell, the daughter of an aristocratic family, whom he had been courting since 1856, were married secretly.

Foreign office. Burton now entered the British Foreign Office as consul in Fernando Po, a Spanish island off the coast of West Africa. During his three years there, he made many short trips of exploration into West Africa, gathering enough material to fill five books. His explicit descriptions of tribal rituals concerning birth, marriage, and death, as well as fetishism, ritual murder, cannibalism, and bizarre sexual practices, though admired by modern anthropologists, won him no favour with the Foreign Office, which considered him eccentric if not dangerous.

Returning to London on leave in September 1864, Burton was invited to debate with Speke before the British Association for the Advancement of Science. Speke, who with the British soldier and explorer James Augustus Grant had made a memorable journey from Zanzibar to Lake Victoria and then down the whole length of the Nile, was expected to defend his conviction that Lake Victoria was the true Nile source. After the preliminary session on September 15, Speke went hunting, dying mysteriously as a result of a shotgun wound in his chest. The coroner's jury ruled the death an accident, but Burton believed it to be a suicide. He wrote in anguish to a friend, "The charitable say that he shot himself, the uncharitable say that I shot him."

Burton spent the next four years as consul in Santos, Braz., where he wrote a book on the highlands of Brazil (1869) and translated *Vikram and the Vampire, or Tales of Hindu Devilry* (1870). He also began translating the works of the romantic Portuguese poet-explorer Luís de Camões, with whom he felt a deep sense of kinship. Yet his work did not help him to overcome his increasing aversion for Brazil. He took to drink, and finally he sent his devoted wife to London to obtain a better post for him. She succeeded in persuading the Foreign Secretary to appoint Burton consul in Damascus.

Back in the Middle East, which he loved, Burton for a time was highly successful as a diplomat; but Muslim intrigue, complicated by the proselytizing indiscretions of his Catholic wife, resulted in his humiliating dismissal in August 1871. The details of this event were recorded by Isabel Burton in her lively, defensive *Inner Life of Syria* (1875).

Trieste. In 1872 Burton reluctantly accepted the consulate at Trieste, and although he considered it an ignominious exile, he eventually came to cherish it as his home. There he stayed until his death, publishing an astonishing variety of books. He wrote a book on Iceland, one on Etruscan Bologna, (reflecting his passion for archaeology), a nostalgic volume on the Sind, two books on the gold mines of the Midian, and one on the African Gold Coast (now Ghana), none of which matched the great narratives of his earlier adventures. His *Book of the Sword* (1884), a dazzling piece of historical erudition, brought him no more financial success than any of the others. In 1880 he published his best original poetry, *The Kasidah,* written under a pseudonym and patterned after the *Rubáiyát of Omar Khayyám.*

In Trieste, Burton emerged as a translator of extraordinary virtuosity. He translated and annotated six volumes of Camões, a volume of Neopolitan Italian tales by Giambattista Basile, *II Pentamerone,* and Latin poems by Catullus. What excited him most, however, was the erotica of the East. Taking it upon himself to introduce to the West the sexual wisdom of the ancient Eastern manuals on the art of love, he risked prosecution and imprisonment to translate and print secretly the *Kama Sutra of Vatsyayana* (1883), *Ananga Ranga* (1885), and *The Perfumed Garden of the Cheikh Nefzaoui* (1886). He also published openly, but privately, an unexpurgated 16-volume edition of the *Arabian Nights* (1885–88), the translation of which was so exceptional for its fidelity, masculine vigour, and literary skill that it has frightened away all competitors. Moreover, he larded these volumes with ethnological footnotes and daring essays on pornography, homosexuality, and the sexual education of women. He railed against the "immodest modesty," the cant, and hypocrisy of his era, displaying psychological insights that anticipated both Havelock Ellis and Sigmund Freud. His *Nights* were praised by some for their robustness and honesty but attacked by others as "garbage of the brothels," "an appalling collection of degrading customs and statistics of vice."

In February 1886 Burton won belated recognition for his services to the crown when Queen Victoria made him Knight Commander of St. Michael and St. George. He died in Trieste four years later. His wife, fearful lest her husband be thought vicious because he collected data on what Victorian England called vice, at once burned the projected new edition of *The Perfumed Garden* he had been annotating. She then wrote a biography of Burton in which she tried to fashion this Rabelaisian scholar-adventurer into a good Catholic, a faithful husband, and a refined and modest man. Afterward she burned almost all of his 40-year collection of diaries and journals. The loss to history and anthropology was monumental; the loss to Burton's biographers, irreparable. (F.M.B.)

BIBLIOGRAPHY. Burton wrote 43 volumes on his explorations and travels and more than 100 articles, as well as almost 30 volumes of translations. These are meticulously listed in Norman Penzer, *Annotated Bibliography of Sir Richard Francis Burton* (1923, reprinted 1970). Some of the manuscript material that escaped Lady Burton's burning is now housed in the Royal Anthropological Institute of Great Britain and Ireland, London, which also has Burton's private library. Isabel Burton, *The Life of Captain Sir Richard F. Burton,* 2 vol. (1893), though highly romanticized, remains the best single source book. Thomas Wright, *The Life of Sir Richard Burton,* 2 vol. (1906, reprinted 1968), is largely hostile; that by Burton's niece Georgiana Stisted, *The True Life of Capt. Sir Richard F. Burton* (1896), is a panegyric, with the hostility reserved for Burton's wife. For short but

vivid and perceptive portraits, see Frank Harris, *Contemporary Portraits* (1920) and *My Life and Loves* (1963); and an excellent account by Alan Moorehead, *The White Nile* (1960). Byron Farwell, *Burton* (1963), is a good biography. Fawn M. Brodie, *The Devil Drives: A Life of Sir Richard Burton* (1967), is thoroughly documented and defines the psychological complexities of Burton's personality.

Burton, Robert (b. Feb. 8, 1577, Lindley, Leicestershire, Eng.—d. Jan. 25, 1640, Oxford), English scholar, writer, and Anglican clergyman whose *Anatomy of Melancholy* is a masterpiece of style, a mine of curious information, and a valuable index to the philosophical and psychological ideas of the time.

Burton was educated at Oxford, elected a student (life fellow) of Christ Church (one of the colleges of the university) in 1599, and lived there the rest of his life, becoming a bachelor of divinity in 1614 and vicar of St. Thomas' Church, Oxford, in 1616. He also held livings in Lincolnshire (1624–31) and Leicestershire, the latter bestowed by his patron, Lord Berkeley. His "silent, sedentary, solitary" life, as he himself describes it, lent his view of mankind an ironic detachment, but it certainly did not make it that of a scholar remote from reality: he is as informative on the pastimes of his day as on the ideas of the ancients, and as keen to recommend a rational diet as to relate man's disorders to his own essentially Christian view of the universe.

Burton's first work was the Latin comedy *Philosophaster* (1606; edited with an English translation by P. Jordan-Smith, 1931), a vivacious exposure of charlatanism that has affinities with Ben Jonson's *Alchemist.* It was acted at Christ Church in 1618.

The *Anatomy of Melancholy . . . by Democritus Junior* appeared in 1621, and five subsequent editions (1624, 1628, 1632, 1638 and 1651) incorporated Burton's revisions and alterations. In the treatise, Burton sets himself in the first part to define melancholy, discusses its causes, and sets down the symptoms. The second part is devoted to its cure. Love melancholy is the subject of the lively first three sections of the third part. A master of narrative, Burton includes as examples most of the world's great love stories, again showing a modern approach to psychological problems. The fourth section deals with religious melancholy, and on the cure of despair he rises to heights of wisdom and of meditation.

Burton's frisky, colloquial style is as individual as his matter. It is imaginative and eloquent, full of classical allusions and Latin tags that testify to his love of curious and out-of-the-way information as well as to his erudition. He is a master of lists and catalogs, but their sonorous roll is often broken by his humorous asides.

The *Anatomy,* widely read in the 17th century, lapsed for a time into obscurity, but in the 18th it was admired by Samuel Johnson, and Laurence Sterne's borrowings from it are notorious. In the 19th century the devotion of Charles Lamb helped to bring the *Anatomy* into favour with the Romantics.

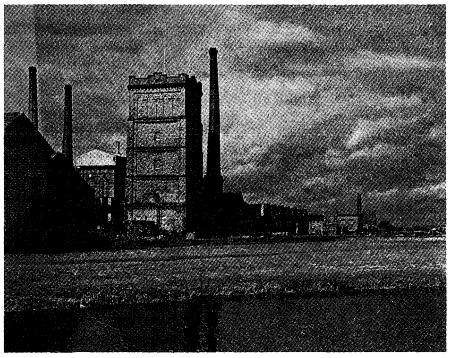
Burton, William Merriam (b. Nov. 17, 1865, Cleveland—d. Dec. 29, 1954, Miami), American chemist who developed a thermal cracking process for increasing the proportion of gasoline obtainable from crude petroleum.

Burton began work as a chemist at the Standard Oil Co. (Indiana) refinery at Whiting, Ind., in 1890, rising swiftly to serve as president from 1918 to 1927. Crude oil, a mixture of various hydrocarbons, can be separated into several groups of constituents by physical means, commonly distillation. His thermal cracking process, patented in 1913, utilized chemical methods that doubled the yield of gasoline by transforming many of the less volatile components into gasoline. Although other refining techniques have since been developed, the Burton process is still widely used.

Burton upon Trent, town, East Staffordshire district, county of Staffordshire, England, mainly on the left bank of the River Trent and on the Grand Trunk (Trent and Mersey) Canal.

A Benedictine abbey was founded there in 1002. Burton was granted charters for an annual fair and two weekly markets and became known for cattle and horse fairs. Brewing is an ancient industry of the town—the well water, impregnated with calcium sulfate derived from gypsum, being particularly suitable—and the activity originated with the monks of Burton Abbey. By 1801 there were nine brewing firms in Burton; it is still an important industry there. Modern developments date from the improvement of communications in the 18th century, particularly the building of the Grand Trunk Canal in the 1760s. Besides brewing, industries include foundries and manufacturing.

Of the abbey, only a gatehouse, part of the walls, and a fine doorway remain; a 15th-century half-timber building stands on the site of the abbot's house. The bridge over the Trent dates at least from the 12th century. The



Breweries at Burton upon Trent, Staffordshire
A.F. Kersting

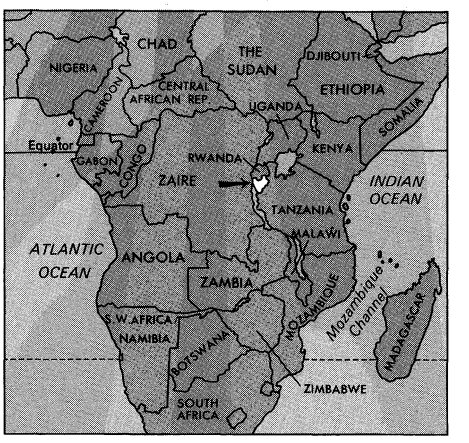
Church of St. Modwen, built in the 18th century, embodies an older building. Pop. (1981) urban area, 59,595.

Buru, also spelled BOEROE, island in the Moluccas, Maluku *propinsi* (province), Indonesia, administered from Ambon as part of Maluku Tengah *kabupaten* (Central Moluccas regency). The island lies 42 mi (68 km) west of the island of Seram across the Selat (strait) Manipa and is about 3,670 sq mi (9,505 sq km) in area. Mountainous and heavily wooded, it has a narrow coastal plain and a good harbour and airport at Namlea, the principal town, on the northeastern coast. Coral reefs surround the island. The highest peak reaches 7,967 ft (2,428 m). The island was conquered by the Dutch (1652–58). It produces forest products and sago.

Between 1969 and 1980 Buru was used by the Indonesian government as the site of a prison camp for those accused of complicity in the attempted coup of Sept. 30, 1965. Approximately 10,000 persons were detained on the island, the majority of them Javanese who were thought to be hard-core Communist cadre. Most were released during 1979 and 1980. Pop. (1971) 37,624.

Burūjird (Iran): *see* Borūjerd.

Burundi, officially REPUBLIC OF BURUNDI, French RÉPUBLIQUE DU BURUNDI, Rundi REPUBLIKA Y'UBURUNDI, landlocked republic in east central Africa south of the Equator, covering an area of 10,747 square miles (27,834 square km). The capital is Bujumbura. To the north it is bounded by Rwanda, to the east and south by Tanzania, to the southwest by Lake Tanganyika, and to the west by Zaire; Burundi extends only about 215 miles (345 km) from north to south and 165 miles (265 km) from east to west. Burundi's population in 1986 was estimated to be 4,830,000. With



Burundi

about 450 people per square mile (174 per square km), it is one of the most densely populated countries in Africa.

The article that follows is a summary of significant detail about Burundi. For full treatment, *see* MACROPAEDIA: Central Africa. For current history and for statistics on Burundi's society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Burundi occupies a high plateau, mountainous in the west, straddling the watershed of the Nile and Congo (Zaire) rivers. The divide, rising to 9,055 feet (2,760 m) at its highest point, runs north–south and slopes gently eastward to form the country's large plateau region, descending to between 5,000 and 6,500 feet at its eastern boundary. The plateau contains the Ruvubu River basin, the southernmost extension of the Nile Basin. In the west, the Ruzizi River, flowing for 65 miles along the trough of East Africa's Great Rift Valley, forms the northern third of the country's western boundary as it connects Lake Kivu (at an elevation of 4,790 feet) in the north with Lake Tanganyika (at 2,530 feet) to the south. The Rift Valley's fault scarp, rising abruptly from the narrow plain formed by the Ruzizi, forms the crest of the Nile and Congo watersheds. The rift system, which extends the length of East Africa—from the Red Sea in the north through Mozambique in the south—is moderately active geologically, and Burundi suffers intermittent tremors and earthquakes.

The climate is tropical, although moderated by elevation. The average annual temperature at Bujumbura is 74° F (23° C); on the plateau it is about 70° F (21° C); and on the cooler mountain slopes about 60° F (16° C). Average annual rainfall is greater than 55 inches (1,400 mm) in the highlands and plateau regions. The Ruzizi Valley and the shores of Lake Tanganyika receive less than 40 inches and experience generally higher temperatures. The country's most heavily forested areas are the mountain slopes. At the higher elevations of the plateau, wooded savanna predominates, giving way to more open savanna as elevations decrease eastward. About half of the country's land is arable, and another third is used for pasture. The country's wildlife is varied and includes elephant, hippopotamus, crocodile, buffalo, warthog, baboon, and antelope.

Burundi's reserves of metallic ores, located in the southeast, were estimated to contain 3 percent of the world's reserves of nickel, as well as smaller quantities of copper, cobalt, and vanadium. Commercial reserves of tin and tungsten are located in the northeast in

deposits along the Rwanda border. There is petroleum in the Ruzizi Valley and beneath part of northeastern Lake Tanganyika.

The people. Burundi's population is composed primarily of two ethnic groups, the Hutu and the Tutsi (or Tussi). The Hutu, comprising about four-fifths of the total population, are Bantu-speakers believed originally to have come from the Chad–Niger region of West Africa. They are primarily agriculturists. The Tutsi, who came from the Nile Valley, or perhaps Ethiopia, are related to the Galla peoples of eastern Africa and are cattle raisers. The country's first inhabitants—Twa Pygmies, who make up only about 1 percent of the population—are thought to have entered Burundi from the Congo Basin. Rundi and French are the official languages of Burundi, but Swahili is also spoken, and English is taught in some schools. The principal forms of religion are Christianity, primarily Roman Catholicism, and the local traditional religions. Burundi's birth and death rates are both extremely high by world standards, and the annual growth rate, which is about the same as that of Africa as a whole, exacerbates the social problems caused by Burundi's already high population density. These problems have led the government to focus its attention on programs dealing with redistribution of the population and shortages of food.

The economy. Burundi has a developing free enterprise economy, partly state, partly private in structure, which is based predominantly on agriculture. Although the gross national product (GNP) is growing more rapidly than the population, the GNP per capita is one of the lowest in the world.

Agriculture contributes about half of the GNP and employs more than four-fifths of the labour force. Little of Burundi's land is irrigated, but irrigation schemes have been implemented in the Imbo plain and the Mossu region for rice and cotton crops. Coffee, cotton, and tea are the principal cash crops. Domestic crops include cassava, bananas, and sweet potatoes, as well as dry beans, corn (maize), sorghum, peanuts (groundnuts), dry peas, and millet. The principal livestock reared are goats, cattle, and sheep. Cattle hides are an important export.

Although forests were reduced by half between 1960 and 1980 (to cover only 2 percent of the land), reforestation projects were undertaken in the 1980s. The wood cut is used primarily for fuel and charcoal. The waters of Lake Tanganyika are commercially fished. Mining extracts kaolin clay, gold, lime, and peat.

Manufacturing accounts for about 5 percent of the GNP and employs about 2 percent of the labour force. Burundi's distance from coastal ports has hampered the development of export-oriented industries. Cotton textiles, cement, processed coffee and tea, palm oil, cosmetics, shoes, pottery, insecticides, paint, soap, bananas, beer, and cigarettes are the principal products. Electrical production is almost all imported from the hydroelectric station at Bukavu in Zaire. The hydroelectric dams and power stations at Gitega on the Ruvubu and near Bubanza on the Mugere River also produce some electricity.

Mineral exploration, heavy industry, and the cotton textile industry are government owned. Industrial development is conducted through five-year plans, but Burundi requires foreign and international agency assistance because of its fluctuating international trade balance. Burundi, Rwanda, and Zaire formed the Economic Community of the Great Lakes Countries in 1976 to integrate their economies.

Revenue derives principally from customs duties, income tax, and excise taxes. Expenditures are chiefly for goods and services, subsidies and transfers, and loans. The Banque de la République du Burundi is the central bank; it regulates the operation of national and foreign banks.

Only a small portion of the road network is paved. Lake Tanganyika ports at Bujumbura, Rumonge, and Nyabisindu are important for internal and international shipping. Burundi's major trade problem is the transshipment of imports and exports. All trade from outside Africa must be shipped across the lake from either Tanzania or Zaire, both of which lack adequate transport and port facilities. Bujumbura has an international airport.

Burundi's large trade deficit in the early and mid-1980s was compensated for by foreign aid, largely from Belgium, France, and West Germany. Exports include coffee (four-fifths of the total), tea, raw cotton, and animal hides, imported mainly by West Germany, Italy, Belgium–Luxembourg, and the United Kingdom. Imports are mostly consumer goods, petroleum products, and machinery obtained mainly from Belgium–Luxembourg, France, West Germany, and the United States.

Administrative and social conditions. Burundi is a one-party republic, ruled by the National Union for Progress and Unity (UPRONA). All major political power is centred in UPRONA's 70-member Central Committee and eight-member Politburo, both of which are influenced by the military. UPRONA's president serves as the president of the republic. He shares legislative responsibilities with the National Assembly and appoints the Cabinet. Burundi's constitution, which was adopted in 1981, directs the country's courts to decide cases according to the "party's decisions and the revolutionary concept of the law." During the late 1970s through the mid-1980s, the Tutsi minority dominated the military and the government.

Health conditions in Burundi are extremely poor; measles, dysentery, malaria, and pulmonary tuberculosis are widespread. The country has few doctors, and infant mortality is very high. The country's life expectancy rates are among the world's lowest, about 42 years for men and only about 46 years for women. Burundi's social welfare system covers only wage earners and has done little to alleviate the country's health problems.

All education is free, but it is estimated that only one-fourth of all children of primary school age actually attend school. Rundi is the language of instruction in the primary schools, while French is used in the secondary schools. Only about one-third of the total population over 10 years of age is literate.

Cultural life. National culture is traditional rather than written. There is a considerable body of oral literature consisting of stories, legends, and fables, as well as poetry and songs. Music is played on such instruments as the harp (*inanga*), the *dingidi* (a single-stringed fiddle), and the *ikimbe* (a linguaphone). Burundi folk dancing, particularly that of the Tutsi, is internationally famous.

History. The Twa, today only a tiny fraction of Burundi's total population, were probably its first inhabitants. They are a pygmoid people who engaged in hunting and pottery making from earliest times. The largest ethnic group is the Hutu, whose arrival in Burundi took hundreds of years and was probably completed by the 11th century AD. Some 300 or 400 years later, the Tutsi began to appear and, though never more than 15 percent of the population, successfully subjugated the numerically superior Hutu through elaborate land and cattle contracts.

A political system developed centring upon the *mwami* (king) and the *ganwa* (ruling princes), who functioned much as feudal lords. The Hutu and Twa became an inferior caste. In the period *c.* 1675–1705, King Ntare Rushatsi expanded his rule from the central Nkoma area over the neighbouring Bututsi, Kilimiro, and Buyenzi regions. A later king, Ntare II Rugaamba (*c.* 1795–1852), made further conquests, occupying parts of what is now southern Rwanda and western Tanzania. The organization of the kingdom was decentralized: local princes enjoyed semiautonomy, and conflicts over succession to the kingship were frequent; these became serious in the late 19th century, and by 1900, Ntare Rugaamba's successor, Mwezi Kisabo, controlled only half the kingdom.

The first Christian mission (Roman Catholic) was set up in 1879. In 1885 the Congress of Berlin placed Burundi in the German sphere of influence, but the first German resident did not arrive until 1906. The Belgians took control in 1916, and in 1923 the League of Nations made Burundi and Rwanda a Belgian mandate called at that time Ruanda-Urundi. The mandate was replaced by a United Nations trusteeship after World War II.

The conditions of the colonial period intensified ethnic animosities, and by the time independence neared, internal ethnic hostility was Burundi's most serious problem.

Independence was granted in 1962 as a kingdom—ruled by the Tutsi. In 1965 the Hutu rebelled. They were brutally repressed, and one year later a military coup established a republic bent on further purging of Hutu elements in the government and military. In 1970–71 some Tutsi were also purged, but a civil war broke out that left nearly 250,000 Hutu dead and another 100,000 homeless.

Another coup in 1976 established a Supreme Revolutionary Council that created a one-party state and concluded its work in 1977 with the election of Jean-Baptiste Bagaza as president. A new constitution was promulgated in 1981.

Burushaski language, language spoken by the Burusho people living in the Gilgit territory of northwestern Kashmir. Burushaski is not known to be related to any other language of the world.

Among the grammatical characteristics of Burushaski is the division of nouns into four categories, or genders: (1) male human beings, (2) female human beings, (3) animals of either sex and some inanimate objects, and (4) the remaining inanimate objects. Additional characteristics include plural suffixes for nouns and adjectives, demonstrative pronouns and adjectives, and third-person endings for verbs, all of which vary according to gender; a set of pronominal prefixes; and a number system in which higher numbers up to 1,000 are based on multiples of 20 and 40. The language is not written.

The somewhat divergent Werchikwār, or Wershikwār, dialect of Burushaski is spoken in the valley of the Yāsīn River in Kashmir.

Burutu, town and port, Bendel State, southern Nigeria, built on two sides of the Forcados channel of the Niger Delta, 20 miles (32 km) upstream from the Bight of Benin. It has served as a link between river transport and the sea since the Royal Niger Company established a base there in the late 19th century. Modern Burutu exports palm oil and kernels, rubber, and timber from the surrounding area; it also ships peanuts (groundnuts) and cotton from northern Nigeria and Chad, palm produce and timber from eastern Nigeria, and sesame seeds and peanuts from Benue and Plateau states, which are brought to the port by the motorized rivercraft that navigate up the Forcados and the Niger to Onitsha, the Niger's largest port.

Offshore petroleum deposits were discovered near Burutu in 1964, and in the following year the first crude oil from the state was exported (from a loading point at sea). Burutu's port has eclipsed that of Forcados, 5 miles downstream, the former transshipment point for goods destined for Lagos, the Nigerian capital. Burutu is known for shipbuilding and

repairing, but it also serves as an agricultural trade centre for the Ijaw people. It has a hospital. Pop. (1971 est.) 8,360.

Bury, district (borough), metropolitan area of Greater Manchester, England, with an area of 38 square miles (99 square km). The River Irwell flows through the borough, which stretches from Pennine moorland in the north to within 4 miles (6.5 km) of the centre of Manchester in the south. It is crossed by major motorways in both directions.

The name Bury is derived from the Anglo-Saxon *burgh,* meaning "stronghold," and today the town is the natural centre of the district. The woolen industry was established in the 14th century and, although still found in the area, was superseded in economic importance by cotton in the 18th century. Both John Kay and his son Robert, inventors of the flying shuttle and drop box, respectively, were 18th century inhabitants of the district.

The borough experienced tremendous industrial expansion in the 19th century, with numerous businesses involved in the manufacture of cotton, bleaching, and calico printing. Textiles are still important, but other activities have developed, including papermaking and the manufacture of papermaking machinery as well as metalworking and a wide range of light industry. The borough also includes essentially residential areas, especially Prestwich and Whitefield, as well as some surviving villages in Ramsbottom in the north. Pop. (1985 est.) 173,300.

Bury, J(ohn) B(agnell) (b. Oct. 16, 1861, County Monaghan, Ire.—d. June 1, 1927, Rome), British classical scholar and historian whose works are considered to be among the finest illustrations of the revival of Byzantine studies.

The son of a prominent Irish clergyman, Bury was educated by his well-read parents and sent to Foyle College, Londonderry, and in 1878 entered Trinity College, Dublin. Graduating with honours in 1882, he was elected a fellow in 1885; he received a chair in modern history there eight years later and in 1902 was appointed regius professor of modern history at Cambridge, where he remained until his death.

Highly trained in classics and philology, Bury began developing an interest in history in the 1880s. By 1890 he had published *The Nemean Odes of Pindar,* and two years later he completed another work, *The Isthmian Odes of Pindar,* simultaneously serving as editor on the scholarly journal *Kottabos.* After learning Russian and Hungarian, he produced two major volumes on the Roman Empire, *A History of the Later Roman Empire, from Arcadius to Irene,* 2 vol. (1889), and the *History of the Roman Empire from Its Foundation to the Death of Marcus Aurelius* (1893). Between 1896 and 1900 he completed a new edition of Gibbon's *Decline and Fall of the Roman Empire* with notes and appendixes documenting new research. He also produced *A History of Greece to the Death of Alexander the Great* (1900) and acted as editor of the *Byzantine Texts* between 1898 and 1904. A series of lectures delivered at Harvard University in 1908 was published a year later as *The Ancient Greek Historians,* and in 1912 he added another volume to his works on Rome, *A History of the Eastern Roman Empire from the Fall of Irene to the Accession of Basil I.* Widening his interests to more generalized studies in intellectual history, he later wrote *A History of Freedom of Thought* (1914) and *The Idea of Progress* (1920). His last work was yet another volume on Rome, *History of the Later Roman Empire from the Death of Theodosius I to the Death of Justinian* (1923). Two posthumous publications of his lectures were *The Invasion of Europe by the Barbarians* (1928) and *History of the Papacy in the 19th Century (1864–1878)* (1930). In addition to his other publications, he edited the *Cambridge Ancient History* and planned much of the *Cambridge Medieval History.*

Bury regarded history as a methodological science, though involving factors sufficiently fortuitous to discourage inference of general laws or of didactic guidance. His skepticism, however, was limited; in general, he represented the Victorian generation and its ultimate faith in the growth of reason and its capacity to elucidate the European past and make intelligible the present. His *History of Freedom of Thought* probably best expresses his conception of history as the record of man's rational struggles and progress. In addition to providing high standards of scholarly excellence, he was one of the first English historians to participate in the revival of Byzantine studies, including philosophy, art, culture, and architecture, as valid representations of a civilization's history.

Norman H. Baynes's *Bibliography of the Works of J.B. Bury* (with memoir) appeared in 1929.

Bury, Richard de, original name RICHARD AUNGERVILLE (b. 1287, Bury St. Edmunds, Suffolk, Eng.—d. 1345, England), scholar, diplomat, and bishop of Durham who was a noted English bibliophile.

De Bury displayed an interest in books at an early age. He collected books from scriptoria, libraries, and booksellers while on diplomatic missions to Europe in the service of Edward III of England. In 1333 de Bury became bishop of Durham, a position that increased his opportunities to collect. His *Philobiblon* ("The Love of Books"), a treatise in praise of books, was completed in 1344 and was first printed in 1473. It has since had many translations and editions.

De Bury planned to establish a college at Oxford and to endow it with his library of more than 1,500 volumes. Because of heavy debts at the time of his death, however, the collection was sold.

Bury Saint Edmunds, locality, St. Edmundsbury district, county of Suffolk, England, northwest of Ipswich on the River Lark.

At Beodricesworth, as the town was first called, Sigebert, king of the East Angles, is said to have founded a monastery in about 630; its end is unknown. In the 10th century the town built a shrine for the remains of St. Edmund, an East Anglian king slain by the Danes in 869, and Canute the Great, king of England and Denmark, founded a Benedictine abbey at St. Edmund's shrine in 1020. The shrine became a place of pilgrimage, and from it the town took its name in the 11th century. Bury St. Edmunds received a royal charter of incorporation in 1606. In the abbey church the barons swore (1214) to compel King John to accept their demands that became enshrined in the Magna Carta. Within the 12th-century precinct wall, several monastic buildings are preserved, including an abbey gate and Norman bell tower. St. James's Church (with a 15th-century nave) became in 1914 the cathedral church of the new bishopric of St. Edmundsbury and Ipswich. St. Mary's Church contains the tomb of Mary Tudor, queen consort of Louis XII of France. Other notable architectural features include Moyses Hall (a Norman house preserved as a museum) and several fine Georgian buildings, including the Town Hall (*c.* 1780) by Robert Adam.

Situated in the grain-raising district of East Anglia, Bury St. Edmunds is an important agricultural market and rural service centre; its industries include brewing, processing of beet sugar, and other related agricultural-engineering concerns. Pop. (1981) 31,178.

Buryat, also spelled BURIAT, northernmost of the major Mongol peoples, living south and west of Lake Baikal. By the Treaty of Nerchinsk (1689) their land was ceded by China to the Russian Empire.

The Buryat are related by language, history, habitat, and economic type to the Khalkha Mongols of Outer Mongolia, the Mongols of Inner Mongolia and Manchuria (Northeast Provinces), and the Kalmyk (Oyrat), who together form the principal Mongol peoples. The Buryat are among the smaller of these groups; they numbered about 390,000 in the Soviet Union in the late 1980s.

The origins of the Buryat are not clear. One theory is that they were formed as an ethnic unit from various elements that settled in their present territory during the 13th and 14th centuries. By tradition they are a nomadic pastoral people, whose stock consists of cattle, horses, sheep, goats, and a few camels. In their traditional social organization, they were separated into noble and common strata; they also kept a few slaves. They traced descent through the paternal line, living in patrilineal families

Ruins of the 11th-century Benedictine abbey at Bury St. Edmunds, England
A.F. Kersting

grouped into kin villages, clans, and clan confederations. The more permanently organized confederations were ruled by princely dynasties.

In their religious life the Buryat had an intricate combination of shamanist and Buddhist traits. The eastern Buryat, under the closer influence of the Khalkha Mongols, were more thoroughly Buddhist in their rite than the western. During tsarist times some became Orthodox Christians.

Since the Russian Revolution, the Buryat's primitive open-pasture pastoralism has been replaced by collective-farm cattle breeding; experimental farms for rearing sables in captivity have augmented the hunting and trapping in the taiga region; timbering has become a major industry; and the fishing industry has been developed. In 1979 there were about 350,000 Buryat in the Russian Soviet Federated Socialist Republic, U.S.S.R., many of them living in the Buryat Autonomous Soviet Socialist Republic. They also had two autonomous *okruga* (areas) outside the republic, in the Irkutsk and Chita *oblasti*. About 35,000 live in the Mongolian People's Republic.

Buryat Autonomous Soviet Socialist Republic, also spelled BURIAT, also called BURYATIYA, administrative division of the Russian Soviet Federated Socialist Republic, in Eastern Siberia. Lying along the eastern side of Lake Baikal, with a panhandle bordering Mongolia and extending westward beyond the southern end of the lake, the republic covers about 135,650 sq mi (351,300 sq km). Called the Buryat-Mongol A.S.S.R. until 1958, it was created in 1923 by the union of the Buryat-Mongol and Mongolo-Buryat autonomous *oblasti* (administrative regions).

A complex of mountain ranges, plateaus, basins, and river valleys, Buryatiya includes the Sayan Mountains in the panhandle, which rise to over 10,000 ft (3,000 m); the Khamar-Daban Range, which rises from the southern end of Lake Baikal; the Barguzin Mountains which parallel the northeastern shore; the Vitim Plateau in the northeast; and the Yablonovo Range on the eastern border. Uplifted in very early geological time, the region has undergone severe folding and fracturing from earth movements and earthquakes, which still occur. The chief river systems are the Selenga, a navigable river flowing into Lake Baikal, and the Vitim, a northward-flowing tributary of the Lena. Thick, swampy forests, or taiga, mostly of conifers, cover 70 percent of the area, while in the intermontane basins and valleys steppe vegetation prevails. Poor soils predominate in the taiga, but fertile black earths can be found in the steppe regions. The continental climate has long winters, with temperatures ranging from −58° F (−50° C) to 100° F. Most of the republic receives less than 20 in. (500 mm) of rain annually, except at the southern end of Lake Baikal where rainfall is 47 in.

Colonization, which began in the mid-17th century by Russians seeking gold and furs, reached significant proportions only after the coming of the Trans-Siberian Railroad at the end of the 19th century. Originally offering strong opposition to the Russian settlers, the Buryats, who belong to the Mongoloid group of peoples, ceased being nomadic herdsmen living in felt tents and adopted a sedentary, agricultural life; most now live in the permanent wooden structures typical of Siberian peasant life. In the early 1980s the Buryat people comprised only 23 percent of the population (the remainder being mostly Russian). About 60 percent of the population live in urban areas, with the greatest concentration in the Selenga River Basin, in which Ulan-Ude (*q.v.*), the capital and largest city, is located.

The area's rich mineral resources include gold, tungsten, molybdenum, nickel, aluminum, iron, manganese, coal, graphite, asbestos, mica, and limestone. The chief industries are mining and metallurgy; machine manufacturing; timber working and sawmilling; the production of building materials (cement, glass, asbestos); leather, textile, food, and fish processing; and power engineering, most of which is concentrated in Ulan-Ude. Stock raising (cattle, sheep, goats, pigs, and reindeer) and horse breeding are major agricultural activities. The chief area of cultivation is the broad Selenga Valley, in which spring wheat, potatoes, vegetables, and sugar beets are grown. Fur farming (silver fox and raccoon) and hunting (chiefly squirrel and sable) are also important, as is fishing on Lake Baikal. The republic is traversed by the Trans-Siberian Railroad, with a branch from Ulan-Ude to Ulaanbaatar in Mongolia. A major new railroad, the BAM (Baikal–Amur Magistral), of which part will cross the Buryat A.S.S.R., was under construction in the early 1980s. Roads join Ulan-Ude to Ulaanbaatar and Irkutsk. Water transport, mainly along the Selenga and across Lake Baikal, is well developed. Pop. (1983 est.) 970,000.

To make the best use of the Britannica, consult the INDEX *first*

bus, also called OMNIBUS, any of a class of large self-propelled, wheeled vehicles that are designed to carry passengers, generally on a fixed route.

A brief treatment of buses follows. For full treatment, *see* MACROPAEDIA: Transportation.

The first bus in operation was probably a steam-driven version that was introduced in 1830 in England. The first bus powered by a gasoline engine was built in Germany in 1895 and could carry eight passengers. Until the 1920s buses consisted of bus bodies mounted on truck chassis. Most school buses continue to be designed and built in this manner. The Fageol Safety Coach Company of Oakland, California, built the first true bus in 1922, with a lower frame, an extra-long wheelbase, wide-tread tires, and a front engine. Four years later the same company built the first integral-frame bus, in which the roof, sides, and floor serve as structural members. Twin engines were mounted under the floor.

Gasoline-electric buses were also built during the 1920s and 1930s. Small gasoline engines drove electric generators that supplied power to electric motors that drove the rear wheels. Transcontinental bus service was initiated in the United States in 1928, and by the end of the next decade buses were common on American highways.

In 1931 the diesel engine began to replace gasoline as the chief motive power, and models with rear engines were introduced. Air suspension was first used on buses in 1953 and was soon widely accepted. Its chief advantage was that buses equipped with these systems adjusted automatically to varying loads, which was not possible to do with conventional coil or leaf springs. A fully loaded bus stood as high off the road as an empty one, because added weight simply increased the air pressure in a central reservoir from which the air springs (heavy rubber bellows) drew their supply.

One of the major developments in bus travel came in 1954 with the introduction of the Scenicruiser for long distance routes. It had air suspension and six wheels (two singles in the front and four doubles in the rear) for optimum load distribution and a two-deck arrangement with integral-frame body. On the lower level were accommodations for 10 passengers, a driver, and sanitary facilities. The upper deck held 33 passengers and had a windshield so that passengers could see forward.

Double-decked buses, once popular in New York City, continue to appear in many European cities because of their manoeuvrability and the relatively small space they occupy in light of the number of passengers they can carry. In large urban areas articulated buses, which pull trailers with flexible joints, are common. Trolley buses, their electric motors supplied with power from overhead wires, are also popular.

There are four main types of modern buses: city or transit, suburban, intercity, and school. The city bus is the most specialized vehicle, with low maximum speed, two entrances on one side, provision for a large number of standing passengers, low-back seats, and no luggage space. The suburban bus is a maverick vehicle designed for short intercity runs in heavy traffic but with a single entrance at the front and some luggage space. The intercity bus emphasizes passenger comfort, with no standing room and plenty of luggage space. Although most school buses are built on truck chassis, some integral-frame models have been built.

Busan (South Korea): *see* Pusan.

Busby, Sir Matt(hew) (b. May 26, 1909, Bellshill, Lanark, Scot.), British association football (soccer) player, manager, director (from 1971), and president (from 1980) of the Manchester United soccer team.

Busby coached the Manchester United team to five championships in the first division of the English League (1952, 1956–57, 1965, 1967), two victories in the Football Association Challenge Cup finals (1948, 1963), and one triumph in the European Cup finals (1968). As manager of Manchester United (1945–69), he successfully introduced a style of offense that depended on a highly mobile centre forward. He also was noted for recruiting many talented youth players.

On Feb. 6, 1958, an airliner carrying the Manchester United team crashed near Munich, killing eight first-string players. Busby, who survived the disaster, then performed probably his greatest coaching feat by guiding a patchwork team to the Football Association Challenge Cup final match (losing to the Bolton Wanderers). He was knighted in 1968.

Busch, Adolphus (b. July 10, 1842, near Mainz, Hesse—d. Oct. 10, 1913, near Langenschwalbach, Ger.), German-born U.S. co-founder with Eberhard Anheuser of the firm later to be known as Anheuser-Busch, Inc., one of the largest breweries in the United States.

Busch, the son of wealthy parents, emigrated to the United States in 1857, settling in St. Louis, Mo. With an inheritance, he established a brewer's supply company and, in 1866, entered the brewing business in partnership with his father-in-law, Eberhard Anheuser. In 1873 Busch discovered a means of bottling beer to withstand temperature fluctuations, enabling the firm to distribute nationwide. By 1901 Anheuser-Busch Brewing Association (as the company had been called since 1879) had surpassed its rival Pabst and was selling more than 1,000,000 barrels of beer a year, making it the nation's largest brewery.

Busch was known as an astute marketer. Working with Carl Conrad, a St. Louis restaurateur, he developed a light beer called Budweiser in the belief that consumers would prefer a light beer to the dark brews then prevalent. Budweiser thereafter became the world's best-selling beer.

Upon retirement, Busch turned the business over to his son August; his heirs retain a substantial interest today. At the time of his death in his hunting lodge in Germany his wealth was estimated at $60,000,000.

Busch, Wilhelm (b. April 15, 1832, Wiedensahl, Hanover—d. Jan. 9, 1908, Mechtshausen bei Siesen, Ger.), German painter and poet best known for his drawings, accompanied by wise, satiric rhymes. His Bilderbogen (pictori-

al broadsheets) can be considered precursors of the comic strip.

After study at academies in Düsseldorf, Antwerp, and Munich, Busch began in 1859 to contribute his series of comic sketches to *Fliegende Blätter,* the leading German comic weekly. These were followed by his continuous pictorial narratives with short verse-texts, including *Max und Moritz, Der heilige Antonius von Padua, Die fromme Helene, Hans Huckebein, Dideldum!,* and *Herr und Frau Knopp.* By 1910 more than half a million copies of *Max und Moritz,* forerunner of "The Katzenjammer Kids," had been printed in German, and his works had been translated into many languages.

Busch's work continues to be popular, and his writings are widely quoted in German-speaking countries. His style, copied by innumerable artists, was remarkable for its extreme simplicity. With a few rapid scrawls he conveyed the most complex contortions and the most transitory movement. In 1878 he retired to his native Wiedensahl, occasionally publishing poems or pieces of prose based on his experiences.

Büsching, Anton Friedrich (b. Sept. 27, 1724, Stadthagen, Lower Saxony [now in West Germany]—d. May 28, 1793, Berlin), German geographer and educator who helped develop a scientific basis for the study of geography by stressing statistics rather then descriptive writing.

Büsching was director (1766–93) of the Gymnasium zum Grauen Kloster in Berlin, where he made significant contributions to German education. Most important among his more than 100 publications was the multivolume *Neue Erdbeschreibung,* which began appearing in 1760. At his death only the sections dealing with Europe and a part of Asia had been published. *A New System of Geography,* a six-volume English translation of the first parts, was published in 1762.

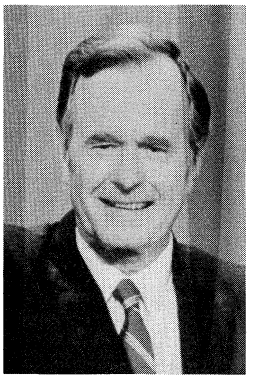
Busenbaum, Hermann, Busenbaum also spelled BUSEMBAUM (b. 1600, Nottuln, Westphalia [now in West Germany]—d. Jan. 31, 1668, Münster, Münster [now in West Germany]), Jesuit moral theologian.

Busenbaum entered the Society of Jesus in 1619 and was later appointed rector of the colleges of Hildesheim and Münster. His celebrated *Medulla Theologiae Moralis, Facili ac Perspicua Methodo Resolvens Casus Conscientiae ex Variis Probatisque Authoribus Concinnata* (1650; "The Heart of Moral Theology, an Easy and Perspicacious Method Resolving the Claims of Conscience Compiled from Various and Worthy Authors") was published in more than 200 editions before 1776. This work constituted the basis of subsequent commentaries written by a number of eminent moral theologians and was used as a textbook in many seminaries.

Bush, George (Herbert Walker) (b. June 12, 1924, Milton, Mass., U.S.), politician and businessman who was vice president of the United States from 1981 to 1989 and who became the 41st president of the United States (from 1989).

He was the son of Prescott Sheldon Bush, an investment banker and U.S. senator from Connecticut. The young Bush grew up in Greenwich, Conn., and attended private schools there and in Andover, Mass. Upon graduation from Phillips Academy, Andover, he joined the U.S. Naval Reserve and served (1942–44) as a torpedo bomber pilot on aircraft carriers in the Pacific during World War II, when he won the Distinguished Flying Cross.

Upon returning to Greenwich, Bush attended Yale University, graduating in 1948. Rejecting a position in his father's firm, he moved to Texas and became a salesman of oil-field supplies. He cofounded the Zapata Petroleum Corporation (1953) and the Zapata Off-Shore



George Bush, 1988
AFP Photo/Pearson

Company (1954). He became active in the Republican Party in Houston in 1959, and, after losing a campaign for the U.S. Senate in 1964, he was elected (1966) to a safely Republican seat in the U.S. House of Representatives. He gave up the seat in 1970 to run again, unsuccessfully, for the Senate. President Richard M. Nixon chose Bush to serve as U.S. ambassador to the United Nations (1971–72). In 1973, as the Watergate Scandal was erupting, Bush became chairman of the Republican National Committee, in which post he stood by President Nixon until August 1974, when he called on the president to resign. President Gerald R. Ford appointed him chief of the U.S. Liaison Office in Peking later that year. He served in this capacity until he was called home to head the Central Intelligence Agency (1976–77).

In 1980 Bush mounted a campaign for the Republican Party's nomination for the presidency but abandoned it in May to support Ronald W. Reagan, who chose Bush as his running mate. Reagan defeated the Democratic candidate in the 1980 presidential election. As vice president (and president of the Senate), Bush won Reagan's loyalty and was nominated and reelected in 1984 for a second term.

As vice president, Bush was an early and leading candidate for his party's nomination to the presidency in 1988. He secured the nomination and defeated the Democratic candidate, Michael Dukakis, in the November 1988 presidential election, winning 54 percent of the popular vote to Dukakis' 46 percent.

Bush, Vannevar (b. March 11, 1890, Everett, Mass., U.S.—d. June 28, 1974, Belmont, Mass.), U.S. government official and electrical engineer who developed the differential analyzer, the first electronic analogue computer.

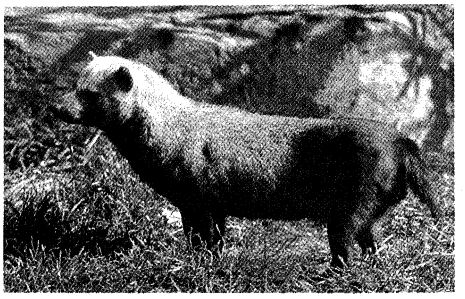
Bush taught at Tufts University, Medford, Mass., from 1914 to 1917. After conducting submarine-detection research for the U.S. Navy, he joined the faculty of the Massachusetts Institute of Technology (MIT) at Cambridge in 1919. In the late 1920s he devised the network analyzer to simulate the performance of large electrical networks. From 1930 he worked with a team at MIT to build the differential analyzer for solving differential equations. The finished machine, which could handle up to 18 independent variables, foreshadowed the electronic computers developed after World War II. Bush's other developments include the Rapid Selector, a device using a code and microfilm to facilitate information retrieval.

In 1940 Bush was appointed chairman of the National Defense Research Committee. The following year he became director of the newly established Office of Scientific Research and Development, which coordinated research for the war effort and advised the government on scientific research and development. After the war he served as chairman of the Joint Research and Development Board (1946–47) and was a member of the Research and Development Board of the National Military Establishment (1947–48). Bush also served as president of the Carnegie Institution from 1939 to 1955.

bush baby, small arboreal primate, a species of galago (*q.v.*).

bush bear (African primate): *see* potto.

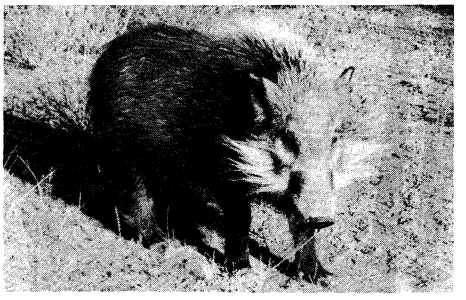
bush dog, also called SAVANNAH DOG (*Speothos venaticus*), small, stocky carnivore of the family Canidae found in the forests and savannas of Central and South America. A rare species, it is declining as a result of destruction of its natural habitat. The bush dog has short legs and long hair and grows to a shoulder height of about 30 cm (12 inches). It is 58–75 cm (23–29 inches) long, exclusive of



Bush dog (*Speothos venaticus*)
Richard Batchelor—EB Inc.

its 13–15-centimetre tail. It weighs about 5–7 kg (11–15 pounds) and is brown with reddish or whitish forequarters and dark hindquarters and tail. Little is known of its habits, though it is reported to be nocturnal, to hunt in packs, and to feed largely on rodents.

bush pig (*Potamochoerus porcus*), African member of the family Suidae (order Artiodactyla), resembling a hog but with long body hair and tassels of hair on its ears. The bush pig lives in groups, or sounders, of about 4 to 20 animals in forests and scrub regions south of the Sahara. It is omnivorous and roots for food with its snout. The adult bush pig stands 64–76 cm (25–30 inches) tall at the shoulder.



Bush pig (*Potamochoerus porcus*)
Thase Daniel

Coat colour ranges from reddish brown to blackish, with black and white face markings and a white crest on the back. There are several subspecies of bush pig, among them the reddish brown animal called the red river hog (*P. porcus porcus*).

bush poppy, also called TREE POPPY (*Dendromecon rigida*), yellow flowering bush or small tree of the poppy family (Papaveraceae), native to chaparral areas of southern California and northwestern Mexico. The bush poppy reaches from 0.5 to 3 m (about 2 to 10 feet) in height and displays deep, butter-yellow, four-petaled blooms, 4 to 5 centimetres (1.5 to 2 inches) across. The narrow 2.5–10-centimetre, gray-green, waxy leaves are evergreen, and the bark is shreddy and yellow-gray. The

variety known as island tree poppy (*D. rigida harfordii*), from islands off the southern California coast, reaches a height of six metres.

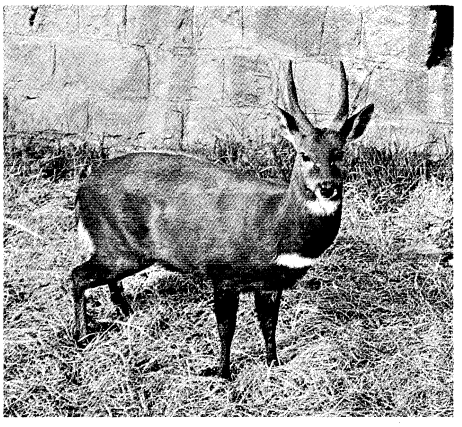
Bush poppy (*Dendromecon rigida*)
V.E. Ward—The National Audubon Society Collection/Photo Researchers

Bush poppies are hardy as ornamentals only in areas with mild winters.

bush-shrike, any of certain African shrike species. *See* shrike.

Būshahr (Iran): *see* Bushire.

bushbuck, also called HARNESSED ANTELOPE (*Tragelaphus scriptus*), African antelope, family Bovidae (order Artiodactyla), found in sub-Saharan forests and brush. The bushbuck,



Bushbuck (*Tragelaphus scriptus*)
P. Morris—W.C.I.

nocturnal, shy, and usually solitary, stands about 1 metre (39 inches) at the shoulder and ranges from reddish brown to almost black, depending on the subspecies. Markings vary, but include white patches on the neck and throat and vertical stripes or rows of spots on the sides. Horns, present in males, are spirally twisted and relatively straight.

Būshehr, *ostān* (province), southwestern Iran, bordering the Persian Gulf on the west and bounded by the *ostān*s of Hormozgān and Fārs on the southeast and east, Boyer Aḥmadī-ye Kohkīlūyeh on the northeast, and Khūzestān on the northwest. It has an area of 8,677 sq mi (27,653 sq km). Būshehr was part of former Banāder va Jazāyer-e Khalij-e Fārs va Daryā-ye 'Omān *ostān* until the mid-1970s. The region is part of the Zagros Mountains and consists of fingers of upland within a plateau, rather than of serried ranks of ridges and valleys. The Rūdkhāneh-ye (stream) Shāpūr drains the region and is an inland waterway from the coast of the Persian Gulf at Bushire. Rainfall is low and sporadic. Agriculture is the principal occupation of most of the population; crops include wheat, barley, date palms, mangoes, and citrus fruits. Industries produce woven cloth, milled rice and flour, building materials, and processed food. Roads run almost parallel to the Persian Gulf. A number of oil and gas fields are located in the province; there is a gas pipeline from the oil field at Gach Sārān. New agricultural settlements were established in the 1970s in the *ostān* from lands formerly used mainly for grazing grounds by nomads. Pop. (1983 est.) 428,000.

Būshehr (city, Iran): *see* Bushire.

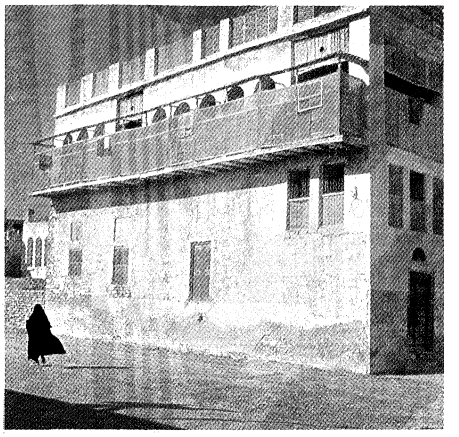
bushel, unit of capacity in the U.S. Customary and British Imperial systems of measurement. In the British system the units of liquid and dry capacity are the same, and since 1824 a bushel has been defined as 8 imperial gallons, or 2,219.36 cubic inches (36,375.31 cubic centimetres). In the United States the bushel is used only for dry measure. The U.S. level bushel (or struck bushel) is equal to 2,150.42 cubic inches (35,245.38 cubic centimetres) and is the equivalent of the Winchester bushel, a measure used in England from the 15th century until 1824. A U.S. level bushel is made up of 4 pecks, or 32 dry quarts. Two bushels make up a unit called a strike. In 1912 the U.S. Court of Customs defined a "heaped bushel" for measuring quantities of apples as 2,747.715 cubic inches (45,035.04 cubic centimetres). One or another unit called a bushel has been in use for more than 600 years. Various theories exist about its origins.

Bushidō (Japanese: Way of the Warrior), the code of conduct of the samurai (*q.v.*) class of Japan that in the mid-19th century was made the basis of ethical training for the whole society, with the emperor replacing the feudal lord, or daimyo, as the object of loyalty and sacrifice. As such it contributed to the rise of Japanese nationalism and to the strengthening of wartime civilian morale up to 1945.

Though the name Bushidō was not used until the 16th century, the idea of the code developed during the Kamakura period (1192–1333). Its precise content varied historically as the samurai class came under the influence of Zen Buddhist and Confucian thought, but its one unchanging ideal was martial spirit, including athletic and military skills as well as fearlessness toward the enemy in battle. Frugal living, kindness, and honesty were also highly regarded, as was filial piety. But the supreme obligation of the samurai was to his lord, even if this might cause suffering to his parents.

During the Tokugawa period (1603–1867) Bushidō thought was infused with Confucian ethics and made into a comprehensive system that stressed obligation or duty. The samurai was equated with the Confucian "perfect gentleman" and was taught that his essential function was to exemplify virtue to the lower classes. Obedience to authority was stressed, but duty came first even if it entailed violation of statute law.

Bushire, Persian BŪSHEHR, also spelled BŪSHAHR, port city and capital of Būshehr *ostān* (province), southwestern Iran, near the head of the Persian Gulf at the northern end of a flat and narrow peninsula, connected with the mainland by tidal marshes. At the beginning of the reign of Cyrus the Great, *c.* 559 BC, it was called Persis and was the headquarters of a province governed by Hystaspes. During the Achaemenian period, revolts broke out in Iran; Vahyazdala rose in rebellion at Persis town but was defeated and hanged. The defeat of Antiochus the Great in 190–189 BC by the Romans led to the rise of the Parthians, and Persis became the capital of a vassal state within the Roman Empire. The town lost most of its importance in the subsequent Sāsānian period and the restive conditions that prevailed following the invasions of the Mongols and Timur (Tamerlane). It rose to prominence again during the reign of Nāder Shāh when he established a naval base at Bushire in 1734 to control the periphery of the Persian Gulf. In the 1780s the English and Dutch East India companies transferred their trading posts to Bushire from Bandar 'Abbās. It became the seat of a British political resident in the 19th century and of several European consulates. Though its commercial importance declined with the



Three-storied house built in Persian Gulf style, Bushire, Iran
Laurence D. Loeb

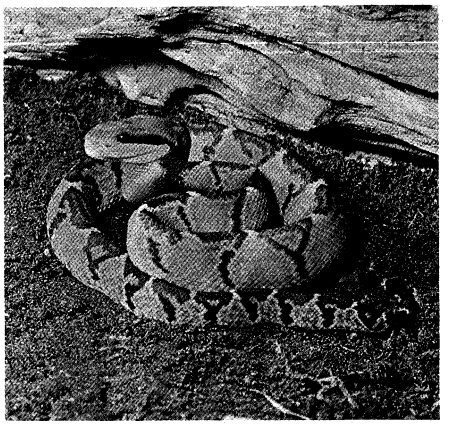
development by the Iranian government in the 1970s of Khorramshahr as the principal port on the Persian Gulf, Bushire continues to be a major port, along with Bandar 'Abbās and Bandar-e Khomeynī (formerly Bandar-e Shāhpūr), which together, until the revolution in 1978–79, handled about three-fourths of Iran's international commerce.

Bushire has a deep but exposed outer anchorage and an inner one and is connected by road to Bandar-e Khomeynī, Bandar 'Abbās, Deyyer, Kangān, Tāherī, Nāy Band, and Bander-e Chārak; it is also linked to Tehrān by air and by road via Shīrāz and Isfahan. Bushire is now a regional centre for oil distribution, has a degree-granting college, and is a fisheries centre. This development, with the establishment of a thermoelectric power plant there, encouraged the growth of food-processing and engineering industries. Dried fruits, gums, and raw cotton are exported. Bushire suffered extensive damage in the war with Iraq in the early 1980s. Pop. (1976) 57,681.

Bushman languages: *see* San languages.

Bushmanland (South West Africa/Namibia): *see* Boesmanland.

bushmaster (*Lachesis muta*), venomous snake of the viper family, Viperidae, found in



Bushmaster (*Lachesis muta*)
Dade Thornton—The National Audubon Society Collection/Photo Researchers

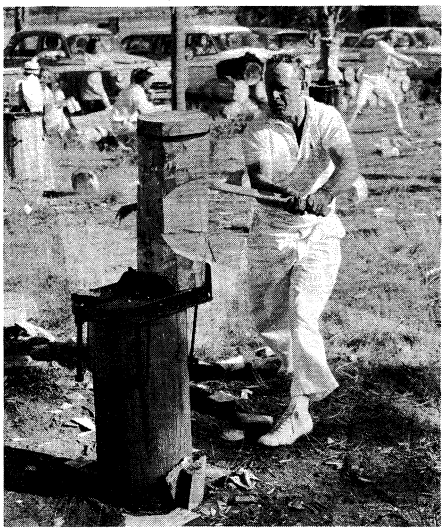
scrublands and forests from Costa Rica to the Amazon Basin. The bushmaster is a pit viper (subfamily Crotalinae)—*i.e.,* it has a small sensory pit between eyes and nostrils.

The longest venomous snake in the New World, it is normally about 1.8 metres (6 feet) long but reportedly may attain twice this

length. It is pinkish or tan in colour, marked with large, dark, diamond-shaped blotches. Although seldom encountered, the bushmaster is dangerous, with a potentially lethal venom. It is the only American pit viper that lays eggs rather than bear live young.

Bushmen: *see* San.

bushmen's carnival, exhibition and contest of cattle herding and related skills, the Australian equivalent of the U.S. rodeo. Bushmen's carnivals have been held in one form or another since the early days of cattle breeding in Australia, but they increased in popularity and took on a more American character during and after World War II, sometimes being called rodeos. Competition generally includes such standard rodeo events as buckjumping (bronc-riding), bullock (bull) riding, bulldogging (wrestling steers), and milking wild cows,



A bushmen's carnival wood-chopping contest, Tasmania

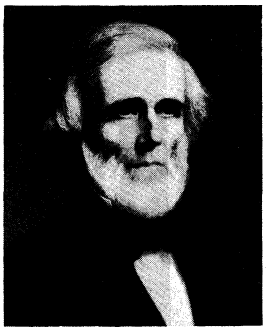
By courtesy of the Australian Information Service, New York City

as well as more indigenous contests, such as campdrafting, *i.e.,* cutting out a chosen steer from a herd and leading it through a set course. Bushmen's carnivals have been most successful in New South Wales, Victoria, Queensland, and South Australia, and they are generally held under supervision of either the Australian Bushmen's Carnival Association (for amateurs) or the Australian Rough-Riders Association (for professionals).

Bushnell, David (b. 1742, Saybrook, Conn.—d. 1824, Warrenton, Ga., U.S.), U.S. inventor, renowned as the father of the submarine.

Graduated from Yale in 1775, at the outbreak of the American Revolution, he went to Saybrook, where he built a unique turtle-shaped vessel designed to be propelled under water by an operator who turned its propeller by hand. The craft was armed with a mine, or a torpedo, to be attached to the hull of an enemy ship. Several attempts were made with Bushnell's "Turtle" against British warships. Though the submarine gave proof of underwater capability, the attacks were failures, partly because Bushnell's physical frailty made it almost impossible for him to perform in person the many demanding functions required to control the craft. Gen. George Washington, however, gave him a commission in the engineers, where he rose to captain and command of the U.S. Army Corps of Engineers stationed at West Point. In his later years he studied medicine and entered practice in Warrenton.

Bushnell, Horace (b. April 14, 1802, Bantam, Conn., U.S.—d. Feb. 17, 1876, Hartford, Conn.), Congregational minister and controversial theologian, sometimes called "the father of American religious liberalism." He grew up in the rural surroundings of New Preston, Conn., joined the Congregational Church in 1821, and in 1823 entered Yale with plans to become a minister. After his graduation in 1827, however, he taught school briefly, served as associate editor of the *New York Journal of Commerce,* and studied law at Yale. Not until 1831, after he had qualified for the bar, did his religious doubts diminish sufficiently for him to begin his theological education. He entered Yale Divinity School and in 1833 was ordained minister of the North Congregational Church in Hartford, where he served for more than 20 years until ill health forced his resignation.



Horace Bushnell, detail from an oil painting by William R. Wheeler, 1875; in the Yale University Art Gallery

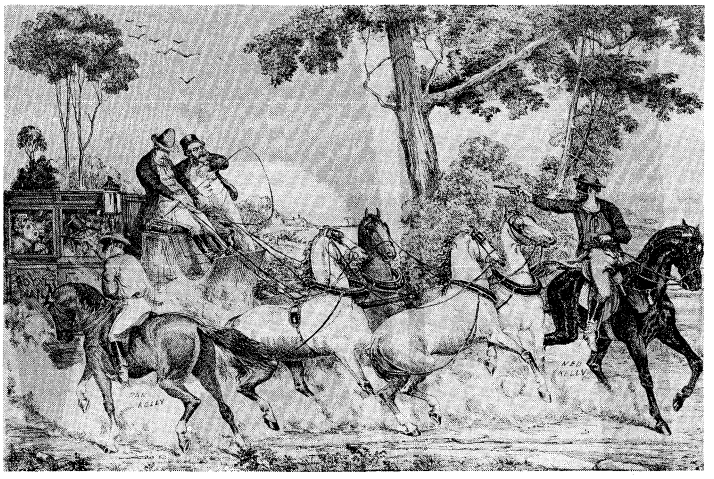
By courtesy of the Yale University Art Gallery, gift of Dr. Edwin P. Parker, D.D., 1875

A major figure in U.S. intellectual history, Bushnell stood between the orthodox tradition of Puritan New England and the new romantic impulses represented by Ralph Waldo Emerson, Samuel Taylor Coleridge, and especially Friedrich Schleiermacher. His first significant publication, *Christian Nurture* (1847), was a thorough critique of the prevailing emphasis placed on the conversion experience by revivalists. In *God in Christ* (1849), published in the year of his mystical experience that illumined the gospel for him, Bushnell challenged the traditional, substitutionary view of the atonement (*i.e.,* that the death of Christ was the substitute for man's punishment for sin) and considered problems of language, emphasizing the social, symbolic, and evocative nature of language as related to religious faith and the mysteries of God. *Christ in Theology* (1851) amplified and defended his attitude toward theological language, giving special attention to metaphoric language and to an instrumental view of the Trinity. In *Nature and the Supernatural* (1858) he viewed the twin elements of the title as constituting the one "system of God" and sought to defend from skeptical attack the Christian position on sin, miracles, incarnation, revelation, and Christ's divinity.

Bushnell's views were bitterly attacked, and in 1852 North Church withdrew from the local "consociation" in order to preclude an ecclesiastical heresy trial. Despite such opposition, however, his ability to assemble and present coherent arguments guaranteed the impact and influence of his interpretation of Christianity. Among his numerous works are *The Vicarious Sacrifice* (1866), *Forgiveness and Law* (1874), and six volumes of essays and sermons. An essay on "Science and Religion" (1868) shows his resistance to Darwinian evolutionary theory. His moderate and cautious views on social issues are recorded in *A Discourse on the Slavery Question* (1839); *The Census and Slavery* (1860); and *Women's Suffrage: The Reform Against Nature* (1869).

bushranger, any of the bandits of the Australian bush, or outback, who harassed the settlers, miners, and Aborigines of the frontier in the late 18th and 19th centuries and whose exploits figure prominently in Australian history and folklore. Acting individually or in small bands, these variants of the classical bandit or highwayman followed the usual pattern of robbery, rape, and murder. They specialized in robbing, or "bailing up," stagecoaches, banks, and small settlements. From 1789, when John Caesar (called "Black Caesar") took to the bush and probably became the first bushranger, until the 1850s, the bushrangers were almost exclusively escaped convicts. From the 1850s until their disappearance after 1880, most bushrangers were free settlers who had run afoul of the law. The last major bushranger—and also the most celebrated—was Ned Kelly (1855–80).

While many bushrangers, such as John Lynch and Daniel "Mad" Morgan, were ruthless killers, the glorification of bushranging in Australian society stems in part from the actual deeds of certain figures: Matthew Brady and Edward "Teddy the Jew-boy" Davis, both transported convicts, were known for their humane treatment of their victims; Davis actually shared his booty with the poor. Both ended their career on the gallows, despite popular protestations for leniency. The cult of the bushranger is the source of such folk songs as "Bold Jack Donahoe" and "Wild Colonial Boy," as well as the expression "as game as Ned Kelly."

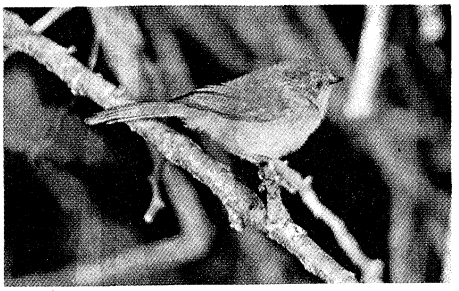


Ned Kelly and his gang attacking a coach

By courtesy of the Mitchell Library, Sydney

bushtit, gray bird of western North America, belonging to the songbird family Aegithalidae, or Paridae (order Passeriformes). The common bushtit (*Psaltriparus minimus*), 11 cen-

timetres (4½ inches) long, ranges from British Columbia to Texas and Guatemala. "Black-eared" forms have been separated, perhaps unwarrantedly, as *P. melanotis*. Bands of bushtits



Common bushtit (*Psaltriparus minimus*)
Herbert Clarke

forage busily for insects in dryland scrub and make pouchlike nests.

Bushveld, Afrikaans BOSVELD, also called LOWVELD, natural region in southern Africa, at an altitude of about 2,500–4,000 ft (800–1,200 m). Centred in the northern Transvaal, South Africa, it extends into northern Natal, Swaziland, Mozambique, Zimbabwe, and Botswana. The bushveld ("thornbush field") is characterized by trees—acacia and baobab as well as thornbushes—and tall grasses. It is moderately dry, with annual rainfall of about 15–25 in. (380–640 mm). Herding is the principal economic activity; large-scale cultivation is possible only in irrigated areas.

Busignies, Henri-Gaston (b. Dec. 29, 1905, Sceaux, Fr.—d. June 20, 1981, Antibes), French-born U.S. electronics engineer whose invention of high-frequency direction finders (HF/DF, or "Huff Duff") permitted the U.S. Navy during World War II to detect enemy transmissions.

In 1926 Busignies received a degree in electrical engineering from the University of Paris and began his career by inventing the airborne radio compass, which permitted accurate aircraft navigation. He joined the International Telephone and Telegraph Corporation (ITT) in 1928 and continued work on his first crude radio compass and radio direction finders. He and other ITT scientists left France for the United States in 1940. Busignies's work for the U.S. Navy resulted in 1941 in development of a high-frequency direction-finding system that was installed throughout the world during the war; later versions were carried on U.S. aircraft, on ships, and by military vehicles. After the war he invented moving-target indicator (MTI) radar, which allows detection of an object, such as an aircraft, while it passes behind a large obstacle. Busignies retired from ITT in 1975 as senior vice president.

business cycle, periodic fluctuation in the rate of economic activity, as measured by the levels of employment, prices, and production. Since these movements are neither so regular nor so predictable as the term cycle might suggest, some authors prefer to avoid the term. Such periodic changes range from the variations in demand for electricity over the course of a day and for heating oil over the course of a year to cycles of recession and growth measured in decades.

A brief treatment of business cycles follows. For full treatment, *see* MACROPAEDIA: Economic Theory.

The American and European economies have long faced regular economic crises, marked by stock market crashes, bank failures, corporate and personal bankruptcies, and severe unemployment. It was commonly thought that these periods were the economic equivalent of disease, with growth and prosperity seen as the normal condition of health. Clément Juglar, a French physician of the mid-19th century, was probably the first to propose that periodic variations were a normal feature of economies. Other investigators, developing Juglar's work, have identified recurring 8- to 10-year cycles, each of which consists of three phases: prosperity, crisis, and liquidation.

Smaller cycles, such as the approximately 40-month cycle in the levels of business inventories, have been identified within the larger Juglar cycle. Agricultural commodities are subject to periodic changes in the relationship of supply and demand, such as hog cycles (three to four years) and cotton cycles (two years). Longer cycles have also been proposed, most notably by the Russian economist Nikolai Kondratieff, who argued that Western market economies are subject to broad 50-year cycles of expansion and contraction.

Attempts to subject economic data to rigorous statistical analysis are complicated by their sheer complexity, by events such as wars, revolutions, and natural disasters, as well as by noncyclical developments such as technological progress and changes in economic organization. Much work has been done to create models of a typical business cycle through the study of past cycles. Econometrics (*q.v.*), the study of economic activity on the basis of elaborate statistical models, has identified groups of leading and lagging indicators, which are statistical series that respectively anticipate and follow changes in the direction of economic activity. Examples of leading indicators are stock prices and building permits.

But characterizing business cycles does not explain them. Aside from random shocks (wars, disasters, technological changes, etc.), two of the major influences on the level of economic activity are investment and consumption. An increase in investment, such as building a factory, will generate more income than the original expenditure itself, as the workers who build the factory will spend their wages. Conversely, increases in consumer demand will eventually require that new factories be built to satisfy the demand. These ripple effects, called respectively the investment multiplier and consumption accelerator, reinforce each other until the economy reaches its full capacity. At this point there is little free capital, no new demand, and thus neither a need for nor sources of new investment. The process then reverses itself and contraction ensues. Many theories have been proposed to explain what causes these changes in investment or consumption in the first place. The oldest theories rely on changes in agricultural markets, which are influenced by meteorological and other natural cycles, spreading throughout the economy. Psychological theorists have argued that since individuals tend to imitate each other, a follow-the-leader mentality influences economic activity, particularly the periodic booms and busts of the financial markets. Wars and technological and demographic changes have important and obvious effects on business conditions, but such events are not strictly cyclical and may themselves actually be caused by economic pressures.

Besides these essentially external factors, many analysts stress the importance of internal factors in business cycles. Underconsumption theories hold that production expands too rapidly for consumers to purchase all the goods manufactured, so that a bust inevitably follows a boom. Monetarists hold that changes in the money supply (cash and bank credits) are the principal determinants of economic activity: easy credit, low interest rates, and plentiful cash stimulate business; tight credit, high rates, and a shortage of cash depress it. Some economists hold that the supply of capital for investment is the key to economic activity; booms end when all available capital is invested.

Since World War II government policy with respect to spending, taxation, and the money supply has become an important influence on the economy. (*See* fiscal policy; monetary policy.) Such policy aims to prevent the extremes of inflation and depression by stimulating the economy in slack times and restraining it during expansions. Much of this so-called countercyclical policy is almost automatic. During a recession, tax receipts fall and welfare spending rises, preventing a disastrous slide by limiting the decline in personal income; in an expansion, tax receipts rise faster than general prosperity, thus cooling a potentially dangerous boom. Business cycles have indeed moderated economic extremes since World War II, although the recessions of the 1970s and 1980s have been more severe than those of the 1950s and 1960s.

It has been claimed that centrally planned economies, such as that of the U.S.S.R., are not subject to such cyclical fluctuation, since there is no free market and the agencies that devise the economic plan control its long-range execution as well, but such is not always the case. Because of trade and financial ties to the West, the socialist countries are not immune to the fluctuations of market economies. Some writers argue that planners may overinvest, causing underconsumption crises similar to those described above. Natural disaster and political unrest can also frustrate the designs of planners. It may be that cyclical fluctuations are the price of economic growth in capitalist and socialist economies.

business finance, the raising and managing of funds by business organizations. Such activities are crucial to the success of any firm and are usually the concern of senior management, although some routine aspects of financial operations may be carried out by lower-level staff. Since non-financial decisions may affect the firm's ability to raise capital in the future, financial officers also play an important role in operational management and the establishment of strategic goals.

A brief treatment of business finance follows. For full treatment, *see* MACROPAEDIA: Business Organization.

Financial management employs a variety of tools to gauge the performance and requirements of a firm. Ratio analysis is an important way of judging a firm's current health. For example, the ratio of current assets to current liabilities (current or liquidity ratio) is an index of the firm's ability to meet short-term obligations. Leverage ratios weigh the corporation's debt against its assets and the value of the stockholder's shares (equity). Activity ratios, measuring turnover of such assets as inventory and accounts receivable, indicate how intensively a firm is employing its assets. Profit ratios (*e.g.*, as a percentage of sales or assets) indicate whether a firm is earning a good return on its invested capital.

Financial forecasting is important in planning for the firm's future growth. Generally, management develops a long-term plan, deciding what types and quantities of products it will manufacture or what markets it will emphasize. Shorter term budgets are then devised to fit this scheme. For example, if a firm is contemplating expanding or entering new markets, it must estimate its future costs and sales. Financial officers must analyze whether increased sales or the firm's own cash reserves will pay for the expansion; if new financing is needed, financial officers must decide on the best kind to seek.

A firm's long-term plan may be sound, but it may be impossible to realize without sufficient cash flow. Thus, a cash budget, projecting the surplus or deficit of funds from day to day and month to month, is an essential financial tool. If a firm has excess cash, it may invest it in short-term securities, build-

ing a reserve against future obligations. Negative cash flow, however, may force a firm to borrow from banks to cover immediate expenses. A firm must also manage its accounts receivable (credit granted to customers) and inventories. Firms offer customers credit as a way of expanding sales; the risk of not being paid must be taken if new customers are to be won. Firms must also maintain inventories to assure steady supplies for customers and to take advantage of economies of scale, but inventories are expensive to hold, since the costs of manufacture and storage must be paid without recording a sale. Financial officers play an important role in judging the risks of extending credit to customers and in determining the optimum level of inventories. Such short-term considerations often create the need for short-term financing. The most common types are bank loans, trade credits extended by suppliers, and commercial paper (promissory notes sold by creditworthy corporations to other firms with a cash surplus).

In general, short-term financing must be repaid in less than one year, intermediate-term obligations in one to 15 years, and long-term obligations in more than 15 years. Common intermediate-term financial arrangements include term loans from banks and installment sales contracts or leases for the acquisition of machinery. Leasing is especially advantageous for firms requiring expensive equipment that depreciates in value.

Long-term capital may be raised in the form of either debt (bonds) or equity (stock). Bonds, which are promissory notes requiring the borrowing firm to pay holders specified interest payments at fixed intervals, create no claim on a firm's profits. Stockholders, on the other hand, have a claim on the corporation's profits. Thus, in choosing long-term financing strategies, corporate finance officers weigh the relative advantages of debt or equity financing. Regular interest payments to bondholders increase a firm's fixed costs while offering the firm "leverage"—the potential to increase profits without increasing equity, the total claims of shareholders. Issuing new stock, while creating no new fixed costs, dilutes the firm's profits per share of stock. Other factors affecting a choice between issuing bonds or stock include current conditions in the respective financial markets and the corporation's existing ratio of debt to equity.

The amount of profits distributed to shareholders as dividends is an important corporate concern. A young, rapidly growing firm may choose to retain its earnings to reinvest; more mature corporations are likely to pay a larger dividend, either because their opportunities for growth are limited or because their capital needs are more easily met.

There are other strategies for deploying corporate assets to increase growth. Mergers—corporate combinations in which one firm disappears—work best when the two businesses complement each other, thus making the whole greater than the sum of its parts. A large firm may also buy a smaller one, operating it as a subsidiary; the subsidiary retains legal and management autonomy. Conglomerates, which are firms combining many separate, unrelated businesses, attempt to take advantage of economies of scale in such senior management activities as financial and legal operations and marketing.

When a firm faces bankruptcy, management may seek to liquidate or to reorganize it. In a liquidation the firm simply quits, selling whatever assets it has to pay its debts. In a reorganization the firm attempts to postpone or reduce debt payments, changing or scaling down its business strategy and perhaps obtaining concessions from employees or suppliers. Such a reorganization is generally a complicated procedure supervised by courts and requiring cooperation among management, shareholders, and creditors.

business law, the body of rules, whether by convention, agreement, or national or international legislation, governing the dealings between persons in commercial matters.

A brief treatment of business law follows. For full treatment, *see* MACROPAEDIA: Business Law.

Business law falls into two distinctive areas: (1) the regulation of commercial entities by the laws of company, partnership, agency, and bankruptcy and (2) the regulation of commercial transactions by the laws of contract and related fields.

In civil-law countries, company law consists of statute law; in common-law countries it consists partly of the ordinary rules of common law and equity and partly statute law. Two fundamental legal concepts underlie the whole of company law: the concept of legal personality and the theory of limited liability. Nearly all statutory rules are intended to protect either creditors or investors.

There are various forms of legal business entities ranging from the sole trader, who alone bears the risk and responsibility of running a business, taking the profits, but as such not forming any association in law and thus not regulated by special rules of law, to the registered company with limited liability and to multinational corporations. In a partnership, members "associate," forming collectively an association in which they all participate in management and sharing profits, bearing the liability for the firm's debts and being sued jointly and severally in relation to the firm's contracts or tortious acts. All partners are agents for each other and as such are in a fiduciary relationship with one another.

An agent is a person who is employed to bring his principal into contractual relations with third parties and various forms of agency, regulated by law, exist: universal, where an agent is appointed to handle all the affairs of his principal; general, where an agent has authority to represent his principal in all business of a certain kind; and special, where an agent is appointed for a particular purpose and given only limited powers. Appointment may be express or implied and may be terminated by acts of the parties; the death, bankruptcy, or insanity of either the principal or agent; frustration; or intervening illegality.

It is inevitable that in certain circumstances business entities might be unable to perform their financial obligations. With the development of the laws surrounding commercial enterprises, a body of rules developed relating to bankruptcy: when a person or company is insolvent (*i.e.,* unable to pay debts as and when they fall due), either he or his creditors may petition the court to take over the administration of his estate and its distribution among creditors. Three principles emerge: to secure fair and equal distribution of available property among the creditors, to free the debtor from his debts, and to enquire into the reasons for his insolvency.

Business law touches everyday lives through every contractual dealing undertaken. A contract, usually in the form of a commercial bargain involving some form of exchange of goods or services for a price, is a legally binding agreement made by two or more persons, enforceable by the courts. As such they may be written or oral, and to be binding the following must exist: an offer and unqualified acceptance thereof, intention to create legal relations, valuable consideration, and genuine consent (*i.e.,* an absence of fraud). The terms must be legal, certain, and possible of performance.

Contractual relations, as the cornerstone of all commercial transactions, have resulted in the development of specific bodies of law within the scope of business law regulating (1) sale of goods, *i.e.,* implied terms and conditions, the effects of performance, and breach of such contracts and remedies available to the parties; (2) the carriage of goods, including both national and international rules governing insurance, bills of lading, charter parties, and arbitrations; (3) consumer credit agreements; and (4) labour relations determining contractual rights and obligations between employers and employees and the regulation of trade unions.

Business law, on national and international levels, is continually evolving with new areas of law developing in relation to consumer protection, competition, and computers.

Būṣīrī, al-, in full SHARAF AD-DĪN MUḤAMMAD IBN SAʿĪD AL-BŪṢĪRĪ AṢ-ṢANHĀJĪ (b. *c.* 1212, Abūṣīr or Dilāṣ, Egypt—d. *c.* 1295, Alexandria), Arabic poet of Berber descent who won fame for his poem *al-Burdah* (*The Poem of the Scarf,* 1893).

In this poem al-Būṣīrī said that he had devoted his life to poetry. He also worked as a copyist, being known for his calligraphy. It was said that he wrote his famous poem in praise of the Prophet Muḥammad after being cured of partial paralysis when the Prophet appeared to him in a dream and wrapped him in a mantle. In the poem, al-Būṣīrī contrasts the shortcomings of his life with the miracles of Muḥammad. The poem has been much venerated by Muslims, and its verses have been used as amulets and in lamentations for the dead. It has frequently been commented on, edited, and made the basis for new poems.

Busiris, in Greek mythology, Egyptian king, son of Poseidon (the god of the sea) and Lyssianassa (daughter of Epaphus, a legendary king of Egypt). After Egypt had been afflicted for nine years with famine, Phrasius, a seer of Cyprus, arrived in Egypt and announced that the famine would not end until an annual sacrifice of a foreigner to Zeus was instituted. Later Heracles, who had arrived in Egypt from Libya, was seized and brought to the altar. Heracles, however, burst his bonds and slew Busiris and his son Amphidamas.

Although some of the Greek writers made Busiris an Egyptian king and successor of Menes (traditionally the first king of a united Egypt), those better informed by the Egyptians rejected him altogether. The name Busiris is probably an earlier and less accurate Grecism than Osiris for the name of the Egyptian god Usire. All shrines of Osiris were called P-usiri (Busiris), but the principal city of the name was in the centre of the Delta, capital of the ninth (Busirite) nome, or district, of Lower Egypt.

Busken Huet, Conrad (b. Dec. 28?, 1826, The Hague—d. June 1, 1886, Paris), the greatest and also one of the liveliest Dutch literary critics of his time.

A descendant of an old French Protestant family, Busken Huet studied theology at Leiden and became pastor of the Walloon chapel

Busken Huet, portrait by an unknown artist

By courtesy of the Iconographisch Bureau, The Hague

at Haarlem but resigned because of his modernist views. He turned to literary criticism and from 1862 to 1865 was an editor of the influential literary magazine *De gids* ("The Guide"). After many disappointments, he left The Netherlands for the Dutch East Indies, where he worked as a journalist. For the last years of his life he lived in Paris.

As a critic, Busken Huet took the French dean of critics, Sainte-Beuve, and the Danish Georg Brandes as his guides and sought to bring Dutch literature into closer touch with other European cultures. He wrote brilliantly about the Dutch classics, about the minor Dutch poets, and about both the classic and modern literature of other countries. He castigated some of the Dutch writers of his own time severely for their narrowness and dullness. Busken Huet collected his most important critical writings in 25 volumes entitled *Litterarische fantasiën en kritieken* (1868–88; "Literary Fantasies and Criticisms"). They are still read with enjoyment for their style and acute perception. His history of Dutch culture in the 17th century, *Het land van Rembrandt* (1882–84; "The Country of Rembrandt"), remains a classic.

Buskerud, *fylke* (county), south central Norway. Extending northwest from Oslofjorden for 130 mi (209 km) to the Hardangervidda and the Hallingskarvet mountains, it has an area of about 5,766 sq mi (14,933 sq km). Its western part is a mountainous plateau with forested valleys and high, grassy pastures; its eastern part contains a lowland basin with many lakes and streams that provide hydroelectric power, including the Dramselva (Dram River). Most of the population lives in the Ringerike region in the east, where Hønefoss is the industrial and commercial centre. Paper and pulp mills are located along the Dramselva, while fruit, vegetables, and corn (maize) are grown on the lowlands. Silver was mined at Kongsberg from the 17th century but was discontinued in 1957. The county seat is Drammen (*q.v.*). Pop. (1983 est.) 217,402.

Busnois, Antoine, also called ANTOINE DE BUSNE (b. *c.* 1430, probably at or near Béthune, Fr.—d. Nov. 6, 1492, Bruges), French composer best known for his chansons, which typify the Burgundian style of the second half of the 15th century. Priest, poet, and musician, Busnois entered the service of Charles the Bold, duke of Burgundy, in 1467 and remained a member of the ducal chapel until the death of Mary of Burgundy, in 1482. At the time of his death, Busnois held the post of *rector cantoriae* at the church of Saint-Sauveur, in Bruges.

In his later years, his reputation as a composer was second only to that of Ockeghem among his contemporaries. His chansons (about 60 have survived) were admired particularly for their melodic beauty, rhythmic subtlety, harmonic colour, and clarity of structure.

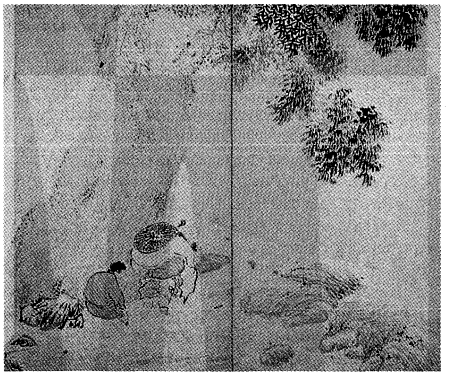
Busoga, province, southeastern Uganda, East Africa, bordering Lake Victoria on the south, Central and North Buganda provinces on the west, and Eastern Province on the north and east. With an area of about 5,200 sq mi (13,400 sq km), it has flat-topped hills in the north giving way to rounded hills in the south. Lake Kyoga on the northern boundary lies amid large areas of swamps with sandy soil.

In the south are both Stone Age and Early Iron Age sites. The Bigo culture, dating from AD 1300–1400, predominated until the 16th century, when the area became part of the newly founded Kingdom of Bunyoro. The British conquered Karaboga, the Bunyoro chief, and in 1894, declared Uganda a British protectorate. A Busoga political leader, Wilberforce Nadiope, founded the Uganda People's Union in 1958. When independence came in 1962 Busoga became a part of Uganda.

The province is mostly covered with elephant grass and there is much papyrus swamp and some forestland. Wildlife is plentiful and includes elephant, hippopotamus, water buffalo, sitatunga, bush pig, leopard, and various antelopes, protected in the Jinja Animal Sanctuary. The major ethnic group is the prosperous and literate Soga, who culturally and linguistically resemble the neighbouring Ganda. Primarily agriculturists, they grow cotton, coffee, sugar, bananas, cassava, millet, sweet potatoes, peanuts (groundnuts), and corn (maize). Livestock rearing and riverine and lake fishing are subsidiary occupations. Industries gin cotton; process tea, coffee, sugar, and tobacco; and produce textiles, wearing apparel, rubber and paper goods, gears, cement and concrete products, electrical machinery, bicycles, industrial chemicals, vegetable oils and fats, and metal products. Jinja, the capital of the province and the country's main industrial centre, is linked by railway and road to Mbulamuti and Kampala and by road to Iganga. The Owen Falls Dam and hydroelectric station at the outflow of the Victoria Nile from Lake Victoria is located near Jinja. Pop. (1980 prelim.) 1,221,872.

Buson, also called YOSA BUSON, original name TANIGUCHI BUSON (b. 1716, Kema, Settsu Province, Japan—d. Jan. 17, 1784, Kyōto), Japanese painter of distinction but even more renowned as one of the great haiku poets.

Buson came of a wealthy family but chose to leave it behind to pursue a career in the arts. He travelled extensively in northeastern Japan and studied haiku under several masters, among them Hayano Hajin, whom



"Traveling in Autumn," detail of a *byōbu* screen painting by Yosa Buson; in the Tokyo National Museum

By courtesy of the Tokyo National Museum

he eulogized in *Hokuju Rōsen wo itonamu* (1745; "Homage to Hokuju Rōsen"). In 1751 he settled in Kyōto as a professional painter, remaining there for most of his life. He did, however, spend three years (1754–57) in Yosa, Tango Province, a region noted for its scenic beauty. Here he worked intensively to improve his technique in both poetry and painting. During this period he changed his surname from Taniguchi to Yosa. Buson's fame as a poet rose particularly after 1772. He urged a revival of the tradition of his great predecessor Matsuo Bashō, but never reached the level of humanistic understanding attained by Bashō. Buson's poetry, perhaps reflecting his interest in painting, is ornate and sensuous, rich in visual detail. "Use the colloquial language to transcend colloquialism," he urged, and he declared that in haiku "one must talk poetry." To Buson this required not only an accurate ear and an experienced eye but also intimacy with Chinese and Japanese classics. Consequently, in his longer verse he sometimes employed Chinese. He also experimented with the traditional haiku form.

Busoni, Ferruccio (Benvenuto) (b. April 1, 1866, Empoli, Tuscany—d. July 27, 1924, Berlin), musician who attained fame as a pianist of brilliance and intellectual power but

Busoni, drawing by Edmond X. Kapp, 1921; in Manchester City Art Galleries, England

Edmond X. Kapp

who was also an important composer. The son of an Italian clarinetist and a pianist of German descent, Busoni was taught by his mother. He appeared as a child prodigy and later completed his studies in Vienna and Leipzig. In 1889 he became professor of piano at Helsingfors (now Helsinki), and from there he moved to Moscow and later to the United States. From 1894 to 1914 (and again from 1920 until his death) he lived in Berlin, conducting a series of orchestral concerts containing music by his contemporaries and making concert tours devoted mainly to J.S. Bach, Beethoven, and Liszt. During World War I, divided in his loyalty between Italy and Germany, he retired to Zürich. This conflict affected him also as a composer, his music being compounded of romantic fervour controlled by an austere intellect and Latin brilliance and clarity. His most ambitious work was the unfinished opera *Doktor Faust*, based not on Goethe but on earlier versions of the Faust legend. It was completed by his pupil Philipp Jarnach and performed in Dresden (1925). Two other short operas, *Arlecchino* and *Turandot*, composed at Zürich, attempted to revive the commedia dell'arte in modern form. Busoni's piano works include an immense concerto with choral finale; six sonatinas, which contain the essence of his musical thought; and the great *Fantasia Contrappuntistica* on an unfinished fugue by Bach (two versions, 1910; one version, 1912; fourth version for two pianos, 1922), which sums up his lifelong experience of Bach's music.

Busoni made transcriptions for piano of Bach organ works, and he made arrangements of such Liszt piano pieces as *La Campanella* and *La Chasse* that added polyphony to them. He wrote many piano solo pieces, and, in addition to the piano concerto, he wrote the *Indianische Fantasie* and *Konzertstück*, both for piano and orchestra. Orchestral works include incidental music for Gozzi's play *Turandot*, which preceded the opera, and an orchestral suite and symphonic poem.

Buṣrā ash-Shām (ancient Syria): *see* Bozrah.

Bussa Rapids, rapids on the Niger River, below its confluence with the Sokoto River, south of Yelwa, Nigeria. There the river cuts into an outcrop of ancient basement rock, forming rapids that extend for about 50 mi (80 km) to Jebba. Before the construction of the Kainji Dam and Reservoir (1969), the rapids were an obstacle to navigation. The Kainji Dam has a total hydroelectric capacity of 960 megawatts; a smaller dam was under construction at Jebba in the early 1980s.

Busselton, town, southwestern Western Australia, on the south shore of Geographe Bay, southwest of Bunbury. The locality was settled by the Bussel family, who established its "Cattle Chosen" stock station there in 1832.

In 1871 the first railway in Western Australia was built from Busselton into the forest nearby, to carry timber to the port. The town was the site in 1921 of one of the first attempts at group settlement of British immigrants under a policy proposed by Sir Thomas Mitchell, then state premier. The surrounding area has dairy, potato, fat-lamb, pig, and bee farming, lumbering, and beach-sand mining for ilmenite.

Situated on a rail line and the Bussel Highway to Perth (120 mi [190 km] northeast), Busselton centre has a foundry and plants that produce fibrous plaster, cement slabs, and prefabricated steel. Its small port has been largely superseded by Bunbury for commercial shipping, but its beaches and mild climate make Busselton a growing resort. Pop. (1981) 6,463.

Bussum, *gemeente* (municipality), Noordholland *provincie* (province), west central Netherlands, near the IJsselmeer (Lake IJssel). Originally a rustic extension of the old fortress town of Naarden, it is now a residential suburb, southeast of Amsterdam, and a resort for the Gooiland region of lakes and woods. The Dutch television studios are located there. Economic activities include tree nurseries and the production of cocoa and chocolate (since 1840), pharmaceuticals, chemicals, and electronic equipment. Pop. (1983 est.) 33,941.

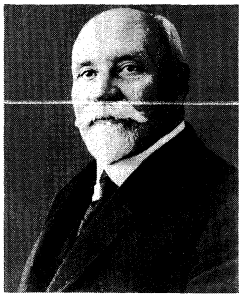
Bussy-Rabutin, Roger de, in full ROGER DE RABUTIN, COMTE (count) DE BUSSY (b. April 13, 1618, Épiry, Fr.—d. April 9, 1693, Autun), French libertine who amused the nobility of his time with scandalous tales told in a light classical prose style; he was the cousin and confidant of the celebrated letter writer the Marquise de Sévigné.

During the civil wars of the Fronde (uprisings against the government of Cardinal Mazarin), Bussy-Rabutin served first the rebels, then the government. Although his raffish escapades got him into trouble, he was nevertheless allowed to buy the exalted rank of lieutenant colonel general of the light cavalry in 1653 and was elected to the Académie Française in 1665.

Then came his downfall with the unauthorized printing, in 1665, of his now best known work, *Histoire amoureuse des Gaules,* four scandalous and amusingly written tales about court ladies. After 13 months' imprisonment he was exiled from Paris to his native Burgundy. His disgrace was deepened when his enemies produced more libellous pamphlets dressed up as supplements to the *Histoire.* From exile, however, he conducted a voluminous correspondence, highly esteemed before the publication of the now famous letters of the Marquise de Sévigné.

Bustam (Iran): *see* Basṭām.

Bustamante y Sirvén, Antonio Sánchez de (b. April 13, 1865, Havana—d. Aug. 24, 1951, Havana), lawyer, educator, Cuban politician, and international jurist who drew up the Bustamante Code dealing with international private law. Adopted by the sixth Pan-American Congress (Havana, 1928), which also elected him president, his code was ratified without reservations by six Latin American nations and in part by nine others.



Bustamante y Sirvén
BBC Hulton Picture Library

In 1884, when he was 19 years old, Bustamante won a public competitive examination for the professorship of international law at the University of Havana. From 1902 (when the Republic of Cuba was constituted) until 1918 he was a Cuban senator. He represented Cuba at the second international conference at The Hague (1907) and at the World War I peace conference in Paris (1919). In 1908 he was made a member of the Permanent Court of Arbitration, The Hague, and in 1921 he became a judge of the Permanent Court of International Justice, newly established by the League of Nations.

Bustamante wrote numerous books, including *Tratado de derecho internacional privado* (1896; "Treatise on International Private Law"); *El Tribunal Permanente de Justicia Internacional* (1925; *The World Court,* 1925); and *Derecho internacional público,* 5 vol. (1933–38; "International Public Law").

Bustānī, Buṭrus al- (b. 1819, ad-Dubbīyah—d. May 1, 1883, Beirut), scholar whose works, notably an Arabic dictionary and the first six volumes of an Arabic encyclopaedia, played a significant role in revitalizing the Arabic culture of his time.

Bustānī's most significant activities were literary. He felt that Arabs should study Western science and civilization, and the volumes of his encyclopaedia were an impressive contribution toward that end. He believed, however, that such acculturation could be accomplished only if the Arabic language were molded into a supple and effective means for expressing the concepts of modern thought, and he developed his dictionary to achieve that goal.

In 1870 Bustānī began publication of *al-Jinān* ("The Shield"), a political and literary review that expressed his views on the need for a cultural revitalization. A Christian, he also worked to spread a spirit of toleration and trust among the different religious groups in Syria. He saw as his homeland a Syria that did not yet exist as an administrative entity; it expressed a concept of cultural unity that transcended the district of Lebanon in which he lived.

bustard, any of numerous medium-to large-sized game birds of the family Otididae, related to the cranes and rails in the order Gruiformes. There are about 23 species, confined to Africa, southern Europe, Asia, Australia, and part of New Guinea. Bustards have rather long legs, adapted to running. They have only three toes, lacking the hind toe (hallux). The body is compact, carried in a rather horizontal position, and the neck stands erect, forward of the legs, in the manner of other tall running birds.

The best known bustard is the great bustard (*Otis tarda*), largest European land bird, the male weighing as much as 14 kilograms (31 pounds) and having a 120-centimetre (4-foot) length and a 240-centimetre (8-foot) wingspread. It is found in grainfields and open steppes from central and southern Europe to Central Asia and Manchuria. The sexes are similar in coloration, being grayish above, barred with black and brown, and whitish below. The male is stouter and has whitish, bristly feathers at the base of the bill. A wary bird, the great bustard is difficult to approach, running swiftly when endangered. On land it assumes a stately gait; on the wing, it displays a relatively slow but powerful and sustained flight. The spring courtship ceremonies are characteristic: the cock's head is bent back almost touching the uplifted tail, and the throat pouch is inflated. Two or three eggs, olive blotched with brown, are laid in a shallow excavation sheltered by low vegetation.

The little bustard (*Otis tetrax*) ranges from western Europe and Morocco to Afghanistan. The bustards of South Africa are known as paauw, the largest being the great paauw or kori bustard (*Ardeotis kori*). The Arabian bustard (*A. arabs*) is found in Morocco and in northern tropical Africa south of the Sahara,

Kori bustard (*Ardeotis kori*)
M.P. Kahl

as are a number of species belonging to several other genera. In Australia the bustard *Choriotis australis* is called turkey.

bustard quail (bird): *see* button quail.

Bustelli, Franz Anton (b. April 12, 1723, Locarno, Switz.—d. April 18, 1763, Munich), modeller of porcelain sculpture, recognized for the excellence of his work in the light, asymmetric, lavishly decorated Rococo style.

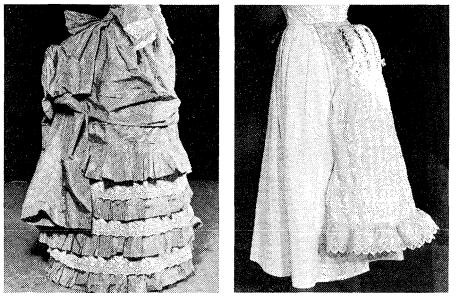
There is no record of Bustelli's early life or training, but it is known that he was employed by the porcelain factory at Nymphenburg, near Munich, from 1754 until his death. His work is characterized by graceful lines, the effective

Columbine, figure from the commedia dell'arte, enamel and gilt on porcelain by Bustelli, *c.* 1755–60; in the Victoria and Albert Museum, London
By courtesy of the Victoria and Albert Museum, London

use of rich colours on milky-white porcelain, and a respect for the limitations of his medium. His subjects included the commedia dell'arte, Chinese figures, cupid-like children, and such groups as those in the work called "Tea Party." Figurines produced during the

period of his association with the Nymphenburg factory are rare and extremely valuable. They are still reproduced by the factory with modern marks.

bustle, item of feminine apparel for pushing out the skirt in back just below the waist; although used at various times since the 14th century, it was first known under this name in the 19th century. The specific fashion for the bustle, or *tournure,* came between 1865 and 1876 and again in the 1880s. It followed the



A bustle (left) under a ruffled dress, French, 1885, in the Brooklyn Museum, New York City; (right) uncovered, English, 1884, in the City Art Gallery, Manchester

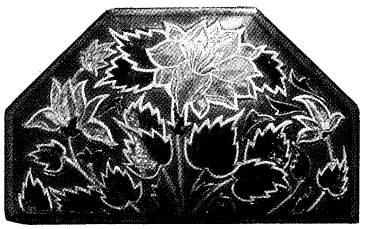
By courtesy of (left) the Brooklyn Museum, gift of Mrs. Lillian Glenn Pierce, Mrs. Mabel Glenn Cooper, Mrs. Victor L. Pierce, (right) the Gallery of English Costume, City Art Gallery, Manchester

decline of the crinoline (*q.v.*) and began as a bunching up of material behind the waist but became a wire cage attached to the petticoat, sticking out backward like a shelf, over which the dress material was draped.

A pouf, or small saddle cushion at the back, worn in the 1860s and 1870s, revived a fashion originating in France in the 1780s. But padded rolls at the hips were known as "bum rolls" and "bearers" in the 16th and 17th centuries, as "cork rumps" in the 18th, and finally as "dress improvers" in Victorian times.

Busto Arsizio, city, Varese province, Lombardia (Lombardy) region, northern Italy, on the Olona River just northwest of Milan. Its Renaissance church of Sta. Maria di Piazza (1515–23) was designed by Donato Bramante. Busto Arsizio has experienced considerable industrial growth in the 20th century and is an important textile centre (especially for cotton), with diversified manufacturing. Pop. (1981 prelim.) mun., 79,769.

būṭā (Hindi-Urdu: "flower"), one of the most important ornamental motifs of Mughal art, consisting of a floral spray with stylized leaves and flowers. It is used in architecture and painting and in textiles, enamels, and almost all other decorative arts.



Enamel *būṭā,* floral spray decoration on a silver box, from Rājasthān, India, 19th century; in a private collection

P. Chandra

The motif began to gain importance in the reign of Jahāngīr (1605–27), and by the time of Shāh Jahān (1628–58) it was in constant use. In the Tāj Mahal (*c.* 1632–*c.* 1649), at Āgra, are examples of great delicacy and beauty of colour. The motif tended to become stiff and inert in the 18th century and later, but its popularity never declined.

Butades OF SICYON, also called DIBUTADES (fl. *c.* 600 BC?), ancient Greek clayman, who, according to the Roman writer Pliny the Elder, was the first modeller in clay. The story is that his daughter, smitten with love for a youth at Corinth, where they lived, drew upon the wall the outline of his shadow and that upon this outline her father modelled a face of the youth in clay and baked the model along with the clay tiles which it was his trade to make. (This model was reportedly preserved in Corinth until Mummius sacked that town in 146 BC.) This incident led Butades to ornament the ends of rooftiles with human faces. He is also said to have invented a mixture of clay and ruddle or to have introduced the use of a special kind of red clay.

butadiene, either of two aliphatic organic compounds that have the formula C_4H_6; the term ordinarily signifies the more important of the two, 1,3-butadiene, which is the major constituent of many synthetic rubbers. It was first manufactured in Germany during World War I from acetylene. During World War II, butenes from petroleum and natural gas were the raw material for 60 percent of U.S. butadiene production, ethyl alcohol for the rest. Butadiene rubber has now completely displaced the natural product in the manufacture of automobile tires. Nearly all butadiene is made by dehydrogenation of butane or butenes or by high-temperature cracking (breaking up of large molecules) of petroleum distillates.

1,3-Butadiene is the simplest member of the series of conjugated dienes, which contain the structure C=C−C=C, C being carbon. The wide variety of chemical reactions peculiar to this system makes butadiene important in chemical synthesis. Under the influence of catalysts, butadiene molecules combine with each other or with other reactive molecules, as acrylonitrile or styrene (*q.v.*), to form elastic, rubberlike materials. In uncatalyzed reactions with reactive unsaturated compounds, such as maleic anhydride, butadiene undergoes the Diels–Alder reaction, forming cyclohexene derivatives. Butadiene is attacked by the numerous substances that react with ordinary olefins, but the reactions often involve both double bonds (*e.g.*, addition of chlorine yields both 3,4-dichloro-1-butene and 1,4-dichloro-2-butene).

At atmospheric conditions, 1,3-butadiene exists as a colourless gas, but it is liquefied either by cooling to −4.4° C (24.1° F) or by compressing to 2.8 atmospheres at 25° C (77° F).

butane, either of two colourless, odourless, gaseous hydrocarbons (compounds of carbon and hydrogen), members of the series of paraffinic hydrocarbons; their chemical formula is C_4H_{10}. The compound in which the carbon atoms are linked in a straight chain is denoted *n*-butane; the branched-chain form is isobutane. Both compounds occur in natural gas and in crude petroleum and are formed in large quantities in the cracking of oil to produce gasoline.

The butanes present in natural gas are separated from the large quantities of lower boiling, gaseous constituents such as methane and ethane. The butanes thus obtained can be shipped safely at ordinary temperatures in tank cars or in cylinders. The butanes may be separated by fractional distillation: *n*-butane boils at −0.5° C (31.1° F); isobutane boils at −11.7° C (10.9° F). Commercially, *n*-butane can be added to gasoline to increase its volatility, transformed to isobutane, or dehydrogenated to butenes and butadiene. Isobutane reacts with certain other hydrocarbons in the presence of hydrogen fluoride or sulfuric acid to form compounds that are valuable constituents of high-octane gasoline.

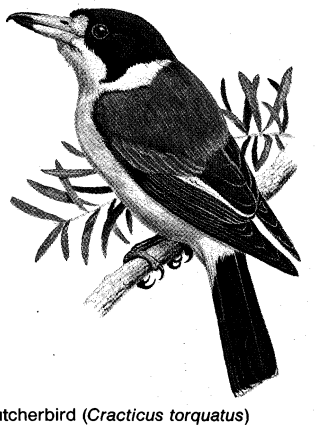
Butare, *préfecture* (Kinyarwanda *prefegitura*), southern Rwanda, Central Africa, bordering Gitarama *préfecture* (north), Gikongoro *préfecture* (west), and the country of Burundi (east and south). Comprising about 705 sq mi (1,825 sq km), Butare lies mainly on the country's central plateau, where elevations vary from 4,900 to 6,600 ft (1,500 to 2,000 m). The *préfecture*'s warm climate and highly fertile soil provide favourable conditions for a variety of crops, including coffee (*arabica*), beans, sorghum, bananas, rice, and sweet potatoes. Large numbers of cattle also use the land for grazing. Butare is the nation's most densely populated *préfecture;* its administrative centre is Butare town, Rwanda's second largest urban area. A match factory was completed in 1981, providing non-agricultural employment. Butare town is Rwanda's main centre of higher education and scientific research, housing the Université National du Rwanda, the Institut National de Recherche Scientifique (which has a laboratory producing vaccines for cattle, sheep, and goats), and the Institut Pedagogique National. The town of Nyanza (Nyabisindu) north of Butare town houses the supreme court of Rwanda. A major road links Butare *préfecture* with Uganda to the north and Burundi to the south; another road connects it with Zaire. Pop. (1978 prelim.) 601,165.

Butare, town and educational centre, Butare *préfecture*, southern Rwanda, Central Africa. Before Rwanda's independence in 1962, the town was called Astrida. It consists of the traditional housing areas of Ngoma and Matyazo, the former colonial settlement, and a newer commercial section with a nearby airstrip. Butare, the second largest town in Rwanda, houses the National University of Rwanda, which was established in 1963, a teacher's college, a national institute of scientific research, and a school of agriculture. Non-Africans, including foreign teachers, represent nearly 10 percent of the population. Pop. (1980 est.) 25,800.

Butaritari Atoll, also called MAKIN ATOLL, formerly PITT ISLAND, coral atoll of the Gilbert Islands, part of Kiribati, in the west central Pacific Ocean. Located in the northern Gilberts, it comprises a central lagoon (11 mi [18 km] wide) ringed by islets, with a total area of 5.2 sq mi (13.5 sq km), which provides a good deep anchorage with three passages to the open sea. Occupied by Japanese forces from 1941 to 1943, the atoll served as a U.S. air and naval base for the last two years of World War II. The main village and port is on the islet of Butaritari. Copra is exported. Pop. (1983 est.) 3,470.

Butcher of Lyon (Nazi leader): *see* Barbie, Klaus.

butcherbird, in general, any bird that impales its prey (small vertebrates, large insects) on a thorn or wedges it into a crack or a forked twig in order to tear it or, sometimes, to store it. The name is given to *Lanius* species



Gray butcherbird (*Cracticus torquatus*)

Painting by Albert E. Gilbert

(*see* shrike) and in Australia to the four to seven species of *Cracticus*—contrastingly patterned (usually black-gray-white) members of the family Cracticidae (order Passeriformes). Butcherbirds are stocky, about 28 centimetres (11 inches) long, with big feet and heavy, hook-tipped bills. Year-round, pairs defend their territory—they may attack humans—and sing beautiful duets. A familiar species is the gray butcherbird (*C. torquatus*).

butcher's broom, any dark green shrub of the genus *Ruscus* of the family Asparagaceae, native to Eurasia. The plants lack leaves but have flattened, leaflike branchlets. The small flower clusters are borne in the centre of the branchlets, or on one side of the branchlet. The fruit is a red berry.

One species, called Jew's myrtle (*R. aculeatus*), is cultivated for its branchlets, which are

Jew's myrtle (*Ruscus aculeatus*)
A to Z Botanical Collection—EB Inc.

dyed and used as decorations in winter. The young shoots are edible; dried branches are used to make brooms.

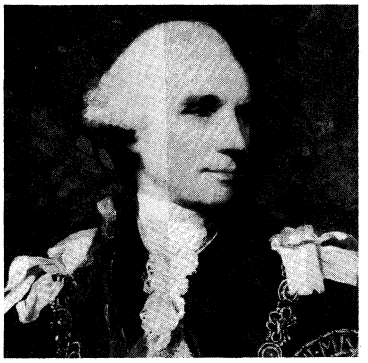
Bute, also called BUTESHIRE, former county, southwestern Scotland, including Bute, Arran, the Cumbraes, Holy, Pladda, and Inchmarnock islands, all lying in the Firth of Clyde. In the reorganization of 1975, the county was divided between two districts, one called Argyll and Bute, the other Cunninghame (*qq.v.*), of Strathclyde region.

Bute, island, Argyll and Bute district, Strathclyde region, Scotland; most important of a group of islands in the Atlantic Ocean inlet known as the Firth of Clyde. It is separated from the mainland by the Kyles of Bute, a narrow winding strait. To the south, the Sound of Bute separates Bute from the larger island of Arran. Bute is about 15 mi (24 km) long and covers 47 sq mi (122 sq km), reaching a height of 913 ft (278 m) at Windy Hill in the north. The northern part of the island is hilly, while the southern part is flatter and more fertile. There are numerous prehistoric remains and early Christian chapels. Most of the island is good farmland. Bute has also developed as a residential and holiday resort in proximity to central Scotland. Rothesay is the chief port and resort. Mount Stuart, a modern Gothic mansion, is a seat of the marquess of Bute. Pop. (1981) 7,733.

bute (hill): *see* butte.

Bute, John Stuart, 3rd earl of (b. May 25, 1713, Edinburgh—d. March 10, 1792, London), Scottish royal favourite who dominated King George III of Great Britain during the first five years of his reign. As prime minister (1762–63), he negotiated the peace ending the Seven Years' War (1756–63) with France, but he failed to create a stable administration.

Succeeding to his father's earldom in 1723, he remained aloof from politics until he met (1747) and won the favour of Frederick Louis, prince of Wales, son of King George II. Upon Frederick's death in 1751, Bute became the constant companion and confidant of the Prince's son George, heir to the throne, whose



Bute, detail of an oil painting by Sir Joshua Reynolds; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

tutor he had been. After his accession George made the earl secretary of state (March 1761). From the first, Bute, as a Scotsman, was widely disliked in England. He aroused further hostility by ousting from his administration William Pitt (later 1st earl of Chatham), creator of England's successful wartime strategy. Bute replaced Thomas Pelham-Holles, 1st duke of Newcastle, as first lord of the Treasury (in effect, prime minister) in May 1762, and in February 1763 he signed the Treaty of Paris, which was extremely unpopular in England. After imposing a hated cider tax and becoming involved in the controversial elevation of Henry Fox to the peerage, Bute resigned (April 1763). Nevertheless, he maintained his influence with George III until the new prime minister, George Grenville, made the King promise (May 1765) that he would neither employ Bute in office nor seek his counsel.

Butenandt, Adolf (Friedrich Johann) (b. March 24, 1903, Bremerhaven-Lehe, Ger.), German biochemist who, with Leopold Ruzicka, was awarded the 1939 Nobel Prize for Chemistry for his work on sex hormones. Although forced by the German government to refuse the prize, he was able to accept the honour in 1949.

In 1929, almost simultaneously with E.A. Doisy in the U.S., Butenandt isolated estrone, one of the hormones responsible for sexual development and function in females. In 1931 he isolated and identified androsterone, a male sex hormone, and in 1934, the hormone progesterone, which plays an important part in the female reproductive cycle. He carried out much research on the interrelationships of the sex hormones and on their possible carcinogenic properties. The large-scale production of cortisone stemmed largely from Butenandt's work on hormones.

Butenandt studied at the universities of Marburg and Göttingen, receiving his Ph.D. from the latter in 1927. He then taught at Göttingen and at the Technische Hochschule in Danzig, becoming director of the Kaiser Wilhelm Institute (later the Max Planck Institute) in 1936. He was elected president of the Max Planck Society for the Advancement of Science, serving from 1960 to 1972.

butene, also called BUTYLENE, any of four isomeric compounds belonging to the series of olefinic hydrocarbons; chemical formula, C_4H_8. The isomeric forms (same empirical formula but different molecular structure) are 1-butene, *cis*-2-butene, *trans*-2-butene, and isobutylene. All four butenes are gases at room temperature and pressure.

Butenes are formed during the cracking (breaking down of large molecules) of petroleum to produce gasoline; they can also be prepared commercially by the catalytic dehydrogenation (elimination of hydrogen atoms from the molecule) of butanes. The major part of the butenes is utilized for the production of octanes, which are important constituents of gasoline. This is done either by causing the butenes to react with isobutane or by dimerizing (combining two molecules of the same compound) butenes to form octenes, which, on hydrogenation (addition of hydrogen atoms to molecules), yield octanes. On treatment with water in the presence of catalysts, the butenes are transformed to secondary and tertiary butyl alcohols, used as commercial solvents. On dehydrogenation, normal butenes form butadiene, the main starting material for synthetic rubber.

buteo, any of several birds of prey of the genus *Buteo,* variously classified as buzzards or hawks. *See* buzzard; hawk.

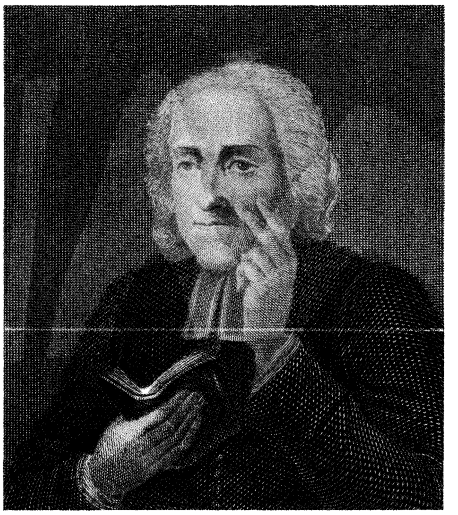
Butkus, Dick, byname of RICHARD J. BUTKUS (b. Dec. 9, 1942, Chicago), U.S. professional National Football League (NFL) middle linebacker for the Chicago Bears, who was considered one of the best defensive players in the game.

Butkus played football in grade school and as a fullback and linebacker at Chicago Vocational High School. At the University of Illinois (Urbana-Champaign) as a linebacker (1962–64), he starred in the 1963 Rose Bowl game and the 1965 College All-Star game. He was also named to All-America teams (1963–64).

In his first year with the Bears (1965), Butkus intercepted five passes and in 1970 was voted by NFL coaches as the player they would most like to have on their teams. His career was shortened by injuries and he had surgery after the 1970 season. After retiring in 1973, he was active in television and films. He was elected to the Football Hall of Fame in 1979.

butler, chief male servant of a household who supervises other employees, receives guests, directs the serving of meals, and performs various personal services. The title originally applied to the person who had charge of the wine cellar and dispensed liquors, derived from Middle English *boteler* (and various other forms), from Old French *bouteillier,* "bottle bearer." In the Middle Ages it meant precisely this, but in time it came to mean an official of the crown, who nominally had charge of the wine but who in fact was a person of high rank, having different duties in different countries at different times.

Butler, Alban (b. Oct. 24, 1710, Northampton, Northamptonshire, Eng.—d. May 15, 1773, Saint-Omer, Fr.), Roman Catholic priest and educator, renowned for his classic *Lives of*



Alban Butler, detail from an engraving by J.W. Cook, 18th century
By courtesy of the Mary Evans Picture Library

the Saints. Butler was educated at the English College in Douai, Fr., where after ordination in 1734 he held successively the chairs of philosophy and divinity. In 1749 he returned to England but later became president of the English College at Saint-Omer.

Butler's monumental achievement, *The Lives of the Fathers, Martyrs, and Other Principal Saints* (4 vol., 1756–59), was considered a sound, critical, and authoritative work. Containing more than 1,600 hagiographies, it went through many editions. It was revised by Hubert Thurston and Donald Attwater (*Butler's Lives of the Saints*, 4 vol., 1956) to bring up to date its content and treatment.

Butler, Benjamin F(ranklin) (b. Nov. 5, 1818, Deerfield, N.H., U.S.—d. Jan. 11, 1893, Washington, D.C.), U.S. politician and army

Benjamin F. Butler

By courtesy of the Library of Congress, Washington, D.C.

officer during the Civil War (1861–65) who championed the rights of workers and black people.

A prominent attorney at Lowell, Mass., Butler served two terms in the state legislature (1853, 1859), where he distinguished himself by vigorously supporting the cause of labour and of naturalized citizens. Though he was affiliated with the Southern wing of the Democratic Party in the 1860 elections, he strongly supported the Union after the Civil War broke out. He was appointed a Union officer for political reasons, and his military career was mercurial and often controversial. As a brigadier general of the Massachusetts militia, he commanded the troops that occupied Baltimore and in May 1861 was promoted to the rank of major general in command of Ft. Monroe, Virginia. There he refused to return fugitive slaves to the Confederacy, using the logic that they constituted "contraband of war"—an interpretation later upheld by his government. In June 1861 he lost the engagement at Big Bethel, Va., but succeeded in capturing the forts guarding the inlet at Hatteras, N.C., two months later.

Early in 1862 Butler was given command of the land forces that accompanied the victorious Union expedition against New Orleans. The city fell late in April, and from May to December Butler ruled it with an iron hand: he executed a citizen who had torn down the U.S. flag, undertook sanitary measures to prevent an outbreak of yellow fever, and confiscated the property of Confederate sympathizers. Partly because of difficulties arising from his relations with foreign consuls concerning confiscated property, he was recalled at the end of the year.

As commander of the Army of the James (River, Va.) in 1864, Butler became bottled up in Bermuda Hundred, Va., and was unsuccessful in operations before Richmond and Petersburg, Va. After the failure of an expedition against Ft. Fisher, North Carolina, he was relieved of his command (January 1865).

After the war Butler became a Radical Republican in the U.S. House of Representatives (1867–75, 1877–79), supporting firm Reconstruction measures toward the South and playing a leading role in the impeachment trial of Pres. Andrew Johnson. Although a staunch supporter of Pres. Ulysses S. Grant after 1868, he broke with the party in 1878 because of his sympathy with the inflationary Greenback Movement. After two unsuccessful tries, he was elected Democratic governor of Massachusetts in 1882 and two years later became the presidential candidate of the Greenback Labor Party and the Anti-Monopoly Party. He advocated the eight-hour day and national control of interstate commerce but failed to win a single electoral vote.

At various times in his career Butler was accused of corruption, but no charges against him were ever proved.

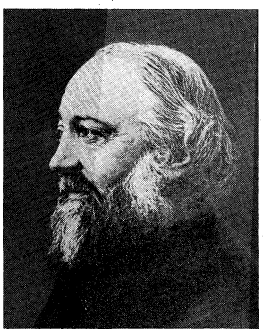
Butler, Guy (Frederick) (b. Jan. 21, 1918, Cradock, Cape Province, S.Af.), South African poet and playwright, many of whose poems have extraordinary sensitivity and brilliant imagery, especially those that touch on his dual sense of affection for and alienation from Europe.

Butler began his career as a writer during his war service in Europe (1940–45). After studying at Oxford, Butler returned to South Africa, where he joined the faculty of Rhodes University in Grahamstown. He studied and edited diaries of colonial settlers and edited an influential broadsheet of contemporary poetry, *New Coin*, but he was also considerably involved in the theatre. His first play, *The Dam* (1953), won the Van Riebeeck Festival Prize, and subsequent verse drama included *The Dove Returns* (1956), *Cape Charade* (1968), and *Take Root or Die* (1970). The collection *Stranger to Europe* (1952) contains some of his best poetry. The first volume of Butler's autobiography, *Karoo Morning* (1977), demonstrates his continued affection for South Africa by recalling his early memories of his family.

Butler, Henry Montagu (b. July 2, 1833, Gayton, Northamptonshire, Eng.—d. Jan. 14, 1918, Cambridge, Cambridgeshire), headmaster of Harrow School in England from 1859 to 1885, who reformed and modernized the school's curriculum.

Butler's father, George Butler, had been the Harrow headmaster before him. Educated at Harrow and at Trinity College, he was elected to the Harrow headmastership at the age of 26.

The young Butler, opposed at first by an old-fashioned staff, overcame their opposition through tact and firmness. As a brother-in-law of the scientist Francis Galton, he was in sympathy with the scientific thought of the period; during his headmastership science was officially recognized as a subject in the school curriculum. He also created (1869) a modern division of studies, with the proviso that only boys with a satisfactory record in classics should be admitted. He was a great lover of music, and during his headship the cycle of



Henry Montagu Butler

BBC Hulton Picture Library

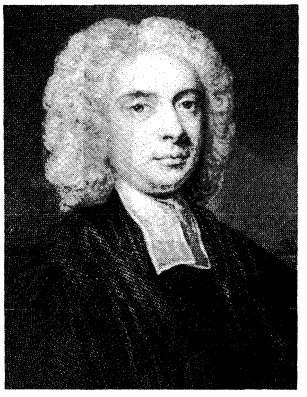
Harrow school songs was completed. He was known for his warm Sunday sermons and his Latin verses; his friends said that he turned Harrow into a miniature Parnassus.

Butler's headmastership ended when he became master of Trinity College at Cambridge (1886–1918), but this did not diminish his interest in Harrow. At Trinity he formed lines of communication among various religious denominations and showed great interest in classes for workingmen. In 1912 he was appointed chaplain-in-ordinary to the king. His published works consist chiefly of sermons and his autobiography, *Some Leisure Hours of a Long Life* (1914).

Butler, James: *see* Ormonde, James Butler, 12th earl and 1st duke of: Ormonde, James Butler, 2nd duke of.

Butler, Joseph (b. May 18, 1692, Wantage, Berkshire, Eng.—d. June 16, 1752, Bath, Somerset), Church of England bishop, moral philosopher, preacher in the royal court, and influential author who defended revealed religion against the rationalists of his time.

Ordained in 1718, Butler became preacher at the Rolls Chapel in London, where he delivered his famous "Sermons on Human Nature" (1726), addressed to the practical side of Christian living. After several years as a parish priest, in 1736 he was appointed head chaplain to Caroline, wife of King George II.



Joseph Butler, detail from an engraving by Dean, 1848, after a portrait by Johan van der Banck

BBC Hulton Picture Library

In the same year he published his most celebrated work, *The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature,* attacking Deist writers whose approach to God consisted in arguing rationally from nature rather than from faith in the doctrine of revelation. His *Of the Nature of Virtue,* appended to the *Analogy,* presented a firm refutation of hedonism and of the notion that self-interest is the ultimate principle of good conduct; for this work Butler has been considered by some critics to be the greatest British moral philosopher.

After the Queen died in 1737, Butler went in 1738 to Bristol as bishop. His abilities as chaplain, however, had impressed the King, and in 1746 Butler was recalled to the royal household. A year later Butler declined an offer to become primate (archbishop of Canterbury), but in 1750 he accepted the bishopric of Durham. Among the many thinkers subsequently influenced by his arguments in favour of traditional theology was the Roman Catholic cardinal John Henry Newman (1801–90).

Butler, Mother Marie Joseph, *née* JOHANNA BUTLER (b. July 22, 1860, Ballynunnery, Kilkenny, Ire.—d. April 23, 1940, Tarrytown, N.Y., U.S.), Roman Catholic nun who founded the Marymount schools in Europe and the United States.

In 1876 Butler entered the Congregation of

the Sacred Heart of Mary in Beziers, Fr., and in 1879 was sent to teach in Portugal. Ten years later she was sent to the United States to extend the work of the congregation there.

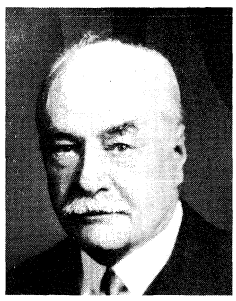
In 1908 Butler opened the Marymount School in Tarrytown, N.Y., which became a college for Catholic women in 1918. Branches of the college were subsequently opened in Los Angeles, Paris, Rome, and Santa Barbara, Calif. Butler promoted in the Marymount schools an educational policy that emphasized social and physical training, along with religious and intellectual pursuits, and she established courses in political science and law to help train her students to become active and informed citizens.

In 1926 Butler was elected mother general of the Congregation of the Sacred Heart of Mary. She thereafter helped to expand the congregation's work in Europe and South America.

Butler, Nicholas Murray (b. April 2, 1862, Elizabeth, N.J., U.S.—d. Dec. 7, 1947, New York City), American educator, publicist, and political figure who was a Nobel laureate and served as president of Columbia University from 1901 to 1945.

Butler was educated at Columbia College, which became his intellectual and occupational home for the rest of his life. There, under the influence of Pres. F.A.P. Barnard, he decided to prepare for a professional career in education. After completing his undergraduate work in 1882, he continued at Columbia as a graduate fellow in philosophy, taking his Ph.D. in 1884. A year in Paris and Berlin completed his formal education. He was appointed an assistant in philosophy at Columbia in 1885, becoming professor of philosophy and education in 1890 and president of the university in 1901. He held the latter post until his retirement in 1945. Under his leadership Columbia grew from a provincial college into a university of world renown.

As a young man Butler strongly criticized the pedagogical methods of his time. As founder and president of the Industrial Education Association (1886–91) he played a central role in the establishment of the New York College for the Training of Teachers, subsequently Teachers College, Columbia University. Later,



Nicholas Murray Butler
By courtesy of Columbia University, New York

however, he criticized pedagogical reform itself, steadfastly defending the "great tradition" of humanism in education and lashing out against such contemporary trends as vocationalism in education and Behaviorism in psychology as the "new barbarism."

Butler was a champion of international understanding, helping to establish the Carnegie Endowment for International Peace, of which he was a trustee and later president (1925–45). He shared with Jane Addams the Nobel Peace Prize in 1931. He was active in the councils of the Republican Party for more than half a century, attending many national conventions. He was also president of the American Academy of Arts and Letters (1928–41).

Butler, Pierce (b. March 17, 1866, near Northfield, Minn., U.S.—d. Nov. 16, 1939, Washington, D.C.), associate justice of the United States Supreme Court (1923–39).

Butler was admitted to the Minnesota bar in 1888. After serving as assistant county attorney and then county attorney in St. Paul, he formed a law firm and, over 25 years, became the foremost railroad attorney of the Northwest. During the latter part of this period he was occasionally called upon to prosecute antitrust cases for Pres. William Howard Taft's attorney general, George Wickersham; on another occasion he saved substantial sums for the Canadian government in valuation proceedings against the western railroads. In 1922 Butler was appointed to the U.S. Supreme Court by Pres. Warren G. Harding on the recommendation of Chief Justice Taft and over the objections of liberal Senators George W. Norris and Robert M. La Follette.

Butler was a strict constitutional constructionist, voting with the conservative bloc of justices Willis Van Devanter, James C. McReynolds, and George Sutherland on many issues. He opposed government control of business, consistently voted against the imposition of state and federal taxes, and joined with the court's majority in voting down two important New Deal programs, the Agricultural Adjustment Administration and the National Recovery Administration.

Butler, Piers, Piers also spelled PIERCE: *see* Ormonde, Piers Butler, 8th earl of.

Butler, R(ichard) A(usten), BARON BUTLER OF SAFFRON WALDEN, byname RAB BUTLER (b. Dec. 9, 1902, Attock Serai, India—d. March 8, 1982, Great Yeldham, Essex, Eng.), British statesman high in the councils of government during World War II and the postwar years.

Educated at Cambridge (1921–25), Butler lectured at that university on French history until 1929, when he was elected to Parliament as a Conservative. During the 1930s he worked successively in the ministries governing Indian, labour, and foreign affairs and earned some later reproach for championing the Munich Pact of 1938. During World War II, as president of the Board of Education, he was chiefly responsible for developing the comprehensive and revolutionary Education Act of 1944. After the war he was one of the prime advocates of an international educational body, resulting in the formation of UNESCO.

When the Conservatives returned to power in 1951, Butler became chancellor of the exchequer; in 1955 he became lord privy seal and vigorously supported Prime Minister Anthony Eden during the Suez Crisis in 1956; for doing so, he was passed over for Harold Macmillan when a new Conservative prime minister was chosen. He was leader of the House of Commons from 1955 to 1961. His subsequent ministerial posts were home secretary (1957–62), deputy prime minister (1962–63), and foreign secretary (1963–64). He was created a life peer, Baron Butler of Saffron Walden, in 1965 and made a Knight of the Garter in 1971. His *The Art of the Possible* (1971) is considered an excellent autobiography.

Butler, Reg, byname of REGINALD COTTERELL BUTLER (b. April 28, 1913, Buntingford, Hertfordshire, Eng.—d. Oct. 23, 1981, Berkhampstead, Hertfordshire), English sculptor of figurative works noted for their strenuous quality of line.

Butler studied architecture and lectured at the Architectural Association School, London (1937–39). He worked for a time as a blacksmith, and his early openwork sculptures in wrought iron reflect this training. His first one-man exhibition was held in London in 1949, and in 1952 and 1954 he exhibited at the prestigious Venice Biennale. Butler's work in shell bronze from the mid-1950s shows an increasing concern with volume and texture; his continued preoccupation with line, however, lends the naturalistic nudes of this period a distinctive tension. After 1960, rejecting a set personal idiom, he sculpted abstract towers, nudes influenced by African primitive art, and realistically painted erotic nudes.

Butler, Samuel (baptized Feb. 8, 1612, Strensham, Worcestershire, Eng.—d. Sept. 25, 1680, London), poet and satirist, famous as the author of *Hudibras,* the most memorable burlesque poem in the English language and the first English satire to make a notable and successful attack on ideas rather than on personalities. It is directed against the fanaticism, pretentiousness, pedantry, and hypocrisy that Butler saw in militant Puritanism, extremes which he attacked wherever he saw them.

Butler, the son of a farmer, was educated at the King's school, Worcester. He afterward obtained employment in the household of the countess of Kent, at Wrest, Bedfordshire, where he had access to a fine library. He then passed into the service of Sir Samuel Luke, a rigid Presbyterian, a colonel in the Parliamentary army, and scoutmaster general for Bedfordshire. In his service Butler undoubtedly had firsthand opportunity to study the motley collection of cranks, fanatics, and scoundrels who attached themselves to the Puritan army and whose antics were to form the subject of his famous poem. At the restoration of the monarchy he obtained a post as secretary to Richard Vaughan, earl of Carbery, lord president of Wales, who made him steward of Ludlow castle, an office he held throughout 1661. About this time he is said to have married a woman with a "competent fortune" that was, however, squandered through "being put out on ill securities."

The first part of *Hudibras* was apparently on sale by the end of 1662, but the first edition, published anonymously, is dated 1663. Its immediate success resulted in a spurious second part appearing within the year; the authentic second part, licensed in 1663, was published in 1664. The two parts, plus "The Heroical Epistle of Hudibras to Sidrophel," were reprinted together in 1674. In 1677 Charles II, who delighted in the poem, issued an injunction to protect Butler's rights against piratical printers. In 1678 a third (and last) part was published.

The hero of *Hudibras* is a Presbyterian knight who goes "a-coloneling" with his squire, Ralpho, an Independent. They constantly squabble over religious questions and, in a series of grotesque adventures, are shown to be ignorant, wrongheaded, cowardly, and dishonest. Butler had derived his outline from Cervantes, and his burlesque method (making everything "low" and undignified) from Scarron. However, his brilliant handling of the octosyllabic metre, his witty, clattering rhymes, his delight in strange words and esoteric learning, and his enormous zest and vigour create effects that are entirely original. Its pictures of low life are perhaps the most notable things of their kind in English poetry between Skelton and Crabbe, with both of whom Butler has a certain affinity.

According to John Aubrey, the antiquary, after the appearance of *Hudibras* King Charles and the lord chancellor, Clarendon, promised Butler considerable emoluments that never seem to have materialized. In the latter part of his life he was attached to the suite of George Villiers, 2nd duke of Buckingham; but there seems little doubt that Butler died a poor and disappointed man who, at the end of an apparently successful literary career, in the words of a contemporary, "found nothing left but poverty and praise."

Butler's other works include "The Elephant in the Moon" (1676), mocking the solemnities of the newly founded Royal Society; and "Re-

partees between Puss and Cat at a Caterwalling," laughing at the absurdities of contemporary rhymed heroic tragedy. *Genuine Remains in Verse and Prose of Mr. Samuel Butler,* in two volumes (1759), was edited by Robert Thyer from Butler's papers and includes more than 100 brilliant prose "Characters" in the manner of Theophrastus, as well as a satiric analysis of the duke of Buckingham, "Duke of Bucks," that bears comparison with the "Zimri" characterization in Dryden's *Absalom and Achitophel.*

The best modern editions of Butler's works are *Hudibras, Parts I and II, and Selected Other Writings,* edited by John Wilders and Hugh De Quehen (1973); and *Prose Observations,* edited by Hugh De Quehen (1978).

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

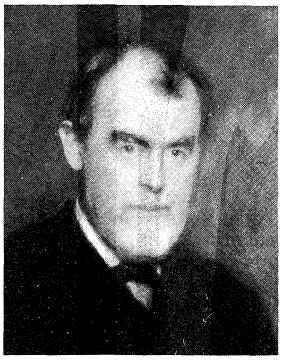
Butler, Samuel (b. Dec. 4, 1835, Langar Rectory, Nottinghamshire, Eng.—d. June 18, 1902, London), English novelist, essayist, and critic whose satire *Erewhon* (1872) foreshadowed the collapse of the Victorian illusion of eternal progress. *The Way of All Flesh* (1903), his autobiographical novel, is generally considered his masterpiece.

Butler was the son of the Rev. Thomas Butler and grandson of Samuel Butler, headmaster of Shrewsbury School and later bishop of Lichfield. After six years at Shrewsbury, the young Samuel went to St. John's College, Cambridge, and was graduated in 1858. His father wished him to be a clergyman, and young Butler actually went as far as to do a little "slumming" in a London parish by way of preparation for holy orders. But the whole current of his highly independent and heretical nature was carrying him away from everything his father stood for: home, church, and Christianity itself—or what Christianity had appeared to mean at Langar Rectory. Butler returned to Cambridge and continued his musical studies and drawing, but after an unpleasant altercation with his father he left Cambridge, the church, and home and emigrated to New Zealand, where (with funds advanced by his father) he set up a sheep run in the Canterbury settlement.

When Darwin's *Origin of Species* (1859) came into his hands soon after his arrival in New Zealand, it took him by storm; he became "one of Mr. Darwin's many enthusiastic admirers," and a year or two later he told a friend that he had renounced Christianity altogether. Yet, as it proved, Christianity had by no means finished with him. For the next 25 years it was upon religion and evolution that Butler's attention was mainly fixed. At first he welcomed Darwinism because it enabled him to do without God (or rather, without his father's God). Later, having found a God of his own, he rejected Darwinism itself because it left God out. Thus, he antagonized both the church and the orthodox Darwinians and spent his life as a lonely outsider, or as Butler called himself after the biblical outcast, "an Ishmael." To the New Zealand *Press* he contributed several articles on Darwinian topics, of which two—"Darwin Among the Machines" (1863) and "Lucubratio Ebria" (1865)—were later worked up in *Erewhon.* Both show him already grappling with the central problem of his later thought: the relationship between mechanism and life. In the former he tries out the consequences of regarding machines as living organisms competing with man in the struggle for existence. In the "Lucubratio" he takes the opposite view that machines are extracorporeal limbs and that the more of these a man can tack on to himself the more highly evolved an organism he will be.

Having doubled his capital in New Zealand, Butler returned to England (1864) and took the apartment in Clifford's Inn, London, which was to be his home for the rest of his life. In 1865 his *Evidence for the Resurrection of Jesus Christ . . . Critically Examined* appeared anonymously. For a few years he studied painting at Heatherley's art school and tried to convince himself that this was his vocation. Until 1876 he exhibited occasionally at the Royal Academy. One of his oil paintings, "Mr. Heatherley's Holiday" (1874), is in the Tate Gallery, London, and his "Family Prayers," in which the ethos of Langar Rectory is satirically conveyed, is at St. John's College, Cambridge. Later he tried his hand at musical composition, publishing *Gavottes, Minuets, Fugues and Other Short Pieces for the Piano* (1885), and *Narcissus,* a comic cantata in the style of Handel—whom he rated high above all other composers—in 1888; *Ulysses: An Oratorio* appeared in 1904. It was typical of Butler to use his native gifts and mother wit in such exploits, and even in literature, his rightful territory, much of his work is that of the shrewd amateur who sets out to sling pebbles at the Goliaths of the establishment. "I have never," he said, "written on any subject unless I believed that the authorities on it were hopelessly wrong"; hence his assault on the citadels of orthodox Darwinism and orthodox Christianity; hence, later, his attempt to prove that the *Odyssey* was written in Sicily by a woman (*The Authoress of the Odyssey,* 1897); and hence his new interpretation of Shakespeare's sonnets (*Shakespeare's Sonnets Reconsidered, and in Part Rearranged,* 1899).

Erewhon (1872) made whatever reputation as a writer Butler enjoyed in his lifetime; it was the only one of his many books on which he made any profit worth mentioning, and he only made £69 3*s.* 10*d.* on that. Yet it was received by many as the best thing of its kind since *Gulliver's Travels*—that is to say, as a satire on contemporary life and thought conveyed by the time-honoured convention of travel in an imaginary country. The opening chapters, based upon Butler's recollections of the upper Rangitoto Mountains in New Zealand, are in an excellent narrative style; and a description of the hollow statues at the top of the pass, vibrating in the wind with unearthly chords, makes a highly effective transition to the strange land beyond. The landscape and people of Erewhon are idealized from northern Italy; its institutions are partly utopian and partly satiric inversions of our own world. Butler's two main themes, religion and evolution, appear respectively in "The Musical Banks" (churches) and in chapters called "Some Erewhonian Trials" and "The Book of the Machines." The Erewhonians have long ago abolished machines as dangerous competitors in the stuggle for existence, and by punishing disease as a crime they have produced a race of great physical beauty and strength.



Samuel Butler, detail of an oil painting by Charles Gogin, 1896; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

The Fair Haven (1873) is an ironical defense of Christianity, which under the guise of orthodox zeal undermines its miraculous foundations. Butler was dogged all through life by the sense of having been bamboozled by those who should have been his betters; he had been taken in by his parents and their religion; he was taken in again by friends, who returned neither the money nor the friendship they accepted from Butler for years; life itself, and the world, sometimes seemed to him a hollow sham. Was Darwin himself, his saviour from the world of Langar Rectory, now to prove a fraud as well? This was the suspicion that dawned upon him while writing *Life and Habit* (1878) and envenomed the series of evolutionary books that followed: *Evolution, Old and New* (1879), *Unconscious Memory* (1880), and *Luck or Cunning* (1887). Darwin had not really explained evolution at all, Butler reasoned, because he had not accounted for the variations on which natural selection worked. Where Darwin saw only chance, Butler saw the effort on the part of creatures to respond to felt needs. He conceived creatures as acquiring necessary habits (and organs to perform them) and transmitting these to their offspring as unconscious memories. He thus restored teleology to a world from which purpose had been excluded by Darwin, but instead of attributing the purpose to God he placed it within the creatures themselves as the life force.

Many regard *The Way of All Flesh,* published in 1903, the year after Butler's death, as his masterpiece. It certainly contains much of the quintessence of Butlerism. This largely autobiographical novel tells, with ruthless wit, realism, and lack of sentiment, the story of Butler's escape from the suffocating moral atmosphere of his home circle. In it, the character Ernest Pontifex stands for Butler's early self and Overton for his mature self; Theobald and Christina are his parents; Towneley and Alethea represent "nice" people who "love God" in Butler's special sense of having "good health, good looks, good sense, experience, and a fair balance of cash in hand." The book was influential at the beginning of the anti-Victorian reaction, and Butler was saluted by G.B. Shaw as "the greatest English writer of the latter half of the nineteenth century."

(B.W.)

MAJOR WORKS. *Topographical. A First Year in Canterbury Settlement,* 1863 (ed. by R.A. Streatfield, with other early essays, 1914); *Alps and Sanctuaries of Piedmont and the Canton Ticino,* 1882; *Ex Voto: An Account of the Sacro Monte or New Jerusalem at Varallo-Sesia,* 1888.

Satirical and theological. The Evidence for the Resurrection of Jesus Christ, as Given by the Four Evangelists, Critically Examined, 1865 (anon.); *Erewhon; or, Over the Range,* 1872 (anon.); *The Fair Haven,* 1873; *Erewhon Revisited,* 1901; *God the Known and God the Unknown,* 1909.

Scientific. Life and Habit: An Essay After a Completer View of Evolution, 1878; *Evolution, Old and New,* 1879; *Unconscious Memory,* 1880; *Luck or Cunning as the Main Means of Organic Modification?,* 1887.

Novel. The Way of All Flesh, 1903.

Miscellaneous. A Lecture on the Humour of Homer, 1892; *The Life and Letters of Dr. Samuel Butler,* 2 vol., 1896; *The Authoress of the Odyssey,* 1897; *The Iliad of Homer, Rendered into English Prose,* 1898; *Shakespeare's Sonnets Reconsidered, and in Part Rearranged,* 1899; *The Odyssey, Rendered into English Prose,* 1900; *Essays on Life, Art and Science,* 1904; *The Note-Books of Samuel Butler* (ed. H. Festing Jones), 1912.

Musical compositions. Gavottes, Minuets, Fugues and Other Short Pieces for the Piano, 1885 (in collaboration with H. Festing Jones); *Narcissus,* 1888 (a comic cantata in the style of Handel); *Ulysses: An Oratorio,* 1904.

BIBLIOGRAPHY. The standard biography is H. Festing Jones, *Samuel Butler, Author of Erewhon*

(1835–1902): A Memoir, 2 vol. (1919). Studies on different aspects of Butler as man and writer include: M.R. Garnett, *Samuel Butler and His Family Relations* (1926); C.G. Stillman, *Samuel Butler: A Mid-Victorian Modern* (1932); Malcolm Muggeridge, *The Earnest Atheist: A Study of Samuel Butler* (1936); P.N. Furbank, *Samuel Butler, 1835–1902* (1948); Philip Henderson, *Samuel Butler: The Incarnate Bachelor* (1953); Basil Willey, *Darwin and Butler: Two Versions of Evolution* (1960); U.C. Knoepflmacher in *Religious Humanism and the Victorian Novel,* ch. 7–8 (1965); also essays in J.B. Yeats, *Essays, Irish and American* (1918); H. Kingsmill, *After Puritanism, 1850–1900* (1929); Desmond MacCarthy, *Collected Essays II* (1932). See also A.J. Hoppe, *A Bibliography of the Writings of Samuel Butler (Author of "Erewhon") and of Writings About Him* (1925, reprinted 1967).

Butler, Thomas: *see* Ormonde, Thomas Butler, 10th earl of.

Butlerov, Aleksandr Mikhaylovich (b. Sept. 6, 1828, Chistopol, Russia—d. Aug. 17, 1886, Butlerovka), Russian chemist who helped advance the theory of structure in chemistry, especially with regard to tautomerism, the facile interconvertibility of certain structurally similar compounds.

Butlerov, portrait by an unknown artist
Novosti Press Agency

Joining the faculty of Kazan University in 1849, Butlerov took up the new theories of the French chemists Auguste Laurent and Charles Gerhardt and worked on new methods of synthesizing known compounds and on entirely new synthetics.

In 1861 Butlerov stated his concept of chemical structure: that the chemical nature of a molecule is determined not only by the number and type of atoms but also by their arrangement. He foresaw and demonstrated the existence of isomers (molecules composed of the same atoms but in different arrangements), such as the two butanes and three pentanes. In 1866 he synthesized isobutane. Two years later he discovered that unsaturated organic compounds contain multiple bonds.

Buto, also called UTO, UDJO, EDJO, WADJET, or WADJIT, cobra goddess of ancient Egypt. Depicted as an asp, twined around a papyrus stem, she was the protective goddess of the prehistoric northern kingdom and symbolized Lower Egypt. Buto and Nekhbet, the vulture-goddess of Upper Egypt, were the protective goddesses of the king and were often represented together on the king's diadem, symbolizing his reign over all of Egypt. In mythology, she was nurse to the infant god Horus and helped Isis, his mother, protect him from his treacherous uncle, Seth, when she took refuge in the Delta swamps. The similarity of this myth to the Greek story of Leto and Apollo on Delos probably resulted in the later identification of Buto with Leto.

Buto is also the Greek form of the ancient Egyptian Per Wadjit (Coptic Pouto, House of Wadjit), the name of the capital of the 6th Lower Egyptian nome (province), modern Tall al-Farāʿīn, of which the goddess was the local deity.

Buton (Indonesia): *see* Butung.

Butor, Michel (b. Sept. 14, 1926, Monsen-Baroeul, Fr.), French novelist and essayist, one of the leading figures among exponents of the *nouveau roman* ("new novel"), the avant-garde French novel that emerged in the 1950s.

After his early education at the Lycée Louis-le-Grand, Paris, Butor studied at the Sorbonne. From 1951 to 1953 he was lecturer at the University of Manchester, and he was subsequently a teacher in Thessaloníki (1954–55) and Geneva (1956–57). After an early experimental novel, *Passage de Milan* (1954; "Passage from Milan"), Butor won critical acclaim with *L'Emploi du temps* (1956; *Passing Time,* 1960), a complex evocation of his gloomy season in Manchester. With his third novel, *La Modification* (1957; in Britain, *Second Thoughts,* in U.S., *A Change of Heart,* 1958), Butor perfected his experimental technique and was considered to have arrived at his full powers. The work won the Prix Renaudot, and its popular success enabled Butor to give up his academic career.

Butor, who regarded the novel as a blend of philosophy and poetry, owed much to the influence of James Joyce. A feature common to all his novels is a rigid structure: in *Passage de Milan,* a single day in a tenement building; in *La Modification,* a journey in a compartment of the Paris–Rome express. *Degrés* (1960; *Degrees,* 1961), his fourth novel, imposes on the action the rigid pattern of a college timetable. Outstanding among his nonfiction works is *Mobile* (1962), a prose–rhapsody aiming to capture the spirit of the United States. Later works include *Portrait de l'artiste en jeune singe* (1967; "Portrait of the Artist as a Young Monkey") and *Boomerang* (1978). He has also published several collections of poetry.

butsudan, in Japanese households, the Buddhist family altar; historically, it was maintained in addition to the Shintō *kamidana* ("god shelf"). The Buddhist altar generally contains memorial tablets for dead ancestors and, in accordance with sect affiliation, representations of various Buddhist divinities. Incense and candles are lit and flowers are

Butsudan in a Japanese home
Bob and Ira Spring

offered by the devout at simple daily services and, periodically, the family ancestors are memorialized before the *butsudan.*

The formal precedent for household altars was probably the establishment in AD 655 of a court chapel; an Imperial order called for similar sanctuaries to be set up in every house. The *butsudan* did not become common, however, until the 17th century, when, as a part of a measure to eliminate Christianity, Buddhist priests were required by the government to inspect households for proper maintenance of the altar. In modern Japan the *butsudan* has survived or supplanted the Shintō *kamidana* in many homes, though the rituals connected with it have commonly become abbreviated.

Butt, Dame Clara (Ellen), married name CLARA ELLEN KENNERLEY RUMFORD (b. Feb. 1, 1872, Southwick, Sussex, Eng.—d. Jan. 23, 1936, North Stoke, Oxfordshire), English contralto known for her performances of ballads and oratorios.

She made her debut in 1892 as Ursula in Sir Arthur Sullivan's cantata *The Golden Legend.* She possessed a powerful contralto voice

Dame Clara Butt, poster portrait by an unknown artist, 1916
By courtesy of the Victoria and Albert Museum, London

and a commanding personality and was admired especially in the oratorios of Handel and Mendelssohn. She also became popular as a ballad singer. Sir Edward Elgar wrote his song cycle *Sea Pictures* for her, and she inspired the part of the angel in his oratorio *Dream of Gerontius.* In 1900 she married the baritone Kennerley Rumford, with whom she gave recitals. One of her few opera appearances was as Orfeo in Gluck's *Orfeo ed Euridice.* She was appointed a Dame of the British Empire in 1920.

Butt, Isaac (b. Sept. 6, 1813, Glenfin, County Donegal, Ire.—d. May 5, 1879, near Dundrum, County Dublin), lawyer and Irish nationalist leader who, if not the originator of the term Home Rule, was the first to make it an effective political slogan. Founder (1870) and first chief of the Home Government Association and president (1873–77) of the Home Rule Confederation of Great Britain, he was superseded in 1878 as head of the Home Rule movement by the younger and more forceful Charles Stewart Parnell.

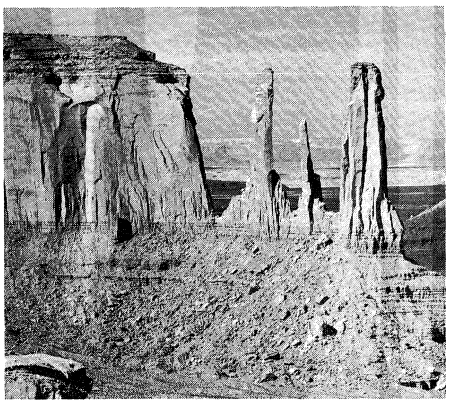
Appointed professor of political economy at Trinity College, Dublin (1836–41), Butt was called to the Irish bar in 1838 and the English bar in 1859. In 1848 he undertook the defense of the Young Ireland leaders, who were charged with high treason for their abortive insurrection that year. From 1865 to 1869 he was the principal defense counsel for the imprisoned leaders of the Fenians (Irish Republican, or Revolutionary, Brotherhood). Intermittently from 1852 he represented, successively, one English and two Irish constituencies in the British House of Commons.

Despite his legal work for the Fenians, Butt, who was basically a conservative, feared the consequences of a successful Fenian revolt. Disillusioned, however, by the British government's failure to relieve the great Irish famine of the late 1840s, he became convinced that a native parliament was required for Irish land reform and other needs. In November 1869 he advocated a political party that would unite all Irish nationalist groups; in May 1870 he called for an Irish Parliament subordinate to the imperial Parliament at Westminster, and later that year he formed the Home Government Association. From 1871 he quickened

the Irish nationalist agitation in the House of Commons but gradually lost his leadership, partly because he disapproved of Parnell's tactics of obstructing routine parliamentary business.

A biography, *The Road of Excess* (1946), was written by Terence de Vere White.

butte, also spelled BUTE (French *butte*, "hillock" or "rising ground"), a flat-topped hill surrounded by a steep escarpment from the



Sandstone buttes and pinnacles, Monument Valley, Arizona
Josef Muench

bottom of which a slope descends to the plain. The term is sometimes used for an elevation higher than a hill but not high enough for a mountain. Buttes capped by horizontal platforms of hard rock are characteristic of the arid plateau region of the western United States. *See also* mesa.

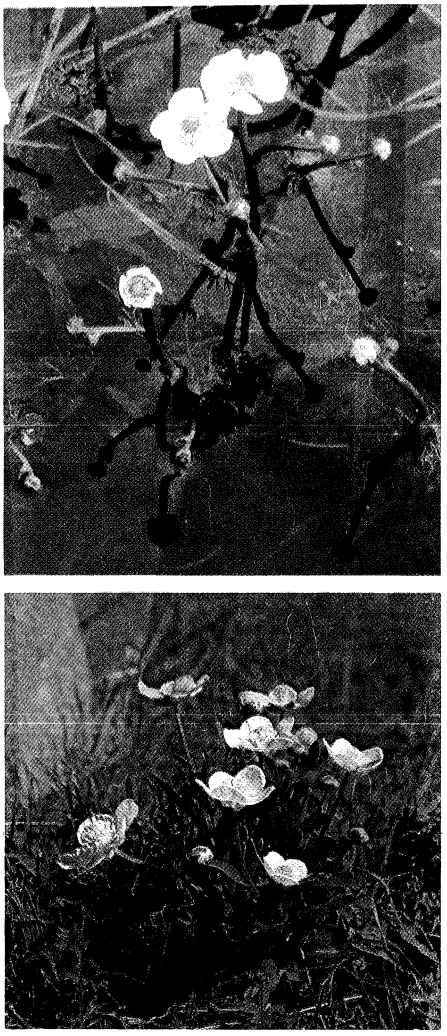
Butte-Silver Bow, city, seat (1881) of Silver Bow County, southwestern Montana, U.S., on the western slope of the Continental Divide. Butte was laid out in 1886 and was named for Big Butte, a nearby conical peak. The rich mineral deposits of the area attracted settlers: placer gold was discovered in 1864, and silver was first successfully treated there in 1875. Economic expansion was slow until the arrival of the railroads in the 1880s. Copper production, developed by the Anaconda Company, began there in 1882, and by 1900 was yielding half the nation's output; zinc, lead, and manganese are also found in quantity. The decline in mining and the increased use of machinery after 1940 brought an economic labour slump, resulting in a 20-year economic plan (the Greater Butte Project) and the inauguration of open-pit mining in the area. Light industry and livestock sales now supplement mining. The city of Butte and Silver Bow county merged in 1977 creating Butte-Silver Bow. The Montana College of Mineral Science and Technology (1893) is in Butte-Silver Bow. Tourism is an added source of income, based on displays of mining and smelting operations, nearby Columbia Gardens, Lewis and Clark Caverns State Park, Deerlodge National Forest (headquartered in Butte-Silver Bow), and the Beef Trail Ski Area. Inc. 1879. Pop. (1980) 37,205.

butter, a yellow to white solid emulsion of fat globules, water, and inorganic salts produced by churning cows' milk or cream. Butter is a high-energy food, containing approximately 715 calories per 100 grams. It has a high content of milkfat, or butterfat (at least 80 percent), but is low in protein. Butter has substantial amounts of vitamins A and D and also contains calcium and phosphorus. The colour of butter is caused by carotene and other fat-soluble pigments in the fat. Butter has long been used as a spread and as a cooking fat. It is an important edible fat in northern Europe, North America, and other places where cattle are the primary dairy animals.

buttercup, also called CROWFOOT, any of about 250 species of herbaceous flowering plants comprising the genus *Ranunculus* of the family Ranunculaceae. Buttercups are distributed throughout the world and are especially common in woods and fields of the North Temperate Zone.

Most buttercups have tuberous or fibrous roots and solitary or loosely clustered flowers with five green sepals, five glossy yellow (sometimes white) petals, and numerous male and female structures (stamens and pistils).

The turban, or Persian buttercup (*R. asiaticus*), is the florist's ranunculus; usually the double-flowered form *R. asiaticus* 'Superbissimus' is grown for the winter trade. Among the many wild species are the tall meadow buttercup (*R. acris*), native to Eurasia but widely introduced elsewhere; the swamp buttercup (*R. septentrionalis*) of Eastern North American wetlands; and the Eurasian creeping buttercup, or butter daisy (*R. repens*), widely naturalized in America. Both the pond crowfoot (*R. peltatus*) and common water crowfoot (*R. aquatilis*) have broad-leaved floating leaves and finely dissected submerged leaves.



(Top) Aquatic buttercup (*Ranunculus flabellaris*), and (bottom) terrestrial buttercup (*R. glaberrimus*)
(Top) Kitty Kohout from Root Resources—EB Inc., (bottom) Frances V. Davis

butterfat, also called MILKFAT, natural fatty constituent of cows' milk and the chief component of butter. Clear butterfat rises to the top of melted butter and may be poured off, leaving the albuminous curd and water that favour the growth of organisms promoting rancidity; thus, butterfat does not become rancid as readily as butter and can be stored unrefrigerated for several months. Butterfat is used in cooking and as a component in special dishes.

Ghī (ghee) is the name for butterfat in India, where it is prepared in large quantities; it is commonly mixed with the milk fat of the buffalo. *Ghī* is the chief form of cooking oil in many Indian regional cuisines; it is also used medicinally and plays a part in some Hindu religious ceremonies. *Samna* is the name for butterfat in Egypt, where it is also prepared in large quantities; it is commonly mixed with the milk fats of sheep and goats.

Chemically butterfat consists essentially of a mixture of glycerides, particularly those derived from water-soluble fatty acids, such as butyric, caproic, caprylic, and capric acids. A measure of the amount of these acids, the Reichert–Meissl, or Reichert–Wollny, number is important in the analysis of butterfat.

Butterfield, William (b. Sept. 7, 1814, London—d. Feb. 23, 1900, London), architect who was prominent in the Gothic Revival in England. Sometimes called the Oxford movement's most original architect, Butterfield introduced an architectural realism that included a clear expression of materials in colourful contrast of textures and patterns.

Articled first to a Westminster builder, he later spent three years with a Worcester architect, acquiring a taste for Gothic. In 1843 he became connected with the Cambridge Camden Society, a High Anglican group who wished ecclesiastical architecture to conform to the Oxford reformers' liturgy.

Butterfield, who designed nearly 100 churches noted for their liturgical correctness, worked in a highly original, astringent manner using brick and roughly sawed timber. Variegated brick banding and contrasting coloured materials are characteristic of all Butterfield's works. Interior surfaces were covered with marbles and tiles to achieve an even richer coloration. Butterfield's "structural polychromy" became the fashion of the late Victorian period. His most ornate church is All Saints', Margaret Street, London (1849–59). Others include St. Matthias', Stoke Newington (1851–53), and St. Alban's, Holborn (1859–63), in London; a church at Babbacombe, Devon (1867–74); and in 1891–92, St. Augustine's, Bournemouth, Hampshire. His few secular works include Keble College, Oxford, mostly complete by 1875.

butterfish, any of the thin, deep-bodied, more or less oval and silvery fishes of the family Stromateidae (order Perciformes). Butterfishes are found in warm and temperate seas and are characterized by a small mouth, forked tail, and a single dorsal fin. Like the related rudderfishes (Centrolophidae) and man-of-war fishes (Nomeidae), they also have peculiar, toothed outpocketings in the esophagus. (In some systems of classification Centrolophidae and Nomeidae are included in Stromateidae.)

Certain butterfishes, such as the dollarfish (*Poronotus triacanthus*), are noted for taking shelter when young among the tentacles of jellyfishes. The dollarfish and several other species of butterfishes are commonly used as food. Among these are the harvest fish (*Peprilus alepidotus*), an Atlantic species that usually grows to about 20 centimetres (8 inches) long; the Pacific pompano (*Peprilus simillimus*), a silvery Californian fish; and *Pampus argenteus,* a black-spotted, Oriental fish.

The rock gunnel, family Pholidae, is sometimes also called a butterfish (*see* gunnel).

butterfly, any of several thousand species of insects belonging to about six families (or more, in other systems of classification) constituting the subfamily Papilionoidea. Along with the moths and the skippers, they make

up the insect order Lepidoptera. Butterflies are nearly worldwide in distribution.

Like those of moths, the wings, bodies, and legs of butterflies are covered with dustlike scales that come off when they are handled. Unlike moths, butterflies are usually brightly or strikingly coloured and are active during the day. Perhaps the most distinctive features of the butterfly are its club-tipped antennae and its habit of holding the wings vertically over the back when at rest.

The life cycle of the butterfly, like that of other lepidopterans, has four stages: egg, larva (caterpillar), pupa (chrysalis), and adult (imago). The larva and adults of most species are plant eaters.

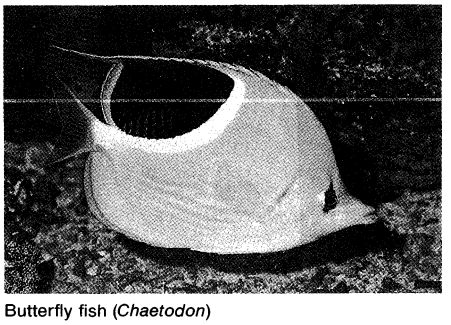
The true butterflies (Papilionoidea) are divided into families as follows: Pieridae, the whites and sulfurs, known for their mass migrations; Papilionidae, the swallowtails and parnassians (the latter sometimes considered a separate family, Parnassiidae); Lycaenidae, including the blues, coppers, hairstreaks, and gossamer-winged butterflies; Riodinidae, the metalmarks, found chiefly in the American tropics; Libytheidae, snout butterflies; and Nymphalidae, called the nymphalid butterflies, the largest and most diverse family (divided by some authorities into several families), which includes such popular butterflies as the admirals, fritillaries, monarchs, zebras, and painted ladies. *See also* lepidopteran.

butterfly bush, any of more than 100 species of plants comprising the genus *Buddleia*, native to tropical and subtropical areas of the world. The genus was formerly included in the family Loganiaceae of the order Gentianales, but many authorities now put it in the family Buddlejaceae of the order Scrophulariales, a family containing about 10 genera and more than 150 species.

Summer lilac (*Buddleia davidi*)
C. Foord from The Natural History Photographic Agency—EB Inc.

Most species of *Buddleia* have hairy or scurfy leaves and clusters of purple, white, yellow, or orange flowers. Several species are cultivated as garden ornamentals.

butterfly fish, any of the approximately 115 species of small, quick-moving marine fishes in the family Chaetodontidae (order Perciformes). Butterfly fishes are found among tropical reefs around the world but are concentrated in the Indo-Pacific oceanic region. Butterfly fishes are deep-bodied and thin from side to side, with a single dorsal fin and a small mouth with tiny, bristle-like teeth. The jaws are sometimes drawn out into a relatively long snout, as in the longnose butterfly fish (*Chelmon rostratus*) of the Indo-Pacific and the longsnout butterfly fish (*Prognathodes aculeatus*) of the Atlantic. Most species have strong, prominent spines on the front portions of their dorsal fins.



Butterfly fish (*Chaetodon*)
P.P. Ching—Shostal/EB Inc.

Butterfly fishes are small, seldom exceeding a length of about 20 centimetres (8 inches). They move about with a flitting, darting motion and are very brightly coloured. Black and shades of yellow predominate, and markings are often in the form of dark bands and one or more large spots (ocelli) on the dorsal or posterior region that may serve to confuse predators. Butterfly fishes usually frequent shallow inshore waters, where they feed on a variety of crustaceans and on coral polyps.

The family contains 10 genera, with the genus *Chaetodon* alone accounting for almost 90 species. Among them are the foureye butterfly fish (*Chaetodon capistratus*), a common West Indian species with a white-ringed, black ocellus near its tail; the spotfin butterfly fish (*C. ocellatus*), a western Atlantic species with yellow fins and a dark spot at the base of its dorsal fin; and the pennant coralfish, or feather-fin bull fish (*Heniochus acuminatus*), a black-and-white striped Indo-Pacific species with a very long spine in its dorsal fin.

Angelfishes (family Pomacanthidae) are closely related to butterfly fishes and are sometimes placed within the family Chaetodontidae; in this context they comprise the subfamily Pomacanthinae.

butterfly orchid, any plant of the genus *Platanthera* (or *Habenaria*), family Orchidaceae, which has about 100 species native to Eurasia, North Africa, and North and Central America. "Butterfly orchid" also is the common name for a species of the genus *Oncidium* (*q.v.*).

The white-flowered lesser butterfly orchid (*P. bifolia*) and the greater butterfly orchid (*P. chlorantha*), with larger, greenish-white flowers, are well-known species. Both have 5 to 15 pleasantly scented flowers arranged on a single spike.

butterfly ray, any of several stingray (*q.v.*) species.

butterfly weed, also called PLEURISY ROOT, ORANGEROOT, or ORANGE MILKWEED (*Asclepias tuberosa*), North American plant of the milkweed family (Asclepiadaceae), a stout, rough-haired perennial with long horizontal roots. The leafy, erect, somewhat branching stem is about 0.3 to 0.9 metre (1 to 3 feet) tall. In midsummer it bears numerous clusters of bright-orange flowers.

Butterfly weed (*Asclepias tuberosa*)
Derek Fell

Unlike most milkweeds, this plant has a scanty milky juice. It is native to dry fields and is often planted in wild gardens or grown as a border plant.

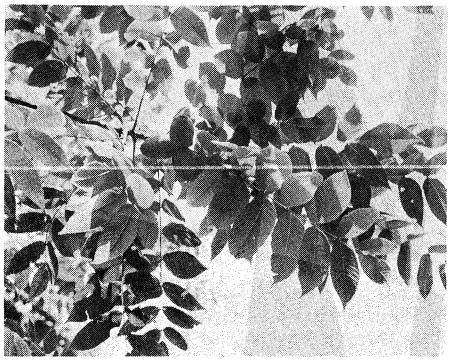
Butterick, Ebenezer (b. May 29, 1826, Sterling, Mass., U.S.—d. March 31, 1903, Brooklyn, N.Y.), American manufacturer who is regarded as the inventor of standardized paper patterns for clothing (1859), first sold in Sterling, in 1863. Butterick established a pattern factory in Fitchburg, Mass., later that year and moved it to Brooklyn, N.Y., in 1869. He founded a fashion magazine, *Metropolitan,* in 1869, to promote pattern sales.

Butterick, *c.* 1890
Butterick Archives

buttermilk, nutritious liquid mixture remaining after the fatty solids in cream have been churned into butter and removed. Buttermilk consists mainly of water (about 90 percent), milk sugar (about 5 percent), and casein (about 3 percent) and contains small quantities of butterfat and lactic acid, which give it a slightly sour taste. Because of its healthful qualities, buttermilk has become popular as a beverage.

Cultured buttermilk is made by adding certain microorganisms to milk. In much of the United States and Canada, most of the buttermilk sold is made by adding certain bacteria to skimmed milk to produce fermentation. The resulting product, called cultured buttermilk, is thicker than natural buttermilk but is similar to it in other respects. Cultured buttermilk is also sold in western Europe and other regions where dairy products are made commercially.

butternut (*Juglans cinerea*), deciduous nut-producing tree of the walnut family (Juglandaceae), native to eastern North America. A mature tree has gray, deeply furrowed bark and is about 15 to 18 metres (50 to 60 feet) tall and 30 to 60 centimetres (12 to 24 inches) in diameter. Each leaf, about 45 to 75 cm long, has 11 to 17 yellowish-green leaflets that are hairy underneath. Chocolate-coloured partitions divide the pith of the twig into many chambers. The egg-shaped fruit has a sticky, greenish-brown husk. The hard woody nut bears many ridges and contains a sweet, oily seed. Light-brown butternut wood is used locally, but the tree is economically important for its edible nuts and for a yellow or orange dye obtained from the fruit husks. Some substances found in the inner bark of the roots are used in medicines.



Butternut (*Juglans cinerea*)
Kenneth and Brenda Formanek—EB Inc.

butternut: *see* Brazil nut.

butterscotch, usually hard candy made by boiling brown sugar and butter or corn syrup together in water. The derivation of the name is disputed as to whether it denotes the candy's origin in Scotland or an original ingredient of "scotched," or scorched, butter. Although the terms butterscotch and caramel are sometimes used interchangeably, butterscotch is generally distinguished by the absence of milk or milk substitutes from its recipe.

Butterscotch in its hard form is typically marketed as translucent, rich yellow drops or disks individually wrapped in cellophane. Butterscotch chips, analogous to chocolate chips, are packaged and sold primarily for use in dessert cooking. In the home kitchen, the making of butterscotch is usually an initial step in the preparation of some more complicated, elegant dessert. The brown sugar and butter formula is basic to a variety of cookies, puddings, icings, fudges, and sauces.

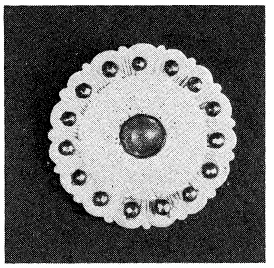
Butterworth, town in Province Wellesley (the mainland part of Pinang state), West Malaysia (Malaya), on the northwestern coastal plain. A railhead and transshipment point on the Sungai (River) Perai Estuary for exports of the Malay Peninsula, it is strategically located 2 mi (3 km) east of the port of Pinang on Pulau Pinang (Penang Island), across the Pinang strait. Linked by ferry to Pinang and by road to the main towns of the peninsula, Butterworth is the hub of a rubber plantation area and has oil-import facilities, a modern tin smelter and steel plant, and the Mak Mandin industrial estate. Directly south across the muddy Perai Estuary is Perai, which has a passenger and goods ferry to Pinang. The town was named for William T. Butterworth, governor of Singapore and Malacca (1843–55). Pop. (1980) 77,982.

Butterworth, town, in the not internationally recognized republic of Transkei, north of East London, South Africa. One of the oldest white settlements in Transkei, it grew from a Wesleyan mission station founded in 1827. Named after Joseph Butterworth, a treasurer of the Wesleyan Mission Society, the settlement acquired town status in 1904. It is a growing industrial centre of Transkei and major industrial sites, including Zitulele and Ibeka, are located on its outskirts. Industries produce processed food, beverages, tobacco products, textiles, weaving apparel, leather goods, wood and wood products, chemicals, and rubber and plastic products. It is on the Umtata-East London railway line and its nearest port is East London. The Butterworth River Cascades with a total drop of 279 ft (85 m) and the Bawa Falls with a sheer drop of 361 ft are located nearby. The town is a point of departure for the popular seaside resorts of Mazeppa Bay and Qolora on the Wild Coast (Indian Ocean) to the east. Pop. (1978 est.) mun., 28,514.

button, usually disklike piece of solid material having holes or a shank through which it is sewed to one side of an article of clothing and used to fasten or close the garment by passing through a loop or hole in the other side. Purely decorative, nonutilitarian buttons are also frequently used on clothing.

The ancient Greeks and Etruscans fastened their tunics at the shoulders with buttons and loops. In medieval Europe, garments were laced together or fastened with brooches or clasps and points, until buttonholes were invented in the 13th century. Then buttons became so prominent that in some places sumptuary laws were passed limiting their use.

By the 14th century buttons were worn as ornaments and fastenings from the elbow to the wrist and from the neckline to the waist. The wearing of gold, silver, and ivory buttons was an indication of wealth and rank. Expensive buttons were also made of copper and its alloys. The metalsmith frequently embellished



French button of pearl shell, metal foil, brass, and rhinestones, 18th century

By courtesy of the Cooper-Hewitt Museum of Decorative Arts and Design, Smithsonian Institution

such buttons with insets of ivory, tortoiseshell, and jewels.

More commonly used buttons were of bone and wood, and button forms of these materials were also used as foundations for fabric-covered buttons. Coarse thread buttons were made by wrapping the thread over a wire ring. In the 18th century luxury metals and ivory largely replaced fabric, although embroidered buttons in designs to complement particular garments were popular. Pewter, the familiar metal of the age, was used to make molded or stamped-out buttons; but these were scorned by the wealthy. Cast brass buttons, particularly calamine brass, with ornamental and distinguishing designs, also became popular on both military and civilian dress.

In the middle of the 18th century, Matthew Boulton, the English manufacturer and partner of James Watt, introduced the bright, costly, cut-steel button, made by attaching polished steel facets to a steel blank. In France the facets of the cut-steel button were elaborated by openwork designs. During the first quarter of the 19th century, a less costly stamped steel button was made in an openwork pattern. Brass buttons gilded by dipping in an amalgam of mercury and gold became popular.

The two-shell metal button was introduced about the same time as the stamped-steel type by B. Sanders, a Danish manufacturer in England. The two shells, thin metal disks enclosing a small piece of cloth or pasteboard, were crimped together on the edges. Sanders also originated the canvas shank. By 1830 fabric-covered buttons were being made mechanically. Also coming into use were animal horns and hoofs, which could be plasticized by heat and cut, dyed, and molded.

Buttons were also made of ceramics and glass. Porcelain buttons became a French specialty; they were decorated by hand-painting or by the transference of designs in coloured inks from tissue paper. Bohemia, modern Czechoslovakia, produced most of the coloured glass used in button manufacture.

In Japan, ceramic buttons, hand-painted in traditional motifs, were developed. Buttons with an intricately carved thickness of vermilion lacquer on a wooden base became a Chinese specialty, and decorated and lacquered papier-mâché buttons became popular in Europe in the late 1800s.

The use of pearly shells of sea mollusks in button-making increased with the mechanization of production. Shell was separated into its component layers by treatment with a nitric acid solution, and blanks were cut out by tubular saws. Holes were bored in the blanks for sewing, and an engraved decoration was mechanically applied. At first only seashell was used, but in the 1890s the U.S. manufacturer John F. Boepple began to use the less iridescent but abundant freshwater mussel shells found along the Mississippi River and its tributaries.

Vegetable ivory buttons made from corozo nutmeats, the fruit of a South American palm, began to appear in the mid-1800s. Thick slices are cured in kilns and processed similarly to shell buttons.

In the 20th century, buttons became primarily utilitarian, not decorative, and in many applications were supplanted by the zipper (*q.v.*). Modern buttons are made of plastics such as cellulose, polystyrene, and polyvinyl resins; designs are usually abstract or geometric. Mass-production machines produce molded buttons either by compressing powdered plastics or by injection—forcing liquid plastic into individual molds through small openings.

Old buttons are increasing in value and are collected for their art and workmanship. The place, date, and name of the maker are usually marked on their backs.

Button, Dick, byname of RICHARD TOTTEN BUTTON (b. July 18, 1929, Englewood, N.J., U.S.), figure skater who dominated U.S. and international amateur competition for several years until 1952, when he became a professional. He was the only man to hold the Olympic, world, European, North American, and United States championships, and in 1948 he held all those titles simultaneously.

At the age of 16 Button became the youngest holder of the U.S. Senior Men's figure skating championship, which he won seven consecutive years (1946–52), tying a record established by Roger Turner (1928–34). He also captured the North American title in 1947, 1949, and 1951 and the European championship in 1948, the last year in which U.S. skaters were permitted to compete.

Button won the world championship five consecutive years (1948–52). In 1948 and in 1952, he won the gold medal for men's figure skating in the Winter Olympic Games. During much of that period he was a student at Harvard University. He skated professionally with the *Ice Capades,* and *Holiday on Ice* skating shows. From 1959, starting his own production company, he was a television producer of sports programs and a commentator for skating telecasts.

Button, Stephen Decatur (b. 1803, Preston, Conn., U.S.—d. Jan. 17, 1897, Philadelphia), U.S. architect whose works influenced modern tall-building design, particularly that of Louis Sullivan. His impact, however, was not recognized by architectural historians until the mid-20th century.

Button discarded the massive dead-wall treatment appropriate to masonry structures and seems to have welcomed the design implications of metal-frame (skeleton) construction 30 years before that method was first used in tall office buildings. Button's 241 Chestnut Street Building (1852) and Leland Building (1855), both in Philadelphia, of five stories each, were given suppressed spandrels and large, squarish windows; their facades appear to be cells of glass. Both were near the office of Furness and Hewitt, the Philadelphia architectural firm for which Sullivan worked as a draftsman in the early 1870s.

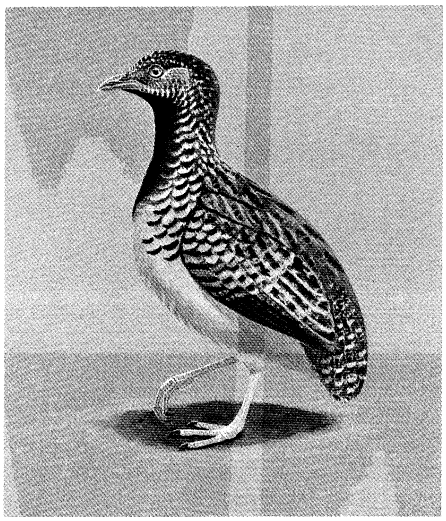
Button, Sir Thomas (d. April 1634), English navigator and naval officer and an early explorer of Canada.

The son of Miles Button of Worleton in Glamorganshire, Wales, Button saw his first naval service in 1588 or 1589; by 1601, when the Spanish fleet invaded Ireland, he had become captain of the pinnace "Moon." He acquitted himself with sufficient distinction to win commendation and a lifetime pension of six shillings eight pence. The following year he commanded a privateer, the "Wylloby," in the West Indies.

In 1612 Button was made a member of the North West Company and given the command of an expedition of two ships—the

"Resolution" and the "Discovery"—to North America to try to find and rescue Henry Hudson, whom mutineers had put adrift in a small boat; Button was also to carry on further exploration of the Northwest Passage. The expedition entered Hudson Strait, where he named Resolution Island for his own vessel. The company found no trace of Hudson but made its way through the strait and southwest across Hudson Bay to Nelson River, where it spent a brutal winter. Many men died, including Button's sailing master, for whom the river is named. In the spring and through the summer of 1613 Button and his crew continued their explorations, finally sailing for home in August. Button was knighted in 1616. He did not return to Canada, although he remained in service. He was a rear admiral in the campaign of 1620–21 against the pirates of the Algerian coast.

button quail, also called BUSTARD QUAIL, any of numerous small, round-bodied birds belonging to the family Turnicidae of the order Gruiformes. The 15 species are confined to scrubby grasslands in warm regions of the Old World. Button quail are dull-coloured birds,



Barred, or common, button quail (*Turnix suscitator*)
Painting by John P. O'Neill

13 to 19 centimetres (5 to 7 inches) long, that run crouching and zigzagging through the grass but are capable of weak whirring flight on their short rounded wings. Button quail usually go about singly or in pairs; they may join flocks of true quails.

Females, larger and more strongly patterned than males, do the courting and nest building. Males are much less vocal. They incubate the eggs and care for the young. The females mate with several different males in a single season, running off as soon as the eggs are laid. The incubation period, 12 or 13 days, is the shortest known for any precocial bird. The young are independent within two weeks, undergo two rapid molts, are full sized in six or seven weeks, and may breed when less than three months old.

The most widely distributed species is the striped button quail, or Andalusian hemipode (*Turnix sylvatica*). It occurs in southern Spain, Africa, and southeastern Asia to the Philippines. The red-backed button quail (*T. maculosa*) is its counterpart in the Australo-Papuan region. The Andalusian hemipode, 15 cm (6 in.) long, has streaked, reddish-gray upperparts and pale underparts with an orange breast patch and black-spotted sides. The sexes look much alike. In the barred, or common, button quail (*T. suscitator*) of India and eastward, females are black-throated in breeding season. The northernmost species, ranging from India to Manchuria, is *T. tanki,* called yellow-legged, Indian, or Chinese button quail.

Another bird of the button-quail family is the lark quail (*Ortyxelos meiffrenii*), of arid African plains. It looks more like a lark than a quail; having longer wings than other button quails, it is a stronger flier. It is about 13 cm (5 in.) long.

button spider, name in South Africa for the black widow (*q.v.*).

buttonbush, also called BUTTON WILLOW, or HONEYBALLS (*Cephalanthus),* genus of shrubs or small trees of the madder family (Rubiaceae, *q.v.*) native to Africa, Asia, and North America. It was named for its fragrant, creamy white, spherical flowers, about 2.5 centimetres (1 inch) in diameter. There are at least 6 species of buttonbush. *Cephalanthus occidentalis,* the most common, grows about 6 meters (20 feet) high.

buttress, in architecture, exterior support, usually of masonry, projecting from the face of a wall and serving either to strengthen it or to resist the side thrust created by the load on an arch or a roof. In addition to their practical functions, buttresses can be decorative, both in their own right and from the designs carved or constructed into them.

Although it has been used in all forms of construction since ancient times (Mesopotamian temples featured decorative buttresses, as did Roman and Byzantine structures), the buttress is especially associated with the Gothic era, when simpler, hidden masonry supports developed into the flying buttress. This semidetached curved pier connects with an arch to a wall and extends (or "flies") to the ground or a pier some distance away. This design increased the supporting power of the buttress and allowed for the creation in masonry of the high-ceilinged, heavy-walled churches typical of the Gothic style.

Other types of buttress include pier or tower buttresses, simple masonry piles attached to a wall at regular intervals; hanging buttresses, freestanding piers connected to a wall by corbels (*q.v.*); and various types of corner buttresses—diagonal, angle, clasping, and setback—that support intersecting walls.

Butua, also spelled BUTWA, former African kingdom in what is now southwestern Zimbabwe. Though called Guruhuswa in Shona tradition, the region was first mentioned in Portuguese records as Butua in 1512.

The Togwa dynasty governed the kingdom until 1683, when it was conquered and absorbed by the *changamire* (or ruler) of the powerful Rozwi kingdom. Butua was renowned as the source of gold for Arab and Portuguese traders.

Butuan, chartered city, capital of Agusan del Norte province, northern Mindanao, Philippines, on the Agusan River near its mouth at Butuan Bay. A major settlement in early Spanish times, Butuan was visited by ships from Borneo and Luzon, reportedly trading for gold, cinnamon, and slaves. A Jesuit mission station was established there in the late 16th century. It has become the main commercial centre for the Agusan Valley and is served by an outport at Magallanes. A sprawling city, it is an important highway junction and has an airport. The city has several sawmills that service the logging industry of the interior, and it is a regional petroleum depot. Inc. city, 1950. Pop. (1980) 172,489.

Butung, Bahasa Indonesia PULAU BUTUNG, also spelled BUTON, BOETON, or BOETOENG, island, and *kabupaten* (regency), Sulawesi Tenggara *propinsi* (Southeast Celebes province), Indonesia, one of a group of islands that includes also Muna, Wowoni, and Kabaena. Its chief town, administrative centre, and port is Baubau on the southwestern coast. With an area of 1,620 sq mi (4,200 sq km), it is thickly forested and has an axial chain of limestone hills rising to 3,904 ft (1,190 m). Butung yields much natural asphalt; teak is used for boatbuilding. The island produces coconuts, and there is some pearl dealing. Trade is carried on in copra and dried fish as well as sugar, tobacco, sago flour, and coffee. The coastal people, most of whom are Buginese, carry on weaving and copperwork but are chiefly trading sailors and fishermen. Pop. (1980) 317,-124.

butyl alcohol, any of four organic compounds having the same molecular formula, C_4H_9OH, but different structures: normal (*n*-) butyl alcohol, secondary butyl alcohol, isobutyl alcohol, and tertiary butyl alcohol. All have numerous industrial applications. *n*-Butyl alcohol is a solvent for lacquers, resins, and other coatings and a component of hydraulic brake fluids. Large quantities are converted to esters: the acetate is a lacquer solvent; the phthalate, a plasticizer. Secondary butyl alcohol is used chiefly in the manufacture of methyl ethyl ketone, a useful solvent. Isobutyl alcohol is interchangeable in many uses with *n*-butyl alcohol and has been cheaper since large-scale production began in the early 1950s. Tertiary butyl alcohol is the least important; it is used in making fine chemicals and as a denaturing agent for ethyl alcohol.

Commercial *n*-butyl alcohol is made by fermentation of corn or molasses or from acetaldehyde by a series of reactions. Secondary butyl alcohol is produced from butenes by absorption in sulfuric acid followed by hydrolysis; tertiary butyl alcohol is similarly produced from isobutylene. Isobutyl alcohol can be made by reduction of isobutyraldehyde.

butylene (chemistry): *see* butene.

butyric acid, also called BUTANOIC ACID ($CH_3CH_2CH_2CO_2H$), a fatty acid occurring in the form of esters in animal fats and plant oils. As a glyceride, it makes up 3–4 percent of butter; the disagreeable odour of rancid butter is that of butyric acid resulting from hydrolysis of the glyceride. The acid is of considerable commercial importance as a raw material in the manufacture of esters of lower alcohols for use as flavouring agents; its anhydride is used to make cellulose acetatebutyrate, a useful plastic.

Butyric acid is manufactured by aerial oxidation of butyraldehyde. It is a colourless liquid, soluble in water and miscible with common organic solvents; it freezes at −4.26° C (24.33° F) and boils at 163.53° C (326.35° F). An isomer, isobutyric acid ($(CH_3)_2CHCO_2H$, or 2-methylpropanoic acid, is found both in the free state and as its ethyl ester in a few plant oils. It is commercially less important than butyric acid. It is generally similar to butyric acid; it freezes at −46.1° C (-51° F) and boils at 153.2° C (307.8° F).

Butzer, Martin (Protestant Reformer): *see* Bucer, Martin.

Buwayhid DYNASTY: *see* Būyid dynasty.

Buxaceae, the box family, in the order Euphorbiales, best known for the ornamental and useful boxwoods and comprising seven genera of trees, shrubs, and herbs, native to North America, Europe, North Africa, and Asia. The plants bear male and female flowers, without petals, on separate plants. The leathery, evergreen leaves are simple and alternately arranged along the stems. Fruits are one- or two-seeded capsules or drupes (stony-pitted fleshy fruits).

Three species of the genus *Buxus* provide the widely grown boxwood: the common, or English, box (*B. sempervirens*), the Japanese box (*B. microphylla*), and the tall boxwood tree (*B. balearica*). *See also* boxwood.

Buxar, also spelled BAKSAR, historic town, Bhojpur district, Bihār state, northeastern India, just south of the Ganges River. The Battle of Baksar (Buxar; 1764) resulted in the final acquisition of lower Bengal by the British. A place of great sanctity, it is believed to have been originally called Vedagarbha (Womb of the Veda). Numerous writers of the Vedic hymns are said to have lived in the town, which is also connected with the early life of the Hindu god Rāma. Pop. (1981) 42,952.

Buxar, Battle of: *see* Baksar, Battle of.

Buxtehude, Dietrich (b. 1637, probably in Oldesloe, Holstein—d. May 9, 1707, Lübeck), Danish organist and composer of church music, one of the most esteemed and influential composers of his time.

His exact place of birth is uncertain, and nothing is known of his early youth. It is usually assumed that he began his musical education with his father, who was organist at Helsingbor (*c.* 1638–41) and at Helsingor (Elsinor; *c.* 1642–71). He settled at Lübeck in 1688 as organist of St. Mary's Church. There he gained such fame as a composer that the city became a mecca for musicians of northern Germany. The young Handel visited him in 1703, and in 1705 young Bach walked more than 200 miles to see him. Both young men hoped to succeed the master at Lübeck, but marriage to one of his daughters was a condition and each found it unacceptable.

Buxtehude's duties as church organist included composing works for public festivals and for the marriages and funerals of the great merchant families of the city. He left a considerable amount of vocal and instrumental music, much of which was not recovered until the 20th century; much more certainly remains lost.

His instrumental music is simple and pleasing; though well constructed, it seldom aims at technical virtuosities. His most important and influential works are considered to be those for organ, which include toccatas, preludes, fugues, chaconnes, pieces based on chorales, and a passacaglia to which J.S. Bach's *Passacaglia in C Minor* is indebted. The preludes are usually brief, and, with one exception, they are unlike Bach's in having no thematic connection with the fugues that follow them. Most of the harpsichord music has been lost.

The vocal music consists chiefly of church cantatas in a variety of forms, more than 100 of which are extant. Their texts are rarely liturgical; the Bible, the hymnbook, and sacred verse of the time are their main sources. All are imbued with a devout simplicity that contrasts strongly with the elaborations of their Bachian successors. It is possible that some were written for the famous *Abendmusiken,* concerts of mixed vocal and instrumental music held in St. Mary's in the late afternoons the five Sundays before Christmas. These performances, instituted by Buxtehude in 1673, became the pride of Lübeck, and their tradition was continued into the 19th century.

Buxton, locality, High Peak district, county of Derbyshire, England, encircled by (but excluded from) the Peak District National Park. Standing between 1,000 and 1,100 ft (305 and 335 m) above sea level, Buxton is the highest market town in England. The mineral waters have long been famous; they were used by the Romans, who called the place Aquae Arnemetiae. The baths fell into neglect but were rebuilt in the 16th century. Later the Church of St. Anne (1625) became known for the cures effected there. At the end of the 18th century, the 5th duke of Devonshire, lord of the manor, improved the town. The Crescent was built (1780–86) in the Doric style and mineral water is still drunk in its pump room. Buxton has a few light industries, and limestone is quarried nearby. Pop. (1981 prelim.) 20,797.

Buxton, Sir Thomas Fowell, 1ST BARONET (b. April 1, 1786, Castle Hedingham, Essex, Eng.—d. Feb. 19, 1845, near Cromer, Norfolk), British philanthropist and politician who, in 1822, succeeded William Wilberforce as leader of the campaign in the

Buxton, detail of a portrait by R.P. Barlow after a portrait by H.P. Briggs; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

House of Commons for the abolition of slavery in the British colonies and thus was partly responsible for the Abolition Act of Aug. 28, 1833.

A brother-in-law of the prison reformer Elizabeth Fry, Buxton, in 1818, published his own *Inquiry into Prison Discipline,* based on his inspection of Newgate Prison, London. In 1823 he joined Wilberforce and others in founding the British and Foreign Anti-Slavery Society. The ideas he expressed in *The African Slave Trade and Its Remedy* (1839) inspired the British government to send an expedition to the Niger River Delta in 1841. Intended to make anti-slave trade treaties with the peoples of the area, to engage in other kinds of trade, and to establish a missionary headquarters, the expedition suffered many deaths from fever and was soon recalled. Although Buxton did not accompany the group, his own health was permanently affected by the shock of the failure of the project. He was made a baronet in 1840.

Buyantu, also known as AYURPARIBHADRA, Chinese temple name (YÜAN) JEN TSUNG, Pinyin romanization YUAN RENZONG (reigned 1311–20), Mongol emperor of the Yüan dynasty of China, who was a patron of literature. He distributed offices more equitably between Chinese and Mongols than had his predecessors, and during his reign commercial ties with Europe increased.

Būyid DYNASTY, also called BUWAYHID (945–1055), Islāmic dynasty of pronounced Iranian and Shīʿī character that provided native rule in western Iran and Iraq in the period between the Arab and Turkish conquests. Of Daylamite (northern Iranian) origin, the line was founded by the three sons of Būyeh (or Buwayh), ʿAlī, Ḥasan, and Aḥmad.

ʿAlī, appointed governor of Karaj about 930 by the Daylamite leader Mardāvīz ebn Zeyār, seized Isfahan and Fārs, while Ḥasan and Aḥmad took Jibāl, Khūzestān, and Kermān (935–936). In December 945 Aḥmad occupied the ʿAbbāsid capital of Baghdad as *amīr al-umarā'* (commander in chief) and, reducing the Sunnī caliphs to puppet status, established Būyid rule (January 946). Thereafter the brothers were known by their honorific titles of ʿImād ad-Dawlah (ʿAlī), Rukn ad-Dawlah (Ḥasan), and Muʿizz ad-Dawlah (Aḥmad).

The dynasty's power, subsequently fragmented among family members and provinces, was consolidated briefly during the reign of ʿAḍud ad-Dawlah (949–983), who established himself as sole ruler (by 977), adding Oman, Ṭabaristān, and Jorjān to the original domains.

The Būyid state was then at its peak; it engaged in public works, building hospitals and the Band-e amīr (Emir's Dam) across the Kūr River near Shīrāz; it had relations with the Sāmānids, Ḥamdānids, Byzantines, and Fāṭimids; it patronized artists, notably the poets al-Mutanabbī and Ferdowsī. The Shīʿī nature of the state was manifest in the inauguration of popular and passionate observance of Shīʿī festivals and the encouragement of pilgrimages to the holy places of an-Najaf and Karbalā' in Iraq.

The major cultural centres of the Būyids were the cities of Rayy and Nayin, in Iran, and Baghdad, in Iraq. The Persian character of Būyid art was deep enough to flavour the art of that part of the world through the reign of the Seljuqs until the Mongol invasions of the 13th century.

Būyids were quite fond of metalwork, particularly fine silverwork. They often employed Sāsānian (pre-Islāmic Persian) techniques and motifs: a typical decoration consists of a seated figure surrounded with wild animals, birds,

Būyid silver basin with Sāsānian motifs, 10th century; in the Tehrān Museum

Holle Bildarchiv

and musicians, depicted in the highly stylized Sāsānian tradition.

Būyid pottery, usually called Gabrī ware, is a red-bodied earthenware covered with a white slip (liquified clay washed over the body before firing). Designs were executed by scratching through the slip to reveal the red body beneath (*see* sgraffito ware). Yellowish or green lead glazes were used. Some pieces were decorated with linear patterns, others with elaborate representational designs, which often included mythological figures such as birds and quadrupeds with human faces. Some of the earliest extant of these pieces illustrate stories from the *Shāh-nāmeh* ("Book of Kings"), the Persian national epic by the poet Ferdowsī (died 1020).

After the death of ʿAḍud ad-Dawlah, a slackening economy, dissention in the army, and general Būyid disunity hastened the dynasty's decline. In 1055, the last Būyid ruler, Abū Naṣr al-Mālik ar-Raḥīm, was deposed by the Seljuq Toghril Beg.

Buys, Paulus (b. 1531, Amersfoort, Utrecht province, Neth.—d. May 4, 1594, IJsselstein), Dutch statesman who, as advocate (provincial executive) of Holland (1572–85), helped the province achieve its preeminent role in the revolt of the Netherlands against Spanish rule.

The harsh religious persecution and high taxes of the Duke of Alba's regime (1567–73) led Buys to join the resistance to the Spanish government, working closely with William I the Silent, prince of Orange, to plan a revolt in the northern provinces. Buys became a member of William's advisory council in

1573, but hopes for William to become count of Holland and Zeeland were dashed by the Prince's assassination in 1584. Buys resigned from office the following year but helped negotiate the Treaty of Westminster (Aug. 20, 1585), by which Elizabeth I of England agreed to send an army headed by Robert Dudley, earl of Leicester, to the Netherlands. Buys fell out of favour when, along with other members of the religiously tolerant urban aristocracy, he opposed Leicester, who was governor, in his idea of a strictly Calvinist state. He was arrested by Calvinist democrats, with Leicester's connivance, in July 1586. Imprisoned for six months, Buys failed to regain a position of power upon his release.

Buys Ballot, Christophorus H(enricus) D(idericus) (b. Oct. 10, 1817, Kloetinge, Neth.—d. Feb. 3, 1890, Utrecht), Dutch meteorologist particularly remembered for his observation in 1857 that the wind blows at right angles to the atmospheric pressure gradient. Although he was not the first to make this discovery, his name remains attached to it as Buys Ballot's law (*q.v.*).

Buys Ballot studied and taught at the University of Utrecht, attaining the rank of professor in 1867. He also served as the director of the Royal Netherlands Meteorological Institute, which he founded in 1854.

Buys Ballot's law, law of wind direction named for the Dutch meteorologist C.H.D. Buys Ballot, who first stated it in 1857. He derived the law empirically, unaware that it already had been deduced theoretically by the U.S. meteorologist William Ferrel, whose priority Buys Ballot later acknowledged. The law states that in the Northern Hemisphere a person who stands facing away from the wind has high pressure on the right and low pressure on the left; in the Southern Hemisphere, the reverse would be true.

Theoretically, the law states that the angle between the wind and the pressure gradient is a right angle. This is almost exactly true in the free atmosphere, but not near the surface, where the angle is usually less than 90° because of friction between the air and the surface. Because of the weakness of the Coriolis effect (produced by the Earth's rotation) in equatorial regions, the law is not applicable there.

Buysse, Cyriel (b. Sept. 21, 1859, Nevele, near Ghent—d. July 26, 1932, Deurle, Belg.), Belgian novelist and playwright, one of the outstanding exponents of Flemish naturalism.

He was given the usual French education thought suitable for the sons of well-to-do Flemings, but he decided to devote his energies to writing in Flemish. His first major novel, *Het recht van den sterkste* (1893; "The Right of the Strongest"), shows his powers as a realist in the tradition of Zola and Maupassant. The grim picture of the miserable life of the peasantry leads to more general reflections of man's inhumanity to man. Some of Buysse's later works, such as *Sursum Corda* (1894), contain a more explicit Socialist message.

Buysse associated himself with all the efforts made to foster the development of Flemish literature and was one of the founders of the influential literary journal *Van nu en straks* ("Today and Tomorrow"), in 1893. Buysse also wrote a number of Flemish plays. In some—*e.g., Het gezin van Paemel* (1893; "The Paemel Family")—Buysse presents the struggles of the oppressed peasantry as he does in his novels. But he also had considerable success in a lighter vein with such comedies as *De plaatsvervangende vrederechter* (1895; "The Substitute Magistrate").

Büyük Menderes Nehri (Turkey): *see* Menderes River.

Buzău, *județ* (district), southeastern Romania, occupying an area of 2,344 sq mi (6,072 sq km). The Buzaului mountain range, part of the Eastern Carpathians and the sub-Carpathian mountains, lies in the west, rising above settlement areas in the valleys and lowlands. The Buzău River and its tributaries drain eastward. Buzău (*q.v.*) city, the district capital, has been an economic centre with ties to Bucharest and Brașov since the 15th century. Manufactures include metals, machinery, and chemicals. Rîmnicu Sărat has oil refineries and factories that produce textiles, wine, and cigarettes. Oil fields are located at Sărata-Monteoru, Berca, and Arbănesi. Building materials are produced in Pătîrlagele. Agricultural activities in the district consist of livestock raising and wheat cultivation. Stephen (Ștefan) the Great's army won battles against the Turks in Rîmnicu Sărat in 1473 and 1481. A 17th-century church in Rîmnicu Sărat contains frescoes, and a Romanian contemporary art museum is located in the town. A monastery founded in 1650 is situated in Măgura. Other towns include Pogoanele, Beceni, Vintilă Vodă, and Ulmeni. Railway and highway connections extend through Buzău city. Pop. (1982 est.) 517,434.

Buzău, city, capital of Buzău *județ* (district), southeastern Romania, on the Buzău River, approximately 60 mi (100 km) northeast of Bucharest. Its location near the foothills of the Eastern Carpathians at the limit of the Danube Plain fostered its development as a market and trading centre. It was first documented in the records of the Brașov merchants in a reference to the Buzău Fair of 1431. The Romanian Orthodox cathedral was built around 1500 and rebuilt in 1650. The district around Buzău is rich in orchards, market gardens, and vineyards. It has metallurgical engineering and plastics industries. Pop. (1982 est.) 116,977.

Buzău Pass, Romanian PASUL BUZĂU, pass connecting Brașov with Buzău, southeastern Romania, over the Buzăului Mountains, in the Eastern Carpathians. It follows the valley of the Buzău River for most of its distance. A road crosses the pass, and there are short, nonconnecting rail branches from Brașov and Buzău.

buzuki (musical instrument): *see* bouzouki.

Buzuluk, city, Orenburg *oblast* (administrative region), in the southern Ural Mountains of the Russian Soviet Federated Socialist Republic, on the Samara River (a tributary of the Volga), near its confluence with the Buzuluk. Founded in 1736 as a Russian fortress, it was chartered in 1781. Industries include the manufacture of heavy metallurgical and agricultural machinery. The city has four technical colleges. Pop. (1983 est.) 79,000.

Buzurg ʿAlavī (b. 1904, Tehrān), one of the leading prose writers of 20th-century Persian literature. Educated in Iran, he was sent to Berlin in 1922, where he learned German and translated a number of German works into Persian. Upon returning to Iran, he taught at the Industrial College of Tehrān and became involved with a group of Iranian Socialists. He was imprisoned with them (1937–41) and while in prison wrote *Panjāh u si* ("The Fifty-Three"), describing the members of the Socialist group and their ordeal in prison, and also a short-story collection, *Varaq-pārahā-yi zindān* ("Notes from Prison").

After World War II, ʿAlavī became a member of the Iranian-Soviet Friendship Society and visited the Uzbek Soviet Socialist Republic, about which he wrote an account, *Uzbakhā* ("The Uzbeks"). He was also a founder of the Tude (Tudeh) Party of Iran. In 1953 he joined the World Peace Council, from which he received a gold medal award, but after the fall of the Iranian prime minister, Mohammed Mosaddeq, in 1954, ʿAlavī left Iran and took a post as visiting professor at Humboldt University in East Germany.

ʿAlavī is best known for his short-story collection *Chamadān* ("The Portmanteau"), in which he exhibits the strong influence of Freudian psychology, and for his novel *Chashmhāyash* ("Her Eyes"), an extremely controversial work about an underground revolutionary leader and the upper-class woman who loves him. ʿAlavī also wrote a number of works in German, among them, *Kämpfendes Iran* (1955; "The Struggle of Iran") and *Geschichte und Entwicklung der modernen Persischen Literatur* (1964; "The History and Development of Modern Persian Literature"). ʿAlavī returned to Iran for a brief period following the revolution of 1979 but later resumed his professorship in East Germany.

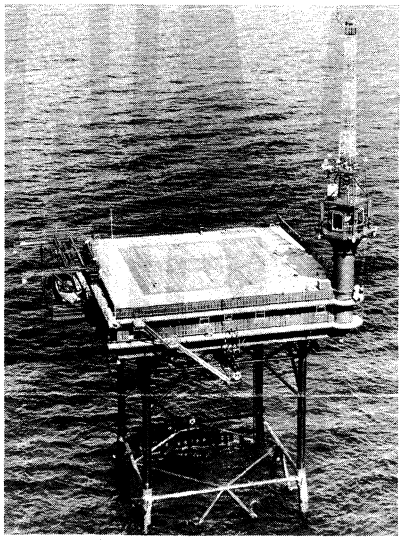
buzz bomb: *see* V-1 missile.

buzzard, any of several birds of prey of the genus *Buteo* and, in North America, various New World vultures (family Cathartidae), especially the turkey vulture (*Cathartes aura*). Similarly, in Australia a large hawk of the genus *Hamirostra* is called a black-breasted buzzard. In North America, *Buteo* species are called buteos, buzzard hawks, or simply hawks.

True buzzards, or buteos, constitute the subfamily Buteoninae of the family Accipitridae. When in flight, they can usually be distinguished from other birds of prey by their broad wings and expansive rounded tails. They fly with slow heavy wing beats and soar gracefully. The plumage of most species is essentially dark brown above and white or mottled brown below, and the tail and underside of the wings usually are barred. There is much variability of pigmentation, however, even between individuals of a single species. Buzzards customarily prey on insects and small mammals and only occasionally attack birds. The nest, in a tree or on a cliff, is substantial, built of sticks and lined with softer materials. The two to five whitish eggs are blotched with brown.

The best known species, the common buzzard (*Buteo buteo*), is found from Scandinavia south to the Mediterranean. Other species range over much of North America, Eurasia, and northern Africa. *See also* hawk.

Buzzards Bay, village and inlet of the Atlantic Ocean, indenting southeastern Massachusetts, U.S. The bay is 30 mi (48 km) long and 5–10 mi wide, extends to the base of the Cape Cod peninsula (northeast) between



Lighthouse at the entrance to Buzzards Bay, Massachusetts

By courtesy of the U.S. Coast Guard

the coast and the cape, and is bounded (southeast) by the Elizabeth Islands. It is connected to Cape Cod Bay by the Cape Cod Canal (northeast). The inlet's jagged coastline is dotted with numerous fishing villages, summer resorts, and yacht clubs. The Buzzards Bay Lighthouse, towering 170 feet above mean low water, was the first in the United States to be built over open water (*i.e.*, lacking a foundation on dry land). The village of Buzzards Bay, administrative headquarters of the Cape Cod Canal and seat of the Massachusetts Maritime Academy (1891), is in Bourne town (township) and is crossed by the canal. Pop. (1980) village, 3,375.

Buzzati, Dino (b. Oct. 16, 1906, Belluno, Italy—d. Jan. 28, 1972, Rome), Italian journalist, dramatist, short-story writer, and novelist, internationally known for his fiction and plays.

Buzzati began his career on the Milan daily *Corriere della sera* in 1928. His two novels of the mountains, written in the style of traditional Realism, *Barnabò delle montagne* (1933; "Barnabus of the Mountains") and *Il secreto del bosco vecchio* (1935; "The Secret of the Ancient Wood"), introduced the Kafkaesque surrealism, symbolism, and absurdity which suffused all of his writing.

The novel generally considered Buzzati's finest, *Il deserto dei tartari* (1940; *The Tartar Steppe,* 1952), is a powerful and ironic tale of garrison troops at a frontier military post, poised in expectancy for an enemy who never comes, and unable to go forward or retreat.

His collections of tales include *Sessanta racconti* (1958; "Sixty Tales"), which included the previously published novellas *I sette messaggeri* (1942; "The Seven Messengers") and *Paura alla scala* (1949; "Terror on the Staircase"). Among his other novels are *Il grande retrato,* a science fiction novel (1960; *Larger Than Life,* 1962), and *Un amore* (1963; *A Love Affair,* 1963), the story of a middle-aged man who is captivated by a devious young vixen.

Of Buzzati's extremely popular plays, the most important is *Un caso clinico* (performed and published 1953; "A Clinical Case"), a modern Kafkaesque horror story in which medical specialists and machinery destroy a perfectly healthy man. Very popular in Italy, the play has also been performed in Berlin and in Paris (the French adaptation was written by Albert Camus).

Buzzati's other plays include *Il mantello* (performed 1960; "The Overcoat"), a supernatural drama in which a soldier who has been declared missing mysteriously returns and is discovered to be a spirit; and *L'uomo che andrà in America* (performed and published 1962; "The Man Who Will Go to America"), the story of an old painter who realizes on being told that he has won a coveted American prize that the news also means the end of his life work and his death.

Though influenced by Kafka, Buzzati has a devastating skill and a detached sort of irony and humour of his own. An English translation of some of his stories is *Catastrophe: The Strange Stories of Dino Buzzati* (1966). After his death appeared *Cronachi terrestri* (1972, "Earthly Chronicles") and an autobiography (1973).

BWA: *see* Baptist World Alliance.

By, John (b. 1781, London—d. Feb. 1, 1836, Shernfold Park, Sussex, Eng.), English military engineer whose canal connecting the Ottawa River and Lake Ontario (1832) gave great impetus to the development of the city of Ottawa.

By, commissioned as second lieutenant in the Royal Engineers in 1799, worked in Canada (1802–11) on the fortification of Quebec and was charged with the building of a canal at Les Cèdres on the St. Lawrence. As a lieutenant colonel he was sent again to Canada in 1826 to design and construct the Rideau Canal between the Ottawa River and Kingston on Lake Ontario. He began construction at a point near the junction of the Ottawa and Rideau rivers, at which a settlement that became known as Bytown developed; it was incorporated as a town in 1850. By 1855 the name of the future federal capital was changed to Ottawa. By returned to England in 1832.

Byang thang (China): *see* Ch'iang-t'ang.

Byblos, modern JUBAYL, also spelled JEBEIL, biblical GEBAL, ancient seaport in Bayrūt *muḥāfaẓah* (governorate), Lebanon; it is one of the oldest continuously inhabited towns in the world. The name Byblos is Greek; papyrus received its early Greek name (*byblos, byblinos*) from the fact that it was exported to the Aegean through Byblos. Hence the English word Bible is derived from *byblos* as "the (papyrus) book."

The Obelisk Temple at Byblos
Ronald Sheridan

Systematic excavations were begun at Byblos by Pierre Montet in 1921; in 1926 Maurice Dunand resumed the work and continued it for many years. The excavations revealed that Byblos was occupied at least by the Neolithic Period (*c.* 8000–*c.* 4000 BC), and that during the 4th millennium BC an extensive settlement developed.

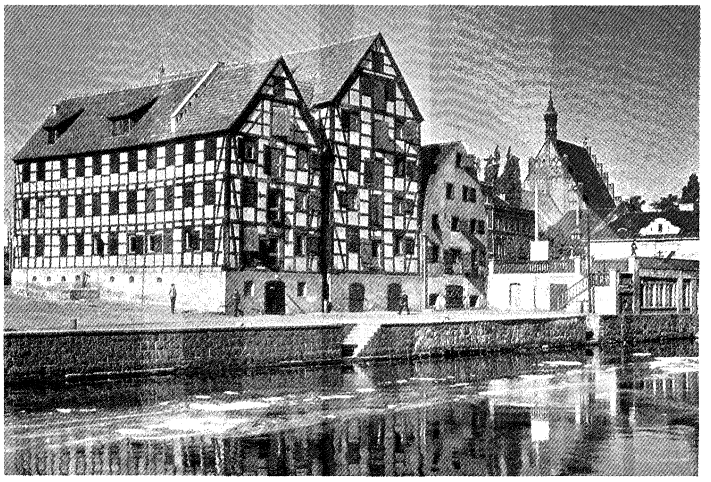
Because Byblos was the chief harbour for the export of cedar and other valuable wood to Egypt, it soon became a great trading centre; it was called Kubna in ancient Egyptian and Gubla in Akkadian, the language of Assyria. Egyptian monuments and inscriptions found on the site attest to close relations with the Nile Valley throughout the second half of the 2nd millennium. During Egypt's 12th dynasty (1991–1786 BC), Byblos again became an Egyptian dependency, and the chief goddess of the city, Baalat (The Mistress), with her well-known temple at Byblos, was worshipped in Egypt. After the collapse of the Egyptian New Kingdom in the 11th century BC, Byblos became the foremost city of Phoenicia.

Byblos has yielded almost all of the known early Phoenician inscriptions, most of them dating from the 10th century BC. By that time, however, the Sidonian kingdom, with its capital at Tyre, had become dominant in Phoenicia, and Byblos, though it flourished into Roman times, never recovered its former supremacy. The crusaders captured the town in 1103 and called it Gibelet, but they later lost it to the Ayyūbid sultan Saladin in 1189.

The ruins today consist of the crusader ramparts and gate; a Roman colonnade and small theatre; Phoenician ramparts, three major temples, and a necropolis.

Bydgoszcz, German BROMBERG, *województwo* (province), northwest central Poland. Established in 1975 and comprising an area of 3,996 sq mi (10,349 sq km), it is bordered by the provinces of Słupsk on the northwest, Gdańsk on the north, Toruń and Włocławek on the east, Poznań and Konin on the south, and Piła on the west. The Vistula is the largest river in the province; others are the Brda, the Wda, and the Noteć. The province is highly industrialized with food processing and paper production in the north, electrical-machinery production and chemical processing in the centre, and building-materials manufacturing in the south. There are rich deposits of salt, clay, and lime. Bydgoszcz (*q.v.*) city, the provincial capital after 1945, is situated at the mouth of the Brda and has well-preserved 15th-century Gothic buildings in the Old Town sector. Pop. (1982 est.) 1,042,800.

Bydgoszcz, German BROMBERG, city, capital of Bydgoszcz *województwo* (province), northern Poland, near the confluence of the Brda and Vistula rivers. Beginning as a frontier stronghold, Bydgoszcz was seized by the Teutonic Knights in the 13th century; it received town rights in 1346. It prospered as a grain and timber centre, was devastated during the 17th-century Swedish wars, and regained importance in the 18th century with the building of the Kanał Bydgoski (Bydgoszcz Canal), linking the basins of the Vistula and Oder rivers and making it a major inland port. In 1946, on its 600th anniversary, it was awarded the Grunwald Cross for its staunch resistance to the Nazi attack of 1939.



The Leon Wyczółkowski Museum on the Bydgoszcz Canal, Poland; dating from the 17th century; it was originally built as a granary
Adam Stelmach

The city is an important water-transport route and rail junction connecting Górny Śląsk (Upper Silesia) with the Baltic ports. It processes forest products and has textile mills, metallurgical plants, chemical and machine plants, and electronics and printing shops—as well as two theatres and a concert hall. It is the site of a higher agricultural and an engineering institution. Pop. (1982 est.) 352,400.

Bydgoszcz Canal, Polish KANAŁ BYDGOSKI, German BROMBERGER-KANAL, canal in Bydgoszcz *województwo* (province), north central Poland. It extends for 17 mi (27 km) between Nakło (west) and the inland port-city of Bydgoszcz (east) between the Notec and Brda rivers, linking the Vistula River Basin with that of the Oder. Construction of the 64-ft- (20-m-) wide canal began in 1774 under Frederick II, who had annexed the region to Prussia in 1772.

Byelorussian (member of a people): *see* Belorussian.

Byelorussian language: *see* Belorussian language.

Bykovsky, Valery Fyodorovich (b. Aug. 2, 1934, Pavlovsky-Posad, Russian S.F.S.R.), Soviet cosmonaut who orbited the Earth 81 times in the spacecraft Vostok 5, from June 14 to 19, 1963.

Bykovsky started flying lessons at the age of 16, joined the Army in 1952, and in 1959 became a jet fighter pilot. In the early 1960s he was trained as a cosmonaut at the Zhukovsky Military Engineering Academy.

On June 16, 1963, after Bykovsky had been in orbit two days, the Soviet Union launched Vostok 6, carrying Valentina Tereshkova, the first woman to travel in space. The two ships held parallel orbits, at one point approaching

Bykovsky, 1963
Novosti—Sovfoto

to within 3.1 miles (5.0 kilometres), but did not rendezvous. They returned to Earth three hours apart.

Bykovsky was made a member of the Communist Party on June 18, while still in orbit, and after his return he received his country's highest honour, Hero of the Soviet Union. He is one of the few men to receive the Soviet Union's highest combat award during peacetime, the Order of the Red Star, presumably for air-combat action in a border incident.

He was chief of cosmonaut training for the Apollo-Soyuz Test Project, which was carried out in July 1975, and was command pilot of Soyuz 22, a 190-hour flight that began on Sept. 15, 1976.

bylina, plural BYLINY, traditional form of Old Russian and Russian heroic narrative poetry transmitted orally, still a creative tradition in the 20th century. The oldest *byliny* belong to a cycle dealing with the golden age of Kiev in the 10th to 12th centuries. They centre on the deeds of Prince Vladimir I and his court. One of the favourite heroes is the independent Cossack Ilya of Murom, who defended the Kievan Rus' from the Tatar khans. Although these ancient songs are no longer known to the peasants around Kiev, they were discovered in the 19th century in the repertoire of peasants living around Lake Onega in the remote northwestern regions of European Russia. They are also known in the far northeastern outposts of Siberia.

Other *byliny,* dealing with all periods of Ukrainian and Russian history, have been collected throughout the country. They may relate events from the reigns of Ivan the Terrible or Peter the Great, or deal with the Cossack rebels Stenka Razin and Pugachov. A 20th-century *bylina,* the *Tale of Lenin,* converts the chief events of the Russian Revolution into a formulaic hero tale. Taken together, the *byliny* constitute a folk history in which facts and sympathies are often at variance with official history.

Byliny may have originated with professional court minstrels, but they are now circulated and created by peasants and simple folk. With the spread of literacy the art of composing and chanting *byliny* is dying out.

Byng, John (b. 1704, Southill, Bedfordshire, Eng.—d. March 14, 1757, harbour of Portsmouth, Hampshire), British admiral executed for failing to relieve the naval base at

John Byng, detail of an oil painting by T. Hudson; in the National Maritime Museum, Greenwich, Eng.

By courtesy of the National Maritime Museum, Greenwich, Eng.

Minorca (in the western Mediterranean) from a French siege. By initiating legal proceedings against Byng, the administration of Prime Minister Thomas Pelham-Holles, 1st duke of Newcastle, hoped to divert public attention from its own failings; nevertheless, Newcastle resigned in November 1756.

The son of George Byng, Viscount Torrington, a prominent admiral, John became a rear admiral in 1745. In May 1756, three months before the outbreak of the Seven Years' War (1756–63), he was sent with an inadequate force to relieve Minorca. Byng fought a half-hearted engagement with a French fleet and then retired, leaving Minorca to the enemy. This failure aroused a storm of indignation in England, motivating Newcastle to promise that "he shall be tried immediately; he shall be hanged directly." Found guilty of neglect of duty, Byng died before a firing squad. The episode provoked the French author Voltaire to remark in *Candide* that the English found it necessary from time to time to shoot an admiral "pour encourager les autres" ("in order to encourage the others"). W.B. Tunstall's biography *Admiral Byng and the Loss of Minorca* was published in 1928.

Byng of Vimy (of Thorpe-le-Soken), Julian Hedworth George Byng, Viscount, also called (1919–28) BARON BYNG OF VIMY OF THORPE-LE-SOKEN (b. Sept. 11, 1862, Wrotham Park, Middlesex, Eng.—d. June 6, 1935, Thorpe Hall, Essex), British field marshal, a distinguished commander in World War I.

As commander of the Canadian Corps in France (from May 1916), he was responsible for one of the most famous Canadian victories in either world war, the capture of Vimy Ridge, north of Arras (April 9, 1917). As commander of the British 3rd Army (from June 1917) he conducted the first large scale attack by tanks in history (at Cambrai, Nov. 20, 1917). His army broke the German Hindenburg Line on Sept. 27, 1918.

A career soldier from 1883, Byng was promoted to major general in 1909, full general in 1917, and field marshal in 1932. After World War I he served as governor general of Canada (1921–26) and commissioner of London police (1928–31). He was created a baron in 1919 and a viscount in 1928.

Bynkershoek, Cornelis van (b. May 29, 1673, Middelburg, Zeeland, Neth.—d. April 16, 1743, The Hague), jurist remembered mainly for his contributions to the development of international law along Positivist lines. He studied law at Franeker and was admitted to the bar at The Hague. In 1703 he was appointed a member of the supreme court of Holland and Zeeland, becoming president of the court in 1724. Although engaged in a demanding judicial career, he found time to produce a large and varied number of works of legal scholarship.

Bynkershoek's principal works in international law are *De Dominio Maris* (1703; "On the Dominion of the Sea"), *De Foro Legatorum* (1721; "On the Forum of Legates"), and *Quaestiones Juris Publici* (1737; "Questions of Public Law"). His opinions on such questions as the sovereignty of the seas, the position of ambassadors, private property in wartime, prizes, neutrality, contraband, and blockade have been highly regarded and influential. In ascertaining the law of nations, he placed greater emphasis than did his predecessors on actual usage, rather than on deduced precepts.

Byoir, Carl (Robert) (b. June 24, 1888, Des Moines, Iowa, U.S.—d. Feb. 3, 1957, New York City), eminent and sometimes controversial public relations consultant important for his contributions to establishing public relations as a recognized profession.

Young Byoir had to work from age 10 to help support his family. In high school he was a reporter for the *Iowa State Register,* and by the age of 17 he was city editor of the *Waterloo Tribune.* He worked his way through the University of Iowa by publishing yearbooks for his own and a number of other colleges, and in law school at Columbia University he earned substantial money through buying and licensing out U.S. rights to the Montessori method of preschool education.

Byoir went to work for Hearst magazines, and by 1916 he was circulation manager of *Cosmopolitan.* His work came to the attention of George Creel, who headed the U.S. propaganda effort in World War I, and Byoir was called to Washington as an associate chairman of the Committee on Public Information.

After the war, health problems led him to Cuba, where he grew interested in promoting U.S. tourism to Cuba, and this led to a contract with the government of the dictator Gerardo Machado, and the establishment of Byoir's firm, Carl Byoir and Associates, in New York City in 1930.

In 1938 Byoir counselled the Great Atlantic and Pacific Tea Company, a grocery chain, and directed a public relations campaign that eventually defeated in Congress a tax bill that chain-store owners considered ruinous. This won him the enmity of the powerful U.S. representative Wright Patman of Texas, a militant "trust buster," and led to Byoir's conviction in 1946 of violating the Sherman Antitrust Act. More controversy was generated in 1940 when Patman charged Byoir with having been a Nazi agent, based on a previous connection with German tourism by an associate of Byoir's. Government investigations cleared Byoir, but the air of controversy lingered.

At the start of his involvement in public relations that craft was scarcely distinguishable from press agentry, but in the course of his career Byoir's emphasis on organization, planning, and effective action contributed significantly to its increasing professionalism.

bypass, coronary: *see* coronary bypass.

Bŷr, Ynys (Wales): *see* Caldy Island.

Byrd, Richard E(velyn) (b. Oct. 25, 1888, Winchester, Va., U.S.—d. March 11, 1957, Boston), U.S. naval officer, pioneer aviator, and polar explorer, best known for his explorations of Antarctica.

Life. After attending Shenandoah Military Academy, the University of Virginia, and the U.S. Naval Academy, Byrd learned flying at the U.S. Naval Air Station, Pensacola, Fla., and served in the navy with distinction until the end of World War I. After the war he turned his attention to developing navigational aids for aircraft; he developed plans for the first NC flying boat transatlantic flights,

Richard E. Byrd, 1925

By courtesy of the National Geographic Society, © 1925 National Geographic Society

but he was deprived of a place in the principal aircraft. He also assisted with dirigibles built for transatlantic crossings. His polar career began in 1924 when he had command of a small naval aviation detachment with Comdr. D.B. MacMillan's Arctic expedition to western Greenland, based at Etah.

The experience of flying over sea ice and glaciers in western Greenland had fired Byrd with the ambition to fly over the North Pole. He claimed this accomplishment on May 9, 1926, while acting as navigator, with a compatriot, Floyd Bennett, as pilot. According to his records, the return journey from King's Bay, Spitsbergen, took 15½ hours, with no mishaps beyond an oil leak from the starboard engine of his Fokker tri-motor airplane. For this feat he was awarded the U.S. Congressional Medal of Honor. (One of Byrd's early associates, Bernt Balchen, claimed after Byrd's death that the flight to the North Pole was a hoax. This remains to be proved.) He later aided the U.S. aviator Charles A. Lindbergh with navigational training and the use of the specially extended runway for Lindbergh's transatlantic solo flight in May 1927.

Byrd next decided to make an attempt to fly the Atlantic from west to east; and in June 1927, with three companions, he made the flight in 42 hours, crash-landing in bad weather at Ver-sur-Mer on the coast of Brittany, France. For this successful flight he was made a Commandant of the French Legion of Honour; he and his crew also received the Medal for Valor from the Mayor of New York City.

In 1928 he announced his decision to explore the unknown regions of the Antarctic from the air. With large financial backing from such wealthy Americans as Edsel Ford and John D. Rockefeller, Jr., his fame was such that he could inspire the American public to contribute liberally to the estimated cost of the venture, which was about $400,000.

Antarctic expeditions. His expedition, the largest and best equipped that ever had set out for the Antarctic, sailed south in October 1928. A substantial and well-supplied base, called Little America, was located on the face of the Ross Ice Shelf, a wide plain of shelf ice fronting the Ross Sea near an indentation in the ice cliff named the Bay of Whales. Flights were made from this base over the Antarctic continent. A range of high mountains, named the Rockefeller Mountains, was discovered; and a large tract of hitherto unknown territory beyond them was named Marie Byrd Land, after Byrd's wife. The following spring—*i.e.,* in November 1929, according to the Antarctic season—Byrd, as navigator, with three companions, flew from Little America to the South Pole and back in 19 hours with no mishap, except that a few of their provisions had to be thrown overboard in order to lighten the plane.

In 1933 a second Byrd expedition visited Little America with the aim of mapping and claiming land around the pole; he extended the exploration of Marie Byrd Land and continued his scientific observations. During the winter of 1934 (from March to August), Byrd spent five months alone in a hut at a weather station named Bolling Advance Base, buried beneath the Barrier face 123 miles (196 kilometres) south of Little America, enduring temperatures between −58° and −76° F (−50° and −60° C) and sometimes much lower. He was finally rescued in a desperately sick condition, suffering from frostbite and carbon-monoxide poisoning. This was perhaps his most controversial exploit.

Byrd led three subsequent expeditions while serving as director of U.S. government expeditions. For brief periods on each trip he continued personally to take an active part in exploration. At the request of Pres. Franklin D. Roosevelt he took command of the U.S. Antarctic service, which was terminated after its first year because of the approach of World War II. Bases were located at Little America and Stonington Island, Antarctic Peninsula. Byrd's discovery of Thurston Island greatly decreased the length of unexplored coast of the continent.

During World War II Byrd served on the staff of the chief of naval operations and, among other duties, evaluated Pacific islands as operational sites. His talent for organization and administration and his influence and skill in public relations led him to serve in many important governmental, patriotic, and humanitarian capacities.

After World War II Byrd was in charge of a program known as Operation High Jump, which claimed to have discovered and mapped 537,000 square miles (1,390,000 square kilometres) of Antarctic territory. Byrd flew into Little America from the deck of the aircraft carrier "Philippine Sea" north of the icepack, about 700 miles from the camp. He made a second flight over the South Pole and took part in several other flights. In 1955 Byrd was made officer in charge of the United States Antarctic programs, the senior authority for government Antarctic matters. He accompanied naval Operation Deep Freeze aboard the icebreaker "Glacier" and took his last exploratory flight over the heartland of Antarctica and once again over the South Pole on Jan. 8, 1956.

Byrd's accomplishments. Byrd's major achievement was to apply the airplane, radio, and other modern technical resources to polar exploration. He did not agree with the Norwegian explorer Roald Amundsen (1872–1928) that the airplane one day would supplant exploration by the traditional means of using sledges and dogs. Rather, he believed that modern techniques of exploration should supplement the traditional methods that would always have the advantage of guaranteeing greater certainty and accuracy. All of his expeditions, therefore, carried dog teams, sledges, and personnel to handle them—a combination that was to prove efficient and to achieve results of great scientific value.

It is in his book *Alone,* which describes his experiences at Bolling Advance Base, that the character of the man can be glimpsed rather than in the more official account, *Little America.* The picture that emerges is that of a simple, homely man, devoted to his family and always full of consideration for others. There is no doubt that men trusted him and followed him, that his ability inspired confidence. He was officially cited 20 times for bravery or conspicuous conduct.

Byrd was also competent in public relations. Indeed, perhaps inevitably, his expeditions were surrounded by a glare of publicity that aroused criticism, particularly by commentators abroad. Press accounts of a "million dollar expedition" conveyed an impression of unlimited funds and profligate expenditure. But the impression was not true. Byrd was as pressed for money as any other polar explorer, and he had to rely largely on the public to provide the funds. Hence the tumult and the shouting. The U.S. public saw in him the virtues they most admired and placed their trust in him. Although Byrd himself knew the value of publicity, he always kept in mind his goal of professional achievement. When he died, he was an international hero. He was buried in Arlington National Cemetery, Virginia, with full military honours. (F.D.O.)

BIBLIOGRAPHY. Richard E. Byrd, *Little America* (1930), is an account of his aerial exploration in the Antarctic and his flight to the South Pole; *Skyward* (1928) is his report of his 1928 to 1930 expedition to the Antarctic, and his report of the flight to the North Pole and flight across the Atlantic; *Alone* (1938) describes his experiences at Bolling Advance Base. Works about Byrd include: Charles J.V. Murphy, *Struggle: The Life and Exploits of Commander Richard E. Byrd* (1928), a biography; and Richard Montague, *Oceans, Poles and Airmen* (1971), disputing Byrd's claim that he flew to the North Pole.

Byrd, William (b. 1543, Lincoln, Lincolnshire?, Eng.—d. July 4, 1623, Stondon Massey, Essex), English organist and composer of the Shakespearean age who is best known for his development of the English madrigal and who also wrote virginal and organ music that elevated the English keyboard style.

Life. Of Byrd's origins and early life virtually nothing is known. He was a pupil and

William Byrd, engraving by Nicola Francesco Haym, after a portrait by Gerard van der Gucht

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

protégé of the organist and composer Thomas Tallis, and his first authenticated appointment was as organist at Lincoln cathedral (Feb. 27, 1563). In 1572 he moved to London to take up his post as a gentleman of the Chapel Royal, where he shared the duties of organist with Tallis.

The close personal and professional relationship between the two men had important musical consequences. In 1575 Elizabeth I granted them a joint monopoly for the importing, printing, publishing, and sale of music, and the printing of music paper. The first work under their imprint appeared in that year—a collection of *Cantiones Sacrae* dedicated to the Queen; of the 34 motets, Tallis contributed 16 and Byrd 18.

In 1577 Byrd moved to Harlington, Middlesex, where he and his family lived for the next 15 years. As a devout and lifelong Catholic he probably preferred the greater privacy of living outside London. Yet in spite of his close social contact with many other Catholics, some of whom were certainly implicated in treasonable activities, his own loyalty to the government was never questioned.

In 1585 Tallis died, and in the following year Byrd's wife, Julian. These sad events may have prompted him to set his musical house in order, for in the next three years he published four collections of his own music: *Psalms, Sonets, & songs of sadnes & pietie* (1588), *Songs of sundrie natures* (1589), and two further books of *Cantiones Sacrae* (1589 and 1591). The two secular volumes were dedicated, respectively, to Sir Christopher Hatton, the lord chancellor, and to Lord Hunsdon, the lord chamberlain and first cousin to the Queen. Both volumes of motets were dedicated to prominent Catholics: the Earl of Worcester, a great friend and patron of Byrd's, whose loyalty to the crown was unimpeachable, and Lord Lumley. Also in 1591 a manuscript volume of Byrd's keyboard music was prepared for "my Ladye Nevell" (probably Rachel, wife of Sir Edward Nevill), while many more keyboard pieces found their way into the volume known as the *Fitzwilliam Virginal Book,* copied by another well-known Catholic, Francis Tregian, during his imprisonment in the Fleet.

In 1592 or 1593 Byrd moved with his family to Stondon Massey, Essex, where he lived for the rest of his life. At the accession of James I, the Catholics' prospects temporarily brightened, and this probably prompted Byrd's next three publications. In his collection of three masses and two books of *Gradualia* (1605, 1607), he attempted to provide single-handed a basic liturgical repertory, comprising music for the ordinary (*i.e.,* the unvarying parts of the mass) and for the proper (*i.e.,* the parts of the mass that vary according to the day or the feast) of all main feasts. It is significant that the dedicatees of both books of *Gradualia* were prominent Catholics ennobled within the first years of James's reign: the Earl of Northampton and Lord Petre of Writtle, another close friend of Byrd's. One further publication came from Byrd, the *Psalmes, Songs and Sonnets* of 1611, containing English sacred and secular music.

Assessment. Byrd's musical stature can hardly be overrated. He wrote extensively for every medium then available except, it seems, the lute. His virginal and organ music brought the English keyboard style to new heights and pointed the way to the achievements of other English composers, such as John Bull, Giles Farnaby, Orlando Gibbons, and Thomas Tomkins. In music for viol consort he also played an extremely important role, pioneering the development of the freely composed fantasia, which was to become the most important form of Jacobean and later composers. Although he admired Italian madrigals and as a publisher helped introduce them to England, Byrd's own secular vocal music is distinctly conservative; much of it is conceived for the old-fashioned medium of solo voice accompanied by viol consort, later abandoned by the English madrigalists, with Thomas Morley (Byrd's pupil) at their head. Byrd sometimes added texts to the polyphonic accompaniments of these songs, in effect making them madrigals.

Byrd's religious beliefs did not prevent him from composing a great deal of church music to English words, most of which has survived only in manuscript. Although this is of generally high quality it cannot be denied that Byrd maintained his highest consistent level in his Latin sacred music. Of this, the 1589 and 1591 sets of *Cantiones Sacrae* (mostly designed for the private edification of the Catholic circles Byrd moved in and therefore unrestricted by liturgical considerations) have an intensity unrivalled in England and a breadth of scale unknown on the Continent. Although the *Gradualia* are necessarily more concise and superficially more similar to the work of Giovanni da Palestrina and Tomás Luis de Victoria, with which Byrd was well acquainted, closer examination reveals their real individuality as well as an astonishingly consistent level of inspiration. (J.J.No.)

MAJOR WORKS. *Roman Catholic church music.* Masses: Masses for three, four, and five voices. Motets: Motets for from three to nine voices in *Cantiones Sacrae,* 1575; *Cantiones Sacrae,* books 1 and 2, 1589 and 1591; *Gradualia,* two books, 1605 and 1607.

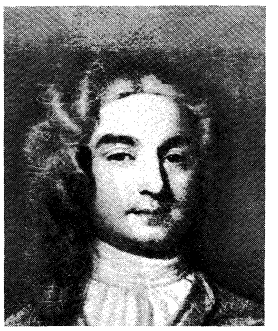
Anglican church music. Anthems: More than 20 motets, for from three to six voices, and for solo voice and viols, most in *Songs of sundrie natures,* 1589; and in the collection *Teares or Lamentations of a Sorrowful Soul* of Sir William Leighton, 1614. Psalms: About 20 in *Psalmes, Sonets, & songs of sadnes & pietie,* 1588; and *Songs of sundrie natures,* 1589. Miscellaneous: Litany for four voices; two complete services; two magnificats and a Nunc Dimittis; prayers and responses. *Songs and madrigals.* Madrigals: About 50 madrigals in *Psalmes, Sonets, & songs of sadnes & pietie,* 1588; *Songs of sundrie natures,* 1589; *Musica Transalpina,* 1588; and *The first sett of Italian Madrigalls,* 1590. Songs: Songs for voices and viols in *Songs of sundrie natures,* 1589; and in *Psalmes, Songs, & sonnets of sadnes & pietie,* 1611; more than 30 for voices and instruments in manuscript; about 40 rounds and canons.

Instrumental music. Viols: Fantasias in three to six parts; In nomines; pavans and galliards. Keyboard: About 140 pieces for keyboard in *Parthenia,* manuscript collection written *c.* 1611; *My Ladye Nevells Booke,* manuscript collection written in 1591; *The Fitzwilliam Virginal Book,* manuscript collection written in *c.* 1612–19; and in *Will Forster's Book,* manuscript collection written in 1624.

BIBLIOGRAPHY. *The Collected Vocal Works of William Byrd,* 2 vol., ed. by E.H. Fellowes (1937–50); and a more scholarly edition of the sacred works in vol. 2, 7, and 9 of *Tudor Church Music* (1921–28). See also Frank Howes, *William Byrd* (1928, reprinted 1978); E.H. Fellowes, *William Byrd,* 2nd ed. (1948); and Imogen Holst, *Byrd* (1972).

Byrd, William, OF WESTOVER (b. March 28, 1674, Virginia Colony—d. Aug. 26, 1744, Westover, Va.), Virginia planter, satirist, and diarist who portrayed colonial life on the southern British plantations.

His birthplace was the James River plantation home of his father, also named William Byrd, an Indian trader and slave importer. The boy went to school in England, travelled in Holland, and studied law in the Middle Temple, London. After he was admitted to the bar in 1695, he returned to Virginia but two years later was again in London as colonial agent. Almost all his youth was thus spent in England, where he became a fellow of the Royal Society. In 1705, after his father died, Byrd returned to Virginia to manage a large estate. Through marriage he became allied to some of the most powerful Virginia families. He was receiver general and a colonel of the county militia, both of which his father had been. In 1709 he was made a king's councillor, an appointment he held for life. He spent the years 1715 to 1726 (except for a trip home in 1720–21) in England, part of the time as colonial agent. He was the spokesman of the large planters against Gov. Alexander Spotswood. Then he returned to the colony for the last time, to lead the busy life of a planter and a member of the ruling clique. He built a large house at Westover, experimented with crops,



William Byrd of Westover, detail of an oil painting by Sir Godfrey Kneller, 1704; in a private collection

By permission of the owner; photograph, Virginia Historical Society

founded the city of Richmond, collected the largest private library in the colonies (around 4,000 volumes), and acquired some 179,000 acres. Byrd was twice married; he was survived by four daughters and a son, William Byrd III.

His diaries illuminate the domestic economy of the great plantations. His "History of the Dividing Line," a witty, satirical account of a 1728 survey of the North Carolina–Virginia boundary, for which he was appointed one of the commissioners, is among the earliest colonial literary works, along with his accounts of similar expeditions, "A Journey to the Land of Eden" and "A Progress to the Mines," published in *The Westover Manuscripts* (1841). He also kept a less literary but more revealing diary in shorthand published as *The Secret Diary . . . 1709–12* (1941).

Byrne, (Francis) Barry (b. Dec. 19, 1883, Chicago—d. Dec. 17, 1967, Evanston, Ill., U.S.), U.S. architect who emerged from the Prairie school of architecture influenced by Frank Lloyd Wright to develop a number of highly individual styles, especially in his designs for Roman Catholic ecclesiastical buildings. One of his finest works, the reinforced concrete Church of Christ the King, Cork, Ireland (from 1928), is said to be the first European Catholic church designed by a U.S. architect.

Trained in Wright's studio in Oak Park, Ill. (1901–07), Byrne worked with Wright's former associates Walter Burley Griffin and Marion Mahony in Chicago (1907–10, 1914–17), practiced alone in Chicago and then (1930–45) in New York City, and later established an office in the Chicago suburb of Evanston. His square-cut but elegant residence for John Valentine (Muncie, Ind., 1917; afterward the Ball State University chapter house, Sigma Tau Gamma fraternity), has been likened to the best contemporary work of the Viennese avant-garde architect Josef Hoffmann.

From the early 1920s Byrne concentrated on churches and religious schools. Immaculata High School, Chicago (1921–22; addition, also by Byrne, 1957), is related to the work of the German architect Hans Poelzig. His elevations for St. Patrick's Church, Racine, Wis. (from 1923), and the Church of Christ the King, Tulsa, Okla. (from 1926), are decep-

tively simple neo-Gothic. His church in Cork has natural lighting provided by narrow slits instead of the conventional large windows; concrete sculpture, integral with the structure, is used as decoration. Byrne's major works after World War II include the Church of St. Francis Xavier, Kansas City, Mo. (from 1948), and St. Benedict's Abbey, Atchison, Kan. (from 1955).

Byrnes, James F(rancis) (b. May 2, 1879, Charleston, S.C., U.S.—d. April 9, 1972, Columbia, S.C.), Democratic Party politician and administrator who, during World War II, was popularly known as "assistant president for domestic affairs" in his capacity as U.S. director of war mobilization (1943–45). He also served effectively as secretary of state (1945–47) in the challenging postwar period.

A self-taught lawyer, Byrnes entered public life in 1908 as public prosecutor in South Carolina. He served in the U.S. House of Representatives (1911–25) and in the Senate (1931–41), where he soon emerged as the actual majority leader; a member of Pres. Franklin D. Roosevelt's "Brain Trust," he helped pilot numerous New Deal measures through Congress. He later rejected many Administration concepts as too radical but was a key figure in launching important defense preparedness legislation on the eve of World War II.

After serving briefly on the U.S. Supreme Court (1941–42), Byrnes was appointed director of economic stabilization and later head of the Office of War Mobilization. He was thus vested with authority over production, procurement, and distribution of all civilian and military goods, manpower allocation, and economic stabilization.

After attending the Yalta (Big Three) Conference with Roosevelt in February 1945, Byrnes resigned but was recalled to active service by Pres. Harry S. Truman as secretary of state and accompanied Truman to the Potsdam Conference in the same year. After World War II, Byrnes declared that the U.S. would maintain a military establishment in Western Europe to prevent Soviet expansion there.

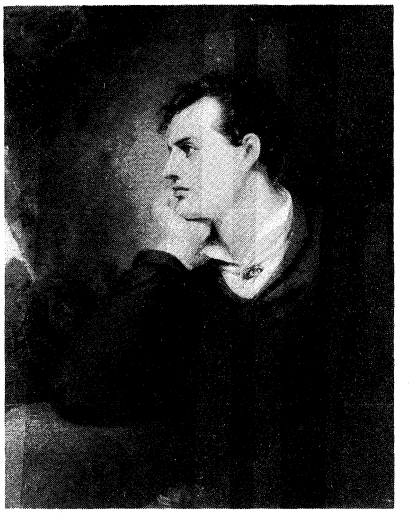
Byrnes served as governor of his state from 1951 to 1955. In later years he defended racial segregation in the schools.

Articles are alphabetized word by word, not letter by letter

Byron, George Gordon Byron, 6th Baron (b. Jan. 22, 1788, London—d. April 19, 1824, Missolonghi, Greece), English Romantic poet and satirist whose poetry and personality captured the imagination of Europe. His major works include *Childe Harold's Pilgrimage* (1812–18) and *Don Juan* (1819–24). He died of fever and exposure while engaged in the Greek struggle for independence.

Early life and travel. As a child George Gordon, who had been born with a clubfoot, was taken by his mother to Aberdeen, Scot., where they lived in lodgings on a meagre income. The boy, who early developed an extreme sensitivity to his lameness, attended the Aberdeen grammar school. His nurse, May Gray, helped to awaken precocious passions in him when he was only nine. This experience and his idealized love for his distant cousins Mary Duff and Margaret Parker shaped his paradoxical attitudes toward women.

At the age of 10, George Gordon inherited the title and estates of his great-uncle, the "wicked" Lord Byron. His mother proudly took him to England. The boy fell in love with the ghostly halls and spacious grounds of Newstead Abbey, which had been presented to the Byrons by Henry VIII, and he and his mother lived in its ruins for a while. He was privately



Lord Byron, portrait by Richard Westall, 1813; in the National Portrait Gallery, London.
By courtesy of the National Portrait Gallery, London

tutored in Nottingham, and his clubfoot was doctored by a quack named Lavender. John Hanson, Mrs. Byron's attorney, rescued him from the pernicious influence of May Gray, the tortures of Lavender, and the uneven temper of his mother. He took him to London, where a reputable doctor prescribed a special brace, and in the autumn of 1799 Hanson sent him to a school at Dulwich.

In 1801 Byron went to Harrow, where his friendships with younger boys fostered a romantic attachment to the school. It is possible that these friendships gave the first impetus to his sexual ambivalence, which became more pronounced at Cambridge and later in Greece. He spent the summer of 1803 with his mother at Southwell, near Nottingham, but soon escaped to Newstead and stayed with his tenant, Lord Grey, and courted his distant cousin Mary Chaworth. When she grew tired of "that lame boy," he indulged his grief by writing melancholy poetry—and she became the symbol of idealized and unattainable love.

After a term at Trinity College, Byron indulged in dissipations in London that put him deeply into debt. He returned in the summer of 1806 to Southwell, where he gathered his early poems in a volume privately printed in November with the title *Fugitive Pieces.* The following June his first published poems, *Hours of Idleness,* appeared. When he returned to Trinity he formed a close friendship with John Cam Hobhouse, who stirred his interest in liberal Whiggism. At the beginning of 1808, he entered into "an abyss of sensuality" in London that threatened to undermine his health. On reaching his majority in January 1809, he took his seat in the House of Lords, published an anonymous satire, *English Bards and Scotch Reviewers,* and embarked with Hobhouse on a grand tour.

They sailed on the Lisbon packet, crossed Spain, and proceeded by Gibraltar to Malta. There Byron fell in love with a married woman and almost fought a duel on her account. Byron and Hobhouse next landed at Préveza, Greece, and made an inland voyage to Janina (Ioánnina) and later to Tepelene in Albania to visit Ali Paşa. On their return Byron began at Janina an autobiographical poem, *Childe Harold,* which he continued during the journey to Athens. They lodged with a widow, whose daughter, Theresa Macri, Byron celebrated as "The Maid of Athens." In March 1810 he sailed with Hobhouse for Constantinople by way of Smyrna (Tur.), and, while becalmed at the mouth of the Hellespont, Byron visited the site of Troy and swam the channel in imitation of Leander. Byron's sojourn in Greece made a lasting impression on his mind and character—he delighted in the sunshine and the moral tolerance of the people.

Byron arrived in London on July 14, 1811, and his mother died on August 1 before he could reach her at Newstead. On Feb. 27, 1812, he made his first speech in the House of Lords, and at the beginning of March, *Childe Harold's Pilgrimage* was published by John Murray and took the town by storm. Besides furnishing a poetic travelogue of picturesque lands, it gave vent to the moods of melancholy and disillusionment of the post-Revolutionary and Napoleonic eras. And the poem voiced with a frankness unprecedented in the literature of the time the disparity between the romantic ideal and the world of reality. Byron was lionized in Whig society and the handsome poet with the clubfoot was swept into liaisons with the passionate Lady Caroline Lamb, the "autumnal" Lady Oxford, his half sister Augusta Leigh, and Lady Frances Webster. The agitations of these affairs and the sense of mingled guilt and exultation they aroused in his mind are reflected in the Oriental tales he wrote during the period. Seeking escape in marriage, in September 1814 he proposed to Anne Isabella (Annabella) Milbanke. The marriage took place on Jan. 2, 1815. After a honeymoon "not all sunshine," the Byrons, in March, settled in London. Delays in negotiations to sell Newstead left them financially embarrassed and before long bailiffs were in the house. Byron escaped to the house of John Murray, his publisher. Augusta Leigh had come for a visit, and Byron, exasperated by debts, irritated by Annabella's humourless sensitivity, and liberated by drink, talked wildly and hinted at past sins.

Lady Byron gave birth to a daughter, Augusta Ada, on December 10, and in January she left with the child for a visit to her parents and let him know that she was not moving back. The reasons for her decision were never given and rumours began to fly, most of them centring on Byron's relations with Augusta Leigh. When the rumours grew, Byron signed the legal separation papers and went abroad, never returning to England.

Exile abroad. After visiting the battlefield of Waterloo, he went to Switzerland. At the Villa Diodati, near Geneva, he was on friendly terms with the poet Percy Bysshe Shelley and his entourage, which included William Godwin's daughter Mary, who was Shelley's wife, and Godwin's stepdaughter by a second marriage, Claire Clairmont, who had insinuated herself into a liaison with Byron before he left England. A boat trip to the head of the lake with Shelley gave Byron material for his "Prisoner of Chillon," and he completed a third canto of *Childe Harold* at Diodati. At the end of the summer the Shelley party left for England, Claire carrying Byron's illegitimate daughter (born Jan. 12, 1817, and named Allegra by Byron). A tour of the Bernese Oberland with Hobhouse provided the scenery for *Manfred,* a Faustian poetic drama that reflected Byron's brooding sense of guilt and remorse and the wider frustrations of the romantic spirit doomed by the reflection that man is "half dust, half deity, alike unfit to sink or soar."

On October 5 Byron and Hobhouse left for Italy. Byron took lodgings in the house of a Venetian draper, with whose dark-eyed wife, Marianna Segati, he proceeded to fall in love. He studied Armenian at the monastery of S. Lazzaro and occasionally attended local literary gatherings. In May he joined Hobhouse in Rome and rode over the ruins, gathering impressions that he recorded in a fourth canto of *Childe Harold.* At a summer villa at La Mira on the Brenta River, he also wrote *Beppo,* a rollicking satire on Italian manners. There he met Margarita Cogni, wife of a baker, who followed him to Venice and eventually replaced Marianna Segati in his affections. During the summer of 1818, he completed the first canto

of *Don Juan*, a picaresque verse satire, with pointed references to his own experiences. Claire had sent his illegitimate daughter Allegra for him to raise and was continually annoying him with admonitions. The sale of Newstead Abbey finally cleared most of his debts and left him with a small income.

Shelley and other visitors, in 1818, had found Byron grown fat, with hair long and turning gray, looking older than his years, and sunk in promiscuity. A chance meeting with the Countess Teresa Guiccioli in April 1819 changed the course of his life. In a few days he fell completely in love with Teresa, 19 years old and married to a man nearly three times her age. Byron followed her to Ravenna, and, later in the summer, she accompanied him back to Venice and stayed until her husband called for her. Byron returned to Ravenna in January 1820, as Teresa's accepted gentleman-in-waiting. He won the friendship of her father and brother who initiated him into the secret revolutionary society of the Carbonari. In Ravenna he was brought into closer touch with the life of the Italian people than he had ever been. He gave arms to the Carbonari and alms to the poor. It was one of the happiest and most productive periods of his life. He wrote *The Prophecy of Dante;* three cantos for *Don Juan;* the poetic dramas *Marino Faliero, Sardanapalus, The Two Foscari,* and *Cain* (all published in 1821); and his satire on the poet Robert Southey, *The Vision of Judgment.* When Teresa's father and brother were exiled for their part in an abortive uprising and she, now separated from her husband, was forced to follow them, Byron reluctantly removed to Pisa, where Shelley had rented the Casa Lanfranchi on the Arno River for him. He arrived on Nov. 1, 1821, having left his daughter Allegra in a convent near Ravenna where he had sent her to be educated. She died on April 20 of the following year.

Byron paid daily visits to Teresa, whose father and brother had found temporary asylum in Pisa, until early summer when they all went to Leghorn, where Byron had leased a villa near Shelley's house on the Bay of Lerici.

There the poet Leigh Hunt found him on July 1, when he arrived from England to join with Shelley and Byron in the editing of a new periodical. Hunt and his family were installed in the lower floor of Byron's house in Pisa, where Byron and Teresa returned after her father and brother were expelled from Tuscany. The drowning of Shelley on July 8 left Hunt entirely dependent on Byron, who had already "loaned" him for his passage and the apartment. Byron found Hunt an agreeable companion, but their relations were somewhat strained by Mrs. Hunt's moral condescension and by the depredations of her six children. Byron contributed his *Vision of Judgment* to the first number of the new periodical, *The Liberal,* which was published in London by Hunt's brother John (Oct. 15, 1822). At the end of September he moved his entire household to a suburb of Genoa, where Teresa's family had found asylum and had taken a large house for him. Mary Shelley leased another house nearby for herself and the Hunts.

Byron's interest in the periodical had waned, but he continued to support Hunt and to give manuscripts to *The Liberal.* After a quarrel with his publisher, John Murray, Byron gave all his later work—including cantos VI to XVI of *Don Juan, The Age of Bronze,* and *The Island*—to John Hunt. Restive in the domesticity of his life with Teresa and longing for the opportunity for some noble action that would vindicate him in the eyes of his countrymen, Byron seized the offer from the London Greek Committee, which came in April 1823, to act as its agent in aiding the Greeks in their war for independence from the Turks.

On July 16, Byron left Genoa on a chartered ship, arriving at the Ionian island of Cephalonia on August 2; he settled in Metaxáta. He sent £4,000 of his own money to prepare the Greek fleet for sea service and then sailed for Missolonghi (Mesolóngion) on December 29 to join Prince Aléxandros Mavrokordátos, leader of the forces in western Greece.

With tremendous energy he entered into the plans to attack the Turkish-held fortress of Lepanto. He employed a fire master to prepare artillery and took under his own command and pay the Souliot soldiers, reputedly the bravest of the Greeks. In addition he made efforts to unite eastern and western Greece by effecting a reconciliation of the factions. But a serious illness on Feb. 15, 1824, followed by the usual remedy of bleeding, weakened him at the same time that an insurrection of the Souliots opened his eyes to their cupidity. Though his enthusiasm for the Greek cause was undiminished, he had thenceforth a more realistic view of the obstacles. He was also suffering from the emotional strain of an unequal friendship with Loukas Chalandritsanos, a Greek boy, whom he had brought as a page from Cephalonia and to whom he addressed his last agonized poems. He was planning to attend a conference at Salona when he contracted a fever, which was aggravated by the bleeding insisted on by the doctors, and he soon died. Deeply mourned throughout the land, he became a symbol of disinterested patriotism and a Greek national hero. His body was taken to England and, refused burial in Westminster Abbey, was placed in the vault of his ancestors near Newstead. Ironically, 145 years after his death, in 1969, a memorial to Byron was finally placed on the floor of the Abbey. (L.A.M./Ed.)

MAJOR WORKS. *Hours of Idleness: A Series of Poems, Original and Translated* (1807); *English Bards and Scotch Reviewers: A Satire* (1809); *Childe Harold's Pilgrimage: A Romaunt,* cantos i and ii (1812); canto iii (1816); canto iv (1818); *The Giaour: A Fragment of a Turkish Tale* (1813); *The Bride of Abydos: A Turkish Tale* (1813); *The Corsair: A Tale* (1814); *Lara: A Tale,* with *Jacqueline: A Tale,* by Samuel Rogers (1814); *The Siege of Corinth: A Poem,* pub. with *Parisina: A Poem* (1816); *Poems* (1816); *The Prisoner of Chillon, and Other Poems* (1816); *The Lament of Tasso* (1817); *Manfred: A Dramatic Poem* (1817); *Beppo: A Venetian Story* (1818); *Mazeppa: A Poem* (1819); *Don Juan,* cantos i and ii (1819); cantos iii–v (1821); cantos vi–viii, cantos ix–xi, and cantos xii–xiv (all 1823); cantos xv–xvi (1824); *Marino Faliero: Doge of Venice,* pub. with *The Prophecy of Dante: A Poem* (1821); *Sardanapalus: A Tragedy; The Two Foscari: A Tragedy; Cain: A Mystery* (1821); *The Vision of Judgment,* first pub. in *The Liberal* (1822).

BIBLIOGRAPHY A full listing of first editions is included in Thomas J. Wise, *A Bibliography of the Writings in Verse and Prose of . . . Byron . . .,* 2 vol. (1932–33, reprinted 1972); vol. 7 of Ernest H. Coleridge (ed.), *The Works of Lord Byron,* new, rev. and enlarged ed., 13 vol. (1898–1904, reprinted 1966), lists first, later, and foreign editions; Oscar José Santucho, *George Gordon, Lord Byron: A Comprehensive Bibliography of Secondary Materials in English, 1807–1974* (1977), contains as well a critical review of research. For Byroniana, see Samuel C. Chew, *Byron in England* (1924, reissued 1970); and S.C. Chew and Ernest J. Lovell, "Byron," in Frank Jordan (ed.), *The English Romantic Poets: A Review of Research and Criticism,* 3rd rev. ed. (1972). A standard modern biography is Leslie A. Marchand, *Byron,* 3 vol. (1957); this is supplemented and updated in *Byron: A Portrait* (1970, reprinted 1979). Good introductory biographies include Bernard Blackstone, *Byron: A Survey* (1975); and Elizabeth H.P. Longford, *The Life of Byron* (1976). See also Doris L. Moore, *The Late Lord Byron* (1961, reissued 1977), on the posthumous reputation of Byron; and Malcolm Elwin, *Lord Byron's Wife* (1962, reissued 1974), based on the Lovelace Papers (Lady Byron's papers). Critical works include Paul G. Trueblood, *Lord Byron,* 2nd ed. (1977); Ernest J. Lovell, *Byron: The Record of a Quest* (1949, reissued 1966); Andrew Rutherford, *Byron: A Critical Study* (1961), and *Byron: The Critical Heritage* (1970), a collection of 19th-century critiques; and Leslie A. Marachand, *Byron's Poetry: A Critical Introduction* (1965).

Byron, John (b. Nov. 8, 1723—d. April 10, 1786, England), British admiral, whose account, published in 1768, of a shipwreck in South America was to some extent used by his grandson, the poet Lord Byron, in *Don Juan.*

The second son of the 4th Baron Byron, he was a midshipman on board the "Wager" in 1741 when it was wrecked off the coast of Chile during George Anson's voyage round the world. After unparalleled hardships Byron eventually reached a Spanish prison and was repatriated in 1745. He was appointed to the command of the frigate "Dolphin" in 1764 and sent out to the Pacific Ocean in an attempt to discover the supposed southern continent, but he made only a fruitless circumnavigation lasting 22 months. Appointed governor of Newfoundland in 1769, he reached flag rank in 1775 and became vice admiral in 1778.

In 1779 he lived up to his nickname "Foul-weather Jack" when, in command of a fleet sent to relieve British forces in America, he encountered one of the worst Atlantic gales on record. It is to this that Lord Byron alludes in his "Epistle to Augusta":

> A strange doom is thy father's son's, and past
> Recalling, as it lies beyond redress;
> Reversed for him our grandsire's fate of yore,
> He had no rest at sea, nor I on shore.

As commander in chief of the West Indies, he fought an inconclusive battle with the Comte d'Estaing off Grenada in 1779.

Byron, John Byron, 1st Baron (b. *c.* 1600—d. Aug. 23, 1652, Paris), English Cavalier and Royalist during the Civil Wars, the eldest son of Sir John Byron (d. 1625), a member of an old Lancashire family which had settled at Newstead, near Nottingham.

During the third decade of the 17th century Byron was member of Parliament for the town and afterward for the county of Nottingham. In December 1641, King Charles I made him lieutenant of the Tower of London, but in consequence of the persistent demand of the House of Commons he resigned in 1642.

Byron fought at the skirmish at Powick Bridge; he commanded his own regiment of horse at Edgehill and at Roundway Down. At Marston Moor, as previously at Edgehill, Byron's rashness gave a great advantage to the enemy; then, after fighting in Lancashire and north Wales, he returned to Chester, which he held for about 20 weeks in spite of the King's defeat at Naseby and the general hopelessness of the royal cause. Having obtained favourable terms, he surrendered the city in February 1646.

Byron took some slight part in the second Civil War, and was one of the seven persons excepted by Parliament from all pardon in 1648. But he had already left England, and he lived abroad in attendance on the royal family until his death. Although twice married, Byron left no children, and his title descended to his brother Richard (1605–79), who had been governor of Newark. Byron's five other brothers served Charles I during the Civil War, and one authority says that the seven Byrons were all present at Edgehill.

Byron Bay, town, northeastern New South Wales, Australia, on Byron Bay, an inlet of the Pacific Ocean. It is on Cape Byron, easternmost point of the Australian mainland, which shelters the bay and was discovered in 1770 by Capt. James Cook, who named it after Commo. (later Adm.) John Byron, grandfather of the poet Lord Byron. Founded in 1860 as a timber port, it was declared a town in 1896 and a shire in 1906. Before coastal shipping declined, Byron Bay was the prin-

cipal port between Newcastle and Brisbane (90 mi [140 km] north-northwest); it was a whaling port during the 1950s. Now mainly an anchorage, Byron Bay is still the commercial centre for a district supporting beef and dairy cattle, fruit (including bananas, pineapples, and avocados), corn (maize), and beach sand mining (rutile and zircon). Connected to Sydney and Brisbane by rail and just off the Pacific Highway, it has butter and bacon factories, surfboard factories, and fish-processing and fish-storage facilities. Pop. (1981) 3,187.

byssinosis, also called BROWN LUNG, or BROWN LUNG DISEASE, respiratory disorder, a type of pneumoconiosis caused by dust from cotton and other fibres, common among textile workers. When inhaled, the dust stimulates histamine release, which causes constriction of the air passages, making breathing difficult. Over time the dust accumulates in the lung, producing a typical discoloration that gives the disease its common name.

Byssinosis was first recognized in the 17th century and was widely known in Europe and England by the early 19th century; today it is seen in most cotton-producing regions of the world. Several years of exposure to cotton dust are needed before byssinosis develops, and workers with lower grade disease usually recover completely upon leaving the industry or moving into an area with less dust. Persons with mild byssinosis have a "Monday feeling" of chest tightness and shortness of breath on the first day of work after a weekend or holiday. As exposure continues, this feeling persists throughout the week, and in advanced stages, byssinosis causes chronic, irreversible obstructive lung disease. Although cotton is by far the most common cause—accounting for such names as cotton-dust asthma and cotton-mill fever—flax, hemp, and other organic fibres can also produce byssinosis.

Byssonychia, extinct genus of Ordovician pelecypods (clams) that serves as a useful index fossil for the Ordovician Period (500,000,000 to 430,000,000 years ago). The distinctive shell of *Byssonychia,* one of the earliest clam genera known, is roughly triangular in outline, tapering sharply to a prominent beak and bearing distinct linear ribbing on the surface. Only one distinct muscle scar is present on the inside of the shell.

Bytom, German BEUTHEN, city, Katowice *województwo* (province), southwestern Poland. One of the oldest and largest industrial cities in the Górny Śląsk (Upper Silesia) coal region, Bytom's origins were in the 11th century under the rule of King Bolesław I the Brave. In the 12th century, lead and silver mines provided the earliest economic base. The town was held by Silesia in the 12th century; in 1282–89 it was the capital of an independent dukedom and for several centuries was under various central European powers. Passing to Germany in the mid-18th century, it had the only Polish gymnasium (secondary school) in Germany and later served as a centre for the Polish underground during World War II. Since 1945 it has become a centre for heavy industry, having an integrated iron and steel works, and for the mining of coal, zinc, lead, and silver—its silver foundry is the largest in Poland—and it has good rail connections. Pop. (1982 est.) 237,800.

Byumba, *préfecture* (Kinyarwanda *prefegitura*), northeastern Rwanda, Central Africa, bordering Uganda on the north-northwest, Tanzania (northeast), and the Rwandan *préfectures* of Kibungo (southeast), Kigali (south), and Ruhengeri (west). The *préfecture*'s relief varies greatly; mountainous areas more than 8,000 ft (2,500 m) high in the west descend into plateaus and then into lowlands of less than 5,000 ft in the east. Byumba has warm temperatures and abundant (*c.* 48 in. [1,200 mm] annually) rainfall, except in the east where hotter, drier (less than 30 in.) conditions prevail. The western portion of Byumba's area of 1,925 sq mi (4,985 sq km) supports cattle breeding and crop raising. Coffee (*arabica*), peanuts (groundnuts), tea, bananas, barley, and sweet potatoes constitute the most important agricultural products. The population density of the *préfecture* declines greatly from west to east, where Kagera National Park (established 1934) along the Tanzanian border provides a protected habitat for many types of African wildlife. The *préfecture*'s administrative centre is Byumba town, which has road links with Kigali, the national capital, and with Uganda. Pop. (1978 prelim.) 519,968.

Byzacium (Tunisia): *see* Sāḥil, as-.

Byzantine art, architecture, paintings, and other visual arts produced in the Middle Ages in the Byzantine Empire (centred at Constantinople) and in various areas that came under its influence. The pictorial and architectural styles that characterized Byzantine art, first codified in the 6th century, persisted with remarkable homogeneity within the empire until its final dissolution with the capture of Constantinople by the Turks in 1453.

Byzantine art is almost entirely concerned with religious expression and, more specifically, with the impersonal translation of carefully controlled church theology into artistic terms; its forms of architecture and painting grew out of these concerns and remained uniform and anonymous, perfected within a rigid tradition rather than varied according to personal whim; the result was a sophistication of style and a spirituality of expression rarely paralleled in Western art.

The earliest Byzantine architecture, though determined by the longitudinal basilica (*q.v.*) church plan developed in Italy, favoured the extensive use of large domes and vaults. Circular domes, however, were not structurally or visually suited to a longitudinal arrangement of the walls that supported them; thus, by the 10th century, a radial plan, consisting of four equal vaulted arms proceeding from a dome over their crossing, had been adopted in most areas. This central, radial plan was well suited to the hierarchical view of the universe emphasized by the Eastern Church. This view was made explicit in the iconographic scheme of church decoration, set forth in the frescoes (*q.v.*), or more often, mosaics, that covered the domes, walls, and vaults of churches in a complete fusion of architectural and pictorial expression. In the top of the central dome was the severe figure of the Pantocrator (the all-ruling Father). Below him, usually around the base of the dome, were angels and archangels and, on the walls, figures of the saints. The Virgin Mary was often pictured high in a half-dome covering one of the four radial arms. The lowest realm was that of the congregation. The whole church thus formed a microcosm of the universe. The iconographic scheme also reflected liturgy; narrative scenes from the lives of Christ and the Virgin, instead of being placed in chronological order along the walls, as in Western churches, were chosen for their significance as feast days and ranged around the church according to their theological significance.

The style in which these mosaics and frescoes were executed reflected their function as static, symbolic images of the divine and the Absolute. The mature Byzantine style, evolved through the stylization and standardization of late classical forms of Early Christian art, was based on the dynamic of lines and flat areas of colour rather than form. Individual features were suppressed in favour of a standard facial type, figures were flattened, and draperies were reduced to patterns of swirling lines. The total effect was one of disembodiment, the three-dimensional representation of an individual human figure replaced by a spiritual presence the force of which depended upon vigour of line and brilliance of colour. The Byzantine image was at once more remote and more immediate than the naturalistic classical one because, though it was not realistic in a conventional sense, it did not require a suspension of disbelief, an illusionistic translation in the mind's eye. The effect of immediacy was increased by the severely frontal pose and the Byzantine facial type, with its huge eyes and penetrating gaze, and by the characteristic use of a gold background which, in pictures of isolated figures, made the image appear to be suspended somewhere between the wall and the viewer.

Little sculpture was produced in the Byzantine Empire. The most frequent use of sculpture was in small relief carvings in ivory, used for book covers, reliquary boxes, and similar objects. Other miniature arts, embroidery, goldwork, and enamelwork, flourished in the sophisticated and wealthy society of Constantinople. Manuscript illumination, though it could not approach the impressive effects of monumental painting and mosaic, was important in spreading Byzantine style and iconography through Europe.

Aside from its own achievements the importance of Byzantine art to the religious art of Europe cannot be overestimated. Byzantine forms were spread by trade and conquest to Italy and Sicily, where they persisted in modified form through the 12th century and became formative influences on Italian Renaissance art; and, by the expansion of the Eastern Orthodox Church, Byzantine forms spread to Eastern centres, particularly Russia, where they remained intact, though again with local modification, through the 17th century.

Byzantine chant, monophonic, or unison, liturgical chant of the Greek Orthodox Church during the Byzantine Empire (330–1453) and down to the 16th century; in modern Greece the term refers to ecclesiastical music of any period. Although Byzantine music is linked with the spread of Christianity in Greek-speaking areas of the Eastern Roman Empire, it probably derives mostly from Hebrew and early Syrian Christian liturgies (*see* Syrian chant). Various types of hymns were prominent, among them those called *troparion,* kontakion, and *kanōn* (*qq.v.*). The music is unrelated to that of ancient Greece and Byzantium.

Documents with Byzantine neumatic notation (see below) date only from the 10th century. Earlier, there was in use an "ecphonetic" notation based on the accent marks of Greek grammarians from Alexandria, Egypt, giving only a vague direction of upward or downward voice movement; the intoned readings to which the signs were added were learned by oral transmission for centuries.

Byzantine neumatic notation in its earliest stage (Paleo-Byzantine; 10th–12th centuries) was more specific than the ecphonetic signs but lacked precision in notating rhythms and musical intervals. This imprecision was remedied in Middle Byzantine notation (developed late 12th century), the principles of which are still used in Greek practice. It consists of signs called neumes. Unlike western European neumes, they do not designate pitch; rather, they show the musical interval from the previous tone. The pitch and length of the starting tone were shown by signs called *martyriai* ("witnesses"), abbreviations of well-known melodies that provided an initial intonation.

The notation in manuscripts from the 16th to the early 19th century is usually called Neo-Byzantine because of some stylistic features in music of that period. In the early 19th century the traditional notation was viewed as too complex, and Archbishop Chrysanthos of Madytos introduced a simplified version

that spread through printing and is used in all Greek Orthodox liturgical music books.

The melodies were formulaic: a composer usually set a text to a traditional melody, which he then modified and adapted to the needs of the text; some melodic formulas were used exclusively at the beginning of a chant, others at endings, and others in either place. There were also transitional passages, some traditional and others apparently used by individual composers. A few melodic formulas using one basic tone constituted the framework of a mode, or *ēchos.* Each *ēchos* had its own formulas, though some formulas occurred in more than one *ēchos.*

Liturgical books containing texts and music included the *Heirmologion* (melodies for model stanzas of *kanōn* hymns); the *Sticherarion* (hymns proper for each day of the church year); and the *psaltikon* and *asmatikon* (solo and choral parts, respectively, for kontakion and some other solo choral chants). In the *Akolouthiai,* or *Anthologion,* were ordinary chants for Vespers, Matins, funerals, and the three liturgies (of St. John Chrysostom, St. Basil, and the Preconsecrated Offerings), as well as optional chants, some of which were usable as bridges at any point in the liturgy, usually sung to single syllables or nonsense syllables.

The earliest composers were probably also poets. St. Romanos Melodos (fl. early 6th century) is revered as a singer and as the inventor of the kontakion. John of Damascus (*c.* 645–749) composed *kanōns,* and legend credits him with the *oktōēchos* classification, though the system is documented a century earlier in Syria. The nun Kasia (fl. 9th century) is believed to have composed several hymns; other prominent names are John Koukouzeles, John Glydis, and Xenos Koronis (late 13th–mid-14th century).

Byzantine Empire, the eastern half of the Roman Empire, which survived for a thousand years after the western half had crumbled into various feudal kingdoms and which finally fell to Turkish onslaughts in 1453.

A brief treatment of the Byzantine Empire follows. For full treatment, *see* MACROPAEDIA: Byzantine Empire, The History of the.

The city of Byzantium grew from an ancient Greek colony founded on the European side of the Bosporus. In AD 330 the Roman emperor Constantine, in an attempt to strengthen the empire, refounded Byzantium as Constantinople, the "New Rome" and eastern capital. At his death in 395 Emperor Theodosius divided the empire between his two sons, and it was never reunited. Theodosius also made Christianity the sole religion of the empire, and Constantinople assumed preeminence over other Christian centres in the East as Rome did in the West. The fall of Rome to the Ostrogoths in 476 left Constantinople the sole capital of the empire.

The eastern realm differed from the western in many respects. It was heir to the Hellenistic civilization, a blending of Greek and Middle Eastern elements dating back to the conquests of Alexander the Great. It was more commercial, more urban, and richer than the West, and its emperors, who in the Hellenistic tradition combined political and religious functions, had firmer control over all classes of society. They were also more skillful in fending off invaders, through both warfare and diplomacy. With these advantages, the Byzantine emperors, who still considered themselves Romans, long nourished the dream of subduing the barbarian kingdoms of the West and reuniting the empire.

The greatest of these was Justinian I (reigned 527–565), who with his able wife Theodora prepared for the reconquest by defeating the Persians on the eastern frontier and extirpating various heresies that had alienated the Roman Church. He sponsored a compilation and recodification of Roman law and built the magnificent Hagia Sophia. Justinian's reconquests of North Africa and Italy were short-lived. The later years of his reign were marred by renewed war with the Persians, incursions by Bulgar and Slavic tribes, and outbreaks of bubonic plague, which created severe shortages of manpower and revenue. The weakened empire, preoccupied with internal problems, grew less and less concerned with the West. Although its rulers continued to style themselves "Roman" long after the death of Justinian, the term "Byzantine" more accurately describes the very different medieval empire.

Perhaps the most significant cultural feature of the Byzantine Empire was the type of Christianity developed there. More mystical and more liturgical than Roman Christianity, it was also less unified because of age-old ethnic hostilities in the region, the survival of various heresies among the clergy in Syria, Egypt, and other provinces, and the early use of the demotic (vernacular) languages in religious services. It was this disunity that partly accounted for the sweeping success of the Arab invasions that began after Muḥammad's death in 632. Within 10 years Syria and Palestine, Egypt and North Africa were under Muslim Arab control. Religious disunity continued to weaken the empire throughout the Iconoclastic Controversy (a dispute over the use of religious images, or icons) of the 8th and early 9th centuries, which left the Eastern Orthodox Church split into factions and further alienated from Rome. A formal schism between Eastern and Western churches was mutually agreed to in 1054. By that time the Eastern Orthodox Church had been revitalized by successful missions among the Russians, Bulgars, and Slavs, some of them directed by the monks Cyril and Methodius, whose invention of Slavonic alphabets (still called Cyrillic) made possible the translation of the Bible and the spread of literacy along with Christianity in Slavic lands.

Although the empire had lost much territory to the Arabs and to the independent kingdoms established in the Balkan Peninsula, its remnants were strengthened by a number of institutional reforms. A new administrative unit, the theme, was introduced along with a system of military land grants and hereditary service that ensured an adequate supply of soldiers. It also laid the foundation for the emergence of great landed families who in later centuries would wage dynastic struggles for the imperial throne. The Byzantine economy was actually strengthened by the loss of territory, as the shrinking empire allowed greater freedom to merchants and agricultural labour.

All of these developments led to a golden age marked by a literary renaissance and brief resurgence of military and naval power under the Macedonian dynasty, whose founder, a peasant adventurer named Basil, murdered his way to the throne in 867. The Macedonian emperors supervised the Hellenization of the Code of Justinian, into which they wrote the principle of imperial absolutism tempered only by the spiritual authority of the church. More dramatically, they reversed for a time the military defeats of their predecessors and reconquered large areas from the Arabs and Bulgars.

No matter how centralized their administra-

Byzantine emperors*

Zeno	474–491	Constantine IX Monomachus	1042–55
Anastasius I	491–518	Theodora (*empress*)	1055–56
Justin I	518–527	Michael VI Stratioticus	1056–57
Justinian I	527–565	Isaac I Comnenus	1057–59
Justin II	565–578	Constantine X Ducas	1059–67
Tiberius II Constantine	578–582	Romanus IV Diogenes	1067–71
Maurice Tiberius	582–602	Michael VII Ducas	1071–78
Phocas	602–610	Nicephorus III Botaniates	1078–81
Heraclius	610–641	Alexius I Comnenus	1081–1118
Heraclius Constantine	641	John II Comnenus	1118–43
Heraclonas (or Heraclius)	641	Manuel I Comnenus	1143–80
Constans II (Constantine Pogonatus)	641–668	Alexius II Comnenus	1180–83
Constantine IV	668–685	Andronicus I Comnenus	1183–85
Justinian II Rhinotmetus	685–695	Isaac II Angelus	1185–95
Leontius	695–698	Alexius III Angelus	1195–1203
Tiberius III	698–705	Isaac II Angelus (*restored*)	1203–04
Justinian II Rhinotmetus (*restored*)	705–711	Alexius V Ducas Murtzuphlus	1204
Philippicus	711–713	*Latin emperors*	
Anastasius II	713–716	Baldwin I	1204–06
Theodosius III	716–717	Henry	1206–16
Leo III	717–741	Peter	1217
Constantine V Copronymus	741–775	Yolande (*empress*)	1217–19
Leo IV	775–780	Robert	1219–28
Constantine VI	780–797	Baldwin II	1228–61
Irene (*empress*)	797–802	John	1231–37
Nicephorus I	802–811	*Nicaean emperors*	
Stauracius	811	Constantine (XI) Lascaris	1204–05?
Michael I Rhangabe	811–813	Theodore I Lascaris	1205?–22
Leo V	813–820	John III Ducas Vatatzes	1222–54
Michael II Balbus	820–829	Theodore II Lascaris	1254–58
Theophilus	829–842	John IV Lascaris	1258–61
Michael III	842–867	*Greek emperors restored*	
Basil I	867–886	Michael VIII Palaeologus	1261–82
Leo VI	886–912	Andronicus II Palaeologus	1282–1328
Alexander	912–913	Andronicus III Palaeologus	1328–41
Constantine VII Porphyrogenitus	913–959	John V Palaeologus	1341–76
Romanus I Lecapenus	920–944	John VI Cantacuzenus	1347–54
Romanus II	959–963	Andronicus IV Palaeologus	1376–77
Nicephorus II Phocas	963–969	John V Palaeologus (*restored*)	1379–90
John I Tzimisces	969–976	John VII Palaeologus	1390
Basil II Bulgaroctonus	976–1025	John V Palaeologus (*restored*)	1390–91
Constantine VIII	1025–28	Manuel II Palaeologus	1391–1425
Romanus III Argyrus	1028–34	John VIII Palaeologus	1421–48
Michael IV	1034–41	Constantine XI Palaeologus	1448–53
Michael V Calaphates	1041–42		
Zoe (*empress*)	1042–56		

*For emperors of the Eastern Roman Empire (at Constantinople) before the fall of Rome, *see* Roman Republic and Empire.

tion or how absolute their power on paper, the emperors were unable to stop the feudalization of the empire and the concentration of land and wealth in a few great families. The rivalry between rural and urban aristocracies led each faction to nominate its own imperial candidates. While they were engaged in civil disputes new enemies, the Normans and the Seljuq Turks, increased their power around the eastern Mediterranean.

In the late 11th century, Emperor Alexius I reluctantly sought help from the outside. He appealed to Venice, to whom he gave the first of the commercial concessions that helped to make it a great maritime power, and to the pope, who in turn appealed to the feudal rulers of the West, many of them, ironically, Normans. These doubtful allies rapidly turned the ensuing Crusades into a series of plundering expeditions not only against the Turks but also against the heart of the Byzantine Empire. The Fourth Crusade resulted in the fall of Constantinople to Venetians and crusaders in 1204 and the establishment of a line of Latin emperors. The empire was recaptured by Byzantine exiles in 1261, but under the final Palaeologus dynasty it was little more than a large city-state besieged from all sides. In the 14th century the Ottoman Turks replaced the Seljuqs as the major enemy in the east. Almost the entire Balkan Peninsula fell to them, but their siege of Constantinople, begun in 1395, was prolonged by the city's near-impregnable strategic position and by Turkish factionalism. It ended in 1453, when the last emperor, also named Constantine, died fighting on the walls. The final stronghold of Greek power, Trebizond, fell to the Turks in 1461.

Byzantine Greek language, an archaic style of Greek that served as the language of administration and of most writing during the period of the Byzantine, or Eastern Roman, Empire until the fall of Constantinople to the Turks in 1453. During the Byzantine period the spoken language continued to develop without the archaizing tendencies of the written language. Byzantine Greek is still the liturgical language of the Greek Orthodox Church.

Byzantine rite, the system of liturgical practices and discipline observed by the Eastern Orthodox Church and by the majority of Eastern-rite churches, which are in communion with Rome.

The Byzantine rite originated in the Greek city of Antioch (in modern southernmost Turkey), one of the earliest and most celebrated centres of Christianity; but it was developed and perfected in Byzantium. Associated primarily with the Great Church of Constantinople, it used the Greek language. As Constantinople extended its influence, however, the rite lost its exclusive Greek character and became Byzantine as it was translated into the vernacular of the diverse people it embraced.

From the original Byzantine rite, 13 canonical rites were derived: Albanian (dispersed; *i.e.*, no longer indigenous to the land of its origin), Belorussian (dispersed, but with a bishop in London), Bulgarian, Greek, Hungarian, Italo-Albanian, Melkite, Romanian (suppressed by the government in 1948), Russian (dispersed), Ruthenian, Slovak (suppressed by the government in 1950, reestablished in 1968), Ukrainian, and Yugoslav. Several of the dispersed or suppressed rites have memberships in other countries, especially in the United States.

In the early Christian Church, liturgies developed gradually and were essentially formed by the 6th century, although further developments occurred. Of the three liturgies in use by Byzantine-rite churches, the Liturgy of St. John Chrysostom is celebrated most frequently and is the normal church service. The Liturgy of St. Basil the Great is longer and is used on 10 special occasions each year. The Liturgy of the Preconsecrated Offerings (of St. Gregory the Great) is celebrated on Wednesdays and Fridays during Lent. A fourth liturgy, that of St. James the Apostle, is very rarely used. The liturgical language varies from country to country, but the Byzantine-rite churches in the United States have generally continued using the language of the parent church.

Byzantium, later CONSTANTINOPLE, modern ISTANBUL, ancient Greek city on the shore of the Bosporus; also, an alternative name for the Byzantine Empire, which had its capital at Constantinople. *See also* Istanbul.

C-47 (U.S. aircraft): *see* DC-3.

Ca, Song, also called LAM GIANG, English CA RIVER, river rising in the Phou Loi (Loi Mountains) of Laos and flowing southeastward through Nghe Tinh province of northern Vietnam to enter the Gulf of Tonkin near Vinh (the provincial capital) after a course of 380 mi (612 km). The coastal riverine lowlands have relief features similar to those of the Red River (Song Hong); wide, level stretches of alluvium predominate with small undulation. There is a high population density in the delta region, particularly near Vinh. A low broken range of basaltic hills on the north side separates the Song Ca Delta from that of the Song Ma and Song Chu.

Ca' da Mosto, Alvise, Ca' da Mosto also spelled CADAMOSTO (b. 1432, Venice—d. July 18, 1488, Venice), Venetian explorer and trader who wrote one of the earliest known accounts of western Africa.

Retained by Prince Henry the Navigator, he set sail on March 22, 1455, visited Madeira and the Canary Islands, and coasted along Africa past the mouth of the Senegal River. He ascended some distance up the Gambia River, but, finding the people hostile, he returned to Portugal.

Ca' da Mosto appears to have been the first European to reach the Cape Verde Islands, two of which he explored (1456) and found uninhabited. Returning to the African shore, he sailed south from the region of the Gambia to the coast of modern Guinea-Bissau.

Ca Mau Peninsula, peninsula, the southernmost projection of Vietnam, lying between the South China Sea on the east and the Gulf of Thailand on the west, with drainage to each. The flat, triangular peninsula, with lengths ranging from 110 to 130 mi (180 to 210 km), averages about 7 ft (2 m) above sea level and owes its configuration largely to shore deposits of the Mekong, which are also responsible for the sweeping spit of Mui (cape) Bai Bung at the tip. The Ca Mau has a tropical monsoonal climate with year-round rainfall except for a short, drier winter season of two to three months. It includes parts of the provinces of Hau Giang and Kien Giang and all of the province of Minh Hai. Its northern limit may be considered to be the westward-flowing Song (river) Cai Lon; in the east the Ca Mau Peninsula merges into the Mekong delta region.

An area without vehicular roads until after World War II, the remote Ca Mau sweeps southward from a canalized plain to a dense, tropical mangrove swamp on whose winding streams the Vietnamese fish. The villagers export and trade in rice, honey, wax, fibre mats, and charcoal made from hardwoods, all of which are staples of the economy of the town of Ca Mau (Quan Long). For many years after World War II much of the Ca Mau Peninsula was successively held by Viet Minh and Viet Cong guerrillas.

Caacupé, capital, La Cordillera department, central Paraguay. The name Caacupé originates from the Guaraní word *caaguycupé*, meaning "the other side of the mountain." Founded in 1770, the city nestles in a valley of the Cordillera (mountains) de los Altos. Although the oranges, tobacco, and sugarcane grown in the hinterland are processed in the city, which also manufactures tiles, Caacupé is best known as a resort and pilgrimage centre. On December 8, Brazilians and Argentines as well as Paraguayans celebrate the festival of the Blue Virgin of the Miracles, whose shrine stands on Caacupé's central plaza. The National Agronomic Institute, created in 1943, operates a large experimental farm in Caacupé to research crops. The city can be reached by paved highway from Asunción. Pop. (1982 prelim.) 9,105.

Caaguazú, department, east central Paraguay, bounded on the north by Canendiyú and San Pedro departments. The Cordillera (mountains) de Caaguazú dominate the eastern portion. Tributaries of both the Paraguay and Paraná rivers traverse the department. The territory comprises 4,748 sq mi (12,298 sq km). Its thinly populated northern forests yield timber and maté (tea); on the savanna of the southwest, the economy depends on tobacco, oranges, sugarcane, and livestock. Coronel Oviedo (*q.v.*), the capital, is linked with Asunción by a paved highway. Pop. (1982 prelim.) 299,227.

caa'ing whale: *see* pilot whale.

Caazapá, department, southern Paraguay, occupying 3,666 sq mi (9,496 sq km), an area that marks the transition zone between the last forested hills of the Brazilian Highlands, including the Cordillera (mountains) de Caaguazú, and the western lowlands of the Río Tebicuary, a tributary of the Paraguay River. Because of its varied terrain, the province accommodates forestry, farming, and cattle raising. Rice, maté (tea), sugarcane, leather, and timber are the principal products. Paraguay's principal railway from Asunción to Encarnación serves the lowlands, while a branch line runs to the forest edge. The departmental capital, Caazapá (*q.v.*), is reached by a road from Villarrica. Pop. (1982 prelim.) 109,530.

Caazapá, capital, Caazapá department, southern Paraguay. Founded in 1607 by Friar Bolaños, the town is situated on the edge of the westward extension of the Brazilian Highlands, including the Cordillera (mountains) de Ybytyruzú. In addition to its administrative functions, Caazapá is a lumbering and agricultural centre, and tanneries are located there. The town has a regional hospital, various educational institutions including an agricultural college, and a monument to Bolaños. Caazapá can be reached by highway and railway from Asunción. Pop. (1982 prelim.) 2,948.

Cabaiguán, city, northern Sancti Spíritus province, central Cuba. It is an important manufacturing and commercial centre for surrounding agricultural and pastoral lands known primarily for their sugarcane, although tobacco and fruits are grown and cattle are raised. Sugar refining is the principal industrial activity in the city, which lies on the central highway and a major railroad. Pop. (1981 prelim.) 36,544.

cabal, a private organization or party engaged in secret intrigues; also, the intrigues themselves. In England the word was used during the 17th century to describe the mystical interpretation of the Hebrew scripture (the Cabala, or Kabbala), as well as to describe any secret or extralegal council of the king, especially the foreign committee of the Privy Council. The term took on its present invidious meaning from a group of five ministers chosen in 1667 by King Charles II (Clifford, Arlington, Buckingham, Ashley Cooper [later earl of Shaftesbury], and Lauderdale), whose initial letters coincidentally spelled cabal. This cabal, never very unified in its members' aims and sympathies, fell apart by 1672; Shaftesbury even became one of Charles II's fiercest opponents.

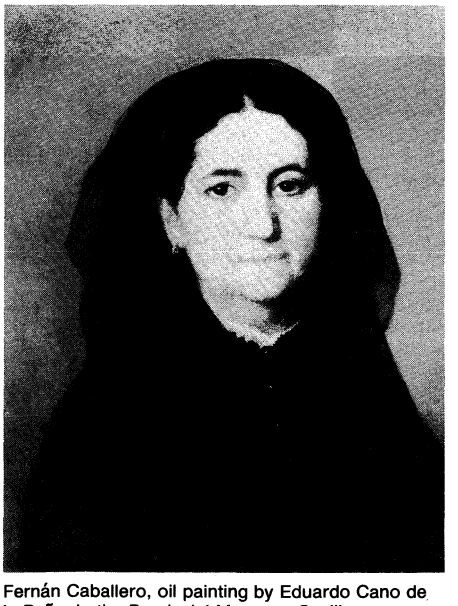
Cabala (Judaism): *see* Kabbala.

cabaletta (Italian *cobola:* "couplet"), originally an operatic aria with a simple, animated rhythm, and later a fast concluding section of an operatic aria, usually at the end of an act. An example of the earlier type is "Le belle immagini" ("The Beautiful Images") in Gluck's *Paride ed Elena* (1770). In 19th-century Italian opera, *cabaletta* may mean either a short aria in quick tempo with repeated sections (examples occur in the operas of Rossini) or a brilliant conclusion to an aria, *e.g.,* Violetta's "Sempre libera" ("Always free") in Verdi's *La traviata.* In Stravinsky's *Rake's Progress* (1951), Anne's *cabaletta* has the older form of a short aria in quick, uniform tempo.

Caballé, Montserrat (b. April 12, 1933, Barcelona), Spanish operatic soprano, admired for her versatility, phrasing, and bel canto style. She began her studies as a child at the Conservatorio del Liceo in Barcelona with Eugenia Kenny and later continued with Napoleone Annovazzi and Conchita Baddia. In 1956 she joined the Basel Opera, in which later that year she had her first major role, as Mimi in Giacomo Puccini's *La Bohème.* In 1959 she became a principal singer with the Bremen Opera. Her repertory soon included 46 Italian, German, and French roles.

In 1964 Caballé made a sensational debut in Mexico City as Jules Massenet's *Manon.* In the following year she gave a highly successful concert performance of Gaetano Donizetti's *Lucrezia Borgia* at Carnegie Hall in New York City, sang the parts of the Countess in Mozart's *Le nozze di Figaro* and the Marschallin in Richard Strauss's *Der Rosenkavalier* at the Glyndebourne Festival in East Sussex, and made her debut at the Metropolitan Opera in New York City as Marguerite in Gounod's *Faust.* She performed in leading opera houses of the world and gave many recitals, most notably of Spanish songs.

Caballero, Fernán, pseudonym of CECILIA BÖHL DE FABER (b. Dec. 24, 1796, Morges, Switz.—d. April 7, 1877, Seville), novelist famous for her defense of the traditional virtues of Spain—Catholic, monarchist, moral, and rural—against the upsurge of 19th-century liberalism. Her German father, who was a critic of Spanish literature, moved his family in 1813 to Andalusia, the native region of her mother, a translator and critic of European literature. Her best known novel, *La gaviota* (1849; *The Seagull,* 1867, 1965), is considered a precursor of the 19th-century Spanish realistic novel. It is also the first outstanding example of a novel influenced by *costumbrismo,* the literary movement that depicted in short prose sketches the rapidly changing customs of rural Spain, almost always with a somewhat nostalgic attitude. She died after a long period of ill health, thrice-widowed and childless.



Fernán Caballero, oil painting by Eduardo Cano de la Peña; in the Provincial Museum, Seville
Archivo Mas, Barcelona

Caballero, Francisco Largo: *see* Largo Caballero, Francisco.

Cabañas, department, north central El Salvador, bordered to the north and east by the Río Lempa Valley, with an area of 426 sq mi (1,104 sq km). It was formed in 1873. The production of indigo, important in the 19th century, has declined. Grain, sugar, rice, and beans are cultivated, and livestock is raised for dairy produce. Cabañas is noted for pottery, made from the excellent local clay deposits and centred at the departmental capital, Sensuntepeque, and at Ilobasco (*qq.v.*). Pop. (1981 est.) 179,909.

Cabanatuan, chartered city, Nueva Ecija province, central Luzon, Philippines, on the Pampanga River. Formerly the capital of the province, it is the commercial centre for the eastern portion of Luzon's central plain, which is heavily farmed in rice. An important highway junction, it is also the terminus of a rail spur line. Cabanatuan is the site of Central Luzon Polytechnic College. During World War II, U.S. and Filipino soldiers captured at Bataan and Corregidor Island by the Japanese were interned in a prison camp at the nearby village of Cabu. Inc. city, 1950. Pop. (1980) 138,298.

Cabanilles, Juan Bautista José (b. Sept. 4, 1644, Algemesí, Valencia, Spain—d. April 29, 1712, Valencia), distinguished Spanish organist and composer for the organ. From 1665 he was organist at the Valencia cathedral, and he was ordained a priest in 1668. He apparently travelled little, although his reputation spread as far as France, where he is known to have played.

His surviving works include many pieces for organ and the other keyboard instruments: *tientos, toccatas, versos, pasacalles, gallardas.* His style varies with the form used and ranges from the brilliant figuration of the *toccatas* to the dissonances of the *tientos de falsas.* It includes elements of Renaissance and Baroque styles.

Cabanis, Pierre-Jean-Georges (b. June 5, 1757, Cosnac, Fr.—d. May 5, 1808, Rueil-Malmaison), French philosopher and physiologist noted for *Rapports du physique et du moral de l'homme* (1802; "Relations of the Physical and the Moral in Man"), which explained all of reality, including the psychic, mental, and moral aspects of man, in terms of a mechanistic Materialism.

Cabanis' early interest in poetry and medicine and a budding political career were eventually abandoned in favour of philosophical science. Nevertheless, he attended the Comte de Mirabeau in his final illness as friend and private physician. He also moved in the company of Diderot, d'Alembert, Condorcet, Condillac, and d'Holbach and knew Benjamin Franklin and Thomas Jefferson during their stay in Paris.

For Cabanis, life was merely an organization of physical forces; thought was the result of "secretions" in the brain analogous to the liver's secretion of bile; behaviour depended upon the arrangement of natural elements. The soul was superfluous since consciousness was merely an effect of mechanistic processes, and sensibility, the source of intelligence, was a property of the nervous system. At the end of his life, Cabanis viewed the ego as immaterial and immortal but saw in this view no incompatibility with his earlier theories.

cabaret, restaurant that serves liquor and offers a variety of musical entertainment. The cabaret probably originated in France in the 1880s as a small club in which the audience was grouped around a platform. The entertainment at first consisted of a series of amateur acts linked together by a master of ceremonies; its coarse humour was usually directed against the conventions of bourgeois society. Before long the French cabaret eventually came to resemble the English music hall with its emphasis on comic skits. The primary exponent of French cabaret entertainment was the Moulin Rouge, in Paris; established in 1889 as a dance hall, it featured a cabaret show in which the cancan was first performed and in which many major stars of variety and music hall later appeared. The world of the Moulin Rouge in its heyday was immortalized in the graphic art of Toulouse-Lautrec.

The French cabaret immortalized in "Moulin Rouge—La Goulue," lithograph by Henri de Toulouse-Lautrec, 1891

EDI Studio Barcelona

Imported from France *c.* 1900, the first German *Kabarett* was established in Berlin by Baron Ernst von Wolzogen. It retained the intimate atmosphere, entertainment platform, and improvisational character of the French cabaret but developed its own characteristic gallows humour. By the late 1920s the German cabaret gradually had come to feature mildly risqué musical entertainment for the middle-class man, as well as biting political and social satire. It was also a centre for underground political and literary movements. Patronized by artists, writers, political revolutionaries, and intellectuals, the German cabarets were usually located in old cellars. They were the centres of leftist opposition to the rise of the German Nazi Party and often experienced Nazi retaliation for their criticism of the government. The composers Paul Hindemith and Hans Eisler, unknown at the time, were active in the cabarets; so also were the playwright Bertolt Brecht and the composer Kurt Weill, whose *Die Dreigroschenoper* (*The Threepenny Opera,* 1928) established their reputations and the stardom of the singer Lotte Lenya. The musical show *Cabaret* (1966) and a film version (1972) portrayed the 1930s German cabaret. The cabaret survives in post-World War II Germany as a forum for topical satire, but it has lost most of its political significance.

The English cabaret has its roots in the taproom concerts given in city taverns during the 18th and 19th centuries. A popular form by the end of the 19th century, it is often called a music hall, although music hall usually means variety entertainment in England.

In the United States, where it is usually called a nightclub, the cabaret is one of the few remaining places where an entertainer, usually a comedian, singer, or musician, can establish rapport with an audience in an intimate atmosphere that encourages improvisation and freedom of material. Although music for dancing is often provided during the entertainers' intermissions, the primary attraction is the featured entertainer. In the post-World War II period a few performers were successful with sharp political and social satire, but commercial considerations were paramount, and nightclubs relied chiefly on established theatrical personalities who could attract a wide audience. By 1980 most nightclubs had disappeared, giving way to theatre restaurants and entertainment centres with larger seating capacity.

Cabarrus, François, conde de (count of), François also rendered FRANCISCO (b. 1752, Bayonne, Fr.—d. April 27, 1810, Seville), financier and economist, adviser to the government of King Charles III of Spain.

Cabarrus originally settled in Madrid as a soap manufacturer but soon became conspicuous within a circle of enlightened reformers who advised the King. He took part in the organization of a bank, the formation of a company to trade with the Philippines, and the reform of currency and taxation. His efforts were halted, however, when in 1788 the reactionary Charles IV succeeded the reformer Charles III.

Like the other reform-minded advisers, Cabarrus was suspect and prosecuted by the new government. Accused of embezzlement and imprisoned in 1790, he was released two years later, restored to favour, and made a count. He was nominated as Spanish ambassador to Paris, but his appointment was rejected by the Directory on the grounds of his French birth. He took no part in the intrigues by which Charles IV was compelled to abdicate in favour of Joseph Bonaparte. His French origin, however, as well as his intimate knowledge of Spanish affairs, recommended him to Joseph Bonaparte, and under the new government he became minister of finance, a post he held until his death.

Cabasilas, Nicholas (b. *c.* 1320, Thessalonica, Byzantine Empire—d. *c.* 1390), Greek Orthodox lay theologian and liturgist who eminently represents the tradition of Byzantine theology. He wrote extensively on Hesychast mysticism (a traditional method of Byzantine Christian contemplative prayer that integrates vocal and bodily exercises) and on the theology of Christian life and worship.

In the Byzantine civil war between the rival emperors John V Palaeologus (1341–91) and John VI Cantacuzenus (1347–54), Cabasilas sided with Cantacuzenus' more conservative policies, performing several diplomatic missions and supporting the positions of the theologian Gregory Palamas (1296–1359). Cabasilas' work *Commentary on the Divine Liturgy* is one of the foremost explanations of Christian sacramental worship that exist.

Cabasilas' chief spiritual–ascetical writing, *Life in Christ,* proposed a program of Christian spirituality integrating divine and human activity in both individual and common liturgical prayer. By essays and political involvement he manifested a social consciousness relative to economic and institutional (including the church) inequities. The high intellectual level of his conferences and sermons and the sensitivity of his religious poetry have gained an international audience.

Cabasilas, Nilus (b. *c.* 1298, Thessalonica, Byzantine Empire—d. *c.* 1363, Constantinople), Greek Orthodox metropolitan, theologian, and scholar, whose treatises critical of medieval Latin theology became classical apologies for the Orthodox tradition of

the Byzantine Church. His support of Greek monastic spirituality furthered the ascetical tradition in the Eastern Church.

Cabasilas' principal work was a voluminous tract, *De processione Spiritus Sancti* ("On the Procession of the Holy Spirit"), in which he presented the Greek Orthodox speculative view of the Trinity (one God in three persons), emphasizing the question of the Holy Spirit's coming forth from the Father. Rejecting the variant position of the Latin Church, as summarized by Aquinas, *De processione* became a standard apologetic text for Eastern Orthodoxy.

Cabasilas' philosophical background influenced his attitude toward the controversy that raged over the teaching on mystical prayer advanced by his contemporary, the theologian Gregory Palamas. Palamas and Nilus' nephew, Nicholas Cabasilas, became the leading exponents of Hesychasm, an ascetical method of contemplative prayer, and of Palamite theology, which strongly affirmed the possibility of real communion with divine life. At first dismissing Palamas' doctrine as contrary to Aristotelian logic and metaphysics, Nilus later came to favour Hesychast teaching. In 1361 Cabasilas was named metropolitan of Thessalonica but died before he could assume jurisdiction.

cabbage, vegetable and fodder plant the various forms of which are said to have been developed by long cultivation from the wild, or sea, cabbage (*Brassica oleracea*) found near the seacoast in various parts of England and continental Europe. The common horticultural forms of *Brassica oleracea* may be classified according to the plant parts used for food and the structure or arrangement of those parts: (1) leaves: loose or open foliage (kale and collards) and leaves folded into compact heads (large terminal heads—*e.g.,* common cabbage and savoy cabbage—and small axillary heads—*e.g.,* Brussels sprouts); (2) flowers and thickened flower stalks: flowers little or not modified (sprouting broccoli) and flowers much thickened and modified (cauliflower and heading broccoli); (3) stem: much expanded to a bulbous structure (kohlrabi).

Head cabbage (*Brassica oleracea* var. *capitata*)
Derek Fell

All these forms of cabbage have succulent leaves free of hairs and covered with a waxy coating; in most of them the waxy coat gives the leaf surface a gray-green or blue-green colour. These plants grow best in mild to cool climates and tolerate frost, and some of them tolerate hard freezing at certain periods of growth. Hot weather impairs the growth and quality of all of them. Edible portions of these plants are low in caloric value. They are an excellent source of ascorbic acid and also supply minerals and necessary bulk in the diet. *See also* broccoli; Brussels sprouts; cauliflower; collard; kale; kohlrabi.

Head cabbage (*Brassica oleracea* var. *capitata*) is by far the most important form. Hard-headed cabbage is a new crop plant that was developed in northern Europe during the Middle Ages. Soft-headed cabbages such as the savoy type are believed to have originated earlier in southern Europe. Head cabbage, generally designated simply cabbage, is a major table vegetable in most countries of the temperate zone. Cole slaw, a salad of grated cabbage, originated in Holland and is extremely popular in the United States. Cabbage soup is a traditional country dish throughout Europe.

The heads of horticultural varieties of head cabbage range in shape from pointed, through globular, to flat; from soft to hard in structure; through various shades of green, gray-green, and magenta or red; and from less than one kilogram to more than three kilograms (two to seven pounds) in weight. They also are suitable for different uses. The less hard varieties must be used more or less promptly after harvest for salads, in cookery, or for the manufacture of sauerkraut; the very hard, late-maturing Danish type is suited to winter storage.

cabbage looper, distinctive green, white-lined larva, or caterpillar, of *Trichoplusia ni,* of the owlet moth family Noctuidae (order Lepidoptera). Like other larvae in this family, the cabbage looper lacks the usual lepidopteran legs beneath the mid-region of the body, which therefore rises up in a loop when the tail advances while the head stands still. It is an economic pest of cabbages and allied crops, particularly in the United States and Europe. The adults, known as Ni moths, migrate considerable distances. They are mottled brown with a pale Y-shaped mark on each fore wing; the typical adult wingspan is about 25 millimetres (one inch).

Cabbalah (Judaism): *see* Kabbala.

Cabeçon, Antonio de (Spanish composer): *see* Cabezón, Antonio de.

Cabedelo, city, eastern Paraíba state, northeastern Brazil. Built on the site of the 17th-century fortress of Santa Rita, Cabedelo lies on the Atlantic Ocean at the mouth of the Rio Paraíba and serves as the port for João Pessoa, the state capital, approximately 12 mi (20 km) by rail and highway to the southeast. Cotton, agave fibres, sugar, and various minerals are handled at the modern port facilities. The city has plants that process whale oil, fish, and coconuts. It also is the site of a seaplane base. Pop. (1980 prelim.) 18,581.

Cabeiri, also spelled CABIRI, important group of deities, probably of Phrygian origin, worshipped over much of Asia Minor, on the islands nearby, and in Macedonia and northern and central Greece. They were promoters of fertility and protectors of seafarers. Perhaps originally indefinite in number, in classical times there appear to have been two male deities, Axiocersus and his son and attendant Cadmilus, or Casmilus, and a less important female pair, Axierus and Axiocersa. These were variously identified by the Greeks with deities of their own pantheon. The cult included worship of the power of fertility, rites of purification, and initiation.

The Cabeiri are often identified with the Great Gods of Samothrace, where the mysteries attracted great attention and initiation was looked upon as a general safeguard against misfortune. In the period after the death of Alexander the Great (323 BC), their cult reached its height.

Cabell, James Branch (b. April 14, 1879, Richmond, Va., U.S.—d. May 5, 1958, Richmond), American writer known chiefly for his novel *Jurgen* (1919).

Born into an old and distinguished Virginia family, Cabell began writing fiction shortly after the turn of the century, but acclaim arrived only after a controversy developed over the morality of *Jurgen.* For a decade or more Cabell was extravagantly praised, especially for the attack in *Jurgen* on American orthodoxies and institutions, in a story replete with sexual symbolism. In the 1930s his mannered style and his philosophy of life and art lost favour.

The 18-volume *Works* (1927–30) included, in addition to *Jurgen, The Cream of the Jest* (1917), *Beyond Life* (1919), *Figures of Earth* (1921), and *The High Place* (1923). His imaginary medieval province of Poictesme, the setting of many of his works, did not conceal his skeptical view of human experience. In the 1940s he published three novels set in Florida; *Let Me Lie* (1947), essays about Virginia; and autobiographical essays, *Quiet Please* (1952).

Cabet, Étienne (b. Jan. 1, 1788, Dijon, Fr.—d. Nov. 8, 1856, St. Louis, Mo., U.S.), French Socialist and founder of a communal settlement at Nauvoo, Ill.

After a career as a teacher, lawyer, revolutionist, and political exile, Cabet published a novel, *Voyage en Icarie* (1840), setting forth his theories on the ideal community. Seeking to put his ideas into practice, he and several hundred followers landed in New Orleans in 1848 and 1849. He purchased the old Mormon settlement at Nauvoo (*q.v.*) and led 280 settlers there to start Icaria. The settlement was at best a compromise, for Cabet was unable to put many of his ideas into practice. The population never exceeded 1,800. In 1856 dissension arose, and Cabet left with 180 followers for St. Louis, where he soon died. Colonies of Nauvoo were established at Cheltenham, near St. Louis; at Corning, Iowa (dissolved 1884); and at Cloverdale, Calif. (dissolved 1895).

Cabeza de Vaca, Álvar Núñez (Spanish explorer): *see* Núñez Cabeza de Vaca, Álvar.

Cabezón, Antonio de, Cabezón also spelled CABEÇON (b. *c.* 1510, Castrillo de Matajudíos, near Burgos, Spain—d. March 26, 1566, Madrid), earliest important Spanish composer for the keyboard, admired for his austere, lofty polyphonic music, which links the stereotyped keyboard style of the early 1500s with the international style that emerged in the mid-16th century.

Blind from infancy, he studied organ in Palencia and in 1526 became organist and clavichordist to the empress Isabel, wife of Charles V; in 1548 he entered the service of the future Philip II. Through the court he met the influential musicians Tomás de Santa María, theorist and composer, and Luis de Narváez, the vihuelist. He travelled with the royal chapel to Italy, Germany, and the Netherlands (1548–51) and to England and the Netherlands (1554–56). His style influenced the English school of virginal composers and the organ style of the Low Countries exemplified by Sweelinck.

The bulk of Cabezón's surviving music was published in the *Libro de cifra nueva* (1557) of Luys Venegas de Henestrosa, which also contains works by other composers, and in the *Obras de música . . . de Antonio de Cabeçon* (1578), published posthumously by Cabezón's son Hernando. Both books are printed in *cifra nueva* ("new tablature"), a notation in which the notes of each octave are numbered 1 to 7, starting on F, with signs to indicate the particular octave; each part is printed on a single line of the staff. Both specify keyboard, lute, or vihuela (a six-course guitar tuned like the lute), although the music is clearly designed for organ or other keyboard. Hernando remarks on how easily the pieces adapt to the harp and gives recommendations for players of the vihuela and of wind and stringed instruments.

Cabezón's compositions consist of *tientos* (ricercari, pieces often using melodic imitation); short plainsong settings for the mass and office; sets of verses on the psalm tones and

their *fabordones* (*i.e., falsobordoni*, four-part chordal harmonizations of the psalm tones); a number of dance pieces; *diferencias*, or variations and divisions, on chansons and motets by the leading continental composers and on popular song tunes; and a few vocal pieces.

His instrumental compositions are conceived for the keyboard, unusual in an era in which the style of instrumental music was taken over from vocal music. In his *tientos* free melodic imitation gives rise to new themes. Cabezón was one of the earliest composers to use the theme and variations form. Especially known are the variations on the song "Canto del caballero" and the three sets of variations on "Guárdame las vacas."

cabezone, Pacific fish of the sculpin (*q.v.*) group.

Cabhán, An (Ireland): *see* Cavan.

cabildo (Spanish: "municipal council"), the fundamental unit of local government in colonial Spanish America. Conforming to a tradition going back to the Romans, the Spaniards considered the city to be of paramount importance, with the surrounding countryside directly subordinate to it. In local affairs each municipality in Hispanic America was governed by its *cabildo* in a manner reminiscent of Castilian towns in the late Middle Ages. Its members, *regidores* (councillors) and *alcaldes ordinarios* (magistrates), together with the local *corregidor* (royally appointed judge), enjoyed considerable prestige and power. The size of these bodies varied but was always small. The *cabildos* of important cities, such as Lima and Mexico, had about 12 members.

The *cabildo* was in charge of all ordinary aspects of municipal government—*e.g.*, policing, sanitation, taxation, the supervision of building, price and wage regulation, and the administration of justice. To assist them in these responsibilities the city councillors appointed various officials, such as tax collectors, inspectors of weights and measures and the markets, and peace officers. In spite of royal decrees to promote honest and efficient city government, the *cabildos* were often corrupt and rapacious.

By the mid-16th century, appointments to *cabildos* were ordinarily made by the Spanish crown; these offices were sold and sometimes became hereditary. Occasionally, the propertied class in a city chose some of the councillors. Creoles (American-born people of Spanish descent), barred from most high offices, were allowed to be council members. Sometimes citizens were asked to attend a *cabildo abierto* (open town meeting) when important matters were to be aired. Such meetings assumed considerable importance in the movement for the independence of Hispanic America in the early 19th century. The *cabildo abierto* of Buenos Aires, in 1810, launched the wars for independence in southern South America.

Cabimas, city, northeastern Zulia state, northwestern Venezuela. On the northeastern shore of Lake Maracaibo, Cabimas is an important centre in the Ambrosio oil fields. Just to the south of the city is La Salina refinery; a pipeline leads from nearby Lagunillas. Cabimas is linked by highway to other oil centres on the lake shore and, via the General Urdaneta Bridge, to Maracaibo, the state capital and the nation's second largest city, 20 mi (30 km) to the northwest across the lake. Pop. (1981 est.) 162,300.

Cabinda, also spelled KABINDA, exclave of Angola, on the west (Atlantic) coast of Africa north of the Congo Estuary, bordered by Congo (Brazzaville) on the north and northeast, and by Zaire on the south and southeast. Its coastline extends for 56 mi (90 km), its greatest width is 70 mi, and its area is 2,807 sq mi (7,270 sq km). Administratively, Cabinda is a province of Angola, from which it is separated by part of Zaire. With continued offshore oil discoveries, crude oil has become the dominant export. Other trade is mainly in timber, palm oil and kernels, cocoa, and coffee. Rubber, fruit, and ivory are also traded, and gold is extracted. Deposits of manganese and phosphates are also found. The chief town, Cabinda, is an oilport on the right bank of the Bele (Lulondo) River. Pop. (1970 prelim.) 80,857.

cabinet, a body of chief ministers of a sovereign or of advisers to a chief executive. It has become important wherever legislative powers have been vested in a parliament, but its form differs markedly in various countries.

In Great Britain the Cabinet is a committee of departmental councillors, with seats in the Parliament, headed by the prime minister. Though formerly empowered to select the Cabinet, the sovereign is now restricted to the mere formal act of inviting the head of the Parliament's majority party to become prime minister and form a government.

Traditionally in many other European countries, notably Italy and France, where several parties often competed and no one party proved able to command stable majorities in the parliament, there have been coalition cabinets. Government stability is often a mark of single-party ministries. When France established the Fifth Republic under de Gaulle (1958), it retained the parliamentary system but reinforced the power of the president. It was an example of the search for a form of executive power that can overcome weaknesses often displayed by cabinets dependent on parliamentary approval. In the United States the Cabinet is wholly different. It is composed of heads of executive departments chosen by the president with the consent of the Senate; the members do not hold seats in Congress. George Washington began the custom of calling regular Cabinet meetings, which are not required under the Constitution. Presidents have varied greatly in their use of the Cabinet. Attendance at U.S. Cabinet meetings is not restricted exclusively to department heads of Cabinet rank. The Cabinet does not ordinarily take votes.

cabinet, originally a small room for displaying precious objects and later a piece of furniture composed of a network of small drawers commonly enclosed by a pair of doors, first used in Italy during the late Renaissance.

Walnut cabinet and stand with floral marquetry, English, late 17th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

In many parts of Europe, cabinets became the most sumptuous pieces of furniture, with great displays of marquetry, carving, inlay, and gilding. Some cabinets were placed on stands, others on chests. More often objects of art rather than functional pieces, they were popular for storing collections of china, coins, shells, and many other objects.

By the early 16th century, cabinets were in use in France and England. The French style was based on architectural lines, often executed in walnut and sometimes elaborately decorated with bas-reliefs, ivory, or mosaics. The earliest English examples, small and mounted on stands, were plentiful among the wealthy by the 17th century. After the Restoration (1660) cabinets were used as decorative objects, and their embellishments included carefully chosen walnut veneers, floral marquetry, needlework, and japanning (oriental-style lacquerwork). A symmetrical arrangement of drawers surrounded a small, central cupboard, in which it was common to find a structure like a temple, with columns backed by mirrors that increased the apparent perspective. Many Chinese and Japanese lacquer cabinets were imported into England during Charles II's reign and were mounted on exuberantly carved stands that were gilded or silvered. In the 18th century and later, many cabinets were fitted with glass shelves to display china.

Inlaid cabinets were a specialty of Antwerp and southern Germany in the mid-17th century. One of the most famous was the "Wrangelschrank," taken as booty in the Thirty Years' War by the Swedish count Carl Gustav Wrangel. Made in Augsburg in 1566, it was decorated with boxwood carvings and outstanding pictorial marquetry.

Cabiri (deities): *see* Cabeiri.

cable, either an assemblage of three or more ropes twisted together for extra strength or a rope made by twisting together several strands of metal wire. This article deals with wire rope. For rope made from synthetic or natural organic fibres, *see* rope.

History. Successful stranded iron wire rope was developed by Wilhelm Albert, a mining official of Clausthal in the Harz Mountains in Saxony, in 1831–34. Even when first tried for hauling and hoisting in his mine, it proved so superior to hemp rope in serviceability and cost that its use soon became widespread in European mining. Known as the Albert Lay, the rope structure he developed was brought to England in 1839 by Lewis Gordon.

In England, wire rope structure and its manufacture became subject to extensive patent litigation. Several inventors, most notably Andrew Smith, had contrived earlier versions of wire ropes, of both stranded and selvage construction. The selvage ropes, made by bundling or wrapping together long lengths of individual parallel wires, were too stiff for use in hoisting or bending service, but were adopted by the British Admiralty in 1838 for standing rigging on the Royal Navy's wooden ships.

In the United States, John A. Roebling (1806–69), who had emigrated from Thuringia in 1831, appears to have been the first to start making stranded wire rope. Such rope replaced the heavy hemp ropes used on the Allegheny Portage Railroad inclined planes. His earliest handmade iron ropes were 1¼ in. (32 mm) in diameter. He established a wire rope factory at Trenton, N.J., in 1849 and supplied wire ropes to the local anthracite mines and canals. It was not until after the Civil War that wire rope manufacture was begun on a really extensive industrial scale.

The stranded wire rope structure as developed corresponded to the present wire rope form in that individual wires were twisted about a hemp rope core to form the strand, six such strands then being twisted about a

larger hemp rope core in reverse direction to form the rope.

Selvage cables composed of parallel wires are ideally suited for the main cables of suspension bridges. This application began in the United States with the erection of a 408-ft-(124-m-) span footbridge over the Schuylkill River at Philadelphia in 1816. For this purpose, the suspension cables were each made up of six wires, each with a 3/8-in. diameter. A shorter span at Galashiel, England, was completed that same year. It was followed by a remarkable series of wire cable bridges erected by French engineers, most notably the 800-ft (265-m) Fribourg Bridge, completed in 1834.

Evolution of improved stranding techniques has been marked by several significant innovations, including Latch and Batchelor's locked-wire process (1884) and Thomas Seale's equal-lay method (1885). This development was completed by the introduction of high-tensile steel wire during the 1880s and the advent of wire-preforming. Steel is the predominant metal now used for wire rope except where corrosion is threatened. In such applications—marine service for example—ropes of galvanized steel, corrosion-resisting steel, and phosphor bronze wire have been used.

Manufacturing process. The manufacture of wire rope is basically similar to making rope from the natural yarns or man-made filaments. The individual wires are first twisted into strands; six strands usually, twisted about a core rope, are then laid into the rope. The cores are cord or rope structures made of steel wires; sisal, manila, henequen, jute, or hemp fibres; or polypropylene monofilaments. The function of the core is to provide a firm cushion for positioning the wires in the strands, to maintain a firm rope structure, and to provide some internal lubrication to extend the rope serviceability, particularly when bending stresses are involved.

The wire, as used in the rope-making operations, is received wound in coils and is first rewound onto spools or bobbins adapted for the strand-forming machines. In this rewinding, the outgoing end of one coil is welded to the new coil to insure a continuous length of wire in the strand.

The design of the stranding machine resembles that of the strand former used in fibre and filament rope making, with the exception that the path of the bends to which the twisted strand will be subject as it is pulled and wound are of larger radius in order to cope with the stiffer wire structure without damaging or kinking the wires. These stranders are of two basic types; tubular, with the bobbins arranged internally in horizontal sequence, or the slower planetary type, with bobbins arranged like the spokes of a wheel.

The strand diameter is attainable by adjusting the number of wires in relation to their size. Strand flexibility is enhanced when a larger number of finer wires are used. A strand made with coarser wires, however, allows the rope to better withstand abrasion and surface wear. Coarse wire strands are usually twisted with seven wires. The most commonly used general purpose wire is made from six strands containing 25 wires each. For ropes where extra flexibility is desired, strands containing 31, 41, or 49 wires are common.

By implementation of the equal-lay principle, strands containing round wires of several different sizes can be made in a single operation. The three common methods of arranging wires are known as Filler Wire, Seale, and Warrington. Also, these methods are often combined within the strand itself, with the aim of producing strands best suited for service under a given set of operating conditions.

The strands, wound on bobbins or reels, are now brought to the closer or layer, where the six strands are twisted together about a rope core, into rope form. These layers, similar to fibre rope layers, are designed with twisting components arranged horizontally or vertically. The largest size layer will provide a rope up to 100 tons in total weight. In terms of maximum quantities this equates to approximately a 2-mi (1.25-km) continuous length of rope with a 3-in. (7.5-cm) diameter. The largest stranded wire ropes currently in use are 5 in. in diameter. As the six bobbins rotate within the rotating platform, the strands are compacted and twisted together about the rope core, laying or closing the rope. The strands, as the rope, are pulled through the laying machine by a pair of grooved drums turning as capstans. The finished rope, wound on a slow-turning reel, is now ready for use.

Most wire ropes are layed with a right twist; each of the six strands is formed with a left twist. Such ropes are designated "regular lay" or right, regular lay. Ropes twisted in opposing directions, designated left, regular lay, also find commercial use. In addition to the regular lay, ropes are also made with "Lang" lay. This designates a right or left twist rope lay, with the strand twist corresponding in direction to the rope twist. Lang lay ropes are named after John Lang, the manager of an English rope factory. With this construction, a greater portion of the strand surface wires are exposed, thereby affording greater area to withstand surface wear and to provide longer service life when severe bending stresses are encountered. The disadvantage of this construction lies in its torsional imbalance. In service, the Lang lay rope will untwist much more readily than regular lay rope, if the ends are free to rotate.

With either regular or Lang lay, the rope structure may be identified as "preformed" or "nonpreformed". The nonpreformed rope is twisted as described in the foregoing. In the manufacture of preformed wire ropes, both the strands and their wires are shaped during the respective rope- and strand-twisting operations, so that the helical twisted form to be assumed in the rope structure is preformed within the strander or layer, before the twisted structure is completed. The result is a rope in which the component strands and wires retain no residual stresses that would cause them to spring out of position when the rope is loose. This method also relieves the rope's tendency to rotate as it bends over a sheave. Both these features contribute to longer service life. The preformed rope is easier to splice and is much less likely to form kinks.

Applications. Most wire ropes are used in hoisting and hauling operations and machinery for these purposes, such as cranes, power shovels, elevators, mine hoists, etc. A flexible rope structure to cope with fast movement and bending stresses is an overall consideration. In other uses, such as support guys, stays, and barrier ropes, this property is not so much a consideration, and a 6×7 (six strands of seven wires each) structure will serve, as against a 6×19 rope.

Similar considerations prevail for marine ropes, which are usually galvanized. A stiff 6×7 structure is suited to rigging, mooring, and towing; but more wires per strand may be required when flexibility and ease in handling become overriding requirements.

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cable, in electrical and electronic systems, a conductor or group of conductors for transmitting electricity for power or communications from one place to another. Power cables may be described as bare (uninsulated), insulated, armoured, oil-filled, gas-filled, pipe type, etc., or as dredge, service drop, vertical riser, etc. Communication cables are described as coaxial, telephone, telegraph, control, etc. The terms aerial, underground, and undersea (submarine) may refer to either power or communication cable. There is no clear distinction between an electric wire and an electric cable. Usually the former refers to a single, solid metallic conductor, with or without insulation, while the latter refers to a stranded conductor or to an assembly of insulated conductors.

Power cables. Probably the simplest, as well as the most common, type of electric power cable is that which is suspended overhead between poles or steel towers. These cables consist of a number of wires, usually of copper or aluminum, twisted (stranded) together in concentric layers. Copper or aluminum is chosen for high electrical conductivity, while stranding gives the cable flexibility. Overhead cables are frequently subjected to severe mechanical stresses by high winds or by the accumulation of sleet, or both. Because copper and aluminum do not possess high mechanical strength, alloys of copper or aluminum are sometimes used. Alloying increases the strength of the cable, at some detriment to its electrical conductivity. A more common solution to the problem is to include in the stranded assembly of a copper or aluminum cable a number of high-strength steel wires. The steel wires are protected from corrosion by a coating of zinc, copper, or aluminum applied directly to the individual wires.

Many overhead cables, especially those operating at high voltages, have no insulating or other coverings. Cables operating at lower voltages frequently have coverings of asphalt-saturated cotton braid, polyethylene, or other material. These coverings offer some protection against electric shock to personnel accidentally contacting the line and prevent short-circuiting in case of temporary contact between the line and a grounded (earthed) object.

An equally important but less conspicuous type of electric power cable is installed in underground ducts and is extensively used in cities where lack of space or considerations of safety preclude the use of overhead lines. The conducting element of such a cable is similar to that of the overhead cable, except that commercially pure copper or aluminum is invariably used (mechanical strength is not a problem underground) and the stranded conductor is frequently rolled to modify its shape and compactness, resulting in a cable of maximum electrical conductance and minimum size.

These overhead and underground power cables compose a major portion of the electrical circuit from the generator to the point of utilization of the electric power. The balance of the circuit (and sometimes the entire circuit) may, however, require specialized cables. Illustrative of these usages and of the special conditions to be met are cables for steel mills, boiler rooms, and electric furnace operation (high temperature); cables on mobile equipment (vibration); shipboard cables; cables in chemical plants (corrosion); submarine and mining cables (mechanical abuse); and portable cables for many uses (excessive flexing). Cables for use near nuclear reactors and in guided missiles and artificial satellites must withstand various types and intensities of radiation and extremes in temperature and pressure.

Communication cables. Cables used to transmit information are quite different from power cables, both in function and in design. Power cables are designed for high voltages and high current loads, whereas both voltage and current in a communication cable are small. Power cables operate on direct current or low-frequency alternating current. Telephone cables operate at higher frequencies, and coaxial cables used for radar, television, and many other communication services may have to carry frequencies up to 10,000 megacycles per second. A power cable usually has not more than three conductors, each of which

may be 1 in. or more in diameter; a telephone cable may have several thousand conductors, the diameter of each being less than 0.05 in. (0.125 cm).

The insulation of telephone cable is almost invariably of dry cellulose (in the form of paper tape wrapped around the conductor or paper pulp applied to the conductor) or of polyethylene. The insulation thickness is a few hundredths of an inch or less. The conductors of a control cable are usually fewer in number, larger in size, and more heavily insulated than those of a telephone cable.

A coaxial cable is a two-conductor cable in which one of the conductors takes the form of a tube while the other (smaller but also circular in cross section) is supported, with a minimum of solid insulation, at the centre of the tube. Several of these coaxial units, along with other types of communication conductors, may be assembled within a common jacket or sheath.

Protective coverings for communication cables are similar to those for power cables. They usually consist of an aluminum or lead alloy tube or of a combination of metallic strips and thermoplastic materials.

The construction of long submarine cables for either telephone or telegraph service is somewhat different from that indicated above. Such cables usually have a single solid or stranded central conductor insulated with gutta-percha or polyethylene, over which may be applied a concentric outer conductor, followed by layers of asphalt or tar-impregnated jute roving and high-strength steel-wire armour. *See also* undersea cable.

Cable, George W(ashington) (b. Oct. 12, 1844, New Orleans—d. Jan. 31, 1925, St. Petersburg, Fla., U.S.), U.S. author and reformer,

Cable

By courtesy of the Library of Congress, Washington, D.C.

noted for novels and stories dealing with life in New Orleans. His first books, *Old Creole Days* (1879), a collection of stories, and *The Grandissimes* (1880), a novel, marked Creole New Orleans as his literary province and were widely praised. In these works he sought to recapture the picturesque scene and the tone of life in the old French–Spanish city. Yet he employed a realism new to Southern fiction.

Although Cable was the son of slaveholders and fought in the Confederate cavalry, he saw slavery and attempts to deny the freedmen full public rights as moral wrongs. Thus his early fiction contained overtones of moral condemnation in his handling of caste and class and authorized oppression, whether before or after emancipation. He used essays and public lectures to urge the cause of Negro rights, in the face of violent abuse in the Southern press, and he published two collections of his social essays, *The Silent South* (1885) and *The Negro Question* (1888). He abandoned the effort only after discrimination in the South had become entrenched. In 1885 he settled in Northampton, Mass. He wrote novels set mainly in the South until he was past 70, but, though better constructed, they were felt to lack the freshness and charm and also the force of moral conviction that characterized his early books. Arlin Turner's biography of Cable (1956) contains an extensive bibliography.

cable, marine: *see* undersea cable.

cable television, also called CABLEVISION, any system that distributes television signals by means of coaxial cables. Such systems originated in the United States in the early 1950s and were designed to improve reception of commercial network broadcasts in remote and hilly areas. During the 1960s they were introduced in many large metropolitan areas where local television reception is degraded by the reflection of signals from tall buildings. Commonly known as community antenna televison (CATV), these cable systems use a "community antenna" on a high, exposed site to receive broadcast signals, which they then re-transmit via coaxial cables to homes and establishments in the local area subscribing to the service. Subscribers pay a specified monthly service charge in addition to an initial installation fee. CATV service is available not only in the United States, but in Canada and various other countries as well.

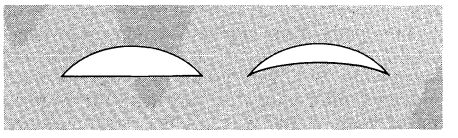
Since the mid-1970s there has been a proliferation of cable television systems offering special services. Besides bringing high-quality signals to subscribers, the systems provide additional television channels. Some of these systems can deliver 50 or more channels because they distribute signals occurring within the normal television broadcast band as well as nonbroadcast frequencies. A frequency-conversion device is connected to the television set of the subscriber to accommodate these signals of nonbroadcast frequencies. The increased number of channels allows expanded programming, including broadcasts from distant cities, continuous weather and stock-market reports, cultural events, and programs produced by community groups and educational institutions. Many cable operators reserve channels for coverage of city council meetings and other local government activities, whereas some provide access to pay-TV (*q.v.*) program materials such as recent motion pictures and sports events not telecast by network and local broadcasters. Another feature offered by more and more cable operators is two-way channel capability, which enables subscribers to communicate with programming facilities or information centres within the system. Using the cable connection, home viewers can, for example, participate in public opinion polls or call up various kinds of written and graphic materials (*e.g.*, citations from reference books, concert schedules, and recipes). The latter feature is offered by systems called videotex, which were first introduced in Great Britain and West Germany. Experiments have been conducted with two-way cable television systems that allow subscribers with home computers to link up with computer networks, giving the subscribers access to data banks and permitting them to interact with other on-line users, as in ordering merchandise from retail outlets and conducting transactions with banking institutions.

Cabo Delgado, province, northeastern Mozambique, East Africa. Formerly an administrative district and designated a province in 1975, it has an area of 30,260 sq mi (78,374 sq km) and terrain that rises from a narrow littoral in the east to hills and low plateaus in the west. Situated along the northern border (formed by the Rovuma River) with Tanzania is the low-lying Maconde Plateau. The province is also drained by the Lugenda River flowing northward into the Rovuma River and forming part of the western border with Niassa province, by the Messalo River in the central part of the province, and by the Lúrio River, forming the southern border with Nampula province. Cotton, rice, sisal, sorghum, cassava, and cashew nuts are grown in the fertile river valleys and coastal lowlands. Agricultural produce is exported at Pemba (*q.v.*, formerly Pôrto Amélia) a port on the Baía (Bay) de Pemba and the provincial capital. A major north–south road traverses the province and there is a road that extends west from Pemba. Pop. (1982 est.) 977,600.

Caboche, Simon, byname SIMON LE COUSTELLIER (the Cutler) (fl. early 15th century), French demagogic agitator whose raising of riots promoted an abortive reform of the royal administration.

A skinner by trade and a leader of the malcontent merchant guilds from 1407, Caboche, along with his followers, was taken under the patronage of John the Fearless, duke of Burgundy. The University of Paris joined this faction, which blamed King Charles VI's officials for the corruption and the taxations of the time. Caboche himself led a mob that besieged and took the Bastille in April 1413. The next month Charles VI issued a major ordinance for administrative reform that became known as the Ordonnance Cabochienne, named for Caboche, which provided for the control of affairs by the deliberations of the political council, of the Parlement, or of the Chambre des Comptes, and for the election of all administrative officials by one or another of those organs. Continued riots, however, caused the Parisian bourgeoisie to react against them and allowed Charles, duc d'Orléans, rival to the Duke of Burgundy, to suppress the rioters. Charles eventually withdrew the ordinance because it was forced by violence, and the rioters were expelled. Caboche never regained his influence, though he returned to Paris with the Burgundians in 1418.

cabochon cut, method of cutting gemstones with a convex, rounded surface that is polished but unfaceted. Opaque stones, asterated stones, iridescent or opalescent stones, or chatoyant stones (displaying a silky sheen in a band like the eye of a cat) are usually cut *en cabochon.* The back of a normal cabochon cut stone is flat, but it may be hollowed to lighten the colour. Garnet, jasper, bloodstone, moon-



Cabochon cut

(Left) Simple-cabochon style; (right) hollow-cabochon style

From E.H. Kraus and C.B. Slawson, *Gems and Gem Materials*; copyright (1947); used with permission of McGraw-Hill Book Co.

stone, cat's-eye, and star ruby and sapphire are among the gemstones usually finished in this manner.

Caboolture, town, southeastern Queensland, Australia, on the Caboolture River. The town was originally a livestock station. Its name was derived from *cabul-tur*, the Aboriginal word for the carpet snake. To relieve shortages brought about by the American Civil War in the 1860s, Caboolture became a cotton-farming centre. Today, citrus and tropical fruits, tobacco, and vegetables are grown, and dairy and stud beef cattle are raised. Timber is milled in the town, which is on the main northern rail line and the Bruce Highway to Brisbane (26 mi [42 km] south). Caboolture served during 1944–45 as the secret headquarters for the Allied High Command in the Pacific theatre of World War II. Toorbul Point Bora Ground, an Aboriginal burial site, is nearby. Pop. (1981) 6,451.

Cabora Bassa, also spelled CAHORA BASSA, arch dam and hydroelectric facility on the

Zambezi River in central Tete province, western Mozambique, East Africa. The dam, located about 80 miles (125 kilometres) northwest of Tete, the provincial capital, is 560 feet (171 metres) high and 994 feet wide at the crest. It has a volume of 667,000,000 cubic yards (510,000,000 cubic metres). The dam impounds Lake Cabora Bassa, which is 150 mi long and 19 mi wide at its widest point. The lake has a capacity of 51,900,000 acre-feet (64,000,000,000 cubic metres) and extends to the Zambia–Mozambique border. The first stage of the power project, begun in 1967 and completed in 1977, consists of five generators with a total electric power capacity of 2,000 megawatts. The second stage, partly completed in 1981, consists of an underground power station on the northern bank of the Zambezi River and more than 1,000 mi of transmission lines throughout the country. The ultimate capacity planned for the project is 3,600 megawatts. Cabora Bassa dam supplies power primarily to South Africa over a 870-mi-long, dual 530-kilowatt transmission line and also to Maputo, Tete province, and the Moatize coal mines near the town of Tete. Power transmission to South Africa has been interrupted, as in most of 1981, by the sabotage of the Mozambique National Resistance Movement. The Portuguese own the Companhia Hidroeléctrica de Cabora Bassa until 1992. The power project is connected by road to the town of Tete.

Cabot FAMILY, prominent American family since the arrival of John Cabot at Salem, Mass., in 1700. The Cabot family has enjoyed a long tradition of wealth, philanthropy, and talent.

John and his son Joseph were highly successful merchants, trading in rum and slaves and also operating a fleet of privateers. Joseph's son George Cabot furthered the family fortune, but he is best remembered for his political career—especially his leadership of the Federalist Party, the Essex Junto, and the Hartford Convention.

Over the generations, the Cabots moved from Salem to Beverly to Boston, Mass. Intermarriage with other wealthy Boston families produced a socially cohesive aristocracy: the Brahmins. Well-known Brahmins of Cabot descent include Francis Cabot Lowell (*q.v.*), Arthur Tracy Cabot, Richard Clarke Cabot, Edward Clarke Cabot, Godfrey Lowell Cabot, Henry Cabot Lodge (*q.v.*), and Henry Cabot Lodge, Jr. (*q.v.*).

Family members have distinguished themselves in medicine, architecture, politics, and philanthropy. Massachusetts General Hospital, the Boston Symphony, and Harvard University are only a few of the beneficiaries of Cabot wealth.

Cabot, George (b. Jan. 16, 1752, Salem, Mass.—d. April 18, 1823, Boston), powerful Federalist Party leader, especially in New England.

After studying at Harvard Cabot went to sea. He became a shipowner and successful merchant, retiring from business in 1794. Cabot was a member of the Massachusetts Constitutional Convention (1779–80), of the state Senate (1783), and of the Massachusetts convention that ratified the Federal Constitution (1788). He served in the U.S. Senate (1791–96), where he was a leading supporter of the financial policies of treasury secretary Alexander Hamilton, and in 1793 he was named a director of the Bank of the United States. He was president of the Hartford Convention, a secret meeting called on Dec. 15, 1814, to express the opposition of the New England Federalists to the War of 1812. Its report of Jan. 5, 1815, attacking Pres. James Madison's administration and the war, aroused charges of lack of patriotism from which the party, already unpopular, never recovered.

Cabot, John, Italian GIOVANNI CABOTO (b. *c.* 1450, Genoa?—d. *c.* 1499), navigator and explorer who by his voyages in 1497 and 1498 helped lay the groundwork for the later British claim to Canada. The exact details of his life and of his voyages are still subjects of controversy among historians and cartographers.

Cabot moved to Venice in 1461, or possibly earlier, and became a citizen of that city in 1476. While employed by a Venetian mercantile firm, he travelled to the eastern shores of the Mediterranean and visited Mecca, a great trading centre where Oriental and Western goods were exchanged. He became skilled in navigational techniques and seems to have envisaged, independently of Columbus, the possibility of reaching Asia by sailing westward.

Cabot moved to London with his family about 1484. His whereabouts and activities over the next 10 years are in doubt, but he may have sought support for a transatlantic voyage in London, Lisbon, and Seville.

On March 5, 1496, King Henry VII of England issued letters patent to Cabot and his sons, authorizing them to voyage in search of unknown lands, to return their merchandise by the port of Bristol, and to enjoy a monopoly of any trade they might establish there. The news of Columbus' recent discoveries on behalf of Spain was a spur to English action and secured some support for Cabot from Bristol merchants.

In 1496 Cabot made a voyage from Bristol with one ship, but he was forced to turn back because of a shortage of food, inclement weather, and disputes with his crew. In May 1497, however, he set sail from Bristol in the small ship "Matthew," with a crew of 18 men. He proceeded around Ireland and then north and west, making landfall on the morning of June 24. The exact landing place has never been definitely established: it has been variously believed to be in southern Labrador, Newfoundland, or Cape Breton Island. On going ashore, he noticed signs indicating that the area was inhabited but saw no people. Taking possession of the land for the English king, he unfurled both the English and Venetian flags. He conducted explorations from the ship along the coastline, naming various features Cape Discovery, Island of St. John, St. George's Cape, the Trinity Islands, and England's Cape. These may be, respectively, the present Cape North, St. Paul Island, Cape Ray, St. Pierre and Miquelon, and Cape Race, all in the area of Cabot Strait.

In the mistaken belief that he had reached the northeast coast of Asia, Cabot returned to Bristol on Aug. 6, 1497. He reported that the land was excellent, the climate temperate, and the sea covered with enough fish to end England's dependence on Iceland's fish. In the midst of an enthusiastic welcome, he announced his plans to return to his landing place and from there sail westward until he came to Japan, the reputed source of spices and gems. On Feb. 3, 1498, he received new letters patent for a second expedition.

Cabot's second expedition probably consisted of five ships and about 200 men. Soon after setting out in 1498, one ship was damaged and sought anchorage in Ireland. There is some evidence to suggest that Cabot reached America again, but at least one contemporary source indicates that the expedition was lost at sea.

Cabot, Sebastian (b. *c.* 1476, Bristol, Gloucestershire, Eng., or Venice—d. 1557, London), navigator, explorer, and cartographer who at various times served the English and Spanish crowns. He may have accompanied his father John Cabot, on the first English voyage to North America (1497), which resulted in the discovery of the Labrador coast of Newfoundland (mistaken at the time for the coast of China).

Although facts concerning his early life remain obscure, Cabot was a cartographer to King Henry VIII in 1512, when he accompanied the English army sent to aid King Ferdinand II of Aragon against the French. Because of his knowledge of the northeast coast of North America, he was commissioned a captain in the Spanish navy, but Ferdinand's death cancelled a voyage he was to command in 1516. His services were retained by the Holy Roman emperor Charles V, and in 1518 he was given membership in the Spanish Council of the New Indies and appointed pilot major and official examiner of pilots.

Cabot returned to England in 1520 and was offered a naval command but in 1525 assumed charge of a three-ship Spanish expedition that was to develop trade with the Orient. He diverted the expedition from this objective, however, because of reports of fabulous wealth in the Río de la Plata region of South America. After about three years of fruitless exploration he returned to Spain, was judged responsible for the failure of the expedition, and was banished to Africa. Pardoned two years later, he was restored to his old post of pilot major. A copy of his well-known map of the world (1544) is in the Bibliothèque Nationale, Paris.

Offered a naval post in England by King Edward VI, Cabot accepted the appointment (1548) and was also pensioned. He remained in England as governor of the Merchant Adventurers, organizing an expedition to search for a northeast passage from Europe to the Orient. Although this objective was not attained, and several naval disasters ensued, trade with Russia was facilitated.

Cabot Strait, channel (60 mi [97 km] wide) between southwestern Newfoundland and northern Cape Breton Island, Nova Scotia, eastern Canada. An important international shipping lane, it connects the Gulf of St. Lawrence with the Atlantic Ocean. The strait was named for John Cabot, the Italian navigator who, sponsored by the English king Henry VII, explored the area in the late 15th century.

Cabra, city, Córdoba province, in the autonomous community (region) of Andalusia, southern Spain, picturesquely situated between the Sierras de la Carba (Cabra) and de Montilla, southeast of Córdoba city. Cabra has a ruined Moorish castle, and its parish church (the former cathedral) was originally a mosque. Called Baebro or Aegabro in ancient times, it was an important episcopal see under the Romans and Visigoths. Taken from the Moors by Ferdinand III of Castile in 1244, it was recaptured by them in 1331 and finally united to Christian Spain in the 15th century. Cabra manufactures bricks, pottery, and textiles. Pop. (1981) 19,819.

Cabral, Amílcar (b. 1921, Bafata, Portuguese Guinea—d. Jan. 20, 1973, Conakry, Guinea), agronomist and nationalist politician, founder (1956) and secretary general of the Partido Africano da Independência da Guiné e Cabo Verde (PAIGC; African Party for the Independence of Guinea and Cape Verde). With Agostinho Neto he was co-founder (1956) of a liberation movement in Angola.

Educated in Lisbon, he there helped to found (1948) the Centro de Estudos Africanos. He took his party into an open war (from 1962) for the independence of Portuguese Guinea. In the late 1960s he was the de facto ruler of the parts of Portuguese Guinea not occupied by army units from Portugal. In 1972 he established a Guinean People's National Assembly as a step toward independence. He was assassinated outside his home in Conakry, where his party had established its headquarters.

Cabral, Pedro Álvares (b. 1467/68, Belmonte, Port.—d. 1520, Santarém?), Portuguese navigator who is generally credited as the discoverer of Brazil (April 22, 1500).

The son of Fernão Cabral, a nobleman, and of Isabel de Gouveia, Pedro Cabral was heir to a long tradition of service to the throne. He himself enjoyed the esteem of King Manuel I

Pedro Álvares Cabral, medallion, 16th century; from the Mosterio dos Jerónimos, Portugal

By courtesy of the Secretaria de Estado da Informacao Cultura Popular e Turismo, Lisbon

of Portugal, from whom he received various privileges in 1497; these included a personal allowance, the title of counsellor to his highness, and the habit of the military Order of Christ. Three years later the King entrusted him with the command of the second major expedition to India, expressing "the great confidence we have in Pedralvares de Gouveia, nobleman of our household." Cabral was named admiral in supreme command of 13 ships, which set out from Lisbon on March 9, 1500. He was to follow the route taken earlier by Vasco da Gama, to strengthen commercial ties, and to further the conquest his predecessor had begun.

In accordance with da Gama's instructions, based on his experiences during the first voyage, Cabral was to sail southwest so as to bypass the becalmed waters of the Gulf of Guinea. This course, which later became known as the "circle around Brazil," had the added advantage of providing the Portuguese with opportunity to reconnoitre along the coast of the lands to the west, which they had previously sighted and which belonged to them in accordance with the Treaty of Tordesillas (1494).

Sailing westward under favourable conditions, on April 22, Cabral discovered the land he named Island of the True Cross. Later renamed Holy Cross by King Manuel, the country ultimately took its modern name, Brazil, from a kind of dyewood, *pau-brasil,* that is found there.

Cabral is reported to have made a special effort to treat the natives kindly, receiving them on board his caravel. Nonetheless, he took formal possession of the country and dispatched one of his ships to Portugal to inform the King. Henceforth, maps of the region showed Portugal as ruler of a great expanse of land with vaguely defined boundaries that came to serve as a point of call on the long voyage from Europe to the Cape of Good Hope and the Indian Ocean.

After a stay of only 10 days in Brazil, Cabral sailed for India, in a voyage that was plagued by a series of misfortunes. On May 29, while the fleet was rounding the Cape of Good Hope, four ships were lost with all hands aboard; Bartolomeu Dias, the Portuguese who had discovered the cape in 1488, was one of those who perished in this disaster. The remaining ships cast anchor on Sept. 13, 1500, at Calicut, India, where the *zamorin* (Muslim ruler) welcomed Cabral and allowed him to establish a fortified trading post. Disputes with Muslim traders soon arose, however, and on December 17 a large Muslim force attacked the trading post. Most of the Portuguese defenders were killed before reinforcements could arrive from the Portuguese fleet lying at anchor in the harbour.

Cabral retaliated by bombarding the city, and then by capturing 10 Muslim vessels and executing their crews. He then sailed for the Indian port of Cochin, farther south, where he was affably received and permitted to trade for precious spices, with which he loaded his six remaining ships. Cabral also made port at Carangolos and Cananor on the same coast, completed his cargo, and on Jan. 16, 1501, began the return voyage to Portugal. On his way, however, two ships foundered, and it was with only four vessels that Cabral finally reached the mouth of the Tagus River in Portugal on June 23, 1501.

King Manuel was pleased at the outcome of the undertaking, in spite of the misfortunes that had beset it; he is said to have at first favoured making Cabral head of a new and more powerful expedition, but in the end it was Vasco da Gama and not Cabral who was appointed to that command. Accounts differ as to the reason for the King's change of heart. One chronicler attributes it to disagreement over division of authority within the new fleet; another offers the explanation that da Gama opposed the appointment of Cabral on the grounds that da Gama himself already held the title admiral of all the fleets that might leave Portugal for India and that the disasters of Cabral's expedition should disqualify him for the new mission.

Whatever the true explanation, the discoverer of Brazil held no further position of authority at the Portuguese court. He retired to his estate in the Beira Baixa province of Portugal and spent his remaining years there. His tomb at Santarém was identified in 1848 by the Brazilian historian Francisco Adolfo Varnhagen.

In 1968, the year that marked the fifth centenary of the birth of Cabral, Brazil and Portugal honoured the memory of the "admiral of the fleet" in joint festivities. Both Rio de Janeiro and Lisbon have erected monuments in his honour. (P.Ca.)

BIBLIOGRAPHY. Pedro Calmon, *História do Brasil,* 7 vol. (1959); William Brooks Greenlee (ed. and trans.), *The Voyage of Pedro Alvares Cabral to Brazil and India from Contemporary Documents and Narratives,* works issued by the Hakluyt Society, 2nd series, no. 81 (1938); D. Antonio Pereira, *Pedralvares* (1968); Jose Carlos Amado, *Pedro Alvares Cabral* (1968).

Cabral de Melo Neto, João (b. Jan. 6, 1920, Recife, Braz.), poet and diplomat, the leading Brazilian poet of his generation.

As a diplomat, Cabral de Melo Neto served from 1954 in a consular capacity in Spain, the United Kingdom, France, and Switzerland. His literary career began in 1942 with the publication of the collection of poems *Pedra do Sono* ("The Stone of Sleep"). *O Engenheiro* ("The Engineer"), published in 1945, gave rise to the epithet "Generation of '45" for the poets and other writers whose careers were launched at approximately the same time and who brought an increasing austerity to the Brazilian poetic style.

Cabral de Melo Neto also published *O Cão Sem Plumas* (1950; "The Featherless Dog"), *Duas Águas* (1955; "Two Waters," including the poet's single most famous composition, "Morte e Vida Severina"), *Uma Faca Só Lâmina* (1956; "A Knife All Blade"), *Dois Parlamentos* (1961; "Two Parliaments"), *A Educação Pela Pedra* (1966; "Education by the Stone"), and *Escola de Facas* (1980; "School of Knives"). His early poetry has a Surrealistic and Cubistic quality, which he later abandoned in favour of a precise lucidity and "arid" imagery inspired by the drought-stricken northeast. Cabral de Melo Neto was elected to the Brazilian Academy of Letters in 1968.

Cabrera, Manuel Estrada: *see* Estrada Cabrera, Manuel.

Cabrera (y Griñó), Ramón (b. Dec. 27, 1806, Tortosa, Spain—d. May 24, 1877, London), influential Spanish Carlist general and later one of the party's most controversial figures.

After the death (1833) of Ferdinand VII, those who supported the claim to the throne of Ferdinand's brother, Don Carlos, against that of Ferdinand's daughter, Queen Isabella II, rose in rebellion; Cabrera became a leading insurgent, soon dominating the Carlist bands in Catalonia and inspiring terror by his relentless cruelty, which rose to a climax after the liberals had shot his mother (1836). Cabrera, who gained several notable victories, including that of Morella (1838), for which he was created conde de Morella, refused to recognize the Convention of Vergara (1839), which

Ramón Cabrera, detail of a lithograph

By courtesy of the Biblioteca Nacional, Madrid

ended the war in the Basque provinces, but in 1840 was driven with 10,000 soldiers over the French border. In exile, first in France and later in England, he objected to the "abdication" (1845) of Carlos in favour of his son, conde de Montemolín. From 1846 to 1849 Cabrera again commanded Carlist bands in Catalonia. In 1860 he married an English Protestant, Marianne Catherine Richards, and settled down in England, gradually growing to advocate a peaceful rather than a military propagation of Carlist views. He was expelled from the Carlists by an assembly held at Vevey, Switz., in 1870, and recognized the legitimist Spanish king, Alfonso XII, in 1875.

Cabrera Infante, Guillermo (b. April 22, 1929, Gibara, Cuba), Cuban film critic, short-story writer, diplomat, and novelist who wrote the brilliant novel *Tres Tristes Tigres* (1967, "Three Sad Tigers"; Eng. trans. *Three Trapped Tigers,* 1971).

In 1947 Cabrera began his association with *Bohemia,* a leading Cuban popular magazine. The following year he edited the magazine *Nueva Generación* and became the literary editor of *Bohemia.* In 1954, writing under a pseudonym, Cabrera served as the film critic for *Carteles* (a magazine that ceased publication in 1961). He supported the revolutionary forces of Fidel Castro in 1958 and wrote against the regime of Fulgencio Batista. After the revolution he was named director of the Cuban Department of Culture. His first major publication was a collection of short stories *Así en la paz como en la guerra* (1960; "In Peace as in War") written during the 1950s, which revealed his revolutionary spirit. The collection appeared simultaneously in French, Italian, and Polish translations in the 1960s.

As Castro embraced socialism and Marxism, Cabrera became disenchanted with the revo-

lution. After several confrontations with the authorities, he was sent to Belgium in 1962 to serve as cultural attaché at the Cuban embassy. He left that post in 1965 and subsequently settled in London and became a British subject.

Tres Tristes Tigres is full of puns, neologisms, and humorous word play. Set in the summer of 1958, the story is an account of the end of the chaotic era of Batista. *Vista del amanecer en el trópico* (1974; *View of Dawn in the Tropics,* 1978) is a collection of vignettes of Cuban history from its discovery to the present. The following year Cabrera published *O* (1975), a collection of essays and articles that treat with irony and satire various aspects of contemporary life. In *Exorcismos de esti(l)o* (1976; "Exorcisms of Style," or, omitting the parenthetical *l,* "of Summer"), a series of short sketches, poems, and aphorisms, the modern world is again viewed in a satirical light. *Arcadia todas las noches* (1978; "Arcadia Every Night") is a collection of Cabrera's critical writings on motion pictures. In 1979 he published the parody *La Habana para un infante difunto (Infante's Inferno-1984).*

Cabrillo, Juan Rodríguez, Portuguese JOÃO RODRIGUES CABRILHO (d. Jan. 3, 1543?, off the coast of northern California), soldier and explorer in the service of Spain, chiefly known as the discoverer of California.

Virtually nothing is known of Cabrillo's early life, though he might have been born in Portugal. As a young man, he appears to have accompanied the Spanish soldier Pánfilo de Narváez (1520) in his unsuccessful punitive expedition against Hernán Cortés, conqueror of the Aztecs of Mexico. He was evidently one of the conquerors of the region now comprising Guatemala, El Salvador, and Nicaragua. He also may have served for a time as governor of Guatemala. It is thought that Cabrillo embarked from the Mexican port of Navidad in June 1542, explored most of the coast of what is now the state of California, entered San Diego and Monterey bays, and landed on several of the islands near the California coast. He apparently died of complications from a broken leg suffered on one such landing.

Cabrini, Saint Frances Xavier, byname MOTHER CABRINI (b. July 15, 1850, Sant' Angelo Lodigiano, Lombardy, Italy—d. Dec. 22, 1917, Chicago; canonized 1946; feast day December 22), founder of the Missionary Sisters of the Sacred Heart and first United States citizen to be canonized.

From childhood, she desired to become a missionary, and, after teaching in Vidardo (1872–74), she was appointed supervisor of an orphanage in Codogno (1874). In 1877 she took her vows and soon after became known as Mother Cabrini. She founded (1880) the Missionary Sisters of the Sacred Heart. She planned to found a convent in China, but Pope Leo XIII directed her to "go west, not east," and she sailed with a small group of sisters for the United States in 1889. Their work in the U.S. was to be concentrated among the neglected Italian immigrants. This journey was the first in a series that took her through the Americas and into Europe. She became a naturalized citizen of the United States in 1909. Although plagued by ill health most of the time, Mother Cabrini established 67 houses—one for each year of her life—in such cities as Buenos Aires (1896), Paris (1898), Madrid (1899), and Rio de Janeiro.

cabriole, ballet jump, formerly performed only by men, in which the dancer beats the calves of the legs together in the air, with a scissors-like movement. When the beat occurs, the legs are extended at either a 45° or 90° angle to the body at the front, side, or back. The dancer may land on one foot, then bring the second foot down to fifth position—*cabriole fermée* ("closed cabriole")—or may

Cabriole executed by Jacques d'Amboise of the New York City Ballet
Fred Fehl

complete the step with the second foot in the air—*cabriole ouverte* ("open cabriole").

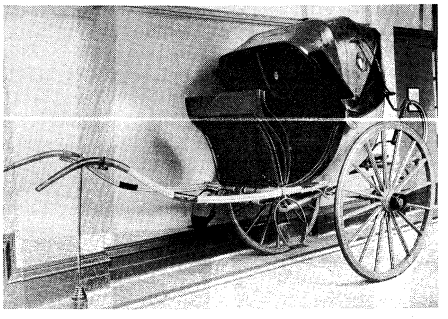
cabriole leg, leg of a piece of furniture shaped in two curves—the upper one convex, the lower one concave. Its shape was based on the legs of certain four-footed animals. Known by the ancient Chinese and by the Greeks,

Side chair with cabriole legs, attributed to Thomas Affleck, Philadelphia, 1760–75; in the Museum of Fine Arts, Boston
By courtesy of the Museum of Fine Arts, Boston

it returned to fashion in Europe in the late 17th century, when it was incorporated into the more curvilinear styles introduced by the English, Dutch, and French.

The early revived forms of the cabriole leg were joined by stretchers, which later were also curved in outline; but these were abandoned, as they interrupted the line of the leg and were not needed for strength. In the second half of the 18th century, its popularity gave way to the straight leg of the Neoclassical period.

cabriolet, originally a two-wheeled, doorless, hooded, one-horse carriage, first used in 18th-century France and often let out for hire. The name is thought to derive from *cabriole* (French: "caper") because of the vehicle's light, bounding motion. Later cabriolets were built with four wheels. When used as hacks, cabriolets often had a jump seat or a side seat for the driver. Later, the word cabriolet, shortened to "cab," was used for any carriage for hire, as a hackney cab.



Cabriolet, 1830; in the Science Museum, London
By courtesy of the Science Museum, London, Crown copyright reserved

Cabrol, Fernand (b. Dec. 11, 1855, Marseille—d. June 4, 1937, Farnborough, Hampshire, Eng.), Benedictine monk and noted writer on the history of Christian worship.

Cabrol took his monastic vows in 1877 and was ordained in 1882. In 1896 he was sent as prior to the monastery at Farnborough and was elected abbot (1903), an office he held until his death.

One of the most important of Cabrol's works was his widely circulated *Livre de la prière antique* (1900; *Liturgical Prayer,* 1922). *Monumenta ecclesiae liturgica* was the title of an ambitious series begun by Cabrol, of which only three volumes were published. He also completed the first volume (1907) of a project launched in 1903, the *Dictionnaire d'archéologie chrétienne et de liturgie* (co-edited by D. Henri Leclerq). He wrote a number of lesser works, mostly on liturgy.

Caca (Roman deity): *see* Cacus and Caca.

cacao, also called COCOA (*Theobroma cacao*), tropical American tree of the family Sterculiaceae (or Byttneriaceae), the seeds of which, after fermentation and roasting, yield cocoa and chocolate (*qq.v.*).

A brief treatment of the cacao and cocoa products follows. For full treatment, *see* MACROPAEDIA: Farming and Agricultural Technology; Food Processing.

The usefulness of the cocoa bean was well known to the Pre-Columbian inhabitants of tropical Meso-America—particularly the Mayas and Aztecs, who used the bean not only to produce a beverage but also as a medium of exchange. During the 16th century cocoa beans were carried to Europe, where refinements in processing led to the development of cocoa and chocolate and to the extraction of cocoa butter (*q.v.*), a natural vegetable fat.

The cacao tree is grown throughout the wet lowland tropics, often in the shade of taller trees. Its thick trunk rises up to 12 metres (40 feet) and supports a canopy of leathery oblong leaves up to 30 centimetres (1 foot) long. The small, foul-smelling, pinkish flowers are borne directly on the branches and trunk. The flowers are followed by the fruit, or pods, which are ovoid, yellow-brown to purple, and divided on the surface by 10 ribs, or ridges. The pods may be up to 35 cm long and 12 cm in diameter. Each pod yields 20–40 seeds, or cocoa beans. The beans, about 2.5 cm long, are embedded within the pod in a pink mucilaginous pulp. After the fourth year a tree may bear 60 to 70 fruits annually.

After harvesting, the pod is split open and the seeds, or beans, are removed and allowed to ferment for several days. They are then subject to a series of processes—including drying, cleaning, roasting, and grinding—that yields a paste called chocolate liquor. This liquor is then either pressed, to produce cocoa butter and cocoa powder, or combined with additional cocoa butter (and sometimes other ingredients), to yield one of many chocolate products.

caccia (Italian: "hunt," or "chase"), one of the principal Italian musical forms of the 14th century. It consisted of two voices in strict canon at the unison (*i.e.,* in strict melodic imitation at the same pitch), and often of a non-canonic third part, composed of long notes that underlay the canonic voices, fol-

lowed by a ritornello. Caccia texts were typically realistic, animated scenes such as the hunt or the marketplace, and horn calls, bird calls, shouts, and dialogue frequently animated the musical settings.

The caccia was related in name to a 14th-century French genre, the chace, a setting of a text in three-part canon. The English catch, a 17th-century type of round, may derive its name from caccia.

Caccianemici, Gherardo (pope): *see* Lucius II.

Caccini, Giulio, also called GIULIO ROMANO (b. *c.* 1550, Rome—buried Dec. 10, 1618, Florence), Italian singer and composer whose songs greatly helped to establish and disseminate the new monodic music introduced in Italy about 1600. This is music in which an expressive melody is accompanied by evocative chords, as opposed to the traditional polyphonic style with its complex interweaving of several melodic lines.

Little is known of Caccini's early years in Rome, but he apparently studied with Giovanni Animuccia before going to Florence with his patron Cosimo I de' Medici sometime before 1574. During the last 20 years of the 16th century, he was closely associated with the Camerata of Count Giovanni Bardi, the Florentine group that produced the earliest operas. While playing and singing in court masques (for some of which he composed music), he perfected the new conception of song that he revealed in *Le nuove musiche* (1602; "The New Music"). This work consists mainly of solo madrigals and arias and contains an important explanatory preface (Eng. trans. in Oliver Strunk, *Source Readings in Music History*, 1952). The madrigals show his new manner most clearly: an elegant and pliable vocal line, scrupulously following the inflections of the words and heightened by affective embellishments, stands out against a subdued chordal accompaniment in diatonic harmony improvised from the newly invented basso continuo. In the course of the next 30 years many other Italian composers took up the fashion for monodies, and Caccini himself produced two more collections. He also wrote an opera in 1600 (performed Florence, 1602) based on the same libretto as Jacopo Peri's *Euridice.*

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Cáceres, province of the Extremadura *comunidad autónoma* ("autonomous community"), western Spain, bordering Portugal on the west. The Tagus River runs through the province, which has an area of 7,701 square miles (19,945 square km). Conquered by Alfonso IX from the Moors in 1229, it became part of the Kingdom of Leon and was made a province of Spain in 1833. Mountainous areas in the extreme north and south are formed by the Toledo and Central mountains, respectively; their landscape and wildlife are preserved by a 69-square-mile (179-square-kilometre) park created in 1979 at Monfrague. The remainder of the province is a fertile plain watered by the Tagus River and its tributaries. The Gabriel y Galán dam, on the Alagón River, is a source of hydroelectric power and irrigation.

Cáceres is primarily an agricultural (cereals, olives, cotton, tobacco, pepper) and cattle-raising region. Large flocks of sheep are pastured along the Tagus during the winter; pig keeping is also important, and there are numerous evergreen, oak, and cork tree forests that are as yet little-exploited. The province includes Las Hurdes, which historically was one of the poorest and most backward regions in Spain. Conditions have improved there, however. Industry is mainly concentrated in Cáceres city, the provincial capital. Pop. (1986 est.) 429,105.

Cáceres, town, capital of Cáceres province, in the Extremadura *comunidad autónoma* ("autonomous community"), western Spain. It is built on a low east–west ridge, south of the Tagus River and about 50 miles (80 km) northeast of Badajoz. Originating as the Roman town of Norba Caesarina, it was under Moorish control from the 9th century and was known as Alkazares until reconquered for the Christians by Alfonso IX of Leon in 1229. The military Order of Santiago (originally the Fratres de Cáceres) was founded there in 1171 to protect the town during a brief interim of Christian rule.

The old, upper town is surrounded by massive and turreted walls that are half Roman and half Moorish. This part of the town has several medieval palaces and is dominated by the lofty tower of the Gothic church of San Mateo, built in the 16th century on the site of a mosque. Other notable landmarks include Santa María la Mayor church (15th century) and the Casa de Toledo–Moctezuma, once the home of the conquistador Juan Cano. The provincial museum houses local artifacts. The lower, modern town contains law courts, the town hall, and the palace of the bishops of Coria.

Cáceres produces cork and leather goods, pottery, and cloth and exports grain, fruit, oil, livestock, wool, sausages, and phosphates from nearby mines. It is well-known for its hams. Pop. (1986 est.) 70,044.

cachalot: *see* sperm whale.

cachet, lettre de (French: "letter of the sign," or "signet"), a letter signed by the king and countersigned by a secretary of state and used primarily to authorize someone's imprisonment. It was an important instrument of administration under the ancien régime in France. Lettres de cachet were abused to such an extent during the 17th and 18th centuries that numerous complaints on the subject appear on the list of grievances presented to the Estates-General of 1789.

State lettres de cachet were sent by the government in the interests of society, either to maintain public order or to assure the proper functioning of institutions. In the first case, a public authority (in Paris the lieutenant general of police) might obtain from the king the orders for someone's detention for a limited period of time, or a public prosecutor would demand a lettre de cachet for the arrest of an accused person before trial. In the second case, the king might use a lettre de cachet to summon political bodies (such as the Estates-General), to order them to discuss a particular matter, or to exclude from their meetings some person or persons considered undesirable. Lettres de cachet were also used to arrest suspect foreigners or spies. They were also granted to private persons for action on another individual. Couched in very brief, direct terms, a lettre de cachet simply commanded the recipient to obey the orders therein without delay, giving no explanation.

Obviously, a device such as the lettre de cachet could be used quite arbitrarily, but research has discounted the common 18th-century belief that lettres de cachet were sometimes delivered blank, though duly signed and countersigned, so that the recipient had only to fill in the name of a personal enemy in order to be rid of him. It was also mistakenly believed that there was an illicit trade in blank lettres de cachet. On the contrary, research has shown that lettres de cachet were delivered only in accordance with a well-defined procedure and after a serious inquiry had been conducted into the grounds of the demand, especially when the demand was made by private persons.

The effect of a lettre de cachet was to initiate and enforce the imprisonment of an individual in a state fortress, particularly the Bastille, or in a convent or hospital. That the duration of the imprisonment was not necessarily specified in the lettre de cachet served to aggravate the arbitrary character of the measure taken. Nor was there any legal mechanism for appeal against a lettre de cachet; release, no less than detention, depended entirely upon the king's pleasure. In the law of the ancien régime, the lettre de cachet was thus an expression of that exercise of justice that the king reserved to himself, independently of the law courts and their processes, just as he reserved the right to grant *lettres de grâce,* or pardons, to persons who had been convicted by the courts.

During the Revolution the use of lettres de cachet was abolished by the Constituent Assembly in March 1790.

Cacheu, town, northwestern Guinea-Bissau, western Africa. It lies along the south bank of the Cacheu River near its mouth. Cacheu was made an official Portuguese captaincy in 1588, and it gained economic importance as a centre for the slave trade in the 17th and 18th centuries. Its importance declined in the early 19th century with the decline of the western African slave trade and the rising importance of Bolama, the capital of Portuguese Guinea (now Guinea-Bissau) until 1942. It is a small port town and provides a market for coconuts, palm oil, and rice produced in the surrounding coastal lowlands. Subsistence crops of millet, corn (maize), and sorghum are also grown in the area, and some of the land is used for grazing cattle, sheep, and goats. Phosphate deposits were discovered near Cacheu in the late 1970s. Pop. (1979) mun., 15,194.

Cachoeira do Sul, city and river port, central Rio Grande do Sul state, southern Brazil. It lies along the Jacuí River at 200 feet (60 m) above sea level. Founded in 1819 as São João de Cachoeira and given city status in 1859, Cachoeira do Sul is the centre of one of Brazil's major rice-growing areas. Rice, wool, wheat, and fruits are processed and shipped from the city, which is about 103 miles (165 km) west of Pôrto Alegre, the state capital; the city can be reached by rail, road, and air. Pop. (1980 prelim.) 59,967.

Cachoeiro de Itapemirim, city, southern Espírito Santo state, eastern Brazil. It lies along the Itapemirim River, at 95 feet (29 m) above sea level and about 30 miles (48 km) inland from the Atlantic coast. It was given city status in 1889. Cachoeiro de Itapemirim is a manufacturing centre and serves a livestock-raising region. It lies on the main highway and railroad linking Vitória, the state capital (70 miles [113 km] northeast), with Campos, in Rio de Janeiro state. Pop. (1980 prelim.) 84,994.

cacique, any of a dozen tropical American birds belonging to the family Icteridae (order Passeriformes) and resembling the related oropendolas. Caciques are smaller than oropendolas and have a less-powerful bill, which lacks a frontal shield. These striking black-and-yellow or black-and-red birds make hanging nests. A common species is the all-black, yellow-billed cacique (*Cacicus,* or *Amblycercus, holosericeus*), about 20 cm (8 inches) long, found in areas from southern Mexico to Bolivia.

caciquism, Spanish: CACIQUISMO ("bossism"), in Latin-American and Spanish politics, the rule of local chiefs or bosses (caciques). As a class, these leaders have often played a key role in the political structure of their countries.

The word *cacique* is of Indian origin but was

adopted by the Spanish conquistadores and used to describe heads of Indian tribes or, in the more developed Indian states, governors of districts. The Spaniards retained *caciques* as hereditary chiefs in the Indian communities to serve as minor judges, to apportion labour, and exact tribute. Bosses of forced labour gangs were called *caciques* in colonial Mexico and *curacas* in Peru. The term was later adopted in Spain, where its connotation of political bossism was even stronger.

CACM: *see* Central American Common Market.

cacomistle, also spelled CACOMIXL (*Bassariscus*), either of two species of large-eyed, long-tailed carnivores related to the raccoon (family Procyonidae). Cacomistles are grayish brown with lighter underparts and white patches over their eyes. The total length is about 60–100 centimetres (24–40 inches), about half of which is the bushy, black-and-white-ringed tail. The animals weigh about 1 kilogram (2.2 pounds) and have small faces with long ears and pointed snouts. They are arboreal and nocturnal and feed on a variety of small animals, fruit, and vegetation. Litters contain from one to five (usually three or four) young.

The species *B. astutus*, widely known as miner's cat, ringtailed cat, or ringtail, is found in rocky areas from the southwestern U.S. to southern Mexico. It is an agile animal with rounded ears and semiretractile claws. It is sometimes kept as a pet and is an excellent mouser. The species *B.* (formerly *Jentinkia*) *sumichrasti* ranges in forests from Central America to Peru. Larger, darker furred, and more arboreal than the ringtail, it has pointed ears and nonretractile claws.

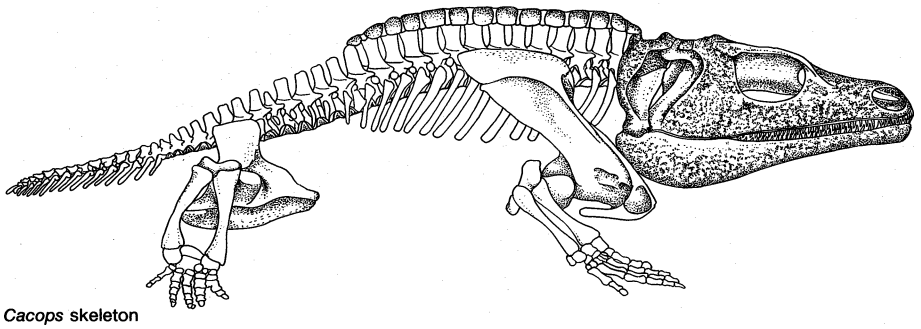
Cacomistle (*Bassariscus astutus*)
Leonard Lee Rue III

Caconda, town, northern Huíla province, west central Angola. It is located 140 mi (225 km) inland from the Atlantic Ocean on the Huíla Plateau (a high tableland sloping westward to the Atlantic coast in a series of descending escarpments) at an elevation of about 5,400 ft (1,650 m).

A Portuguese military post was established at Caconda *c.* 1680 to facilitate expansion of the slave trade and in the late 18th century, a permanent presidio, that became the first European settlement in the highlands, was built there. Caconda remained an advanced frontier post (until the late 19th century) for Portuguese colonial trade with the interior. In 1948, the first *colonato* (planned agricultural community) for black Africans in Angola was established near the town. Various crops (including corn [maize] and cotton) and especially cattle were raised with the assistance of agronomists. In 1975 prior to Angola's independence, the evacuation of the Portuguese technicians and other European settlers disrupted the town's economy; by the early 1980s the area was again producing cattle and subsistence crops. Pop. (latest census) 38,185.

cacophony: *see* euphony and cacophony.

Cacops, extinct amphibian genus found as fossils in Lower Permian rocks in North America (the Permian Period began 280,000,000 years ago and lasted 55,000,000 years). *Cacops* reached a length of about 40 centimetres (16 inches). The skull was heavily constructed, and the otic notch, the region in the hind part of the skull that housed the hearing mechanism, was extremely large and closed behind by a bony bar, indicating that *Cacops* probably relied heavily upon its sense of hearing and might have been nocturnal. With its strongly developed legs and limb girdles, the animal was well equipped to move about on land. The tail was relatively small, and the thick plating of bony armour on the back was probably an adaptation against attack. It is likely that *Cacops* spent more of its time on land than any other amphibian known in the fossil record.



Cacops skeleton

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Cactales, the cactus order of flowering plants, comprising the family Cactaceae. *See* cactus.

cactus, plural CACTI, or CACTUSES, any member of the family Cactaceae (order Cactales). Cacti are flowering plants characterized by large, fleshy stems usually without leaves. They are characteristic of and well-adapted to dry regions and most members are native to the Americas.

A brief treatment of cacti follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

Terrestrial cacti require properly drained soil containing no fresh organic material, but they tolerate many soil types. Even though many persist in very arid regions, they require water during their growing period. Potted cacti decline in vigour if allowed to dry out often, but die when overwatered.

The fruit of many prickly-pears (*Opuntia*) is eaten locally and marketed in many countries. *Opuntia ficus-indica,* the spineless Indian fig, is widely grown for food and forage in warmer regions. Burbank's spineless variety, a derivative, is raised for cattle feed. Cacti fruits are also made into drinks and used in folk medicine. Several genera contain the hallucinogenic drug mescaline. An example is peyote, or mescal buttons, used in some North American Indian religious rituals.

The cacti are noted for the evolution of many stem types. The night-blooming Queen-of-the-night (*Hylocereus undatus*) possesses a three-angled stem, with wavy wings two inches (five centimetres) wide. Leaves are borne on the wings, but are diminutive and last only a few weeks; short spines appear on the stream above each leaf. In the prickly-pears, the stems are flattened and are often mistaken for huge, succulent leaves; furthermore, one rounded stem-joint grows atop another. The tiny, true leaves are tongue-shaped and drop off within a few weeks. Associated with each leaf is a rounded, raised area, the areole, which bears spines and often many bristles. Most barrel and cushion cacti are ridged; areoles and spines are located along the ridges.

The internal structure of cacti stems conforms to the pattern of dicot; a cambium layer of dividing cells, located between the woody inner tissues and those near the outside of the stem, is present. The bulk of the stem, however, consists of thin-walled storage cells that contain mucilaginous substances that prevent the loss of moisture. The stem of cacti is the main food-manufacturing and food-storage organ.

A few cacti develop small plantlets at ground level that, as offsets, reproduce the species vegetatively. Tissues of cacti are broadly compatible so that terminal portions of one species may be grafted on top of another.

The primary method of reproduction, however, is by seeds. Flowers usually are solitary and always are associated with areoles. All genera have a floral tube, consisting of transitional and developed sepals and petals, that grows above a one-chambered ovary. A style topped by many pollen-receptive stigmas, also arises from the top of the ovary. Pollination and fertilization result in the development of the seed from the ovule (of which many are produced), and the development of the fruit from the ovary. Soon after pollination, which may be effected by wind or by birds, the entire floral tube detaches from the top of the ovary to leave a prominent scar.

Cacus and Caca, in Roman religion, brother and sister, respectively, originally fire deities of the early Roman settlement on the Palatine Hill, where "Cacus' stairs" were later situated. The Roman poet Virgil described Cacus as the son of the flame god Vulcan and as a monstrous fire-breathing brigand who terrorized the countryside. He stole some of the giant Geryon's cattle from the hero Hercules and hid them in his lair on the Aventine Hill; but a lowing cow betrayed Cacus, and Hercules, bursting in, killed him. There are various versions of this story, which is traditionally connected with the establishment of Hercules' oldest Roman place of worship, the Ara Maxima, in the Forum Boarium (Cattle Market), whose name is believed to commemorate these events.

Cadalo, Latin CADALUS (antipope): *see* Honorius (II).

Cadalso y Vázquez, José de, Cadalso also spelled CADAHLSO (b. Oct. 8, 1741, Cádiz, Spain—d. Feb. 27, 1782, Gibraltar), Spanish writer famous for his *Cartas marruecas* (1793; "Moroccan Letters"), in which a Moorish traveller in Spain makes penetrating criticisms of Spanish life. Educated in Madrid, Cadalso travelled widely and, although he hated war, enlisted in the army against the Portuguese during the Seven Years' War. His prose satire *Los eruditos a la violeta* (1772; "Wise Men Without Learning"), directed against the pseudo-learned, was his most popular work.

Although influenced by the classics, as seen in his neoclassical drama *Sancho García* (1771) and his anacreontic verse in *Ocios de mi juventud* (1773; "Diversions of My Youth"), Cadalso is considered a forerunner of Spanish Romanticism because of his *Noches lúgubres* (1789–90; "Sombre Nights"), an auto-

biographical prose work inspired by the death of his love, the actress María Ignacia Ibáñez.

Cadamosto, Alvise (Venetian explorer): *see* Ca' da Mosto, Alvise.

Cadbury, George (b. Sept. 19, 1839, Birmingham, Warwickshire, Eng.—d. Oct. 24, 1922, Birmingham), English businessman and social reformer who, with his elder brother, Richard, took over their father's failing enterprise (April 1861) and built it into the highly prosperous Cadbury Brothers cocoa- and chocolate-manufacturing firm. George was perhaps more important for his improvements in working conditions and for his successful experiments in housing and town planning.

In 1879 the Cadburys moved their business four miles from industrial Birmingham to a rural site they called Bournville (then in Worcestershire, but now part of Birmingham). There they introduced a private social security program and improved working conditions much in advance of their time. In 1893 George Cadbury (who became chairman of the firm on Richard's death in 1899), bought 120 acres (50 hectares) nearby. His long experience as a teacher in a Birmingham "adult school" for workingmen had convinced him that bad housing was the cause of many social evils. From 1894 he and his architect, W. Alexander Harvey, built working-class dwellings unusual for their ample gardens and other amenities. By 1900, when Cadbury renounced his proprietorship of the estate and set up the Bournville Village Trust, there were 313 houses for various social classes; by 1960 the trust held 1,000 acres with 3,500 houses. Economically self-sustaining, Bournville is not a company town, being independent of the factory and open to residents other than Cadbury employees. It has been a model for other "garden cities" and "garden suburbs."

George Cadbury was an enthusiast for Quaker (Society of Friends) evangelism. Beginning in 1901 he or his family, wishing to express Liberal Party views, acquired the London *Daily News* (afterward the *News Chronicle*) and other newspapers.

caddisfly, member of one of some 7,000 species of mothlike aquatic insects of the order Trichoptera. Caddisflies, generally dull brownish in colour, are found in freshwater environments, often on plants near the water's edge. They may be distinguished by the characteristically hairy wings folded rooflike over the abdomen and by the long antennae.

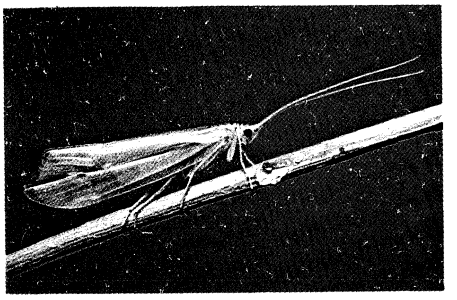
A brief treatment of caddisflies follows. For full treatment, *see* MACROPAEDIA: Insects.

Caddisflies are found in freshwater habitats all over the world, and a few species frequent brackish water and tidal regions. Many fossils have been preserved from the Early Jurassic Period (about 185,000,000 years ago).

The bodies of caddisflies are divided into head, thorax, and abdomen. The head contains the mouth, antennae, and eyes. The mouth typically has poorly developed mandibles and a hypopharynx adapted to sucking liquids. The antennae are long to very long—they are often longer than the wingspan—and are many-segmented. The eyes are relatively small. The thorax bears a pair of walking legs and two pairs of wings. Flight is weak and unsteady, however.

Most caddisflies take to the air at night and, like moths, are strongly attracted to light. The species that fly by day frequently do so in swarms. Most feed on plant juices and the nectar of flowers; a few, however, are predacious.

The female scatters her eggs into water or places them on rocks or plants at or beneath the surface. The eggs hatch in a few days to release the larvae, or caddisworms, which in nearly all species live in fresh water. Depending on the species, they may prey on algae, plants, or other insects. Some larvae are free-living, but many construct a portable case

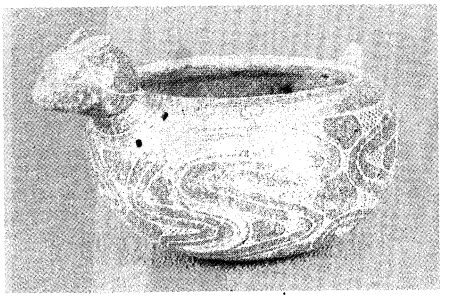


Caddisfly (*Psychoglypha*)
E.S. Ross

made of grains of sand, bits of shells, and plant debris. A silky substance secreted by labial glands acts as a glue to hold the case together. The cases are usually tubular, open at both ends. The case covers the abdomen, while the armoured head and the thorax protrude from the front. In the advanced stages of their development, many larvae attach the cases to a solid object, close both ends, and pupate inside; others construct a separate cocoon. When the pupa matures it cuts or bites its way out of the case or cocoon and swims to the surface of the water to complete the transformation into the adult stage.

Caddisflies are an important part of the freshwater ecosystem. They help clean the water by consuming plant and animal debris. They also serve, both in larval and adult forms, as an important food for fish in freshwater streams and ponds; trout, in particular, prey on caddisflies, which is why the flies used by anglers are often modelled on them.

Caddo, one of a confederacy of tribes of North American Indians that composed the Caddoan linguistic family. The Caddo proper originally occupied the lower Red River area in what are now Louisiana and Arkansas. In the late 17th century they numbered 8,000 persons living in villages scattered along the Red River and its tributaries. This is also the region of the Caddoan archaeological complex, where many striking examples of Indian workmanship have been found. Archaeological research shows the Caddoan tenancy to be ancient. During the 18th century the French and Spanish disputed over Caddo territory, and the tribe was at first friendly to the French. By the close of the 18th century various pressures from white settlers on the Caddo had broken up their tribal life and turned many of them into wanderers in their own land. When Louisiana was purchased by the U.S.,



Incised redware cat effigy bowl, Caddoan from Louisiana; in the Museum of the American Indian, Heye Foundation, New York City
By courtesy of the Museum of the American Indian, New York

white immigration increased, and the tribe was pushed farther south. Under the treaty of 1835 the Caddo ceded all their land to the U.S. The Louisiana Caddo moved southwest to join others of the tribe in Texas. There they lived peaceably for a time, but in 1859 threats of a massacre by the whites forced them to flee to east central Oklahoma, where they were settled on a reservation on the banks of the Washita River.

When first encountered, the Caddo were a semi-sedentary agricultural people. They lived in conical-shaped dwellings constructed of poles covered with a thatch of grass; these were grouped around ceremonial centres of temple mounds. The Caddo were skillful potters and basket makers. They wove cloth of vegetable fibres and, on special occasions, wore mantles decorated with feathers. They also wore nose rings and practiced tattooing.

Descent was matrilineal, and a hereditary upper group, marked by head deformation and other status symbols, directed political and religious activities. There are scattered reports of ceremonial human sacrifice and cannibalism. These and other traits relate the Caddo to the centres of high Indian culture in Mexico and Yucatán.

caddy, container for tea. A corrupt form of the Malay *kati,* a weight of a little more than a pound (or about half a kilogram), the word was applied first to porcelain jars filled with tea and imported into England from China. Many caddies made from silver, copper, brass, pewter, and other decorative materials, such

Silver tea caddy with maker's mark C.N., hallmark for 1767–68, London; in the Victoria and Albert Museum, London
By courtesy of the Victoria and Albert Museum, London; photograph, A.C. Cooper Ltd.

as veneers of tortoiseshell or ivory on wood, were made in the 18th century.

When the price of tea dropped considerably in the 1780s, larger tea caddies were made, and wood became the commonest material. The form of the wooden caddy was a box or casket with hinged lid and a lock, fitted with lidded compartments for tea and one or two glass bowls for sugar and for blending the tea.

Cade, Jack, byname of JOHN CADE (b. Ireland—d. July 12, 1450, Heathfield, Sussex, Eng.), leader of a major rebellion (1450) against the government of King Henry VI of England; although the uprising was suppressed, it contributed to the breakdown of royal authority that led to the Wars of the Roses (1455–85) between the houses of York and Lancaster.

Cade was living in Sussex when, in 1449, he was accused of murdering a woman. He fled to France but returned in 1450 and settled in Kent, posing as a physician named John Aylmer. In June 1450 Jack Cade emerged as leader of a Kentish rebellion of small property holders victimized by high taxes and prices. By assuming the name John Mortimer, he identified himself with the family of Henry VI's rival, Richard, duke of York, who was living in virtual exile in Ireland. Cade issued a manifesto demanding the removal of several of the King's chief ministers and the recall of Richard. His forces defeated a royal

army at Sevenoaks, Kent, on June 18, and, on July 3 he entered London, where he executed the hated lord treasurer, James Fiennes, Lord Saye and Sele. Nevertheless, Cade's lawlessness quickly alienated the Londoners, who drove the insurgents from the city on July 5–6. The government persuaded most of the rebels to disperse by offering them a pardon, but Cade continued his resistance. Wounded and captured near Lewes, Sussex, on July 12, he died while being transported to London.

cadence, in music, formula signifying the end of a phrase or half-phrase, section, or entire composition. The concept of cadence implies broadly acknowledged conventions, especially of a harmonic nature, conveying a sense of relative completion, analogous to the use of punctuation in literature. The term derives from the Latin word *cadere* ("to fall") and originally referred to the stepwise descent of the tenor part, associated with formal endings in certain types of late medieval polyphony. With the emergence of functional harmony in the course of the 17th century, the cadence assumed previously unsuspected structural significance, especially in homophonic music, which literally moved from cadence to cadence.

Three principal types evolved in this purely harmonic context: the perfect, or full (final), cadence; the half cadence, or semicadence; and the deceptive cadence. The perfect cadence, in turn, can be either authentic (with the dominant as the penultimate chord, resolving to the tonic) or plagal (with the subdominant as the penultimate chord, resolving to the tonic); only the authentic perfect cadence produces a truly decisive ending. Half cadences occur especially at the midpoint of phrases or periods. They fulfill only half of their cadential obligations since, by coming to rest on the dominant rather than the tonic, they fail to provide full release from previously generated harmonic tensions. In fact, it is the residual tension between the half cadence and the original tonic that gives further impetus to the remainder of the phrase or period, until it settles in a final tonic cadence. Deceptive cadences are akin to half-cadences in that they, too, are transitory in nature; in deceptive cadences, however, the dominant chord is followed by a tonic substitute, typically the chord built on the sixth scale degree, also known as the submediant. The ensuing "deception" merely reinforces the desire for a speedy return to the tonic and its confirmation by a perfect cadence.

In monophonic music (consisting of a single line of melody), such as plainchant, certain melodic formulas imply cadence. The melodic styles of a culture frequently prescribe the proper final note of a melody and how to approach it. Certain rhythmic patterns may be recognized as indicators of cadence, as in some Japanese music. Colotomic structure, the systematic use of prescribed instruments at fixed rhythmic intervals, may also signal cadence—*e.g.,* in Indonesian gamelan—as the recognized pattern approaches its end.

cadenza (Italian: "cadence"), unaccompanied bravura passage introduced at or near the close of a movement of a composition and serving as a brilliant climax, particularly in solo concerti of a virtuoso character. Until well into the 19th century such interpolated passages were often improvised by the performer at suitable openings left for that purpose by the composer. They were displays not only of performing skill but also of more or less spontaneous invention and imagination. Modern performers use written-out cadenzas even for classical concerti, and in modern concerti that include cadenzas they are usually written by the composer. *See also* improvisation.

cadi (Muslim judge): *see* qāḍī.

Cadillac, city, seat (1869) of Wexford County, northwestern Michigan, U.S., on the shores of Lakes Cadillac and Mitchell (linked by a canal), 97 mi (156 km) north of Grand Rapids. Settled by lumbermen in the 1860s and incorporated in 1875 as the village of Clam Lake, it was renamed at its incorporation as a city in 1877 for the founder of Detroit, Antoine de la Mothe Cadillac. Cadillac is the headquarters of the Huron and Manistee national forests and is a year-round resort noted for boating, fishing, and winter sports (at nearby Caberfae). Its economy is now balanced between light manufacturing, tourism, and agriculture. Pop. (1980) 10,199.

Cadillac, Antoine Laumet de La Mothe, sieur de (sire of) (b. March 5, 1658, Les Laumets, Fr.—d. Oct. 15, 1730, Castelsarrasin), French soldier, explorer, and administrator in French North America, founder of the city of Detroit (1701), and governor of Louisiana (1710 to 1716 or 1717). Going to Canada in 1683, he fought against the Iroquois Indians, lived for a time in Maine, and first served in present-day Michigan as commandant of the important frontier post of Mackinac (1694–97).

With permission from King Louis XIV, Cadillac established a Great Lakes fur-trading post and founded Fort-Pontchartrain du Détroit, later called Detroit. He governed there until 1710, when his enemies in Quebec and Paris forced his removal to the new French colony of Louisiana. Increasingly unpopular there, he was recalled to France and was briefly confined in the Bastille. He lived the rest of his life in retirement in Languedoc. The city of Cadillac, Mich.; Cadillac Mountain, Maine; and the Cadillac automobile are named for him.

Cadiz, chartered city and port, Negros Occidental province, northern Negros island, Philippines. It is one of five chartered cities and one of the principal ports on the island where most of the country's sugar is grown and refined and where fishing is a major industry. Herring, anchovy, round scad, and mackerel are caught. Cadiz fronts north on the Visayan Sea and lies some 40 mi (65 km) northeast of the provincial capital of Bacolod City, another major fishing port and sugar town. It is connected to Bacolod and other coastal cities by a road that nearly circles the island. Inc. city, 1967. Pop. (1980) 129,632.

Cádiz, province, in the autonomous community (region) of Andalusia, southwestern Spain, fronting the Mediterranean Sea (southeast) and the Atlantic (west). Formed in 1833 from districts taken from Seville, it has an area of 2,851 sq mi (7,385 sq km), exclusive of Ceuta on the Moroccan coast to the south across the Strait of Gibraltar, which is administratively part of Cádiz.

The eastern part of the province is crossed by wooded spurs of the Penibético Mountain System, while the west central is a low plain crossed by the Guadalete and Barbate rivers and their tributaries. Along the coast are the marshy Laguna de la Janda and numerous salt ponds that constitute the basis for one of the province's most important industries. The provincial coastline also has important harbours, including Gibraltar Bay and Cádiz bays. Punta Tarifa (Point Marroquí), on the Strait of Gibraltar, is the southernmost cape on the European mainland. The mild climate and naturally fertile soil make fruit, vine, and olive growing the chief economic activities, though severe droughts often cause great distress. Jerez de la Frontera is famous for the production and export of sherry. Cork is obtained from the mountain forests, and fish are caught off the coast and salted for export. Much salt is obtained by evaporation of seawater in pans near Cádiz city. Apart from Cádiz (*q.v.*), the provincial capital, important urban centres are Algeciras, Tarifa, Jerez de la Frontera, and Rota. Industrial growth was given impetus in 1980 when construction of two automotive-parts plants began at Puerto Real. Railway communication is limited in the west to a line from Sevilla to Cádiz, with branch lines from Sanlúcar de Barrameda to Jerez and El Puerto de Santa María, and in the east to a line from Sevilla to Algeciras. Pop. (1982 est.) 992,296.

Cádiz, city, capital and principal seaport of Cádiz province, in the autonomous community (region) of Andalusia, southwestern Spain, on a long narrow peninsula extending into the Gulf of Cádiz (an inlet of the Atlantic Ocean). With a 6- to 7-mi (9.5- to 11-km) circumference, hemmed in by the sea from which it is protected by walls, the city has only one land exit. Traditionally founded as Gadir (meaning "an enclosure") by Phoenician merchants from Tyre as early as 1100 BC, it was occupied by the Carthaginians about 501 BC. Credence was given to the city's Phoenician origins by the discovery in 1980 and earlier of Phoenician sarcophagi at two separate sites.

At the close of the Second Punic War the city willingly surrendered to Rome, and from that time, as Gades, its prosperity steadily increased. A Roman theatre, one of the oldest and best preserved in Spain, was discovered

Cádiz, Spain, with the cathedral in the background (right)
C.I.R.I.—EDISTUDIO

in the suburb of Pópolo in 1980. In the 5th century the city was destroyed by the Visigoths. Moorish rule over the port, which was renamed Jazīrat Qādis, lasted from 711 until 1262, when Cádiz was captured and rebuilt by Alfonso X of Castile.

Its renewed prosperity dated from the discovery of America in 1492, when it became the headquarters of the Spanish treasure fleets. During the 16th century it repelled a series of raids by Barbary corsairs; in 1587 its harbour shipping was burned by an English squadron under Sir Francis Drake. After being blockaded (1797–98) and bombarded (1800) by the British, it was besieged by the French in 1810–12, during which time it served as the capital of all Spain not under the control of Napoleon. There the Cortes (Spanish parliament) met and proposed the famous liberal constitution of March 1812, which led to the 1820 revolution.

The loss of the Spanish colonies in the Americas dealt a blow to the trade of Cádiz from which it never recovered. Its decline was later accelerated by the disasters of the Spanish–American War of 1898 and by its antiquated harbour works. After 1900, considerable improvements were made in quayside construction, and recovery proceeded steadily. In the Spanish Civil War of 1936–39 Cádiz fell to the Nationalists almost at once and served as an important port of entry for reinforcements from Spanish Morocco. In 1947 the city suffered great damage from the explosion of a naval arms store.

Industrial development is rather limited, but important naval and mercantile shipbuilding yards and various factories exist on the mainland, and there are tuna fisheries off the coast. The city is primarily a commercial port, exporting wine (principally sherry from Jerez de la Frontera), salt, olives, figs, corks, and salted fish; and importing coal, iron and machinery, timber, cereals, coffee, and other foodstuffs. Several shipping lines call there, and passenger traffic is important. A military airfield and a Spanish–U.S. air base are nearby.

Notable landmarks include the old cathedral, originally built by Alfonso X of Castile (1252–84) and rebuilt after 1596; and the Baroque cathedral, begun in 1722 and completed in 1838, where the composer Manuel de Falla (1876–1946) is buried. It also holds a magnificent collection of art treasures. Other landmarks include San Sebastián and Santa Catalina castles, numerous museums, and the famous Torre de Vigía (100 ft [30 m]), a signal tower in the centre of the city. Pop. (1982 est.) 146,048.

Cádiz, Bay of, Spanish BAHÍA DE CÁDIZ, small inlet of the North Atlantic Ocean. It is 7 mi (11 km) long and up to 5 mi wide, indenting the coast of Cádiz Province, southwestern Spain. It receives the Guadalete River and is partially protected by the narrow Isla de León, on which the major port of Cádiz is located. Other ports along the bay include San Fernando (south), Puerto Real (east), El Puerto de Santa María (northeast), and Rota (north). The bay forms a small portion of the Gulf of Cádiz, which extends southeastward for 200 mi from Cape St. Vincent (Cabo de São Vicente, Portugal) to the Strait of Gibraltar (Spain). The harbours along the bay thrive as commercial centres serving the rich agricultural hinterland; transoceanic vessels call mainly at Cádiz. A considerable amount of salt, obtained by evaporation of seawater, is used to prepare fish caught offshore for export. Situated on the bay are the Spanish–U.S. air and naval base at Rota, the naval station at San Fernando, and the arsenal, or dockyard, of La Carraca just northeast of San Fernando.

Cadman, Charles Wakefield (b. Dec. 24, 1881, Johnstown, Pa., U.S.—d. Dec. 30, 1946, Los Angeles), one of the first U.S. composers to become interested in the music and folklore of the American Indian.

From 1908 to 1910 he was music critic for the *Pittsburgh Dispatch*. A visit to an Omaha Indian reservation reinforced an earlier interest in Indian music. He made recordings of Indian music and from 1909 to 1923 gave lecture-recitals with Tsianina Redfeather, an Indian singer.

In 1924 he took a doctorate in music at the University of Southern California. His songs "At Dawning" (1906) and "From the Land of Sky-Blue Water" (1908) became highly popular. His 1918 opera *Shanewis* (*The Robin Woman*) was the first U.S. opera to play two seasons at the Metropolitan Opera. Other works include the operatic cantata *The Sunset Trail* (1925) and the operas *A Witch of Salem* (1926) and *The Willow Tree* (1931), the first U.S. opera written for radio; the *American Suite* for strings; the *Thunderbird Suite* for piano; and the cantata *The Vision of Sir Launfal*.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

cadmium (Cd), chemical element, metal of Group IIb, or the zinc group, of the periodic table.

Properties, occurrence, and uses. Silver-white and capable of taking a high polish, cadmium is nearly as soft as tin and like tin emits a crackling sound when bent; it can be rolled out into sheets. Cadmium melts and boils at relatively low temperatures; its vapour is deep yellow and monatomic. The metal is permanent in dry air, becomes coated with the oxide in moist air, burns on heating to redness, and is readily soluble in mineral acids. Poisoning results from the inhalation of vapour or dust of cadmium. Friedrich Stromeyer, a German chemist, discovered the element (1817) in a sample of zinc carbonate, and, in the same year, K.S.L. Hermann and J.C.H. Roloff found cadmium in a specimen of zinc oxide. Both zinc compounds were being examined because their purity as pharmaceuticals was suspect. A rare element (about 0.2 gram per ton in the Earth's crust), cadmium occurs in a few minerals and in small quantities in other ores, especially zinc ores, from which it is produced as a by-product. Most cadmium is recovered from the fumes eliminated during the sintering of zinc concentrates, from the dust collected from the gases leaving lead blast furnaces, and from various residues produced during the electrolytic refining of zinc.

Most cadmium produced is electroplated onto steel, iron, copper, brass, and other alloys to protect them from corrosion. Cadmium plating is especially resistant to attack by alkali. Some is used as the anode material in rechargeable storage batteries in which the oxide of nickel or silver is the cathode. Cadmium unites with many heavy metals to yield alloys; the most important are bearing alloys and low-melting alloys used for soldering and brazing. Because it efficiently absorbs thermal neutrons, it is used in control rods for some nuclear reactors.

Natural cadmium is a mixture of eight isotopes: ^{106}Cd (1.2 percent), ^{108}Cd (0.9 percent), ^{110}Cd (12.4 percent), ^{111}Cd (12.8 percent), ^{112}Cd (24.0 percent), ^{113}Cd (12.3 percent), ^{114}Cd (28.8 percent), and ^{116}Cd (7.6 percent).

Compounds. In its compounds cadmium exhibits almost exclusively the +2 oxidation state, as in the colourless Cd^{2+} ion, which forms a number of stable complex ions, especially halide complexes. A few compounds of the +1 oxidation state have been prepared by dissolving cadmium metal in molten cadmium(II) halides. The resultant diatomic cadmium(I) ion, Cd_2^{2+}, is unstable in water and immediately disproportionates to cadmium metal and Cd^{2+}.

The most important cadmium compound is cadmium oxide, CdO. It is a brown powder produced by burning cadmium vapor in air, and provides a convenient starting material for the production of most other cadmium salts. Another compound of some economic value is cadmium sulfide, CdS. Generally produced by treating cadmium solution with a soluble sulfide, it is a bright yellow pigment known as cadmium yellow, which is used in high-grade paints and artist's pigments because of its colour stability and resistance to sulfur and oxidation. One other compound of note, cadmium selenide (CdSe), is commonly precipitated by hydrogen selenide or alkaline selenides from solutions of cadmium salts. By varying the conditions of precipitation, stable colours ranging from yellow to bright red can be produced. On its own or mixed with cadmium sulfide, it is widely used as a high-grade pigment.

atomic number	48
atomic weight	112.40
melting point	321° C (610° F)
boiling point	765° C (1,409° F)
specific gravity	8.65 (20° C, 68° F)
valence	2
electronic configuration	2-8-18-18-2 or $(Kr)4d^{10}5s^2$

cadmium poisoning, toxic effects of cadmium or its compounds on body tissues and functions. Poisoning may result from the ingestion of an acid food or drink prepared in a cadmium-lined vessel (*e.g.*, lemonade served from cadmium-plated cans). Nausea, vomiting, diarrhea, and prostration usually occur within 15 minutes after ingestion and subside within 24 hours. Inhalation of cadmium fumes in industry produces an acute, extremely severe inflammation of the lungs that may be fatal. Chronic poisoning from inhalation may cause a loss of the sense of smell, coughing, difficult breathing, weight loss, and injury of the liver and kidneys. Treatment usually includes the oral administration of calcium edetate.

Cadmus, in Greek mythology, the son of Phoenix or Agenor (king of Phoenicia) and brother of Europa. Europa was carried off by Zeus, king of the gods, and Cadmus was sent out to find her. Unsuccessful, he consulted the Delphic oracle, which ordered him to give up his quest, follow a cow, and build a town on the spot where she lay down. The cow guided him to Boeotia (Cow Land), where he founded the city of Thebes. Later, Cadmus sowed in the ground the teeth of a dragon he had killed. From these sprang a race of fierce, armed men, called Sparti (meaning Sown). Five of

Cadmus slaying a dragon, detail from a black-figure Laconian kylix; in the Louvre

By courtesy of the Musee du Louvre, Paris; photograph, H. Roger-Viollet

them assisted him to build the Cadmea, or citadel, of Thebes and became the founders of the noblest families of that city. Cadmus later took as his wife Harmonia, daughter of the divinities Ares and Aphrodite, by whom he had a son, Polydorus, and four daughters, Ino, Autonoë, Agave, and Semele. Cadmus and Harmonia finally retired to Illyria. But when the Illyrians later angered the gods and were punished, Cadmus and Harmonia were saved, being changed into black serpents and sent by Zeus to the Islands of the Blessed.

According to tradition Cadmus brought the alphabet to Greece.

Cadogan, William Cadogan, 1st Earl (b. 1672, Liscarton, County Meath, Ire.—d. July 17, 1726, Kensington, near London), British soldier, an outstanding staff officer who gained political influence as the friend and trusted colleague of John Churchill, 1st duke of Marlborough.

The son of a Dublin barrister, Cadogan began his military career in 1690; in 1702 he was made quartermaster general to Marlborough, who had just been appointed commander of the allied armies arrayed against the French (War of the Spanish Succession, 1701–14). Cadogan served beside Marlborough in the victories at Blenheim, in Bavaria (1704), and at Ramillies, in present-day Belgium (1706), and he led a cavalry regiment in numerous engagements with the French. In 1709 he was promoted to lieutenant general.

When Marlborough was dismissed by Queen Anne in 1711, Cadogan retired from the army. He became involved in intrigues to secure—by force if necessary—the succession for the house of Hanover, and after the Hanoverian monarch George I came to power in 1714, Cadogan again received military promotions. He crushed a rebellion by Jacobites (supporters of Stuart claims to the throne) in 1716 and

Cadogan, detail of an oil painting attributed to Louis Laguerre, first quarter of the 18th century; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

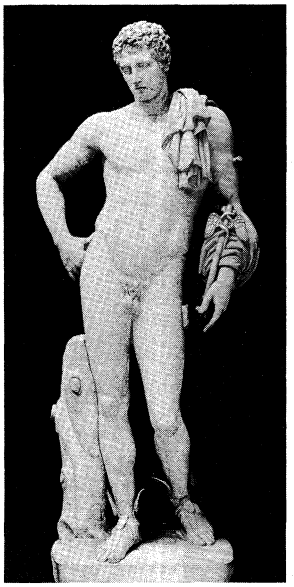
two years later was granted an earldom. Nevertheless, by allying with George's Hanoverian advisers, Cadogan left himself open to attacks by the opposition; hence, by 1720 he had lost most of his political influence.

Cadore, Jean-Baptiste Nompère de Champagny, duc de (duke of): *see* Champagny, Jean-Baptiste Nompère de.

Cadorna, Luigi (b. Sept. 4, 1850, Pallanza, Piedmont, Kingdom of Sardinia—d. Dec. 21, 1928, Bordighera, Italy), general who completely reorganized Italy's ill-prepared army on the eve of World War I and who was chief of staff during the first 30 months of that conflict. His career was marked as much by failure as by success.

Cadorna's principal military successes were the blunting of the Austrian offensive in the Trentino (spring 1916), the capture of Gorizia (August 1916), and the victory at Baensezza (1917). Because of the overwhelming defeat of the Italian army at Caporetto (Oct. 24, 1917), he was removed as chief of staff and transferred to the Allied military council at Versailles. The official inquiry into the defeat at Caporetto forced his recall from Versailles. Nevertheless, he was named a field marshal in 1924.

caduceus, Greek KĒRYKEION, staff carried by Hermes, the messenger of the gods, as a symbol of peace. Among the ancient Greeks



Hermes bearing a caduceus, Roman copy, *c.* 1st century AD, of a Greek sculpture, *c.* 350 BC; in the British Museum

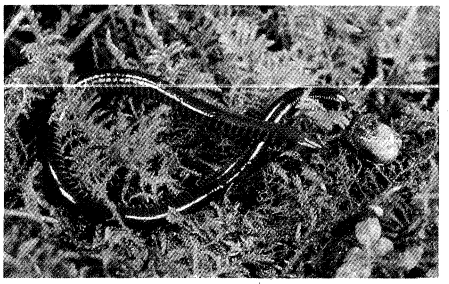
By courtesy of the trustees of the British Museum

and Romans it became the badge of heralds and ambassadors, signifying their inviolability. Originally the caduceus was a rod or olive branch ending in two shoots and decorated with garlands or ribbons. Later the garlands were interpreted as two snakes entwined in opposite directions with their heads facing; and a pair of wings, in token of Hermes' speed, was attached to the staff above the snakes. Its similarity to the staff of Asclepius the healer (a staff branched at the top and entwined by a single serpent) resulted in modern times in the adoption of the caduceus as a symbol of the physician and as the emblem of the U.S. Army Medical Corps.

Cadwalader (early Welsh and West Saxon kings): *see* Cadwallon; Caedwalla.

Cadwallon, also spelled CAEDWALLA, or CADWALADER (d. 633), British king of Gwynedd (in present north Wales) who, with the Mercian king Penda, invaded Northumbria in 632, killed the Northumbrian king Edwin in battle, and devastated the region. A year later Cadwallon was defeated and slain by Oswald, who became king of Northumbria.

caecilian, any of the approximately 150 species of the amphibian order Gymnophiona



Caecilian

Oxford Scientific Films—Bruce Coleman Inc.

(formerly Apoda). They are burrowing or swimming, secretive animals and occur in the Western Hemisphere from Mexico to northern Argentina and in Africa, southeastern Asia, and the Seychelles Islands. Their bodies are elongate, without limbs or girdles, and are characterized by numerous annuli (rings) repeated the length of the body. The length varies from about 10 to 150 centimetres (about 4 to 60 inches). The body diameter of the largest is about 5 cm (2 in.), and the colour ranges from blackish to pinkish tan. The eyes are tiny and covered by skin and often by bone. A chemosensory tentacle lies between the eye and nostril.

Externally the male and female appear identical, but the male possesses an intromittent organ for internal fertilization of the female. More primitive species lay eggs that are guarded by the female; the eggs hatch into free-living larvae. Other species lay eggs but are not direct developers. Many species are viviparous, giving birth to miniature adults following nutrition in the oviduct by the maternal partner. Caecilians spend their lives underground and eat worms and insects. They, in turn, are sometimes eaten by snakes.

Caecilius OF CALACTE (fl. early 1st century AD; b. Calacte, Sicily), Greek rhetorician who was one of the most important critics and rhetoricians of the Augustan age. Only fragments of his works are extant, among which may be mentioned: *On the Style of the Ten Orators; On the Sublime,* which was attacked by the so-called Longinus (*q.v.*) in a more famous work of the same title; *History of the Servile Wars,* or slave risings in Sicily; *On Rhetoric* and *Rhetorical Figures;* an *Alphabetical Selection of Phrases,* an Attic lexicon, mentioned in the later *Suda lexicon* as one of its authorities; and *Against the Phrygians,* probably an attack on the florid style of the Asiatic school of rhetoric.

Caecilius, Statius (b. *c.* 219 BC—d. 166 BC, Rome), Roman comic poet ranked by the literary critic Volcatius Sedigitus at the head of all Roman writers of comedy. Information is too meagre to justify any firm statement beyond saying that he was a writer of considerable moral power (a tribute paid by the poet Horace); that he admired and imitated the Greek playwright Menander; that his work was less lively than that of his predecessor, Plautus, and less polished than that of his young contemporary, Terence.

Little is known certainly of his life, though many writers refer to him. Aulus Gellius says that he was a slave. St. Jerome says that he was an Insubrian Gaul and that he was a close friend of the poet Ennius. Of his comedies only 42 titles (most of them identical with titles of plays by Menander) and 280 lines or parts of lines have survived. Cicero could name Caecilius' *Hymnis* in a public speech without having to indicate the author's name, and perhaps this is some indication of the popularity that he enjoyed.

Caecina Alienus, Aulus (b. Vicetia, Venetia—d. AD 79), Roman general who, during the civil wars of 69, played a decisive role in making first Aulus Vitellius and then Vespasian rulers of the empire.

As a quaestor in Spain, he aided the successful revolt of Servius Sulpicius Galba, governor of Nearer Spain, against the emperor Nero in 68. After Galba was made emperor (ruled June 68 to January 69), Caecina served as a legate in Germania Superior until Galba had him censured for embezzlement. Caecina then sided with Vitellius, who had been proclaimed emperor by the troops of Germania Superior and Inferior. Galba was killed by forces loyal to Marcus Salvius Otho. Otho was made

emperor, but his reign ended when Caecina crushed his forces near Cremona on April 16. Vitellius then became sole emperor and made Caecina consul, but Caecina soon betrayed him. Vitellius' forces fell at Cremona in October 69. Vespasian was installed as emperor two months later. Caecina received imperial honours but was not employed by Vespasian. In 79 Vespasian's son, Titus, had Caecina executed as an alleged conspirator.

caecum (anatomy): *see* cecum.

Caecus, Appius Claudius: *see* Claudius Caecus, Appius.

Caedmon (fl. 658–680), first Old English Christian poet, whose fragmentary hymn to the creation remains a symbol of the adaptation of the aristocratic-heroic Anglo-Saxon verse tradition to the expression of Christian themes. His story is known from Bede's *Ecclesiastical History of the English People,* which tells how Caedmon, an illiterate herdsman, retired from company one night in shame because he could not comply with the demand made of each guest to sing. Then in a dream a stranger appeared commanding him to sing of "the beginning of things," and the herdsman found himself uttering "verses which he had never heard." When Caedmon awoke he related his dream to the farm bailiff under whom he worked and was conducted by him to the monastery at Streaneshalch (now called Whitby). The abbess St. Hilda believed that Caedmon was divinely inspired and, to test his powers, proposed that he should render into verse a portion of sacred history, which the monks explained. By the following morning he had fulfilled the task. At the request of the abbess he became an inmate of the monastery. Throughout the remainder of his life his more learned brethren expounded Scripture to him, and all that he heard, he reproduced in vernacular poetry. All of his poetry was on sacred themes, and its unvarying aim was to turn men from sin to righteousness. In spite of all the poetic renderings that Caedmon supposedly made, however, it is only the original dream hymn of nine historically precious, but poetically uninspired, lines that can be attributed to him with confidence. The hymn—extant in 17 manuscripts, some in the poet's Northumbrian dialect, some in other Old English dialects—set the pattern for almost the whole art of Anglo-Saxon verse.

The "Caedmon Poems," a considerable body of verse contained in a manuscript written in about AD 1000, is now in the Bodleian Library at Oxford. Though attributed to Caedmon, the works in this anthology are by several hands, and there is no proof as to which, if any, pieces are actually his.

Caedmon manuscript, also called JUNIUS MANUSCRIPT, Old English scriptural paraphrases copied *c.* 1000, given in 1651 to the scholar Franciscus Junius by Archbishop James Ussher of Armagh and now in the Bodleian Library, Oxford. It contains the poems *Genesis, Exodus, Daniel,* and *Christ and Satan,* originally attributed to Caedmon (*q.v.*) because these subjects correspond roughly to the list of subjects described in Bede's *Ecclesiastical History* as having been rendered by Caedmon into vernacular verse. The whole is known as Caedmon's Paraphrase and was first published in 1655. Later critical studies make the attribution to Caedmon doubtful, because the poems seem to have been written at different periods and by more than one author.

Genesis is a poem of 2,936 lines. The first 234 lines describe the fall of angels and parts of the creation. Lines 235–851 give a second account of the fall of angels and tell of the fall of man. The sequence, style, and superior quality of these lines reveal them to be interpolated. This section, later identified as a translation of an Old Saxon original, is now known as Genesis B. Its many striking resemblances to *Paradise Lost* suggest that John Milton might have known of the manuscript. The remaining portions, Genesis A, carry the story up to the sacrifice of Isaac.

Exodus, an incomplete poem of 590 lines regarded as older than *Genesis* or *Daniel,* describes the flight of the Israelites with considerable dramatic power.

Daniel, an incomplete poem of 764 lines, is a scholarly work closely following the Vulgate Book of Daniel and much inferior to *Exodus* in poetic quality.

The 729-line piece known as *Christ and Satan* contains a lament of the fallen angels, a description of the harrowing of hell (Christ's descent into hell after his death), and an account of the temptation of Christ by Satan. In spite of its anachronistic sequence, it is regarded by some scholars as a single poem, its unifying theme being the "sufferings of Satan." It has a rude vigour and lack of culture and polish. The manuscript also contains drawings.

Caedwalla (Welsh king): *see* Cadwallon.

Caedwalla, also spelled CADWALADER (b. *c.* 659—d. April 20, 689), king of the West Saxons, or Wessex (from 685), great-grandson of King Ceawlin. In his youth he was driven from Wessex and led the life of an outlaw and, in 685, began harrying Sussex. In that year, he obtained the Wessex throne and again invaded Sussex, then Kent and the Isle of Wight. Suddenly, in 688, he turned Christian, with the same devotion that he had previously shown as a warrior; and in the following year he resigned his kingship and journeyed to Rome, where he was baptized (April 10, 689) and, upon his death, buried at St. Peter's.

Caelius Aurelianus (fl. 5th century AD, Sicca Veneria, Numidia), the last of the medical writers of the Western Roman Empire, usually considered the greatest Greco-Roman physician after Galen. Caelius probably practiced and taught in Rome and is now thought to rank second only to the physician Celsus as a Latin medical writer. His most famous work, *De morbis acutis et chronicis* ("Concerning Acute and Chronic Diseases"), is a thorough exposition of classical medical knowledge.

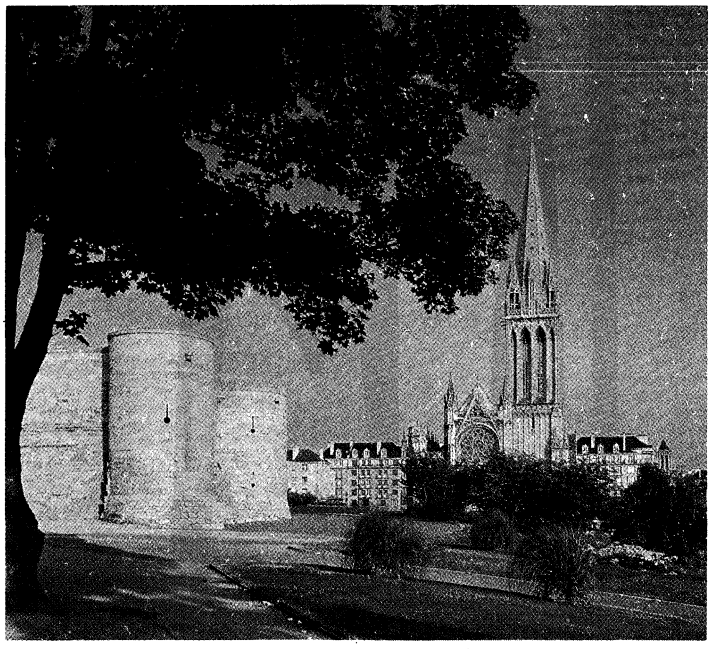
While his works are largely adapted from those of Soranus of Ephesus, the 2nd-century leader of the methodist school of medicine, known for its deprecation of theory in favour of therapeutics (application of remedies), Caelius contributed the clearest and most accurate diagnosis found among ancient writers. His doctrine emphasizes the use of dietetic, mechanical, and hygienic measures in the treatment of disease.

Caelius Rufus, Marcus (b. May 82 BC, Puteoli, Campania—d. 48, Thurii, Bruttium), politician and close friend of Cicero. He is possibly also the Rufus whom the poet Catullus accused of stealing his mistress Clodia. At her instigation Caelius, who had deserted her, was prosecuted for *vis* ("violent acts") in 56, but Cicero and Marcus Licinius Crassus, a man of wealth and influence, spoke in Caelius' defense and he was acquitted.

Caelius was educated under the guidance of Crassus and Cicero. In 59 he prosecuted Cicero's colleague, Gaius Antonius Hybrida, for extortion in the consulship of 63 and succeeded in defeating Cicero's defense. He was tribune in 52. In the Civil War of 49 Caelius sided with Caesar against Pompey and fought in northwestern Italy and Spain. He gained the office of *praetor peregrinus* ("judge of suits involving foreigners") in 48 but quarrelled violently with the urban praetor Gaius Trebonius and introduced measures amounting to a general cancellation of debts. Deprived of his office by the Senate, he left to join Milo in an insurrection against Caesar, in which both he and Milo were killed.

Caemgen, SAINT: *see* Kevin, Saint.

Caen, city, capital of Calvados *département,* Basse-Normandie region, northwestern France, on the Orne River, 9 mi (14 km) from the English Channel, southwest of Le Havre. It first became important under the Norman dukes in the 10th and 11th centuries and was the capital of lower Normandy in the time of William the Conqueror. Captured by the English twice—in 1346 and in 1417—it was held by them until 1450. The revocation of the Edict of Nantes (1685) broke the prosperity of the city, which had become Protestant. During the Revolution, it was a centre for the Girondist movement. Following the Allied Normandy invasion in 1944, the Germans used Caen as the hinge of their resistance to the British–Canadian advance, and the city was two-thirds destroyed. It was reconstructed, with planned industrial zones between the



Saint-Pierre church and the ramparts (left) of the old château, Caen, Fr.
Editions "La Cigogne"—Hachette

Orne and the port canal. A green plain, the Prairie Saint-Gilles, faces the city's southwest side, and public gardens were planted in the city centre. The university, founded in 1432 by Henry VI of England, was resited and reopened in 1957.

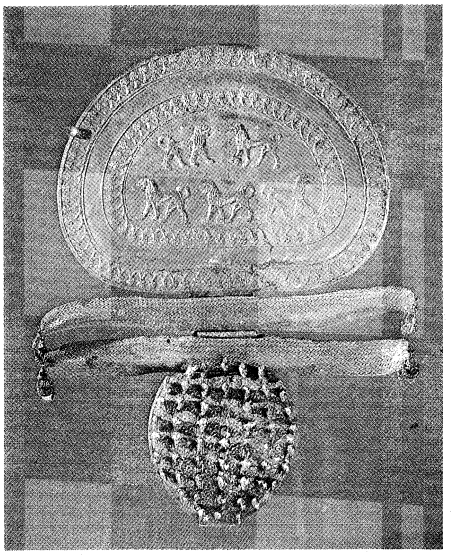
The church of Saint-Étienne (the Abbaye-aux-Hommes), and that of La Trinité (the Abbaye-aux-Dames), escaped war damage; both date from the 1060s and are fine specimens of Norman Romanesque. William the Conqueror's tomb is in front of Saint-Étienne's high altar, and the tomb of his wife, Matilda, stands in La Trinité's choir. William's remains were thrown out during the French Revolution. Saint-Étienne has an austere facade bare of ornament. Its two towers, rising to 295 ft (90 m), are topped by 13th-century spires. The abbey buildings, redone in the 17th century, now house municipal offices. La Trinité's Norman solidity is overburdened by later (especially 19th-century) restoration work. The nave serves as the parish church, the transept and choir as part of the city hospital (*hôtel-dieu*). Midway between these two churches is the highly decorated church of Saint-Pierre, its Gothic and French Renaissance beauties restored after wartime damage. On the Place Saint-Pierre stands the Hôtel Le Valois d'Escoville, a restored Renaissance mansion (1538). The house where the poet François de Malherbe was born (1555) is on the rue Saint-Pierre.

Caen's importance as a port dates from the 19th-century construction of the ship canal (about 9 mi long), which parallels the river and opens to the Channel at Ouistreham. It serves largely to import coke and export steel. The city's steel industry is fed by the iron-ore mines of the Orne Valley. The blast furnaces of Mondeville have been reconstructed, and the working population is housed in the new city of Hérouville. The industrial aspect of the city grew greatly with the location there of automobile, electrical appliance, and electronics plants. Situated in the centre of a fertile grain-growing region, within sight of the verdant bocage of Normandy, Caen is a major service centre for all of western Normandy. Pop. (1982) 112,332.

Caeneus, in Greek mythology, the son of Elatus, a Lapith. At the marriage of Pirithous, king of the Lapiths, the Centaurs (creatures part man and part horse), who were guests, attacked the bride and other women. Caeneus joined in the ensuing battle and, because of his invulnerable body, killed five Centaurs. In desperation the other Centaurs combined against him, piling huge pine trees upon him until the accumulated weight forced him underground, never to appear again. This attack on Caeneus became a favourite theme of Greek art. A later story explained that Caeneus was originally a girl, Caenis, who yielded to the sea god Poseidon and received as a reward the male sex and invulnerability.

Caerdydd (Welsh): *see* Cardiff.

Caere, modern CERVETERI, ancient city of Etruria, about 30 miles northwest of Rome. The English word ceremony comes from the Latin *caeremonium,* meaning "that which has to do with Caere," and reflects the Etruscan fascination with divination and prophecy. Through its port, Pyrgi, the city became an important Etruscan trading centre. In 253 BC, Caere, supporting Tarquinii (modern Tarquinia) against Rome, was defeated and partially incorporated into the Roman state with voting rights for its citizens, a status known as the *jus Caeritum.* Although prosperous under the empire, it declined during the succeeding centuries. The most important of the many tomb chambers excavated in the area is the Regolini-Galassi, the gold and silver objects from which are thought to provide proof of



Gold fibula from the Regolini-Galassi tomb, Caere, 7th century BC; in the Vatican Museum

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an Orientalizing tendency in the Etruscan art of the 7th century BC.

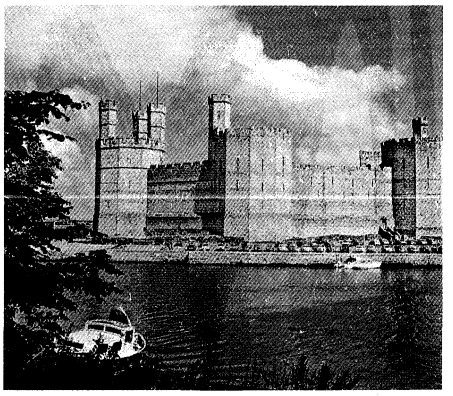
Caerffili (Welsh): *see* Caerphilly.

Caerfyrddin (Welsh): *see* Carmarthen.

Caergybi (Welsh): *see* Holyhead.

Caerleon, Welsh CAERLLION, town and archaeological site, Newport district, Gwent county, Wales, on the River Usk, and a residential suburb of Newport. It was important as the Roman fortress of Isca, which, with Chester and York, was one of the permanent legionary bases in Britain. The foundation of the fortress, set on a terrace in a wide bend of the Usk, is dated to AD 74–75, when the conquest of the Silures of southeastern Wales began. The headquarters and baths were built *c.* 75 and *c.* 85, respectively, and the latest known structural work took place in 253–255. Toward the end of the 3rd century, the legion may have been removed and split up into smaller units. The fortress was occupied, probably by a nonmilitary population, until the 370s. Caerleon, traditionally a seat of the legendary King Arthur, was a Welsh princely capital until the Norman Conquest and thereafter was a marcher lordship mainly in Welsh hands till 1235. The medieval borough enjoyed a brisk coastal trade that was eventually overtaken by the development of Newport to the southwest. Pop. (1981 prelim.) 6,711.

Caernarvon, also spelled CARNARVON, Welsh CAERNARFON, town, Arfon district, seat of Gwynedd (*q.v.*) county, Wales, near the west end of the Menai Strait separating the mainland from the island of Anglesey. A Roman fort, Segontium, was built *c.* AD 75 on a low

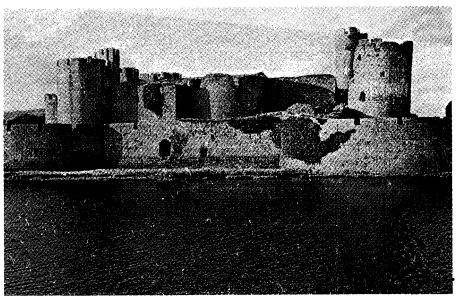


Caernarvon Castle, Gwynedd

J. Allan Cash—EB Inc.

hill southeast of the present town and was the seat of local chieftains after the Roman withdrawal (*c.* 380–390). A Celtic church was also founded there, probably in the 5th century. Norman penetration (11th century) was brief, but it produced a motte (fortified mound), and subsequently the Welsh Gwynedd princes set up a *maenor* ("manor") there. The township was completely transformed by Edward I immediately after his conquest of Wales in 1282–83, for he built a large new stronghold around the motte and a walled borough adjacent to it, with a grid pattern of streets. The borough, to which he granted a charter in 1284, was made the capital of North Wales, and it was at the castle that his son, prince of Wales and later Edward II, was born in 1284. Only since 1911, however, has the castle been used for the investiture of the prince of Wales. Both castle and town walls are exceptionally well preserved and attract many tourists. The town has grown considerably beyond the original walls. A small harbour was mostly important in the 19th century as an outlet for slates from nearby quarries. Pop. (1981 prelim.) 9,506.

Caerphilly, Welsh CAERFFILI, castle town, Rhymney Valley district, Mid Glamorgan county, Wales. The town grew up outside



Caerphilly Castle, Mid Glamorgan

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a 13th-century castle. The still incomplete structure was destroyed in 1270 by the Welsh prince Llywelyn ap Gruffudd but was rebuilt from 1271 onward, with some 14th-century additions. Covering 30 ac (12 ha), the castle is the largest in Britain after Windsor; it was built on a concentric plan with a surrounding moat. Derelict by 1536 except for one part used as a prison, the castle was further destroyed in the English Civil War (*c.* 1640s) by parliamentary forces; but one tower still leans at an angle after an unsuccessful attempt to blow it up. In 1949 the marquess of Bute donated the castle to the crown.

During the 19th century, Caerphilly became a mining town and was also a centre for a local cheese-making industry (now ceased). Since 1945, the community has attracted a considerable number of light industries; it is an active shopping centre and a residential base for commuters to Cardiff. Pop. (1981 prelim.) 42,736.

Caesalpiniaceae, family of trees, shrubs, and rarely herbs, of the pea order (Fabales), comprising many tropical species. The largest genus within the family, *Cassia,* especially abundant in the Western Hemisphere, contains 500 or more species. The compound leaves are once or twice pinnate (*i.e.,* the leaflets themselves may be simple or compound). The fruit is usually a legume or pod.

Caesalpinus, Andreas (Italian scientist): *see* Cesalpino, Andrea.

Caesar, Crispus: *see* Crispus Caesar.

Caesar, Drusus: *see* Drusus Caesar.

Caesar, Gaius (b. 20 BC—d. Feb. 21, AD 4, Lycia), grandson of the Roman emperor

Augustus (ruled 27 BC–AD 14), who would probably, had he survived Augustus, have succeeded to the imperial throne.

Caesar was the eldest son of Augustus' closest associate, Marcus Vipsanius Agrippa, and Julia, the Emperor's daughter. Adopted by Augustus in 17 BC, he was granted proconsular powers in 1 BC for a mission to Armenia, which had been invaded by the Parthians. Gaius established a pro-Roman king on the Armenian throne, but was seriously wounded (AD 2) while attempting to suppress an uprising in the area. He eventually died of his wounds on his way back to Italy. His death forced Augustus to adopt Tiberius and make him his successor.

Caesar, Gallus: *see* Gallus Caesar.

Caesar, Germanicus: *see* Germanicus Caesar.

Caesar, (Gaius) Julius, (b. July 12/13, 100 BC, Rome—d. March 15, 44 BC, Rome), celebrated Roman general and statesman, the conqueror of Gaul (58–50 BC), victor in the Civil War of 49–46 BC, and dictator (46–44 BC), who was launching a series of political and social reforms when he was assassinated by a group of nobles in the Senate House on the ides of March.

A brief account of the life and works of Julius Caesar follows; for a full biography, *see* MACROPAEDIA: Caesar.

A patrician by birth, Caesar married Cornelia (died 67?) in 84. He became prosecuting advocate in Rome (78), and was elected quaestor (69 or 68) and curule aedile for 65. In 63 he was elected pontifex maximus, and in 62 praetor; he became governor of Farther Spain (61–60). He formed the first triumvirate with Pompey and Crassus in 60 and was elected consul in 59. Caesar conquered Gaul in a number of campaigns between 58 and 50; in 49, after being instructed by the Senate to lay down his command, he crossed the Rubicon, signifying the beginning of the Roman Civil War (49–45). He waged campaigns on several fronts, aided Cleopatra of Egypt (49), and acquired the title of dictator. He was assassinated by a group of senatorial conspirators led by Gaius Cassius Longinus and Marcus Junius Brutus.

In addition to his military and political feats, Caesar is also famous for his writings, among which are *Commentarii de bello Gallico* (52–51 BC), on the Gallic War, and *Commentarii de bello civili* (45 BC), on the Civil War.

Caesar, Lucius Julius (d. 87 BC), Roman consul (90) at the outbreak of the Social War between the Romans and their Italian allies; he secured passage of the Julian Law, which granted Roman citizenship to any allies who chose to accept it. Caesar's law was the principal one of the series of concessions by the Romans that brought the revolt to an end. He was the grandfather of Mark Antony.

Caesar Augustus (Roman emperor): *see* Augustus Caesar *under* Augustus (Roman Empire).

Caesar weed (plant): *see* urena.

Caesarea (ancient Mauretania): *see* Iol.

Caesarea, Hebrew HORBAT QESARI (Ruins of Caesarea), ancient port and administrative city of Palestine, on the Mediterranean coast of Israel south of Haifa. It is often referred to as Caesarea Palaestinae or Caesarea Maritima, to distinguish it from Caesarea Philippi near the headwaters of the Jordan. Originally an ancient Phoenician settlement known as Straton's (Strato's) Tower, it was rebuilt and enlarged by Herod the Great, king of Judaea under the Romans, and renamed for his patron, the emperor Augustus Caesar. Intended as a port for Herod's newly built city at Sebaste (Greek: Augusta), the ancient Samaria of central Palestine, Caesarea had an artificial harbour of large stone blocks and typical Hellenistic–Roman public buildings. An aqueduct brought water from springs located almost 10 mi (16 km) to the northeast. Caesarea served

Ruins of the Roman forum, Caesarea, Israel
J. Allan Cash—Ostman Agency

as a base for the Herodian navy, which operated in aid of the Romans as far as the Black Sea.

The city became the capital of the Roman province of Judaea in AD 6. Subsequently, it was an important centre of early Christianity; in the New Testament it is mentioned in Acts in connection with Peter, Philip the Apostle, and, especially, Paul, who was imprisoned there before being sent to Rome for trial. According to the Roman–Jewish historian Josephus, the Jewish revolt against Rome, which culminated in the destruction of Jerusalem and the Temple in AD 70, was touched off by an incident at Caesarea in AD 66. During the Bar Kokhba revolt, AD 132–135, the Romans tortured and killed the 10 greatest leaders and sages of Palestinian Jewry, including Rabbi Akiba. Caesarea was almost certainly the place of execution of Rabbi Akiba and the others according to tradition (*c.* AD 135). The death of these Ten Martyrs is still commemorated in the liturgy for Yom Kippur (the Day of Atonement). After this, Caesarea, became the capital of the province renamed Syria-Palaestina by Hadrian. Under the Byzantine Empire it was capital of the province of Palaestina Prima. The church historian and biblical topographer Eusebius (*c.* 260/264–*c.* 340) served as bishop of Caesarea. The city declined under later Byzantine and Arab rule. Its port and part of the ancient citadel were rebuilt by the crusaders; the city was successively taken and retaken by Muslim and crusader forces, until finally it was captured and razed by the Mamlūk sultan Baybars I in 1265. Between 1884 and 1948 Bosnian Muslims had a settlement there. In 1940 the fishing kibbutz of Sedot Yam was founded just south of the ancient site; this settlement has built a jetty over the Roman and crusader breakwater. It also engages in agriculture and operates one of the resort hotels. Israel's first golf course was constructed nearby.

Excavations undertaken by the Hebrew University beginning in 1950, by the Israel Government Department of Antiquities, and by Italian archaeologists (1959–61) have uncovered a Roman temple, amphitheatre, hippodrome (which seated 20,000), the aqueduct, and other ruins of Roman and later times. Of particular interest is a Roman inscription, found in 1961, which mentions Pontius Pilate, Roman procurator of Judaea at the time of Jesus' crucifixion. This is the first mention of Pilate ever found that can be accurately dated within his lifetime.

Caesarea Cappadociae (Turkey): *see* Kayseri.

caesarian section: *see* cesarean section.

Caesarion: *see* Ptolemy XV Caesar.

Caesarius OF ARLES, SAINT (b. *c.* 470, in the region of Chalon-sur-Saône, Gaul—d. 542, Arles, Fr.; feast day August 27), leading prelate of Gaul and a celebrated preacher whose opposition to the heresy of Semi-Pelagianism (*q.v.*) was one of the chief influences on its decline in the 6th century.

When 20, he entered the monastery at Lérins, Fr., and, having been ordained priest, he became abbot of a monastic community on an islet in the Rhône near Arles. Caesarius succeeded his kinsman Aeonius as archbishop of Arles, the see of which Pope Symmachus made primatial for Gaul and Spain. As primate, Caesarius convened various regional synods of importance, among which the second Council of Orange (529) is a landmark in the history of dogma because it decisively rejected Semi-Pelagian theories in favour of a moderate Augustinianism. Caesarius was no great theologian, but he was a great preacher whose many sermons were preserved and frequently used after his death. He wrote a directory for monks and a rule, *Regula ad virgines,* for the women's monastery of St. John's (later named after St. Caesarius), which he established and where he appointed his sister, St. Caesaria, as abbess. An English translation of Caesarius' sermons by Sister Mary Magdeleine Mueller appears in volume 31 of *The Fathers of the Church* (1956).

Caesarius OF HEISTERBACH (b. *c.* 1170, Cologne—d. *c.* 1240, Heisterbach, Lower Lorraine), preacher whose ecclesiastical histories and ascetical writings made him one of the most popular authors of 13th-century Germany. He was educated at the school of St. Andrew, Cologne, and joined the Cistercian Order in 1199, becoming prior of the Heisterbach house in 1228.

His *Dialogus miraculorum* (*c.* 1223; "Dialogue on Miracles"), edifying narratives dealing with Cistercian life, was his most widely read work and has become an important source for the history of 13th-century Germany. He also composed eight books on miracles (edited by Meister, 1901), a life of St. Elizabeth of Hungary (edited by Hyskens, 1908), and a biographical list of the archbishops of Cologne from 94 to 1238 (in *Monumenta Germaniae Historica,* vol. 24). His life of St. Engelbert (edited by Gelenius, 1663) is generally considered his principal historical work. Caesarius was noted for his practical sermons and for his opposition to the rationalistic tendency of Scholastic philosophy.

caesaropapism, political system in which the head of the state is also the head of the church and supreme judge in religious matters. The term is most frequently associated with the late Roman, or Byzantine, Empire. Most modern historians recognize that the legal Byzantine texts speak of interdependence between the imperial and ecclesiastical structures rather than of a unilateral dependence of the latter; historians believe also that there was nothing in the Byzantine understanding of the Christian faith that would recognize the emperor as either doctrinally infallible or invested with priestly powers. Many historical instances of direct imperial pressure on the church ended in failure, *e.g.,* the attempt of Zeno (474–491) and Anastasius I (491–518) in favour of Monophysitism, and the efforts of Michael VIII Palaeologus (1259–82) in favour of union with Rome. John Chrysostom and most other authoritative Byzantine theologians denied imperial power over the church.

It was normal practice, however, for the Eastern Roman emperor to act as the protector of the universal church and as the manager of

its administrative affairs. Eusebius of Caesarea called Constantine "the overseer of external" (as opposed to spiritual) church problems (*episkopos tōn ektos*). Emperors presided over councils, and their will was decisive in the appointment of patriarchs and in determining the territorial limits of their jurisdiction. Emperor Justinian I, in the preface to his *Novella* 6 (535), described the ideal relation between the *sacerdotium* and the *imperium* as a "symphony," an essentially dynamic and moral interpretation of church–state relations that did allow numerous abuses but was hardly a submission of the church to the state.

Caesaropapism was more a reality in Russia, where the abuses of Ivan IV the Terrible went practically unopposed and where Peter the Great finally transformed the church into a department of the state (1721), although neither claimed to possess special doctrinal authority.

The concept of caesaropapism has also been applied in Western Christendom—for example, to the reign of Henry VIII in England, as well as to the principle *cujus regio, ejus religio* ("religion follows the sovereign"), which prevailed in Germany after the Reformation. *Compare* theocracy.

caesura (Latin: "cutting off"), also spelled CESURA, in modern prosody, a pause within a poetic line that breaks the regularity of the metrical pattern. It is represented in scansion by the sign ‖ . The caesura sometimes is used to emphasize the formal metrical construction of a line, but it more often introduces the cadence of natural speech patterns and habits of phrasing into the metrical scheme. The caesura may coincide with conventional punctuation marks as in the following line from Shakespeare, in which a strong pause is demanded after each comma for rhetorical expression:

> This blessed plot, ‖ this earth, ‖ this realm,
> ‖ this England,

The caesura is not necessarily set off by punctuation, however, as in this line from Keats:

> Thou foster-child of silence ‖ and slow time,

In Germanic and Old English alliterative poetry, the caesura was a formal device dividing each line centrally into two half lines, as in this example from "The Battle of Maldon":

> Hige sceal þe heardra,
> hearte þe cenre,
> mod sceal þe mare,
> þe ure mægen lytlaþ
> (Mind must be firmer, ‖ heart the more fierce,
> Courage the greater, ‖ as our strength diminishes.)

In formal, Romance, and Neoclassical verse, the caesura occurs most frequently in the middle of the line (medial caesura), but in modern verse its place is flexible; it may occur near the beginning of one line (an initial caesura) and near the end of the next (terminal caesura). There may be several caesuras within a single line or none at all. Thus, it has the effect of interposing the informal and irregular patterns of speech as a subtle counterpoint to the poem's regular rhythm; it prevents metrical monotony and emphasizes the meaning of lines.

In classical prosody, caesura refers to a word ending within a metrical foot, in contrast to diaeresis (*q.v.*), in which the word ending and the foot ending coincide. It is strictly a metrical element, not an element of expression.

Caetani FAMILY, also spelled GAETANI, noble family of medieval origin, the so-called Anagni branch of which won political power and financial success with the election of Benedetto Caetani (*c.* 1235–1303) as Pope Boniface VIII (1294–1303; *see* Boniface VIII).

Boniface's policy of augmenting the family's power at the expense of other Roman aristocratic families, notably the Colonna, put the Caetani in a predominant political position lasting until the end of the 15th century. The Caetani's possessions included the powerful duchies of Anagni, Sermoneta, Fondi, and Piedmont. Around 1420 the family split into two branches on the basis of its possessions in Naples and in Rome. Members of the family were prominent in politics and scholarship into the 19th and 20th centuries.

Caetano, Marcelo José das Neves Alves (b. Aug. 17, 1906, Lisbon—d. Oct. 26, 1980, Rio de Janeiro), premier of Portugal from September 1968, when he succeeded António de Oliveira Salazar, until the revolution of April 1974.

Trained as a lawyer, he served with Salazar (then the finance minister) in 1929 and helped to draft the Constitution of 1933 and other legal documents of the New State. He was minister of the colonies (1944–49) and deputy prime minister (1955–59) before leaving political life to become rector of the University of Lisbon.

When Salazar suffered a stroke in 1968, Caetano was appointed prime minister. He admitted an opposition and rectified the Constitution but was unable to curb inflation or appease his critics. Foreign criticism of his African policy and dissatisfaction in the army led to the "Revolution of the Flowers," which in 1974 overthrew the New State and drove Caetano into exile. He settled in Brazil and served as head of the Institute of Comparative Law, Gama Filho University, Rio de Janeiro, until his death.

café, also spelled CAFE, small eating and drinking establishment, historically a coffee house, usually featuring a limited menu that seldom includes liquor. The English term café, borrowed from the French, derives ultimately from the Turkish *kahve*, meaning coffee.

The introduction of coffee and coffee-drinking to Europe provided a much-needed focus for the social activities of the sober. During the two hundred years after the mid-17th century, the most famous coffee houses of Europe flourished in London as ready points for news, discussion, and faction. Coffee house proprietors competed with each other for supplies of both Whig and Tory newspapers; during this time the business of buying and selling insurance, ships, stocks, commodities, and occasionally even slaves was disposed of in coffee houses; a man of letters, an actor, or an artist might perform or declaim for his coterie in his favourite coffeehouse; and coffee houses became informal stations for the collection and distribution of packets and letters. By the 19th century, the daily newspaper and the home post had displaced these functions. At about the same time, as painting and literature attest, the French café and restaurant were at their zenith as gathering places for intellectuals and artists. The wealthier gourmands among the intelligentsia might dine in Paris's high-toned restaurants, as Balzac dined at the Véry, while the more modest café or bistro harboured the "Bohemian" artists.

In the United States in the late 20th century, the term café was somewhat dated, tending to be associated with the stereotypical one-waitress truck stop or dingy, obscure city diner. However, the original, European spirit of the café was being revived after a fashion in the 1970s and '80s in the form of coffee shops and sidewalk establishments of distinctive, if calculated, atmosphere.

cafeteria, self-service restaurant in which customers select various dishes from an open-counter display. The food is usually placed on a tray, paid for at a cashier's station, and carried to a dining table by the customer. The modern cafeteria, designed to facilitate a smooth flow of patrons, is particularly well-adapted to the needs of institutions—schools, hospitals, corporations—attempting to serve large numbers of people efficiently and inexpensively. In addition to providing quick service, the cafeteria requires fewer service personnel than most other commercial eating establishments.

In 1891 the YWCA of Kansas City, Mo., established what food industry historians consider the first cafeteria. This institution, founded to provide low-cost meals for working women, was patterned after a Chicago luncheon club for women where some aspects of self-service were already in practice. Cafeterias catering to the public opened in several U.S. cities in the 1890s, but cafeteria service did not become widespread until shortly after the turn of the century, when it became the accepted method of providing food for employees of factories and other large businesses.

Caffaggiolo maiolica, Italian tin-glazed earthenware produced during the early 16th century under Medici patronage in the castle of Caffaggiolo, in Tuscany. The decoration of Caffaggiolo ware is mostly derived from other leading Italian factories, particularly Faenza; but its execution reveals individual, unique artistry. Characteristics of the ware are a rich and even white glaze, a deep red, and an intense lapis lazuli, which was often used as a coarsely brushed background; bright yellows, oranges, and reds and a semitransparent copper green were also used. Forms include armorial jugs and double-handled jars—both especially vigorous in overall decoration—and drug pots. Many Caffaggiolo dishes were painted in the *istoriato* style, showing a biblical, historical, or mythological scene. Usually the rim of an *istoriato* dish is reserved for rich grotesques or other intricate motifs; but some plates are wholly covered by a design, such as an outstanding piece in the Victoria and Albert Museum, London, representing a maiolica painter at work. From a limited output, a handful of Caffaggiolo dishes rank among the best of Italian maiolica. The factory declined after 1540.

Caffaggiolo maiolica *istoriato* dish with grotesques on the rim, *c.* 1515; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

Caffaro DI CASCHIFELLONE (b. *c.* 1080—d. 1166), Genoese soldier, statesman, diplomat, and crusader who wrote chronicles that are important sources for the history of the First Crusade, as well as for the history of 12th-century Genoa.

Member of a noble family descended from the viscounts who ruled Genoa in the early Middle Ages, Caffaro fought in the siege of Caesarea, north of Jerusalem (1101), at which time he began to keep a yearly record of Genoese history. Five times consul of the Genoese commune, he also served as ambas-

sador to the pope, to the kings of Barcelona and Castile, and to the emperor Frederick I Barbarossa and as captain of war against Pisa and against the Saracens in the Balearic Isles and Spain. In 1152 he presented his history to the consuls of Genoa, who decreed that it should be copied and kept in the public archives. Caffaro continued his annals until 1163, when civil disorders in Genoa caused him to abandon the project. On his death in 1166, he left two books in addition to the annals: *Liber de liberatione civitatum orientis* ("Book About the Liberation of the Cities of the East"), describing Genoese participation in the First Crusade, written from memory more than half a century later; and *Historia captionis Almariae et Tortuose* ("History of the Capture of Almería and Tortosa"), an account of the Genoese expedition to Spain in 1147–48, in which he participated.

caffeine, nitrogenous organic compound of the alkaloid group, substances that have marked physiological effects. Caffeine occurs in tea, coffee, guarana, maté, kola nuts, and cacao.

Pure caffeine (trimethylxanthine) occurs as a white powder or as silky needles, which melt at 238° C (460° F); it sublimes at 178° C (352° F) at atmospheric pressure. It is very soluble in hot water; upon cooling, the solution deposits crystals of caffeine monohydrate. Caffeine is generally less soluble in organic solvents than in hot water. It is odourless but has a bitter taste.

Caffeine is present in ground coffee in amounts ranging between 0.75 and 1.5 percent by weight. The average cup of coffee thus contains about 100 milligrams (0.003 ounce) of caffeine. The caffeine content of tea varies greatly depending on the strength of the tea, but it averages about 40 mg. There are also about 40 mg of caffeine in a 12-ounce glass of cola beverage.

Caffeine has a stimulating effect on the central nervous system, heart, blood vessels, and kidneys. It also acts as a mild diuretic. Caffeine's potent stimulatory action makes it a valuable antidote to respiratory depression induced by drug overdose (*e.g.,* from morphine or barbiturates). The positive effects that have been described in people who use caffeine include improved motor performance, decreased fatigue, enhanced sensory activity, and increased alertness. These positive effects may partly explain the compulsion of many adults to consume coffee or other caffeine-containing beverages as part of the morning ritual of awakening. However, caffeine intake may also produce in people such negative effects as irritability, nervousness or anxiety, jitteriness, headaches, and insomnia. By the mid-1980s decaffeinated coffee and soft drinks had become widely available, giving consumers the choice of regulating their caffeine intake while continuing to enjoy these beverages.

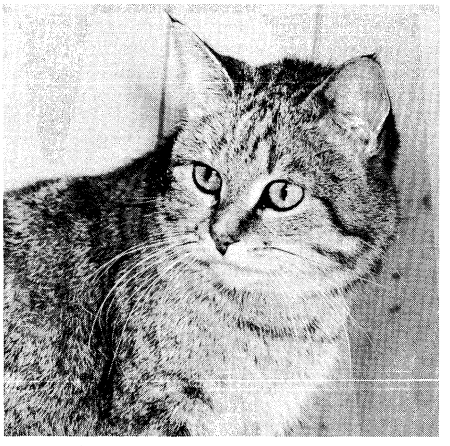
Caffey's syndrome: *see* infantile cortical hyperostosis.

Caffiéri FAMILY, celebrated family of French sculptors and metalworkers known for their vigorous and original works in the Rococo style.

The first prominent member of the family in France was Filippo Caffiéri (b. 1634, Rome—d. Sept. 7, 1716, Paris), an Italian-born sculptor in the service of Louis XIV. Filippo's son Jacques (b. Aug. 25, 1678, Paris—d. 1755, Paris) became a notable metalworker. He completed many works for the palace at Versailles and other royal residences from 1736 up to the time of his death. Both he and his son Philippe (b. 1714, Paris—d. 1774) were famous for their designs of chandeliers, chests, andirons, and ornamental mounts for various pieces of furniture. Jacques was a master of the Rococo style, which he redeemed from triviality by his vigorous and spontaneous handling of scroll motifs and other decorative elements. Important examples of his work are at Versailles and in the Wallace Collection, London. Jacques's works bear the simple signature "Caffiéri," even when they represent a collaboration with his son Philippe. After his father's death, Philippe obtained many of the royal commissions formerly given to his father. Altar furniture made by him for Notre-Dame de Paris (1759) disappeared during the French Revolution, but an impressive cross and candlesticks made for the Bayeux cathedral (1771) survive.

Philippe's younger brother, Jean-Jacques Caffiéri (b. April 29, 1725, Paris—d. June 21, 1792, Paris), became the most famous sculptor of the family. Jean-Jacques trained under his father and won the Prix de Rome in 1748. He executed many portrait busts of famous men of the past for the Comédie-Française, the Bibliothèque Ste.-Genevieve in Paris, and other cultural institutions. But his most interesting busts are those he sculpted from the living model. Among such portraits of his contemporaries are "Rameau" (1761; now destroyed), "Piron" (1762; Dijon Museum), and "Canon Pingre" (1789; Louvre, Paris). These searchingly realistic and expressive character studies proved enormously popular and made Caffiéri for a time a rival to the famous sculptor Jean-Antoine Houdon.

Caffre cat, Caffre also spelled CAFFER, or KAFFIR, also called AFRICAN WILDCAT, or EGYPTIAN WILDCAT (*Felis libyca*), small, tabby-like cat (family Felidae) found in open and forested regions of Africa, Asia, and southern Europe. Possibly the first cat to be domesticated, the Caffre cat is somewhat larger and stockier than the modern house cat, with which



Caffre cat (*Felis libyca*)
Wolfgang Lummer

it interbreeds readily. Its coat, paler in the female, is light or orange brown with narrow, dark stripes. Length of the animal is about 70 centimetres (28 inches), excluding the 40-cm tail; shoulder height averages 23 cm, and the cat weighs about 3.5 kilograms (7.7 pounds). The Caffre cat is a solitary, nocturnal hunter. It preys mainly on birds and small mammals. Mating generally occurs early in the year, and a litter of two to five kittens is born about 56 days later. Geographical races of this species inhabit the Mediterranean islands of Corsica, Sardinia, Majorca, and Crete.

caftan, also spelled KAFTAN, man's full-length garment of ancient Mesopotamian origin, worn throughout the Middle East. It is usually made of cotton or silk or a combination of the two.

A caftan has long, wide sleeves and is open in the front, although frequently it is bound with a sash. The word caftan (or gaberdine)

Man wearing a caftan, "Turkish Painter," oil painting by Gentile Bellini, 1501; in the Isabella Stewart Gardner Museum, Boston
By courtesy of the Isabella Stewart Gardner Museum, Boston

also refers to a black frock coat worn by Ḥasidic Jews since the Middle Ages.

Cagayan, province occupying the northeastern corner of Luzon, Philippines, bounded by the Babuyan Channel (north) and the Philippine Sea (east). Its area of 3,476 sq mi (9,003 sq km) is dominated by the Cagayan River Valley, a broad lowland region covered with alluvial soils and enclosed, except to the north, by relatively high mountains. Rice, corn (maize), and tobacco are the main crops. The Babuyan Islands (*q.v.*) are administratively a part of Cagayan. Tuguegarao, the provincial capital, is in the south. Aparri, the main port, and the towns of Claveria, Abulug, and Ballesteros are located along the low and swampy northern coast. Callao Cave National Park (1935) has an area of 475 ac (192 ha). Pop. (1980) 711,476.

Cagayan de Oro, chartered city, capital of Misamis Oriental province, northern Mindanao, Philippines, on the Cagayan River near the head of Macajalar Bay. After its establishment as a mission station in the 17th century, it was fortified by the Spaniards. Cagayan de Oro was chartered as a city in 1950 and has become the transportation and commercial hub of northern Mindanao. Its international airport is a major stopover for flights south, and the city is the northern terminus of the trans-Mindanao Sayre Highway. Exports include rice, corn (maize), and copra. The satellite town of Carmen is on the left bank of the river, and nearby Bugo is the site of a pineapple cannery. Xavier University (1933), St. Augustine's Cathedral, the Plaza Divisoria, and Gaston Park are in the city. Pop. (1980) 227,312.

Cagayan River, also called RÍO GRANDE DE CAGAYAN, longest stream in Luzon, Philippines. It begins its 220-mi (350-km) course in a twisting pattern in the Sierra Madre in northeastern Luzon. It then flows north into a 50-mi-wide fertile valley that is important for the cultivation of rice and tobacco. Ilagan, Isabela, Tuguegarao, and Cagayan are major riverine towns. At Aparri, the Cagayan enters the ocean at Babuyan Channel of the Luzon Strait. The Chico, Magat, and Ilagan rivers are its main tributaries.

Cagayan Sulu, island, southwestern Sulu Sea, Tawitawi province, Philippines. With an area of 26 sq mi (67 sq km), it is low-lying and surrounded by 13 small islets and coral reefs. A centre of pirate activity by Muslims (Moros)

in the 19th century, the island (together with Sibutu island) was inadvertently omitted when the United States acquired the Philippine islands from Spain in 1898. Cagayan Sulu was later purchased from Spain in 1900 and was part of the Philippines when independence was granted in 1935. Dry-rice agriculture, copra production, and trading are the principal economic activities. The Samalan-speaking Jama Mapun people inhabit the island; they are Christians. Pop. (1980) 19,607.

Cage, John (b. Sept. 5, 1912, Los Angeles), American composer whose work and revolutionary ideas profoundly influenced mid-20th-century music.

Cage

By courtesy of Henmar Press Inc. (C.F. Peters Corporation)

Cage studied with three of the leading innovative composers of the century, Arnold Schoenberg, Henry Cowell, and Edgard Varèse, and had a classical musical education. While teaching in Seattle (1936–38), he experimented with works for percussion ensemble and for dance (in collaboration with the choreographer and dancer Merce Cunningham). His music gained an early adherent in David Tudor, a pianist with whom Cage toured extensively and who performed Cage's pieces for "prepared piano" (the piano was prepared by having objects placed on its strings before the performance, in order to produce novel sound effects). Cage also experimented with tape recorders, record players, and radios in his effort to step outside the bounds of Western music and of individual self-expression.

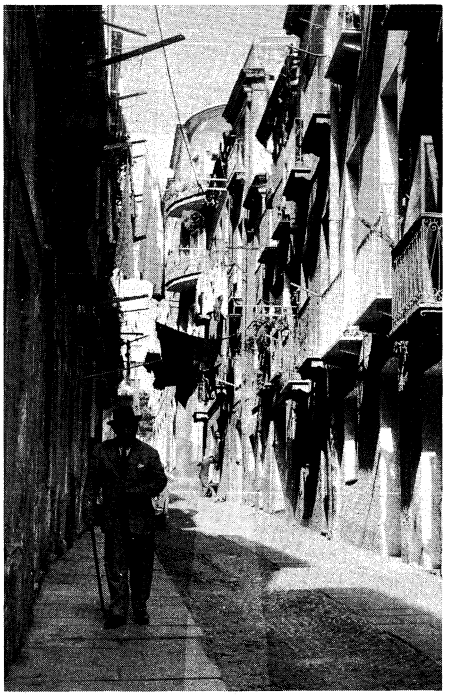
Cage turned to Zen and other non-Western philosophies and concluded that all the activities that make up music must be seen as part of a single natural process. His aim was to encourage audiences to use their ears as funnels rather than as filters, to take note of all sonic phenomena instead of only the pitches selected by a composer. To this end he cultivated the principle of indeterminism in his music. He used a number of devices to ensure randomness and thus eliminate any element of personal taste on the part of the performer: unspecified instruments and numbers of performers, freedom of duration of sounds and entire pieces, inexact notation, and sequences of events determined by random means such as by consultation with the Chinese *I Ching*. In his later works he extended these freedoms over other media, so that a performance of *HPSCHD* (completed 1969) might include a light show, slide projections, costumed performers, with the audience free to wander among the instruments.

Among his best known works are *4′33″* (*Four Minutes and Thirty-three Seconds,* 1952; a piece in which the performer does not play); *Imaginary Landscape No. 4* (1951; for 12 randomly tuned radios, 24 performers, and conductor); the *Sonatas and Interludes* (1946–48; for prepared piano); *Fontana Mix* (1958; based on a series of programmed transparent cards which, when superimposed, give a graph for the random selection of electronic sounds); and *Cheap Imitation* (1969), an "impression" of the music of Erik Satie.

Cage published several books, including *Silence* (1961) and *M: Writings '67–'72* (1973), and taught at a number of universities. His influence extends to such established composers as Earle Brown, Lejaren Hiller, Morton Feldman, and Christian Wolff, and to numerous younger composers.

Cagliari, Latin CARALIS, or CARALES, city, capital of Cagliari province and of the island region of Sardinia, Italy, at the northern extremity of the Golfo di Cagliari, between two salt lagoons in the centre of the south coast of the island. Although it was probably occupied in prehistoric times, its foundation is attributed to the Phoenicians. It was known to the Greeks as Cardlis and to the Romans as Caralis (plural Carales). The principal Carthaginian stronghold in Sardinia, it was occupied by the Romans in the Second Punic War (218–201 BC) and probably obtained full Roman civic rights from Julius Caesar in the 1st century BC. In imperial Roman times (*i.e.,* after 27 BC) Caralis became the most important town on the island, mainly because of its fine sheltered harbour, where a detachment of the fleet of Misenum was stationed. It was probably the seat of the governor (*praeses Sardiniae*) in the 4th and 5th centuries and was also the chief point of the Sardinian road system. It was independent in the Middle Ages as the seat of one of the Sardinian *giudicati* (judiciary circuits; territorial divisions), but later fell to the Pisans and the Aragonese before passing, with the rest of Sardinia, to the House of Savoy in 1718.

The medieval town, on a long, narrow hill running north and south, probably occupies the site of the Carthaginian acropolis, while



Cagliari, Sardinia

Fritz Henle—Photo Researchers

the western quarter and the Marina quarter of the lower town were probably more important under the Romans, as testified to by the great Roman amphitheatre, the remains of a large Roman house (or group of houses), and an extensive Roman necropolis.

The principal monuments of the medieval upper town are the cathedral of Sta. Cecilia (1257–1312; rebuilt 1669–1702), with two of the original transept doors; parts of the Pisan fortifications, including the towers of S. Pancrazio (Torrione di S. Pancrazio; 1305) and the Elefante (Torre dell'Elefante; 1307); the archaeological museum; and the University of Cagliari (founded 1606). In the Villanova quarter, east of the Marina, is the early Christian (5th–6th century) domed basilica of S. Saturnino, or SS. Cosma e Damiano, rebuilt in the 12th century. Cagliari is an archiepiscopal see.

Long the military headquarters of the island, Cagliari had important naval and air bases until these were destroyed by heavy Allied bombing in World War II. The harbour, expanded in 1938, has been rebuilt and is Sardinia's principal port. The chief exports are lead, zinc, salt, and other minerals. Agriculture and salt extraction are important; cement, superphosphates, and ceramics are produced; and there are flour mills and sugar refineries. Pop. (1984 est.) mun., 225,009.

Cagliostro, Alessandro, conte di (count of), original name GIUSEPPE BALSAMO (b. June 2, 1743, Palermo—d. Aug. 26, 1795, San Leo, Papal States), charlatan, magician, and adventurer who enjoyed enormous success in Parisian high society in the years preceding the French Revolution.

Cagliostro traveled to all the major European cities, selling an "elixir of long life," summoning up the dead (who, he said, revealed the future to him), and reading the future in the water of a carafe. He also claimed the power to make gold and diamonds from other substances. He married the Roman beauty Lorenza Feliciani, called Serafina, and in 1776 they appeared in London as Count and Countess Cagliostro. After 1785, when he moved to France, he became involved in the radical masonic movement and introduced an Egyptian masonic sect that he himself had conceived.

His career of deceit often brought him into conflict with the law. Implicated with the Cardinal de Rohan in the scandal known as the Affair of the Diamond Necklace (1785–86), he spent nine and a half months in the Bastille prison and then was banished from France. In 1789 he was arrested in Rome after his wife denounced him to the Inquisition. He was tried for attempting to organize freemasonry in Italy and sentenced to death. Later that sentence was commuted to life imprisonment in the fortress of San Leo in the Apennines.

Cagney, James (b. July 17, 1899, New York City—d. March 30, 1986, near Millbrook, N.Y., U.S.), American actor noted for his versatile talents and absorbing characterizations.

The son of an Irish bartender, he grew up in the rough Lower East Side of New York City. Touring in vaudeville as a song-and-dance man with his wife Frances in the 1920s, Cagney was a success opposite Joan Blondell in the Broadway musical *Penny Arcade* (1929) and repeated his performance in the movie version of the play, entitled *Sinner's Holiday* (1930). In the motion picture *Public Enemy* (1931) he played the first in a memorable series of sneering, explosive criminals. The films *Angels with Dirty Faces* (1938), *Each Dawn I Die* (1939), *The Roaring Twenties* (1939), and *White Heat* (1949) starred Cagney in increasingly complex studies of criminal pathology. Despite his intuitive skill in depicting gangsters, Cagney had also successfully performed such roles as that of a singing-and-dancing vaudeville director in the backstage musical *Footlight Parade* (1933), and it was for his dynamic portrayal of showman George M. Cohan in *Yankee Doodle Dandy* (1942) that the Academy of Motion Picture Arts and Sciences awarded him an Oscar.

His other notable roles included that of Bottom in *A Midsummer Night's Dream* (1935), the naïve dentist in *Strawberry Blonde* (1941), the vengeful captain in *Mister Roberts* (1955), Lon Chaney in *Man of a Thousand Faces* (1957), the frenetic businessman in *One, Two, Three* (1961), and (after a 20-year retirement) the feisty police commissioner in *Ragtime*

(1981). In 1974 Cagney was the recipient of the American Film Institute's Life Achievement Award. In 1984 he was awarded the U.S. Medal of Freedom, and in the same year he starred as an aging boxer in the television movie *Terrible Joe Moran.* His autobiography *Cagney by Cagney* was published in 1975.

Caguas, town and municipality, east central Puerto Rico, in the fertile Caguas Valley, the largest interior valley of the island. It is linked to San Juan, the capital, by a divided highway. Founded in 1775, Caguas derives its name from a local Indian chief who was an early Christian convert. The town has a cathedral. The town's economic activities include diamond cutting, tobacco processing, and the manufacture of leather goods, glass and plastic products, electronic equipment, clothing, and bedding.

The municipality, with an area of 58 sq mi (150 sq km), has 11 barrios (wards), 10 of which are wholly or partly rural. It produces sugarcane, tobacco, fruits, and vegetables. Pop. (1980) town, 87,214; mun., 117,959; metropolitan area, 173,961.

Cahaba, historic village, Dallas County, southwest central Alabama, U.S., at the confluence of the Cahaba and Alabama rivers. Founded in 1819 as the first capital of the state, Cahaba thrived until floods forced the state government to move to Tuscaloosa in 1826. Further damaged during the Civil War, Cahaba remained the seat of Dallas County until replaced by Selma in 1866. Only ruins of the original buildings remain.

Cahan, Abraham (b. July 7, 1860, Vilna, Russian Empire—d. Aug. 31, 1951, New York City), journalist, reformer, and novelist who for more than 40 years served as editor of the Yiddish-language daily newspaper the *Jewish Daily Forward* (Yiddish title *Vorwärts*), which helped newly arrived Jewish immigrants adapt to American culture.

Himself an immigrant, Cahan arrived in the United States in 1882. While working in a cigar factory, he learned enough English in six years to lecture and write. In 1897 he joined the staff of the *Jewish Daily Forward.* He prompted the paper to become more outspoken politically, causing the publication to be regarded as one of the most important institutions upholding the interests of immigrants at the turn of the century. Intensely political and bitterly anti-Communist, Cahan was also active in organizing trade unions, particularly in the garment industries.

Cahan's fiction is largely unremarkable except for *The Rise of David Levinsky* (1917), one of the first books about the Jewish immigrant's experience. Set on the Lower East Side of New York City, the novel traces the fortunes of a penniless immigrant who eventually becomes a wealthy manufacturer. Critics agree that the value of the book is historical rather than literary; its strength lies chiefly in its vivid re-creation of life in a section of New York City. Cahan was more influential as a mentor than as an author, encouraging young writers such as Sholem Asch. As editor of *Jewish Daily Forward* he also provided for them a Yiddish-language forum.

Cáhita, group of North American Indian tribes that inhabited the northwest coast of Mexico along the lower courses of the Sinaloa, Fuerte, Mayo, and Yaqui rivers. They spoke closely related dialects, known as Yaqui and Mayo, which belong to the Uto-Aztecan family. When first encountered by the Spaniards in 1533, they numbered about 115,000. The main surviving tribes, the Yaqui and the Mayo, numbered about 7,000 and 28,000, respectively, in the late 20th century.

Despite initial Yaqui resistance to the Spanish conquest, both groups were rapidly gathered around missions by the Jesuits; during the 17th century all were converted to Christianity. During the 19th century they resisted Mexican domination, the Yaqui continuing the fight into the 20th century. After 1886 the Mexican government began a program of forcible dispersion under which thousands of Yaqui and some Mayo were deported to parts of Sonora, Oaxaca, and Yucatán; others fled to the southwestern United States.

The Cáhita were subsistence farmers who lived mainly in desert lowlands, though some Cáhita are known from the highlands of western Durango. The highland Cáhita were dry farmers, depending entirely on summer rainfall. The lowland Cáhita relied heavily on the annual overflow of the river, as well as on rainfall, as they planted the floodplains with corn (maize), beans, and squash; they raised two crops each year and supplemented their diet with a wide variety of wild foods. The Cáhita produced pottery, basketry, and woven cotton.

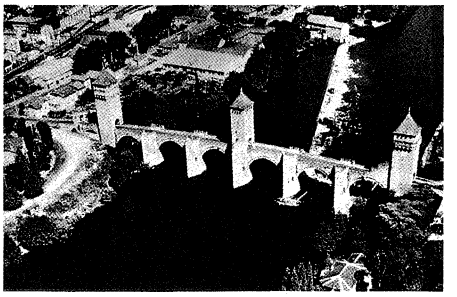
They lived in settlements called by the Spaniards *rancherías,* loose clusters of houses, usually of unrelated households. Each *ranchería* was autonomous, with an elder or group of elders as peacetime authorities. In time of war, however, the *rancherías* united in strong territorial tribal organizations.

The surviving tribes, the Yaqui and Mayo, are subsistence farmers primarily, growing staple crops of corn, beans, squash, and cotton. Some livestock, particularly cattle and sheep, are raised, and hunting and gathering of wild foods still augment the food supply to some extent. Although Yaqui and Mayo settlements are localized in the form of towns, it is not uncommon for households to be set up in the countryside around the town, and among the Mayo the civil structure of the towns has broken down. Ties, then, are often familial rather than with the village. Houses are of adobe surrounded by a yard and woven cane fence. Crafts have been lost for the most part, pottery and cotton weaving being almost nonexistent. Clothing is now commercially manufactured or made of commercially woven cloth.

Ritual kinship, similar to the godparent relationships commonly instituted throughout Middle America, is highly developed and functions as a means of formalized cooperation between households. The Yaqui and Mayo are Roman Catholic, but their worship of Jesus, the Virgin Mary, and various patron saints is clearly influenced in form by pre-Christian religion. The Virgin Mary is also worshiped as a mother figure, as is a pagan goddess, and ceremonies in honour of Jesus may require elaborate observations of taboos, most of which were probably carried over from pre-Christian ceremonies.

Cahokia, village, St. Clair County, southwestern Illinois, U.S., on the Mississippi River, opposite St. Louis, Mo. Founded in 1699 by Quebec missionaries and named for an Indian tribe (Cahokia, meaning "wild geese"), it became a centre of French influence in the upper Mississippi Valley. On July 4, 1778, it was captured for the United States by George Rogers Clark. In 1790, when St. Clair County was formed, Cahokia was made the seat (removed to Belleville in 1814). The Jarrot Mansion (*c.* 1800), Holy Family Catholic Church (built in 1799 and designated a national historic landmark in 1971), and the Cahokia Courthouse (1760, a state historical site) are examples of French pioneer architecture. Cahokia is the seat of Parks College of Aeronautical Technology (1927), now part of St. Louis University. Cahokia Mounds State Historic Site, the location of a large prehistoric Indian city, is to the northeast, near Collinsville. Inc. 1927. Pop. (1980) 18,904.

Cahors, town, capital of Lot *département,* Midi-Pyrénées region, formerly capital of Quercy province, southern France, on a rocky peninsula surrounded by the Lot River and overlooked (southeast) by Mont Saint-Cyr, northeast of Agen. It was capital of the



The Pont Valentré spanning the Lot River, Cahors, Fr.
Club Iris

Cadurci and was the Roman Divona; its ancient spring (Fons Divona) still supplies city water. During the Roman period it was famed for linen cloth. Later it was occupied by Visigoths and by Muslim invaders. In the 13th century, through its moneylenders, it became a well-known financial centre. From 1316 to the Revolution, its bishops administered the region as *coseigneurs* with royal officers. Pope John XXII, a native of the city, established a university there in 1331, which survived until 1751, when it was combined with that of Toulouse.

The boulevard Gambetta (named for the statesman Léon Gambetta [1838–82], who was born in Cahors) divides the city's old and new quarters. The old town to the east is dominated by the cathedral of Saint-Étienne, the first church in France to have cupolas. Founded in 1119 and rebuilt in part between 1285 and 1500, it influenced regional ecclesiastical architecture. The Pont Valentré, with three machicolated towers, is the finest medieval fortified bridge in France. Three other bridges, all built in the 19th century, span the river.

There is light manufacture (automobile accessories, primarily) and a busy winter market for geese and truffles. Pop. (1982) 18,204.

Cahuilla, group of Indians who spoke a Uto-Aztecan language and lived in southern California in an inland basin of desert plains and rugged canyons south of the San Bernardino

"Before the White Man Came-Palm Cañon," photograph of a Cahuilla Indian by Edward S. Curtis, 1924; from *The North American Indian*
By courtesy of the Newberry Library, Chicago, Ayer Collection

and San Jacinto mountains. Acorns and mesquite, the chief staples of many California Indians, were here plentiful only in a few well-watered areas.

The Cahuilla lived in thatched or adobe houses or in sun shelters without walls and were skilled in basketry and pottery. Their social organization was patrilineal and apparently divided into halves, or moieties, which governed such matters as descent and marriage; there were also numerous small bands or clans associated with certain territories.

About 900 Cahuilla descendants remained in the late 20th century. Some have prospered from the sale or use of their lands in such resorts as Palm Springs and such vast irrigated agricultural enterprises as those near Salton Sea.

CAI: *see* computer-assisted instruction.

cai luong, Vietnamese theatre style, the term meaning reformed or renewed theatre. It evolved during the French colonial period of Vietnam's history (1862–1954) and clearly showed the influence of European drama. It transformed (though it did not supplant) the old established classical theatre (*hat tuong*) and somewhat resembled European comic opera in its blend of dialogue and song. Performed in European-style playhouses, the productions made much use of scenery, stage properties, and theatrical costumes.

Cai Shen (in Chinese mythology): *see* Ts'ai Shen.

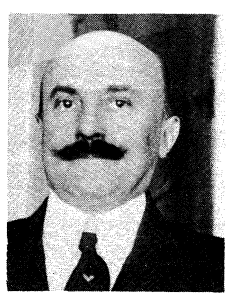
Cai Yuanpei (Chinese educator): *see* Ts'ai Yüan-p'ei.

Caibarién, port city, northeastern Villa Clara province, central Cuba. The province's chief port, Caibarién is a major centre for the collection and distribution of goods from the agricultural hinterland, which yields mainly sugarcane, tobacco, and fruit. Sponge fishing is carried on offshore, and the city contains sawmills, sugar refineries, and fish canneries. Caibarién is linked by highway and railroad to Placetas and to communities along the coast. Pop. (1981 prelim.) 32,094.

Caidian (China): *see* Han-yang.

Caieta (Italy): *see* Gaeta.

Caillaux, Joseph (-Marie-Auguste) (b. March 30, 1863, Le Mans, Fr.—d. Nov. 22, 1944, Mamers), French statesman, who was



Caillaux
H. Roger-Viollet

an early supporter of a national income tax and whose opposition to World War I led to his imprisonment for treason in 1920.

The son of Eugène Caillaux, twice a conservative minister (1874–75 and 1877), he obtained his law degree in 1886 and then joined the Finance Ministry as a deputy inspector. After an initial failure he was elected to the Chamber of Deputies from the Sarthe *département* (1898).

Having acquired a reputation as a fiscal expert, Caillaux was twice called to the Finance Ministry (1899–1902, 1906–09). Although he failed in his attempt to establish an income tax, he was successful with other important financial reforms.

After six weeks in the government of Ernest Monis, Caillaux was named premier (June 27, 1911). In an attempt to defuse a crisis over Morocco, he negotiated a settlement that gave France a protectorate over the North African territory in exchange for generous concessions to Germany in Central Africa—a compromise that brought a massive public attack upon his patriotism. The hostility of a Senate investigating commission proved so embarrassing that he was forced to resign (January 1912). Gaston Calmette, editor of the influential *Le Figaro,* led a press campaign against him. When Calmette threatened to publish love letters between Caillaux and his mistress, who was now Madame Caillaux, she fatally shot him. The trial—in which she was acquitted—dominated French public life and even provoked clashes between leftist and right-wing street gangs.

With the outbreak of World War I, Caillaux, having moved to the left, spoke out in opposition. This and his friendships with German agents led to formal charges of treason. On Dec. 22, 1917, his parliamentary immunity was removed, and on Jan. 4, 1918, he was imprisoned. After a long delay, he was brought to trial (February 1920) and found innocent of treason but guilty of committing "damage to the external security of the state." His three-year prison sentence was commuted, but he was deprived of his civil rights for 10 years.

After an amnesty (July 14, 1924), however, he was called to the head of the Finance Ministry by Paul Painlevé (April 1925). In January 1927 Caillaux was elected to the Senate and, as head of the Commission of Finance, quickly became a dominant figure in the upper house. He did return briefly to the Finance Ministry (June 1–7, 1935), but by this time the world depression was severe, and he had moved back to the political centre.

Caillaux supported Daladier's attempts to negotiate with Hitler in 1938–39, and, when France fell in 1940, he retired to his estate, where he resisted attempts by the Vichy regime to win his support.

Cailletet, Louis-Paul (b. Sept. 21, 1832, Châtillon-sur-Seine, Fr.—d. Jan. 5, 1913, Paris), French physicist and ironmaster, noted for his work on the liquefaction of gases.

As a youth, Cailletet worked in his father's ironworks and later was in charge of the works. He was also active in scientific research. On Dec. 2, 1877, Cailletet liquefied oxygen at a pressure of 300 atmospheres and at −27° C. The oxygen was obtained in the form of a cloud, but later he repeated his experiments at the École Normale at Paris, when he liquefied hydrogen, nitrogen, and air. This work was carried on independently of the work on liquefaction by the Swiss physician Raoul-Pierre Pictet (1846–1929), and there was considerable discussion as to which of the two had succeeded first.

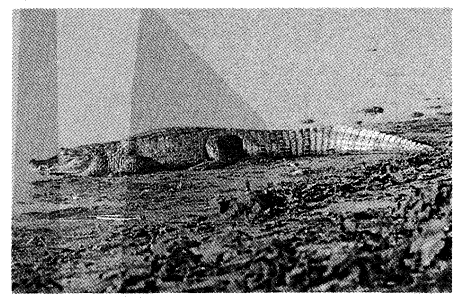
Cailletet was the author of a number of papers in *Comptes Rendus* and other French scientific periodicals on the liquefaction of gases and the production of low temperatures, on the passage of gases through metals, on manometers for measuring high pressures, on critical points, and on the state of matter at low temperatures. He was interested in aeronautics and devised an apparatus for measuring the altitude of an airplane.

He became a member of the Académie des Sciences in 1884.

Caillié, René-Auguste (b. Nov. 19, 1799, Mauzé, near La Rochelle, Fr.—d. *c.* 1838, La Badère, Fr.), the first European to survive a journey to the West African city of Tombouctou (Timbuktu). Before he was 20 he had twice voyaged to Senegal and travelled through its interior.

In 1824 he began to prepare for his journey to Tombouctou by learning Arabic and studying Islām. Posing as an Arab travelling to Egypt, he left the coast of West Africa in April 1827 and reached Tombouctou on April 20, 1828; his journey was interrupted along the way by five months of illness. He remained at his destination for about two weeks and then returned across the Sahara to France, via Morocco. His narrative of the trip, published in three volumes in 1830, was translated into English that same year. An account of his journey, *The Unveiling of Timbuctoo: The Astounding Adventures of Caillié,* by Galbraith Welch, appeared in 1938.

caiman, also spelled CAYMAN, any of several species of Central and South American reptiles related to alligators and usually placed with



Broad-snouted caiman (*Caiman latirostris*)
Karl Weidmann—The National Audubon Society Collection/Photo Researchers

them in the family Alligatoridae. Caimans, like all other members of the crocodile order (Crocodilia), are amphibious, lizard-like carnivores. They live along the edges of rivers and other bodies of water, and they reproduce by means of hard-shelled eggs laid in nests built and guarded by the female.

Caimans are placed in three genera: *Caiman* includes the broad-snouted (*C. latirostris*) and spectacled (*C. crocodilus*) caimans; *Melanosuchus,* the black caiman (*M. niger*); and *Paleosuchus,* two species (*P. trigonatus* and *P. palpebrosus*) known as the smooth-fronted caimans.

The largest of these species is the black caiman, a potentially dangerous animal attaining a maximum length of about 4.5 metres (15 feet). The other species normally attain lengths of about 1.2–2.1 m (4–7 ft), with a maximum of about 2.7 m (9 ft) in the spectacled caiman.

The spectacled caiman, a native of the tropics from southern Mexico to Brazil, takes its name from a bony ridge between the eyes that resembles the nosepiece of a pair of eyeglasses. It is abundant along quiet, mud-bottomed waters. After the Mississippi alligator (*Alligator mississippiensis*) was placed under legal protection, large numbers of spectacled caimans were imported into the United States and sold to tourists.

The smooth-fronted caimans, smallest of the caimans, are inhabitants of fast-flowing, rocky streams and rivers in the Amazon region. Their common name refers to the lack of the bony ridge present in the spectacled caiman. They are strong swimmers and feed on fishes, birds, insects, and other animals.

caiman lizard (*Dracaena*), genus of the family Teiidae. These lizards are found in the wet, forested areas of South America. *D. guianensis* reaches a length of 122 cm (48 in.).

Caiman lizards feed mainly on snails, crushing them with their strong teeth and spitting out the shell pieces before swallowing. Caiman lizards are olive green in colour and have flattened tails with a double crest for swimming.

Cain, in the Old Testament, first-born son of Adam and Eve, who murdered his brother Abel (Gen. 4:1–16). Cain, a farmer, became

enraged when the Lord accepted the offering of his brother Abel, a shepherd, in preference to his own. He murdered Abel and was banished by the Lord from the settled country. Cain feared that in his exile he could be killed by anyone, so the Lord gave him a sign for his protection and a promise that if he was killed, he would be avenged sevenfold.

The biblical story may have intended to explain why a certain tribe, called Cain, had a

"Murder of Abel," bas-relief panel by Jacopo della Quercia, 1425–38, on the *porta maggiore* of S. Petronio, Bologna, Italy

Alinari—Art Resource/EB Inc.

special tattoo mark and why this tribe always severely avenged any murdered member. The story also may explain why that tribe lived the nomadic rather than the settled life. Some biblical critics believe the tribe of Cain was the Kenites (*q.v.*).

According to Irenaeus and other early Christian writers, a Gnostic sect called Cainites (*q.v.*) existed in the 2nd century AD.

Cain, Henri-Louis (French actor): *see* Lekain.

Cain, James M(allahan) (b. July 1, 1892, Annapolis, Md., U.S.—d. Oct. 27, 1977, University Park, Md.), novelist whose violent, sexually obsessed, and relentlessly paced melodramas epitomized the "hard-boiled" school of writing that flourished in the U.S. in the 1930s and '40s. Three classics of the American screen were made from his novels: *Double Indemnity* (1936, filmed 1944), *Mildred Pierce* (1941, filmed 1945), and *The Postman Always Rings Twice* (1934, stage version 1936, filmed 1946, 1981).

Cain graduated from Washington College, Chestertown, Md., in 1910 and edited an Army paper while serving overseas during World War I. After returning to Washington College for a master's degree, he worked as a newspaperman in Baltimore on the *American* and then on *The Sun*. He was professor of journalism at St. John's College, Annapolis, from 1923 to 1924, and editorial writer on the *World* in New York City from 1924 to 1931. For a short time he was managing editor of *The New Yorker*.

His first novel, *The Postman Always Rings Twice*, published when he was 42 years old, was a spectacular success. Its sordid milieu, characters who seek to gain their ends through violence, and taut, fast-paced prose set the pattern for most of his later books. *Serenade* (1937) was daring for its period in its presentation of a bisexual hero. *Three of a Kind* (1943) contained the short novels *Sinful Woman*, *Double Indemnity*, and *The Embezzler*. His books continued to appear after World War II—among them *The Butterfly* (1947), *The Moth* (1948), *The Root of His Evil* (1954), *The Magician's Wife* (1965), and *Rainbow's End* (1975)—but none approached the success of his earlier works.

Caine, Sir (Thomas Henry) Hall (b. May 14, 1853, Runcorn, Cheshire, Eng.—d. Aug. 31, 1931, Isle of Man), British writer known for his popular novels combining sentiment, moral fervour, skillfully suggested local atmosphere, and strong characterization.

He was secretary to Dante Gabriel Rossetti, poet, painter, and leader of the Pre-Raphaelite artists in England, from 1881 to Rossetti's death in 1882. His first novel, *The Shadow of a Crime*, was published in 1885. It was followed by several others—including *The Deemster* (1887), *The Manxman* (1894), *The External City* (1901), *The Woman Thou Gavest Me* (1913), and *The Woman of Knockaloe* (1923). Caine settled in the Isle of Man and sat from 1901 to 1908 in the House of Keys, the lower house of its legislature. He was knighted in 1918 for services as an Allied propagandist in the United States.

Cainite, member of a Gnostic sect mentioned by Irenaeus and other early Christian writers as flourishing in the 2nd century AD, probably in the eastern area of the Roman Empire. The Christian theologian Origen declared that the Cainites had "entirely abandoned Jesus." Their reinterpretation of Old Testament texts reflected the view that Yahweh (the God of the Jews) was not merely an inferior demiurge, as many Gnostics believed, but that he was positively evil because his creation of the world was perversely designed to prevent the reunion of the divine element in man with the unknown perfect God. The Cainites also reversed biblical values by revering such rejected figures as Cain (whence their name), Esau, and the Sodomites, all of whom were considered to be bearers of an esoteric, saving knowledge (gnosis). These biblical persons were said to have been punished by a jealous, irrational creator called Hystera (Womb). The Cainites also honoured Eve and Judas Iscariot and had gospels bearing their names.

The Cainites are sometimes called libertine Gnostics for believing that true perfection, and hence salvation, comes only by breaking all the laws of the Old Testament. The violation of biblical prescriptions was, therefore, a religious duty. (Irenaeus reported that the Cainites invoked angels whenever they broke a commandment.) Because it was difficult to violate all biblical laws during a single lifetime, the Cainites did not look for salvation in the created world but rather escape from it. Their subversion of biblical stories allowed them to use Sacred Scripture to support their dualistic view of existence.

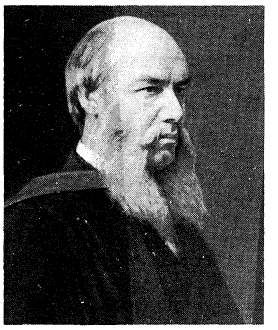
caique, any of certain South American parrot species. *See* parrot.

Caiquetio, also spelled CAIQUETIA (people): *see* Caquetío.

Caird, Edward (b. March 23, 1835, Greenock, Renfrew, Scot.—d. Nov. 1, 1908, Oxford), philosopher and leader in Britain of the Neo-Hegelian school.

After studies in Scotland and at Oxford, Caird served as tutor at Merton College, Oxford, from 1864 to 1866. He was professor of moral philosophy at Glasgow University from 1866 to 1893 and master of Balliol College, Oxford, from 1893 to 1907, when paralysis forced his retirement.

As one of the most influential British exponents of German Idealist philosophy along Hegelian lines, Caird joined his friend T.H. Green, an Oxford professor, in founding the movement in Britain. While Green concentrated on the ethical implications of Hegel's



Edward Caird, detail of a portrait by Sir George Reid, 1886; in the University of Glasgow

By courtesy of the University of Glasgow

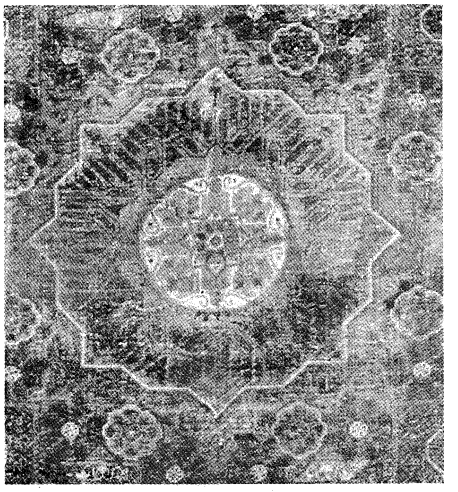
system, Caird applied its principles to the interpretation of philosophy and theology. Also devoted to the philosophy of Immanuel Kant, Caird wrote *A Critical Account of the Philosophy of Kant* (1877) and *The Critical Philosophy of Immanuel Kant*, 2 vol. (1889). Believing that "the greatest theme of modern philosophy is the problem of the relation of the human to the divine," Caird also wrote numerous works in religion, among them *The Evolution of Religion*, 2 vol. (1893), and *The Evolution of Theology in the Greek Philosophers*, 2 vol. (1904).

Caird, John (b. Dec. 15, 1820, Greenock, Renfrew, Scot.—d. July 30, 1898, Greenock), British theologian and preacher, and an exponent of theism in Hegelian terms.

Ordained as a Presbyterian minister on graduating from Glasgow University (1845), Caird made a nation-wide reputation with his learned and eloquent sermons and was appointed professor of theology at Glasgow in 1862 and principal of the university in 1873.

In *An Introduction to the Philosophy of Religion* (1880) and in *The Fundamental Ideas of Christianity*, 2 vol. (1899; the Gifford lectures for 1892–93 and 1894–96), both of which follow Hegelian teaching closely, Caird argues that universal thought is the reality of all things and that the existence of this Infinite Thought, namely God, is demonstrated by the limitations of finite thought. His *Spinoza* (1888) is also Hegelian in its approach. His sermon "Religion in Common Life" (1855) was widely reprinted and translated. There are collected editions of his *Sermons* (1858), *University Sermons, 1873–1898* (1898), and *University Addresses* (1898).

Cairene rug, Egyptian floor covering believed to have been made in or near Cairo, from at



Star-shaped centerpiece of a Mamlūk Cairene rug, 15th century; in the Textile Museum, Washington, D.C.

Textile Museum Collection, Washington, D.C.; photograph, Otto E. Nelson—EB Inc.

least as early as the 15th century to the 18th. The early production, under the Mamlūk dynasty, is characterized by geometric, centralized schemes featuring large and complex star shapes, octagons, or polygonal centerpieces, subdivided and graced with a multitude of tiny radial or clustered forms. Presumably, those in six colours are earlier, for the palette was reduced to three not long before the Ottoman conquest of Egypt in 1517.

Old records indicate that many large, long carpets were produced, but except for one magnificent silk carpet (Österreichisches Museum für Angewandte Kunst, Vienna), those that have survived are usually small, with cross panels toward both ends. The conquest resulted in a variety of transitional designs and ultimately in a large production of floral rugs in the Ottoman manner, many with systems of circular medallions. Both Mamlūk and Ottoman Cairene rugs seem to have been exported in large numbers to southern Europe, where most of the known examples were found, including a few cruciform rugs for use on tables.

cairn, pile of stones used as boundary and track marks and as burial places, often erected on high ground, found primarily in Britain. *See* burial mound.

cairn terrier, working terrier breed developed in Scotland to rout animals that prey on game. The modern breed's characteristics are carefully patterned on those of the dog's ancestor, a 17th-century terrier of the Isle of Skye. The cairn terrier is a short-legged dog with a short, broad face fixed in a "keen" expression that is typical of the breed. Its harsh coat is usually bluish gray, tan, or pale yellowish brown. Generally active, hardy, alert, and spirited, the cairn terrier is valued as a pet and watchdog. It stands 9 to 10 inches (23 to 25.5 cm) and weighs about 13 to 14 pounds (6 to 6.5 kg).

Cairn terrier
Sally Anne Thompson—EB Inc.

Cairnes, John Elliott (b. Dec. 26, 1823, Castle Bellingham, County Louth, Ire.—d. July 8, 1875, London), Irish classical economist who restated most of that school's doctrines in his last and largest work, *Some Leading Principles of Political Economy Newly Expounded* (1874).

Cairnes was educated at Trinity College, Dublin, where he later became professor of political economy (1856–61). He subsequently held chairs in political economy at Queen's College, Galway (1861–66), and at University College, London (1866–72).

In his first book, *The Character and Logical Method of Political Economy* (1857), Cairnes emphasized the abstract deductive nature of classical political economy and advocated its scientific neutrality as between different policies and political principles. His "Essays on the Gold Question" (published in *Essays in Political Economy,* 1873) are considered among the most important 19th-century works on monetary theory. They dealt with the effects of the discoveries of gold in Australia and California. His book *The Slave Power* (1862 and 1863) examined the inherent disadvantages of slave labour and considerably influenced British opinion in favour of the North in the American Civil War (1861–65).

He is also remembered for his concept of non-competing groups, particularly in the labour market, which foreshadowed the more systematic modern treatment of imperfect competitive and quasi-monopolistic conditions.

Cairngorm Mountains, highest mountain massif in the British Isles, named after one of its peaks (Cairn Gorm, 4,084 feet [1,245 m]) and situated in the Highlands between the Spey and Dee valleys. Ben Macdui (4,296 feet [1,309 m]), the highest mountain in the massif, is the second highest mountain in the British Isles. A winter-sports industry in the Cairngorm Mountains, centred on the town of Aviemore, has developed and expanded rapidly since World War II. Recreational activities include skiing, ice and rock climbing, and pony trekking. The associated Cairngorm National Nature Reserve, with rare flora and fauna, is, at 64,000 acres (26,000 hectares), the largest nature reserve in Great Britain.

Cairns, city and port, northeastern Queensland, Australia, on Trinity Bay. Founded in the 1870s as a government customs collection point, it grew in the late 19th century as the result of gold discoveries in the Palmer River, tin discoveries on the Atherton Plateau, and the introduction of sugarcane cultivation in the area. Named after Sir William Wellington Cairns, governor of Queensland (1875–77), it was proclaimed a municipality in 1885, a town in 1903, and a city in 1923. With air and rail links and a location on the Bruce Highway from Brisbane (860 miles [1,380 km] southeast), Cairns serves an agricultural hinterland that produces dairying, sugar, corn (maize), fruit, tobacco, and peanuts (groundnuts). Dairying, lumbering, and tin mining are also carried on in the area. Apart from port activities (especially the shipment of bulk sugar), Cairns has agriculturally based industries, sawmills, foundries, and breweries. Cairns is also a tourist centre for the Great Barrier Reef offshore and has a Roman Catholic cathedral and a school of arts library. Pop. (1981) 48,557.

Cairo, Arabic AL-QAHIRAH ("Victorious"), city, capital of Egypt, and largest city in Africa. The city is located predominantly on the eastern bank of the Nile River, just south of the point at which the lower Nile separates into the Rosetta and Damietta branches. This ancient metropolis, which has stood for more than 1,000 years on the same site and with the same name, presents an eclectic blend of old and new, East and West.

A brief treatment of Cairo follows. For full treatment, *see* MACROPAEDIA: Cairo.

Cairo city is nearly coextensive with Cairo *muḥāfaẓah* (governorate). The city is fan-shaped, being narrow in the south, where the river valley is wedged between desert escarpments, and widest in the north, where the valley blends into the Nile's delta. Over the centuries the city expanded onto land left newly flood-free by a receding channel. The city also has been elongated to the north and south and has spread to the river's western shore, although expansion into the desert there has been largely blocked by terrain and the expense of irrigation. Cairo's desert climate contrasts dry, hot days with cool nights freshened by Nile breezes. The city's scant rainfall occurs only during the brief winter.

From its beginnings, the economy of Cairo has been based on government, commerce, trade, and industrial production. The contemporary city's large-scale industry includes the manufacture of textiles (largely cotton), iron and steel, and consumer goods, as well as food and tobacco processing. In addition, a substantial traditional artisan sector has survived. Most of Egypt's major banking, financial, and transit firms are headquartered in Cairo.

The three oldest quarters of the city constitute densely settled slums that virtually surround a westernized core. The largest of these areas is Fāṭimid city with its wealth of historic monuments, including the Mosque of Baybars I and Saladin's Citadel. The modern downtown area (al-Azbakīyah) and its nearby elegant commercial-residential sections stand in sharp contrast to the impoverished areas. The major thoroughfare is al-Kūrnīsh (the Corniche) highway, which runs parallel to the river and is flanked by imposing modern buildings. The islands of az-Zamālik and ar-Rūḍah in the Nile River are primarily residential and recreational sectors. South of an area of lower-middle-class neighbourhoods is a zone known as the City of the Dead, where exquisite shrine-mosques and mausoleums of early religious leaders are located. A number of Cairo's poorest inhabitants live in this zone, because of the city's extreme housing shortage.

Cairo's architecture is rich and diverse, representing ancient Egyptian, Roman, medieval Arab and Turkish, and more modern times. The Pyramids of Giza, near Memphis, stand at the southwestern edge of the metropolis. The city is endowed with more than 400 registered historic monuments—the largest number in any African or Middle Eastern city—dating from AD 130 to the early 19th century.

As the centre of Egyptian higher education, Cairo attracts students from throughout the Arab Middle East. Cairo University is the major educational institution; others include ʿAin Shams University, al-Azhar University, and the American University in Cairo. Cairo's many cultural facilities include the Egyptian (National) Museum, the Museum of Islāmic Art, and the National Library, as well as numerous mosques and bazaars.

Horse-drawn carts and donkeys have been almost completely supplanted by automobiles, buses, and suburban trains. The Cairo metro, the first subway system in Africa, began operation in 1987. Cairo is connected to other major cities by rail service and by the Cairo International Airport, located beyond Heliopolis. Area city, 82.6 square miles (214 square km). Pop. (1986 est.) 6,325,000.

Cairo, city, seat of Alexander County, extreme southern Illinois, U.S. The city stands on a low-lying delta at the confluence of the Mississippi and Ohio rivers. Bridges over both rivers connect the city with Kentucky and Missouri. Cairo was so named because its site was thought to resemble that of the Egyptian city, and southern Illinois subsequently became known as Little Egypt. Cairo and the Bank of Cairo were chartered in 1818, when there was no settlement and there were no depositors. A second and successful try at establishing a town was made in 1836–37 by the Cairo City and Canal Company, which, however, collapsed in 1840. Cairo was visited in 1842 by Charles Dickens, who was not impressed and made it the prototype for the nightmare City of Eden in his novel *Martin Chuzzlewit* (1843). In 1846, 10,000 acres (4,000 hectares) of the site were purchased by the trustees of the Cairo City Property Trust, a group of Eastern investors who were interested in making the town the terminus of the projected Illinois Central Railroad. City government was established in 1855. Cairo was General Ulysses S. Grant's headquarters during the western campaigns of the Civil War. The city was protected by its levees from destruction during the 1937 flood when the Ohio

River rose to record heights. In the late 1960s and early 1970s the city was the scene of racial strife.

Cairo is a shipping centre for the Ohio and Mississippi river valleys as well as for southern Illinois. Industries include lumber and flour milling and the manufacture of polyurethane foam, work clothing, and pipe fittings. Fort Defiance State Park, site of the Civil War garrison, is just south. Inc. 1818; re-inc. 1837. Pop. (1980) 5,931.

Cairo conferences (November–December 1943), two meetings held in Cairo during World War II. At the first conference (November 22–26), the Allied leaders Winston Churchill and Franklin D. Roosevelt discussed plans for the prosecution of the Normandy invasion; with Chiang Kai-shek, they issued a declaration of the goal of stripping Japan of all the territories it had seized since 1914 and restoring Korea to independence.

Upon conclusion of the first Cairo Conference, Churchill and Roosevelt flew to Iran for the Tehrān Conference (*q.v.*) with Joseph Stalin. The two Western leaders then returned to Cairo.

At the second Cairo Conference (December 2–7), Churchill and Roosevelt tried without success to persuade Pres. İsmet İnönü of Turkey to bring his country into the war on the side of the Allied Powers. Also at this meeting, Roosevelt informed Churchill of his choice of Gen. Dwight D. Eisenhower as supreme commander of the Normandy invasion.

Cairoli, Benedetto (b. Jan. 28, 1825, Pavia, Lombardy—d. Aug. 8, 1889, Naples), politician, leader of the left during the Risorgimento, and three times premier of united Italy.

As a young man Cairoli served as a volunteer in the revolutionary forces of Giuseppe Garibaldi. Twice elected to the Chamber of

Cairoli, detail of a lithograph, 1879

By courtesy of the Museo Centrale del Risorgimento, Rome

Deputies from Pavia (1860–64 and 1867–70), he sat with Garibaldi on the extreme left. On March 3, 1878, he formed his first Cabinet, which fell on December 19 after the attempted assassination of King Umberto I in Naples, in which Cairoli himself was wounded. He formed two subsequent ministries (June 14–Nov. 23, 1879; May 2, 1880–April 7, 1881), which were equally ineffectual. Constant dissension on the left plagued Cairoli's leadership throughout his three governments. He was often criticized for the failure of his foreign policy, which the nationalists regarded as overly friendly to foreign powers, and for his inability to deal effectively with the various factions of the extreme left. His trust in France and lack of political foresight brought about a defeat for Italy in the Treaty of Bardo (1881), which made Tunisia a French protectorate. The reaction against this treaty toppled Cairoli's government and destroyed him as a serious political force.

caisson, in engineering, boxlike structure used in construction work underwater or as a foundation. It is usually rectangular or circular in plan and may be tens of metres in diameter.

A box caisson, open at the top and closed at the bottom, is usually constructed on land, then launched, floated to position, and sunk onto a previously prepared foundation, leaving its upper edge above water level. It serves as a suitable shell for a pier, seawall, breakwater, jetty, or similar work, remaining permanently in place on the sea bottom.

An open caisson, open at both the bottom and the top, is fitted with a cutting bottom edge, which facilitates sinking through soft material while excavation is carried out inside through a honeycomb of large pipes, or dredging wells. As excavating proceeds and the caisson sinks, additional sections are added to the shaft above. This process is continued until the caisson has sunk to the required depth. A floor, usually of concrete, is laid to provide a bottom seal. The dredging wells can then be filled with concrete to complete the structure.

Pneumatic caissons are similar to open caissons except that they are provided with airtight bulkheads above the cutting edge. The space between the bulkhead and cutting edge, called the working chamber, is pressurized to the extent necessary to control the inflow of soil and water; thus the excavating can be performed by workmen operating in the working chamber at the bottom of the caisson.

caisson disease: *see* decompression sickness.

Caitanya, in full ŚRĪ KṚṢṆA CAITANYA, also called GAURĀṄGA, original name VIŚVAMBHARA MIŚRA (b. 1485, Navadvīpa, Bengal, India—d. 1533, Puri, Orissa), Hindu mystic whose mode of worshipping the god Krishna (Kṛṣṇa) with ecstatic song and dance had a profound effect on Vaiṣṇavism in Bengal.

The son of a Brahman, he grew up in an atmosphere of piety and affection. He received a thorough education in the Sanskrit scriptures and, after the death of his father, set up a school of his own. At the age of 22 he made a pilgrimage to Gayā to perform his father's *śrāddha* (death anniversary ceremony). While there he underwent a profound religious experience that completely transformed his outlook and personality. He returned to Navadvīpa a God-intoxicated man, entirely indifferent to all worldly concerns.

A group of devotees soon gathered around Caitanya and joined him in the congregational worship called *kīrtana,* which consists in the choral singing of the name and deeds of God, often accompanied by dance movements and culminating in states of trance. In 1510 he received formal initiation as an ascetic and took the name Śrī Kṛṣṇa Caitanya. His intention was to leave for Vṛndāvana (the area near Mathurā that was the scene of Krishna's childhood and youth), but at the insistence of his mother he agreed instead to settle in Puri, where his disciples could more easily keep in touch with him.

Caitanya neither organized a sect nor wrote any works on theology, entrusting this work to his disciples (*see* Caitanya movement). But his simple life of intense religious emotion proved at once the source and the impetus of a great religious movement. Frequent and prolonged experiences of religious rapture, however, took their toll on his health; he himself diagnosed some of his seizures as epileptic. The exact date and circumstances of his death are unknown, and many legends have sprung up, such as his merger into a temple image or (more plausible) his accidental drowning while in a state of religious ecstasy.

Caitanya movement, intensely emotional form of Hinduism that has flourished from the 16th century, mainly in Bengal and eastern Orissa. It takes its name from the medieval saint Caitanya (1485–1533), whose fervent devotion to Lord Krishna (Kṛṣṇa) inspired the movement. For Caitanya the legends of Krishna and his youthful beloved, Rādhā, were both symbolic of and the highest expressions of the mutual love between God and the human soul. Bhakti (devotion) superseded all other forms of religious practice and was conceived as complete self-surrender to the divine will.

The Caitanya movement had its beginnings in Navadvīpa (Bengal), the saint's birthplace. From the first, a favourite and characteristic form of worship was group singing known as *kīrtana* (or *saṃkīrtana*). This consisted of the singing of simple hymns and the repetition of God's name, accompanied by the sounding of a drum and cymbals and by a rhythmic swaying of the body that continued for several hours and usually resulted in states of religious exaltation.

Caitanya was neither a theologian nor a writer, and organization of his followers was initially left up to his close companions, Nityānanda and Advaita. These three are called the three masters (*prabhū*), and their images are established in temples of the sect.

A theology for the movement was worked out by a group of Caitanya's disciples who came to be known as the six *gosvāmin*s (religious teachers; literally, "lords of cows"). At Caitanya's request, this group of scholars remained in Vṛndāvana, near Mathurā, the scene of the Krishna–Rādhā legends. The six *gosvāmin*s turned out a voluminous religious and devotional literature in Sanskrit, defining the tenets of the movement and its ritual practices. Their reestablishment of the pilgrimage sites of Vṛndāvana and Mathurā was an achievement of importance for all Vaiṣṇavas (devotees of Lord Vishnu [Viṣṇu]). Although Caitanya appears to have been worshipped as an incarnation of Krishna even during his lifetime, the theory of his dual incarnation, as Krishna and Rādhā in one body, was systematically developed only by the later Bengali hymnists.

The present leaders of the sect, called *gosvāmin*s, are (with some exceptions) the lineal descendants of Caitanya's early disciples and companions. The ascetics are known as *vairāgin*s (the "dispassionate").

Caithness, district, Highland region, northern Scotland; created by the reorganization of 1975, it includes the former county of Caithness and part of the former county of Sutherland. The district, with an area of 1,217 sq mi (3,152 sq km), faces the Atlantic Ocean and the Pentland Firth (separating it from the Orkney Islands) on the north and the North Sea on the east.

The area is basically a plateau about 1,000 ft (300 m) high in the south, sloping gently north and northeast to the coast, where it is truncated in an almost continuous line of cliffs up to 400 ft high. Above this plateau of Old Red Sandstone and Highland schists rise several massive hills (Morven, 2,313 ft, and Scaraben, 2,054 ft). In the north the plateau descends to alluvial plains just above sea level. Fertile glacial deposits and small lochs (lakes) cover the eastern area, and, in the western two-thirds, peat bogs predominate. Despite its northern latitude, Caithness has a temperate climate.

Caithness is rich in prehistoric remains from Neolithic times onward. Cairns, standing stones, and hill forts abound, and there are more brochs (ancient dry-stone buildings) than in any other Scottish county. The area was an early Pictish province called Cait, or Cat, which was invaded by Norsemen; its place-names testify to their complete domination. Traces of early Christian chapels are widespread, a very early example being St. Mary's Forse, Thurso. Medieval castles, such as Dunbeath, are found on the coasts; inland castles are usually of a later date.

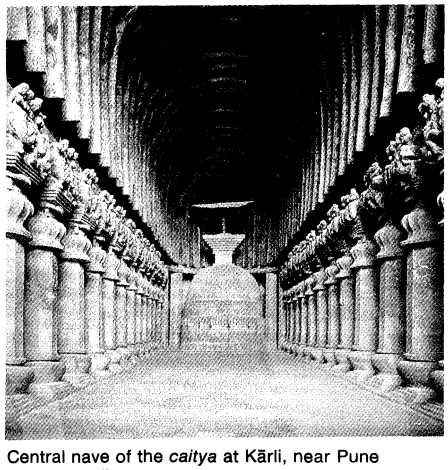
For a time Caithness was firmly integrated

into the Scottish kingdom by William the Lion (reigned 1165–1214), but the earldom of Caithness was held by the Norse earls of Orkney until 1231. It passed in the Middle Ages to several noble Scottish families, including the Sinclairs and later the Campbells of Glenorchy. The estates were subsequently sold to several Caithness families, including the Traills of Castletown, who encouraged agricultural advances during the 18th century. In the 19th century the former county enjoyed a measure of prosperity from its herring industries and the export of flagstones.

Traditional farming and fishing remain the chief occupations, although a different kind of employment is found at the nuclear breeder reactor built by the Atomic Energy Authority in 1955 in Dounreay near Thurso. Caithness was traditionally a stock-raising area, but since 1938 the numbers of dairy cattle (mainly shorthorns) have increased. Sheep also are very important, most of the district being occupied by rough grazing. Caithness farms are generally small; more than half of them are 15 ac (6 ha) or less. The once-famous herring fisheries have seriously declined, but fishing for salmon and whitefish has increased. There is a shellfish-processing plant at Thurso.

Wick and Thurso are the most important towns. Wick is the seat of the district authority. Pop. (1982 est.) 27,563.

caitya (Sanskrit: "that which is worthy to be gazed upon," thus "worshipful"), in Buddhism, a sacred place or object. Originally, *caitya*s were said to be the natural homes of



Central nave of the *caitya* at Kārli, near Pune (Poona), India
Holle Bildarchiv

earth spirits and were most often recognized in small stands of trees or even in a single tree. According to Jaina and Buddhist texts from about 200 BC, wandering Indian ascetics often gathered near *caitya*s to beg alms from local religious pilgrims and to pay homage to the deities residing therein. Later, the term *caitya* assumed the distinctive meaning of a meeting place or meditation grove for mendicant renunciates and a pilgrimage centre for the laity.

It appears that over the years these meditation and pilgrimage groves became the sites for more permanent, probably wooden, structures that housed the people visiting them. From the 2nd century BC to the 8th century AD, *caitya*s were carved directly into the rock bluffs of the Western Ghāts in a style that clearly alludes to wooden prototypes. For example, "beams" were carved into the roofs of the caves. These permanent *caitya*s characteristically consist of a central rectangular nave separated from aisles at either side by two rows of pillars that support the roof. Often, small meditation rooms line the periphery of the space, and a semicircular apse stands at one end of the room. Frequently, this apse holds a *stūpa*, a domed enclosure that protects sacred objects and that serves as a focus of Buddhist cultic worship.

An outstanding example of a classical *caitya* is the magnificent Kārli *caitya*-hall from the late 1st century BC near Pune (Poona), in western India.

Caius (Roman jurist): *see* Gaius.

Caius, also spelled GAIUS (ancient Roman personal name, or praenomen): *see under* gens or family name or honorific (*e.g.*, under Cassius for Gaius [Caius] Cassius Longinus).

Caius SAINT (pope): *see* Gaius, Saint.

Caius, John, Caius also spelled KEES, KEYS, KAY, or KAYE (b. Oct. 6, 1510, Norwich, Norfolk, Eng.—d. July 29, 1573, London), prominent Humanist and physician whose classic account of the English sweating sickness is considered one of the earliest histories of an epidemic.

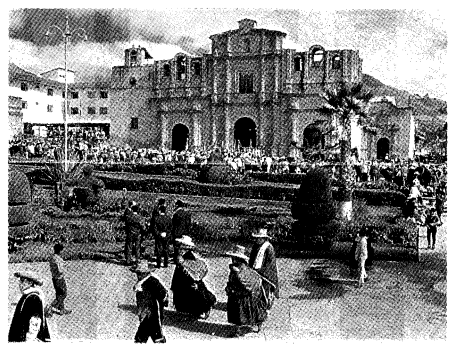
After his student days at Cambridge, Caius visited Italy (1539), studying under Montanus and Andreas Vesalius at Padua. Upon returning to London he practiced medicine and served as president of the Royal College of Physicians for several years. In 1557 he expanded his old college (Gonville Hall), named it Gonville and Caius College, endowed it generously, and in 1559 accepted its mastership.

Caius' medical writings are of particular interest, especially his account of the often fatal sweating sickness, which was epidemic in England six times between 1485 and 1578. *A Boke or Counseill against the Disease commonly called the Sweate, or Sweatyng Sicknesse* (1552) is the main source of knowledge of this disease, which modern investigators think may have been a form of influenza. Caius attributed the cause of the illness to dirt and filth.

Cajal, Santiago Ramón y: *see* Ramón y Cajal, Santiago.

Cajamarca, department (formed 1855), northern Peru, bounded north by Ecuador and east by the Marañón River. It has an area of 13,675 sq mi (35,418 sq km). Economic activity is limited mainly to cattle raising and agriculture. Crops vary with climate and altitude. Coffee and rice predominate in the northern lowlands, corn (maize), cereals, and alfalfa in the southern highlands. Mineral resources include gold, silver, coal, and copper. Cajamarca has the highest percentage of rural population of all Peruvian departments. The only urban area with more than 25,000 inhabitants is the capital city, Cajamarca (*q.v.*). Pop. (1984 est.) 1,170,800.

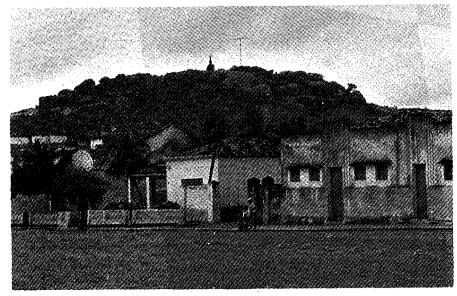
Cajamarca, capital of Cajamarca province and department, northern Peru, lying at 9,022 ft (2,750 m) above sea level on the Río Cajamarca. An ancient Inca city, it was the site of the capture, ransom, and execution of the Inca chief Atahuallpa by the conquistador Francisco Pizarro in 1532. The settlement languished until 1802, when it was raised to the status of a city because of its proximity to



Cajamarca cathedral, Peru
Walter Aguiar—EB Inc.

newly discovered silver mines at Hualgayoc. Cajamarca has several colonial buildings (including a cathedral and the San Francisco Belén church), and it is the site of a National Technical University (1962). Nearby are thermal springs. The chief trade centre in the northern Andes, it is linked by air to Chiclayo and Trujillo on the coast and by road to both the coast and the Amazon Basin. Its economy is based on mining, agriculture, and manufacturing (cloth, leather, straw hats); tourism is also important. Pop. (1981 prelim.) 60,280.

Cajàzeiras, city, western Paraíba state, northeastern Brazil. Founded in about 1700, Cajàzeiras is a transportation and commercial



Street in Cajàzeiras, Braz.
Peter L. Gould

centre for the surrounding agricultural lands. The principal commodities include cotton, sugar, oiticica oil (used in paint and varnish), and fruit. It is the terminus of a short railroad spur leading southward for 13 mi (21 km) from Antenor Navarro, on the Recife–Fortaleza line. The city can also be reached by highway. Pop. (1980 prelim.) 30,834.

Cajetan, Latin CAJETANUS, Italian GAETANO, Dominican name TOMMASO DE VIO (b. Feb. 20, 1468/69?, Gaeta, Naples—d. Aug. 10, 1534?, Rome), one of the major Catholic theologians of the Thomist school.

Entering the Dominican order in 1484, Cajetan studied at Bologna and Padua, where he became professor of metaphysics (1494) and where he encountered Scotism (the doctrine of John Duns Scotus, which rivalled Thomism, the doctrine of St. Thomas Aquinas and his followers), which he relentlessly criticized. He taught theology at Rome (1501–08), where he began his great commentary on the *Summa theologiae* (or, more commonly, *theologica*) of St. Thomas Aquinas.

Cajetan was an ardent upholder of the Dominican ideal, especially with regard to poverty and the study of theology. As Dominican master general (1508–18), he investigated the cult of Girolamo Savonarola, which threatened to divide the order. From 1511 to 1517 he defended papal authority against the schismatic Council of Pisa (1511), and at the fifth Council of the Lateran (1512–17) he urged church reform. Pope Leo X made him a cardinal in 1517.

As the papal legate in Germany, Cajetan was authorized to examine Martin Luther, and they met at Augsburg in 1518. Although Cajetan at first dealt kindly with him, they could not agree on doctrinal matters. Recalled to Rome and made bishop of Gaeta (1519), he helped to draft the bull *Exsurge Domine*, condemning Luther (1520). In 1522 he was influential in the election of the reforming pope Adrian VI, to whom he dedicated his commentary on the third part of the *Summa*. In 1523–24 he was papal legate in Hungary, Poland, and Bohemia. Recalled by Pope Clement VII, he retired to Gaeta in 1527. His commentary on the Psalms (1527) was followed by others on the New and Old Testaments.

Cajetan's fame rests chiefly on his difficult but profound commentary on the *Summa.* Although much of this work is essentially a reply to the criticism of Duns Scotus and others, it is a rigorously analytical examination of the basic principles of natural and Christian theology. He also wrote commentaries on Aristotle and many lesser works.

Cajetan OF THIENE, SAINT, Italian SAN GAETANO DA THIENE, Thiene also spelled TIENE (b. October 1480, Vicenza, Republic of Venice—d. Aug. 7, 1547, Naples; canonized 1671; feast day August 7), Venetian priest who co-founded the Theatine order and became an important figure of the Catholic Reformation.

Receiving his doctorate in civil and canon law at Padua (1504), he was appointed a prothonotary (clerk) in the Roman Curia by Pope Julius II in 1506. Associated with the local Oratory of Divine Love in Rome, Cajetan was ordained in 1516 and continued the charitable works characteristic of the association. He revitalized oratories at Vicenza (1518) and at Verona (1519); at Venice (1522) he founded a hospital for the incurably ill and a local branch of the oratory.

Returning to Rome in 1523, he met Archbishop Gian Pietro Carafa, the future Pope Paul IV, and they established (1524) the Congregation of Clerics Regular (Theatines) to further among diocesan priests the ideals of the Oratory of Divine Love. After Emperor Charles V sacked Rome, Carafa and Cajetan escaped to Venice in 1527. Following his dispatch (1533) as Theatine superior to Naples, Cajetan created at the Church of St. Paul Major (May 1538) a centre of Catholic reform. There, except for 1540–43, when he was at Venice, he remained until his death.

Articles are alphabetized word by word, not letter by letter

Cajori, Florian (b. Feb. 28, 1859, St. Aignan, Switz.—d. Aug. 14, 1930, Berkeley, Calif., U.S.), Swiss-born U.S. educator and mathematician whose works on the history of mathematics were among the most eminent of his time.

Cajori emigrated to the United States in 1875 and taught at Tulane University in New Orleans (1885–88) and at Colorado College (1889–1918), where he also served as dean of

Cajori
By courtesy of Colorado College, Colorado Springs

the department of engineering (1903–18). In 1918 he became professor of the history of mathematics at the University of California, Berkeley.

His major works include *A History of Mathematics* (2nd ed. 1919), *A History of Mathematical Notations,* 2 vol. (1928–29), *A History of Physics in Its Elementary Branches* (1899), *William Oughtred, a Great Seventeenth-Century Teacher of Mathematics* (1916), and *The Chequered Career of Ferdinand Rudolph Hassler* (1929). His revised translation of Sir Isaac Newton's *Principia* was published posthumously in 1934.

Cajun, descendant of French Canadians whom the British, in the 18th century, drove from the captured French colony of Acadia (now Nova Scotia and adjacent areas) and who settled in the fertile bayou lands of southern Louisiana. The Cajuns today form small, compact, self-contained communities and speak their own patois, a combination of archaic French forms with idioms taken from their English, Spanish, German, American Indian, and black neighbours. They variously raise cattle, corn (maize), yams, sugarcane, and cotton, and a few still perform much of their own spinning, weaving, and other home crafts. Their separateness, though often their own preference, is also the result of the prejudice of the non-Cajuns against them.

Cakchiquel, Mayan Indian people of the midwestern highlands of Guatemala, closely related linguistically and culturally to the neighbouring Quiché and Tzutujil (*qq.v.*). They are agricultural, and their culture and religion are fusions of Spanish and Mayan elements. The sharing of a common language does not provide a basis for ethnic identification among the Cakchiquels; the Indians themselves, like other Mayan peoples of the region, are organized into *municipios* (communities, or counties), and the people identify themselves with their own *municipio.* Each community usually speaks its own dialect of Cakchiquel, which is mutually intelligible with other dialects of Cakchiquel and is partly intelligible with Quiché and Tzutujil. Each community also has its own political and religious hierarchy, local costume, patron saints, and economic specialty. Often, marriage outside the *municipio* is considered improper. *See also* Maya.

Cakchiquel language, member of the Quiché group of Mayan languages, spoken in central Guatemala. Closely related to and sometimes considered simply a dialect of Cakchiquel is Tzutujil (Zutuhil), spoken in the same region. Both Cakchiquel and Tzutujil have close grammatical and phonological affinities to the Quiché language. In ancient literature, one very important work in Cakchiquel exists, the *Annals of the Cakchiquels,* which dates from the 16th century. Written in an orthography adapted from that of Spanish, it traces the history of the ruling classes of the Cakchiquel people. *See also* Mayan languages; Quiché language.

cake, in general, any of a variety of breads, shortened or unshortened, usually shaped by the tin in which it is baked; more specifically, a sweetened bread, often rich or delicate.

In the codified cuisine of France, all cakes, or *gâteaux*, derive from one of eight basic doughs: short pastry, flake pastry, sweet pastry, *savarin, brioche, baba, chou* pastry, and *génoise.* To these are added an infinite variety of flavouring and decorative ingredients, such as marzipan, sugar icing, spices, fruits, and cremes.

The torte is a very rich cake found throughout Europe, often of numerous thin layers and containing nuts, fruit, creme, and chocolate in combination. The claim to invention of the world-famous chocolate Sachertorte is disputed between two Vienna hotels.

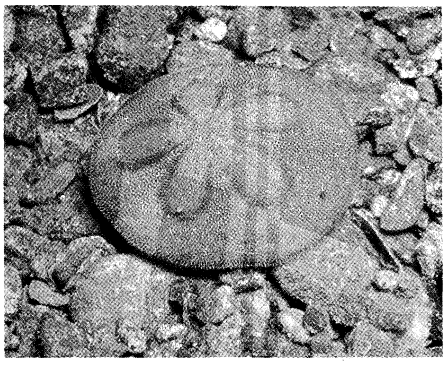
In the United States, cakes usually are made by one of three methods. In the conventional method the sugar and fat are creamed together, the egg added, and a mixture of flour, salt, and baking powder mixed in alternately with the liquid, beginning and ending with dry ingredients. In the quick, dump, or one-bowl method, all the ingredients except the leavening agent are put into a bowl and mixed vigorously (preferably with a power mixer), the leavening agent added, and mixing completed. As a modification of the method, the eggs and part of the milk may be added as a separate stage. The muffin method involves adding the combined liquid ingredients to the combined dry ingredients; but, although rapid and easy, this method unmodified produces a cake that tends to be coarse textured and to have poor keeping quality. Chiffon cake is made by a modification of the muffin method in which the egg white is beaten separately and blended with the other mixed ingredients. Shortened cakes made by these methods can be baked in flat layer pans, in loaf pans, or in individual cups and can be baked at oven temperatures of 350°–400° F (177°–204° C).

English cake recipes using fat are of two main types. The rubbing-in method can be used for most mixtures in which the amount of fat is not more than half the amount of flour by weight. The fat is rubbed into the sifted flour, salt, and leavening agent until the mixture is like fine bread crumbs; sugar and other dry ingredients such as dried fruit are added next, followed by beaten eggs together with any other liquid in the recipe. The ingredients must be mixed thoroughly without beating or overmixing, for satisfactory results. The creaming method is used when the proportion of fat to flour is half or more by weight, thus producing rich cakes. The fat and sugar are creamed well together, the egg beaten into this mixture, and sifted flour and salt, together with raising agent if necessary, folded carefully in, followed by dried fruit and any liquid in the recipe. Baking temperatures vary from 290° F (143° C) for very rich fruit cakes to 425° F (218° C) for small buns.

Spongecake and angel food cake are examples of unshortened mixtures. These cakes depend largely upon incorporated air for leavening, and, unless modified recipes are used, chemical raising agents are unnecessary, sufficient air to produce a light product being incorporated by whisking the eggs. In angel food cake, only the white of egg is used, beaten with cream of tartar, which is acidic and tends to stabilize the egg-white foam; the blended flour, sugar, and salt then are gently folded in and the desired flavouring added. A portion of the sugar may be beaten with the egg whites. When making spongecake, two methods are possible: in the first, the unseparated eggs are whisked with the sugar and any flavouring, and the sifted flour is then cut and folded into this thick, light mixture; in the second, the egg yolks are beaten with lemon juice and all or part of the sugar, and the egg whites are beaten separately, with or without part of the sugar, the flour and salt being added to the yolk mixture and the whole combined with the beaten whites. Baking temperatures for unshortened cakes range from 300° to 450° F (149° to 232° C), the higher temperatures being used for thin products such as Swiss rolls. Cake or pastry flours give lighter, finer grained, and more tender cakes than do stronger flours, which are used for breadmaking.

Throughout Europe and the United States, particular cakes are associated with particular celebrations—*e.g.*, the French Twelfth-Night cake, the German Easter torte, and the Christmas fruitcake of the United States. The nature of the wedding cake, traditional throughout the West, varies from country to country.

cake urchin, any of the echinoid marine invertebrates of the order Clypeasetroida (phylum Echinodermata), in which the body is flattened. The surface is covered with short spines (often furlike) and inconspicuous pedicellariae (pincerlike organs). In many species the hollow, slightly elongated test (internal skeleton), which accommodates the water-vascular system, is symmetrically notched on the edge or has narrow perforations (lunules). The upper surface of the test has a radial, flowerlike arrangement of five porous spaces, called



Sand dollar (*Clypeaster japonicus*)
Douglas Faulkner

petaloids; the pores permit the extension of tube feet modified for respiration. Tube feet on the underside of the body are used for taking food and may also assist the spines in locomotion.

Found worldwide in shallow seas, cake urchins burrow in sand and feed on organic particles wafted to the mouth on water currents. They are in turn the prey of other echinoderms and mollusks.

Cake urchins in which the body is a coinlike, thin-edged disk are called sand dollars, a name sometimes given to cake urchins generally. The test of the common sand dollar (*Echinarachnius parma*) is often washed up on beaches of North America and Japan. Species with lunules are generally called keyhole urchins. The largest and thinnest cake urchin is the yellow or purple sea pancake (*Echinodiscus auritus*) of the East African coast.

cakewalk, couple dance that became a popular stage act for virtuoso dancers as well as a craze in fashionable ballrooms around 1900. Couples formed a square with the men on the inside and, stepping high to a lively tune, strutted around the square. The couples were eliminated one by one by several judges, who considered the elegant bearing of the men, the grace of the women, and the inventiveness of the dancers; the last remaining pair was presented with a highly decorated cake.

Cakewalk, engraving, 1892
Brown Brothers

The cakewalk originated earlier among American black slaves who, often in the presence of their masters, used the dance as a subtle satire on the elegance of white ballroom dances. It contributed to the evolution of subsequent American and European dances based on jazz rhythms, and its music influenced the growth of ragtime.

Çakmak, Fevzi (b. Jan. 12, 1876, Constantinople—d. April 10, 1950, Istanbul), Turkish marshal and statesman who played a leading role in the establishment of the Turkish Republic.

Çakmak was educated at Turkish military colleges and was commissioned as a lieutenant in 1895. He fought in the Balkan Wars (1912–13) as commander of a division at Vardar, and in World War I he successively commanded the Ottoman troops at the Dardanelles, in the Caucasus, and in Syria. He became a general in 1914 and was appointed chief of the Turkish general staff four years later.

Appointed minister of war in the sultan's government in Constantinople (1920), he resigned his post to join the resistance of Mustafa Kemal (later Atatürk) to the Allied occupation of Anatolia. Çakmak was made prime minister and minister of war in the government of the Grand National Assembly in Ankara. Promoted to the rank of full general in April 1921, he resigned his premiership in 1922 and became deputy to İsmet İnönü, then chief of staff. After the Turkish War of Independence (1920–21), he was appointed chief of staff of the Turkish Army, a post he held until 1944.

In 1946, being opposed to the one-party rule of İnönü, then the president of Turkey, and to the extreme secularism of the Republican People's Party (RPP), Çakmak entered the elections as an independent on the ticket of the Democrat Party (DP), the newly formed opposition to the RPP. He was elected to the assembly by an overwhelming majority, but, dissatisfied with the DP, he accepted in 1948 the honorary chairmanship of the conservative National Party (Millet Partisi).

cakra (Hinduism and Buddhism): *see* chakra.

cakravartin (Buddhism and Jainism): *see* chakravartin.

Čakste, Janis (b. Sept. 14, 1859, Lielsesava, Courland, Russian Empire [now in Latvian S.S.R.]—d. March 14, 1927, Riga, Latvia), patriot and president (1922–27) of the Republic of Latvia, who, through political activity in Latvia and Russia and on diplomatic missions to the West, helped spearhead Latvia's struggle for independence.

After serving as a lawyer for some years in the Courland public prosecutor's office, Čakste left public service in 1888 to practice law in Jelgava and edit a Latvian newspaper, *Tevija* ("Fatherland"). He served on a committee appointed by the local administration to inquire into agricultural conditions in Courland (1902) and was frequently a member of Russian imperial government committees. He was elected to the first Russian Duma (Assembly) in 1906, and, after the Duma was dissolved by the imperial government, he was one of those who signed the Viborg protest and consequently lost his political privileges.

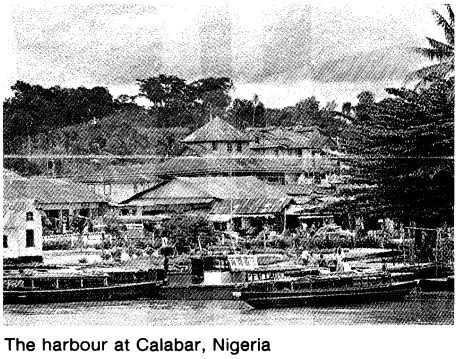
When the German invasion of Courland (July 1915) in World War I obliged him to leave Jelgava, Čakste moved to Petrograd (now Leningrad), where he was one of the founders of the Latvian Refugees Committee, which, in addition to providing relief for war refugees, worked for Latvian autonomy. In 1916 he went to Stockholm to promote the cause of Latvian independence and there wrote *Die Letten und ihre Latwija* (1917; "The Letts and Their Latvia"). Elected chairman of the Latvian People's Council in 1918, he was later the head of the delegation sent to London and to the Paris Peace Conference to secure the recognition of the Latvian republic. While he was absent on that mission, Čakste was elected president of the National Council (1918); he was later elected president of the Latvian constituent assembly (1920) and, when the first Saeima (Parliament) convened, president of the Republic of Latvia (Nov. 14, 1922). He was reelected in November 1925 and died in office.

Calabar, formerly OLD CALABAR, town and port, capital of Cross River State, southeastern Nigeria. It lies along the Calabar River, 5 miles (8 km) upstream from that river's entrance into the Cross River estuary. Settled in the early 17th century by the Efik branch of the Ibibio people, the town became a centre for trade between white traders on the coast and natives farther inland. Fish, cassava, bananas, palm oil, and palm kernels were traded at Calabar for European manufactured goods, and the town also served as a major slave-trading depot. Duke Town and the other Efik settlements near Calabar—Creek Town, Henshaw Town, and Obutong (Old Town)—were forcibly united into the loosely knit state of Old Calabar by the Ekpe secret society, which was controlled by the towns' merchant houses.

By the mid-19th century, after the waning of the slave trade, Old Calabar's economy had become based on the export of palm oil and palm kernels. After the chiefs of Duke Town accepted British protection in 1884, the town, which was called Old Calabar until 1904, served as capital of the Oil Rivers Protectorate (1885–93), the Niger Coast Protectorate (1893–1900), and Southern Nigeria (1900–06) until the British administrative headquarters were moved to Lagos. It remained an important port (shipping ivory, timber, and beeswax, as well as palm produce) until it was eclipsed by Port Harcourt, terminus (1916) of the railroad, 90 miles (145 km) west.

The name Old Calabar (as distinguished from the port and river named New Calabar, 120 miles [193 km] west) was originally given by 15th-century Portuguese navigators to the African inhabitants of that part of the Gulf of Guinea coast. This region was the main source of the Calabar bean, a poisonous bean that, when ingested, markedly affects the nervous system.

The completion of roads from Calabar to Arochukwu, Ikom, and Mamfe (in Cameroon) and the Calabar–Itu–Expene highway (which provides easy access to the rest of Nigeria) has contributed to Calabar's importance as a port. Its natural harbour, which can accommodate vessels of 19.5-foot (6-metre) draft, ex-



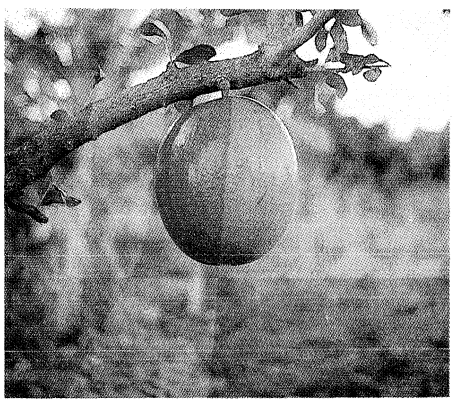
The harbour at Calabar, Nigeria
J. Kraay—Bruce Coleman, Inc./EB Inc.

ports palm produce, timber (mostly obeche), rubber, cocoa, copra, and piassava fibre. The town has a sawmill; rubber-, food-, and oil-palm-processing plants; a cement factory; and a boatbuilding industry. Wood carving is a traditional art of the Efik, and the town's artisans sculpt ebony artifacts for the tourist market in Lagos.

Calabar has long been an educational centre. Its first church school, established by the Reverend Hope Waddell of the Free Church of Scotland in 1846, helped influence the Ekpe secret society to pass a law (1850) prohibiting human sacrifice. Calabar now is the site of the University of Calabar (1975), a college of technology, a teacher-training college, and numerous secondary schools. It also has a television station. Pop. (1983 est.) 126,000.

calabash gourd: *see* bottle gourd.

calabash tree (*Crescentia cujete*), tree of the family Bignoniaceae, 6 to 12 m (20 to 40 feet) tall, that grows in Central and South America, the West Indies, and extreme southern Florida. It is often grown as an ornamental. The calabash tree produces large spherical fruits, up to 50 cm (20 inches) in diameter, the hard shells of which are useful as bowls,



Fruit of the calabash tree (*Crescentia cujete*)
Bradley Smith—Photo Researchers/EB Inc.

cups, and other water containers when hollowed out. The fruit's shell encloses a whitish pulp and thin, dark-brown seeds. The calabash tree's flowers have five petals fused in a funnel shape; they are light green and purple-streaked in colour. The tree may flower and fruit at any time of the year. The branches of the calabash are long and spread outward horizontally with almost no secondary branching. The evergreen leaves are about 5–15 cm (2–6 inches) long, are lance-shaped, and taper at the base. Fruits of the unrelated bottle gourd (*Lagenaria siceraria*) are also known as calabashes.

calabazilla, also called MISSOURI GOURD, or WILD PUMPKIN (*Cucurbita foetidissima*), perennial prostrate vine of the gourd family

Calabazilla (*Cucurbita foetidissima*)
L.N. and Anella Dexter

(Cucurbitaceae), native to southwestern North America. A calabazilla has triangular, long-stalked, finely toothed leaves, yellow flowers about 6.3 to 10.2 cm (2.5 to 4 inches) wide, and inedible, orange-shaped, predominantly green fruits with yellow stripes and markings. Although an unattractive plant with a fetid odour, the calabazilla is grown as an ornamental for its colourful fruits.

Cálabozo, city, central Venezuela. It lies along the Guárico River, 110 miles (180 km) south-southwest of Caracas, on a piedmont plain between the mountains and the Llanos (plains). Founded in 1695, Cálabozo was formerly an administrative centre. It gained prominence in the 1950s as the headquarters of the Guárico River Reclamation Project, which is concerned with irrigation, flood control, and the cattle industry. The city has benefited from the development of a vast rice-producing region and from the construction of modern transport facilities, which link it to San Fernando de Apure, the livestock centre to the south, and to San Juan de los Morros to the north. Pop. (1987 est.) 78,371.

Calabria, region, southern Italy, composed of the provinces of Catanzaro, Cosenza, and Reggio di Calabria, with a total area of 5,822 square miles (15,080 square km). Sometimes referred to as the "toe" of the Italian "boot," Calabria is a peninsula of irregular shape, jutting out in a northeast–southwest direction from the main body of Italy and separating the Tyrrhenian and Ionian seas.

Most of the region is mountainous or hilly, the only extensive lowlands being those of the lower Crati River Valley near Sibari, of the Marchesato (territory) near Crotone (Crotona), of Sant'Eufemia, and of Gioia Tauro. In the north, Calabria is linked to the Appennino Lucano of the Apennine Range by the Mount Pollino massif (7,375 feet [2,248 m]), which is continued southward by the west coast range, which is in turn separated by the Crati River from the extensive La Sila massif (rising to 6,325 feet [1,928 m]). A narrow isthmus between the gulfs of Sant'Eufemia (west) and Squillace (east) separates the northern from the southern part of the region, in which the uplands continue as the Appennino Calabrese and culminate in the extreme south in the Aspromonte massif (Montalto, 6,417 feet [1,956 m]).

In ancient times the region was the focus of powerful and prosperous Greek colonization, notably at Crotona, Sybaris, and Rhegium (Reggio di Calabria). After Rome subjugated the area, founding a colony at Brundisium (Brindisi) in 246 and capturing Tarentum (Taranto) in 209, the Ager Bruttius, as the region was then called, gradually declined into a remote provincial existence. Eventually it passed to the Byzantines, who called the region Calabria. From the 3rd century BC to the 7th century AD, the name Calabria had specifically referred to a district in the southeastern extremity of the Italian peninsula between the Adriatic and the Gulf of Tarentum. According to the Greek geographer Strabo (1st century BC), the region had at one time been the site of 13 prosperous cities, but by the 3rd century BC only the ports of Tarentum and Brundisium, famous for their wool trade, were still thriving.

The expanded region of Calabria was later controlled by the Lombards, the Byzantines again, and the Normans. It then shared with the rest of southern Italy its Hohenstaufen, Angevin (House of Anjou), Aragonese, and Bourbon rulers. Calabria was a stronghold of Italian republicanism until the Risorgimento (movement for political unity) and became part of Italy after the 1860 expedition of the nationalist leader Giuseppe Garibaldi.

The mainstay of Calabria's economy, despite the small lowland area, is farming, which was once characterized by large landed estates (latifundia) and tiny peasant holdings. Under the Italian land reform, the majority of the former latifundia were broken up after 1951 and new, small peasant holdings created, with rural service centres, new houses, and new roads. Formerly, Calabrian agriculture concentrated almost entirely on cereals, olives, and the raising of sheep and goats, with occasional work in the forests of the Sila uplands. The region was long one of the poorest areas in Italy because of its eroded soils and scanty cultivation of them. But the land reforms of the 1950s and subsequent government investment introduced new and more profitable commercial crops, such as citrus fruits (mostly on the west coast), figs, and chestnuts. The government also promoted the development of resorts and recreational areas for tourists in suitable spots along the coasts.

Despite these changes the local Calabrian Mafia, called the *n'dragheta,* persists, and its long-established practice of kidnapping was a model for similar acts by others which plagued Italy during the 1970s. The region's economic development is still hindered by rugged terrain, frequent earthquakes, and poor communications, and there is very little industry of any importance. Hydroelectric power was developed in La Sila in the 1920s and 1930s and is now an important feature of the Calabrian economy, supplying power for electric railways and the chemical industries at Crotone. Catanzaro, the regional capital (1971), Reggio di Calabria, and Cosenza (*qq.v.*) are the only cities of any size. Rail communications are still largely limited to the coasts and consist of the Rome–Naples–Reggio di Calabria line running along the west coast and the Ionian, or Taranto–Reggio di Calabria, line on the east coast. These two railroad lines are connected from Paola to Sibari and from Sant'Eufemia to Marina di Catanzaro. A railway and car ferry link the ports of Reggio di Calabria and Villa San Giovanni with Messina in Sicily.

Calabria is one of the few areas of southern Italy that has a non-Italian minority: a substantial number of Albanians fled the Turkish conquest of their homeland in the 15th and 16th centuries and settled there. They have retained their use of the Albanian language, the Greek Orthodox rite in their churches, and, on occasion, their colourful national costumes. Pop. (1986 est.) 2,131,412.

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Calabrian Stage, major division of Pleistocene marine deposits in Mediterranean Europe (the Pleistocene Epoch began about 2,500,000 years ago and ended about 10,000 years ago). The Calabrian Stage precedes the Sicilian Stage and has been correlated with at least some part of the Villafranchian Stage, a terrestrial stage and the base of the continental Pleistocene. The Calabrian was named for deposits exposed in the Italian region of Calabria. Newer classification schemes insert an additional stage, the Emilian, between the Calabrian and Sicilian. The Calabrian Stage contains a cold-water fossil invertebrate faunal assemblage.

Calah, also spelled KALHU, or KALAKH, modern NIMRŪD, ancient Assyrian city situated south of Mosul in northern Iraq. The city was first excavated by A.H. Layard during 1845–51 and afterward principally by M.E.L. (later Sir Max) Mallowan (1949–58).

Founded in the 13th century BC by Shalmaneser I, Calah remained unimportant until King Ashurnasirpal II (reigned 883–859 BC) chose it as his royal seat and the military capital of Assyria. His extensive work on the Acropolis—which covered about 65 acres (26 hectares)—and the outer walled town was

completed by his son Shalmaneser III and other monarchs. The most important religious building, founded in 798 by Queen Sammu-ramat (Semiramis of Greek legend), was Ezida,

Winged bull of alabaster, guardian of a gate of the palace of Ashurnasirpal II at Nimrūd; in the Metropolitan Museum of Art, New York City

By courtesy of the Metropolitan Museum of Art, New York, gift of John D. Rockefeller, Jr., 1932

which included the temple of Nabu (Nebo), god of writing, and his consort Tashmetum (Tashmit). The temple library and an annex contained many religious and magical texts and several "treaties," including the last will and testament of Esarhaddon (reigned 680–669). In the outer town the most important building is Ft. Shalmaneser, an arsenal that occupied at least 12 acres. This and other buildings have yielded thousands of carved ivories, mostly made in the 9th and 8th centuries BC, now one of the richest collections of ivory in the world.

In the 7th century BC, Calah declined in importance because the Sargonids tended to use Nineveh as their residence; nonetheless it continued to be extensively occupied until the fall of Nineveh in 612 BC.

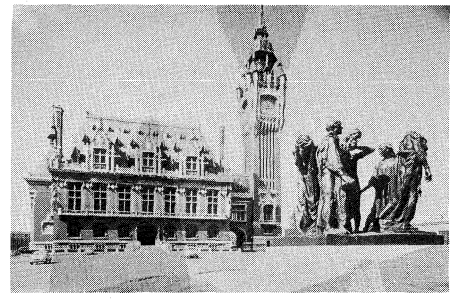
Calahorra, town, in the province and autonomous community (region) of La Rioja, northern Spain, on the south bank of the Río Cidacos near its confluence with the Ebro, southeast of Logroño city. Known as Calagurris to its original Celtiberian inhabitants, the town was famous for its four years' resistance to the Roman general Pompey (76–72 BC). The Romans later called it Calagurris Nassica to distinguish it from nearby Calagurris Fibularia. It was under Moorish control during the 9th and 10th centuries but was taken in 1054 by the Christian king of Navarre.

Historic landmarks include the 5th-century Gothic cathedral (restored 1485); the Casa Santa, which supposedly contains the bodies of the town's patron saints and martyrs, Emeterius and Celedonius, and which is visited by thousands of pilgrims on August 31st; and the nearby ruins of a Roman aqueduct and circus. Calahorra was the birthplace of Quintilian, the Roman rhetorician.

An agriculturally based industrial centre, the town has pepper, tomato, artichoke, and fruit canneries. Pop. (1981) 17,695.

Calais, industrial seaport on the Strait of Dover, Pas-de-Calais *département,* Nord-Pas-de-Calais region, northern France, 21 mi (34 km) by sea from Dover (the shortest crossing from England). On an island, now bordered by canals and harbour basins, Calais originated as a fishing village. It was improved by the Count of Flanders in 997 and was fortified by the Count of Boulogne in 1224. After the Battle of Crécy, it withstood an English siege for almost a year (1346) until it was starved out. The famous episode of the six burghers who surrendered to save Calais is commemorated by Auguste Rodin's statuary group. François de Lorraine, 2nd duc de Guise, took the town from the English in 1558, and the region (Calaisis) became known as the Pays Reconquis. Occupied by the Spanish (1596–98), it was returned to France by the Treaty of Vervins. A part of Napoleon's army for the invasion of England camped there in 1805. Calais was a main objective in the German drive to the sea in May 1940; for three months before its liberation (September 1944), it was a base for launching German flying bombs against Britain. The old town around the citadel (1560) was demolished, and the industrial zone of Saint-Pierre to the south was badly damaged. The rebuilt town still has its 13th-century watchtower.

Calais is a major transit port and the main French cross-Channel passenger and mail port. Traditional manufactures include lacemaking, notably point and pillow lace, tulles, and embroideries that are exported all over the world. Recent development has been associated with



"The Burghers of Calais," a statuary group by Auguste Rodin, in front of the town hall, Calais, Fr.

By courtesy of the Commissariat General au Tourisme (France); photograph, Fronval

the food, chemical, and machinery industries. Pop. (1982) 76,206.

Calais, city, Washington County, eastern Maine, U.S., on the St. Croix River (there spanned by an international bridge to St. Stephen, N.B., Canada), 98 mi (158 km) east-northeast of Bangor. Settlers were first attracted to the area in 1779 by the abundance of natural resources. The community developed as a lumbering centre; after 1801 shipbuilding was the most important industry. It was incorporated as a town in 1809 and named for Calais, Fr., in appreciation for aid given during the American Revolution. The manufacture of wood products remains the economic mainstay. Nearby are Moosehorn National Wildlife Refuge and St. Croix Island National Monument; the latter marks the location where the French explorers Samuel de Champlain and Pierre du Guast, sieur de Monts, established a settlement in 1604. Inc. city, 1850. Pop. (1980) 4,262.

Calais, Pas de (English Channel): *see* Dover, Strait of.

Calais and Zetes, in Greek mythology, the winged twin sons of Boreas and Oreithyia. On their arrival with the Argonauts at Salmydessus in Thrace, they liberated their sister Cleopatra, who had been thrown into prison by her husband, Phineus, the king of the country. According to another story, they delivered Phineus from the Harpies. They were slain by Heracles near the island of Tenos, possibly as a result of a quarrel with Tiphys, the pilot of the Argonauts. Calais traditionally founded Cales in Campania.

Calaisian Substage, division of Holocene deposits and time in northern Europe (the Holocene Epoch began about 10,000 years ago and continues to the present). The Calaisian was named for a sequence of deposits in France and represents a period of rising sea levels; it is correlated with the Middle Flandrian Stage. In The Netherlands, the Calais deposits overlie the Lower Peat and underlie the Velsen Layer and appear to have formed between 8,000 and 6,000 years ago. The Calais deposits are the products of a series of marine invasions of coastal areas.

Calama, capital of El Loa province, Antofagasta region, northern Chile, on the Río Loa in an extremely arid region. It lies on the western slope of the Andes at an altitude of 7,435 ft (2,266 m) and is linked to Antofagasta city, 125 mi (200 km) southwest, by aqueduct. The oasis town is a mining and agricultural marketing centre and a receiving station for cattle brought across the mountains from Argentina. The Smithsonian Institution (U.S.) operates a solar observatory nearby. Pop. (1982 prelim.) 98,551.

Calamian Group, islands lying between Mindoro and Palawan, west central Philippines. Politically a part of the province of Palawan, the group comprises Busuanga, Culion (*q.v.*), and Coron islands and about 95 lesser coral isles and islets, with a total area of 677 sq mi (1,753 sq km). The main islands are quite hilly and are densely settled, with relatively stable populations engaged in subsistence agriculture and fishing. The principal settlement is Coron, on southeastern Busuanga, opposite Coron Island, which is well known for its edible bird's nests. Pop. (1980) 35,477.

calamine, either of two zinc minerals. The name has been dropped in favour of the species names hemimorphite (*q.v.;* hydrous zinc silicate) and smithsonite (*q.v.;* zinc carbonate).

calamine brass, alloy of copper with zinc, produced by heating fragments of copper with charcoal and a zinc ore, calamine or smithsonite, in a closed crucible to red heat (about 1,300° C, or 2,400° F). The ore is reduced to a zinc vapour that diffuses into the copper. Apparently invented in Asia Minor, this method of brass manufacture was common from the 1st millennium BC. In Roman times a brass industry was established based on this process. It continued in use through the 18th century, long after metallic zinc was known, because the calamine brass was esteemed more highly than the brass made by melting the copper and zinc together. *See also* brass.

Calamites, originally, a stem fragment of a fossil plant prominent during the coal age, the Carboniferous Period (from 280,000,000 to 345,000,000 years ago). As such, it was termed a form genus. Later, the connotation was broadened to include an idealized treelike plant, and it became a full genus designation. Furthermore, the term calamite is used for any member of the family to which the original *Calamites* was assigned; the Calamitaceae, order Calamitales, class Sphenopsida. *Calamites* and other treelike plants of the coal age constitute the coal that provides a source of energy today.

Calamity Jane, byname of MARTHA JANE BURKE, *née* CANNARY (b. May 1852?, near Princeton, Mo.?, U.S.—d. Aug. 1, 1903, Terry, near Deadwood, S.D.), legendary American frontierswoman whose name was often linked with that of Wild Bill Hickok. The facts of her life are confused by her own inventions and by the successive stories and legends that accumulated in later years.

She allegedly moved westward on a wagon train when still quite young—her mother dying enroute and her father dying in Salt Lake City, leaving her on her own at an early age. During the following several years she wandered about the West, working as cook, dance-hall girl, camp follower, and bawd and doing whatever necessary to earn a living. In

the spring of 1876 she ended up in Deadwood, S.D., site of new gold strikes, and became a bullwhacker, hauling goods and machinery to the outlying camps. It was probably there that she first met Hickok and knew him only

Calamity Jane
The Bettmann Archive

briefly (he was shot dead in a saloon soon after). Other, disputed stories put their meeting years earlier and even vouch a marriage (Sept. 1, 1870) and a child (Jean Hickok McCormick, born Sept. 25, 1873, and allegedly given up for adoption). By the late 1870s Calamity Jane had captured the imagination of several magazine-feature writers who covered the colourful early days of Deadwood.

In 1891 she married Clinton (Charley) Burke, a hack driver, after living with him for seven years. Beginning in 1895 she toured with Wild West shows throughout the Midwest. In 1901 she appeared at the Pan-American Exposition in Buffalo, N.Y., but was fired for her erratic behaviour and alcoholism. She returned to Deadwood and obscurity.

calamus (writing implement): *see* quill.

Calamy, Edmund (b. February 1600, London—d. Oct. 29, 1666, probably London), English Presbyterian theologian who contributed significantly to the writings of Smectymnuus (1641), the pen name under which was published the Calvinists' famous reply to the Anglican apology for bishops and liturgical worship in the church. The leader of the Presbyterian ascendancy in Parliament during the Commonwealth (1643–53), he nevertheless helped restore Charles II (1660). He was later expelled from his ministry as the principal Nonconformist to refuse the Anglican episcopal structure imposed by the Act of Uniformity (1662). His grandson, Edmund Calamy (1671–1732), wrote the history of the Nonconformists.

Calanthe, genus of orchids, family Orchidaceae, containing about 150 species of primarily terrestrial plants native to Asia and South Africa, with one Central American and West Indian species. Some species lose their leaves during the dry season.

Many species of *Calanthe* lack pseudobulbs (bulblike stems); those that do occur are large and usually are accompanied by large leaves. Many flowers are borne on each flower spike, which may be erect or slightly arched.

Călăraşi, *judeţ* (district), southwestern Romania, occupying an area of 1,835 sq mi (4,754 sq km). The district, consisting mostly of lowlands, was formed in 1981 from portions of Ialomiţa and Ilfov districts. The Danube River, flowing northeastward, marks the district's eastern border; and the Borcea, Barza, and Dimboviţa rivers, tributaries of the Danube, drain southward. The Mostiştea and Gălătui lakes lie in the south. Călăraşi (*q.v.*) city, the district capital, has a paper industry. Machinery is manufactured in Oltenita, and factories in Feteşti and Valea-Roşie process foodstuffs. Agricultural activities consist of livestock raising and cereal growing. Vineyards are cultivated along the Danube and Borcea rivers in the east. The town of Dichiseni is a former Roman settlement. Other towns in the district include Mînăstirea, Grădiştea, and Lupşanu. Major highway and railway connections between Bucharest and Constanţa cross the northern portion of the district. Other highways extend through Călăraşi city. Pop. (1982 est.) 339,942.

Călăraşi, city, capital of Călăraşi *judeţ* (district), southeastern Romania. It is located at the border with Bulgaria on the Borcea arm of the Danube and along Lake Călăraşi, about 60 mi (100 km) east-southeast of Bucharest. Călăraşi is first documented in 1593, during the reign of Michael the Brave (Mihai Viteazul). A river port and trading centre, its chief industries are food processing (particularly fish), flour milling, and pulp and paper making, the latter based on reeds from local swamplands. The town has an archaeological museum, and the nearby town of Dischenі is a former Roman settlement. Călăraşi city has highway and railway connections to Feteşti and Slobozia. Pop. (1982 est.) 56,589.

Calarcá, city, northeastern Quindío department, Colombia, on the western slopes of the Andean Cordillera (mountains) Central, at 5,039 ft (1,536 m) above sea level. Like neighbouring Armenia, the departmental capital, it is an important coffee-growing centre. Calarcá is on the major highway that crosses the Boquerón (pass) del Quindío to Ibagué, capital of Tolima department. Pop. (1973) city, 32,533; mun., 54,658.

Calas, Jean (b. March 19, 1698, Lacabarède, Fr.—d. March 10, 1762, Toulouse), Huguenot cloth merchant whose execution caused the philosopher Voltaire to lead a campaign for religious toleration and reform of the French criminal code.

On Oct. 13, 1761, Calas's eldest son, Marc-Antoine, was found hanged in his father's textile shop in Toulouse. Anti-Huguenot hysteria broke out among the local Roman Catholic populace, and Calas was arrested and charged with having murdered his son to prevent or punish his conversion to Catholicism. At first he attributed the crime to an unknown intruder, but he later insisted that his son had committed suicide. Found guilty by the local magistrates, he was condemned to death by the Parlement (appellate court) of Toulouse on March 9, 1762. The following day he was publicly broken on the wheel, strangled, and then burned to ashes. His son was buried as a martyr to the Catholic faith.

Influential friends of the family in Geneva interested Voltaire in the case, and through a vigorous press campaign the philosopher convinced large segments of European public opinion that Calas's judges had allowed their anti-Huguenot prejudices to influence their verdict. As a result, a 50-judge panel was appointed to review the case. The panel reversed Calas's conviction on March 9, 1765, and the government paid the family an indemnity. The Calas affair greatly strengthened the movement for criminal law reform and religious toleration in France, but the actual reforms were not instituted until the 1780s.

Calasanz, Saint Joseph, Calasanz also spelled CALASANCTIUS, Italian SAN GIUSEPPE CALASANZIO, Spanish SAN JOSÉ DE CALASANZ, (b. Sept. 11, 1556, Peralta, Spain—d. Aug. 25, 1648, Rome; canonized 1767; feast day August 25), priest, teacher, patron saint of Roman Catholic schools, and founder of the Ordo Clericorum Regularium Pauperum Matris Dei Scholarum Piarum (Order of Poor Clerks Regular of the Mother of God of the Pious Schools), popularly called Piarists. The Piarists are a teaching order that, in addition to the usual vows of poverty, chastity, and obedience, practiced a fourth vow: the special care of youth.

Of aristocratic birth, Calasanz was educated at the Spanish universities of Estadilla, Lérida, and Valencia, was ordained priest in 1583, and subsequently became vicar general of Tremp. Later he relinquished much of his inheritance, resigned his vicariate, and went to Rome (1592), where he laboured for the education of poor children. In November 1597 he opened Europe's first free school for poor children.

After other priests joined him, they eventually expanded their headquarters, forming a kind of community life. Increasing student enrollment necessitated a move in 1602, and, after a crippling accident, Joseph was financially assisted by popes Clement VIII and Paul V, who in 1617 recognized his community as a religious congregation. In 1621 the congregation, which was spreading throughout Italy, became papally approved as a religious order, with Joseph as superior.

Mario Sozzi, a priest who was admitted to the Piarists in 1630, eventually caused, out of jealousy, dissension that led to Joseph's unwarranted arrest. An ensuing internal revolt ruptured the order; in 1643 Sozzi died, being succeeded by an equally villainous subordinate, Fr. Cherubini, and Pope Urban VIII quashed the generalate. Joseph, then 86 years old, was tried by the Holy See. Pope Innocent X reinstated him, but in 1646, after further internal disruption, the order was papally reduced to a mere society in which each priest was subject to his bishop. Joseph's hope for the Piarists' complete restoration was not fulfilled until after his death.

Joseph was declared patron of all Christian schools by Pope Pius XII. Among the numerous hagiographies is C.S. Durrant's *The Life of Saint Joseph Calasanctius* (1954).

calash (from Czech *kolesa:* "wheels"), also called CALÈCHE, or BAROUCHE, any of various open carriages, with facing passenger seats and an elevated coachman's seat joined to

Calash, *c.* 1880; in the Suffolk Museum and Carriage House, Stony Brook, Long Island, N.Y.
By courtesy of the Suffolk Museum and Carriage House at Stony Brook, Long Island, N.Y., Melville Collection

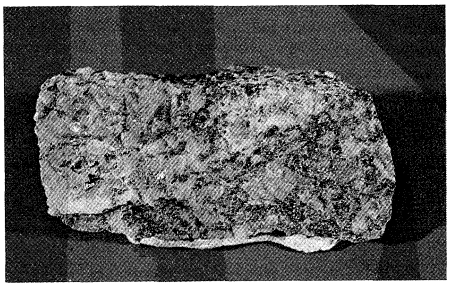
the front of the shallow body, which somewhat resembled a small boat. A characteristic falling hood over the rear seat gave the name calash to any folding carriage top. Most of the vehicles had four wheels, but some had two. A type used especially in Quebec was two wheeled, with one forward-facing seat, and a driver's seat on the splashboard. Other types were almost identical to chaises and victorias.

Calatrava, Order of, Spanish ORDEM DE CALATRAVA, the oldest military and religious order in Spain, founded in 1158 by two Cistercian monks who proclaimed a holy crusade to defend the city of Calatrava against the Moors. The order was formally recognized by the Pope in 1164.

By 1493 it had a membership of 200,000 and

an annual income of 45,000 ducats ($720,000). After the reconquest of Granada, Ferdinand and Isabella deemed that all private armies had outserved their usefulness; they were thus incorporated into the crown in 1493.

calaverite, a gold telluride mineral ($AuTe_2$) that is a member of the krennerite group



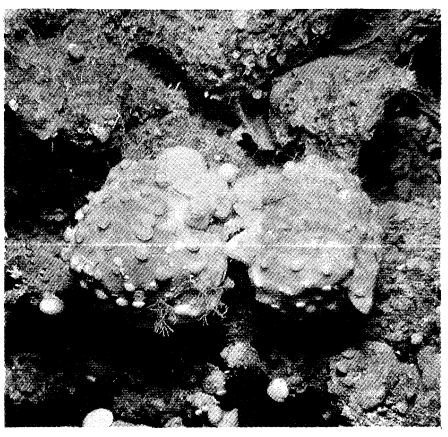
Calaverite in quartz found near Cripple Creek, Colorado
B.M. Shaub

of sulfides and perhaps a structurally altered form (paramorph) of krennerite (*q.v.*); it usually contains some silver replacing gold. It is most commonly found in veins formed at low temperatures, as at Kalgoorlie, Australia; Cripple Creek, Colo.; and Calaveras County, Calif., for which it is named. It crystallizes in the monoclinic system. For detailed physical properties, *see* sulfide mineral (table).

Calbayog, chartered city, on the western coast of Samar Island, Western Samar province, Philippines, on the Samar Sea at the mouth of the Calbayog River. It is a religious and educational centre, with fishing and mat making the main industries. Its chartered area (400 sq mi [1,036 sq km]) includes much rural farmland embracing three municipalities—Calbayog, Oquendo, and Tinambacan—and 83 barrios (wards). Calbayog is a regular port of call for interisland ships, since it is less subject to storms than is the northern coast. It is a leading exporter of abaca and copra and the chief importer of rice and manufactures for northern Samar Island. The city also has an airport. Inc. city, 1948. Pop. (1980) 106,719.

calcarenite, sedimentary rock formed of sand-sized (0.06–2-mm-diameter) calcareous particles that have been deposited mechanically rather than from solution. The particles, which consist of fossil materials, pebbles and granules of carbonate rock, and oölites (spherical nodules with concentric structure), are transported and sorted by flowing water. When formed almost entirely of shell debris, the rock is termed coquina (*q.v.*).

calcareous sponge, any of a class (Calcispongiae, or Calcarea) of sponges characterized by skeletons composed of calcium carbonate spicules (needlelike structures). Calcareous



Calcareous sponge
Douglas Faulkner

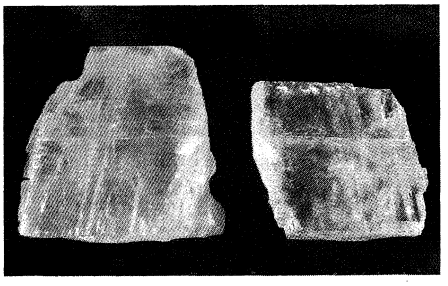
sponges occur mainly on the rocky bottoms of the continental shelves in temperate, shallow waters; they are usually dull in colour. Most are small, seldom exceeding 15 centimetres (6 inches) in length.

calcedony (mineral): *see* chalcedony.

Calchas, in Greek mythology, the son of Thestor (a priest of Apollo) and the most famous soothsayer among the Greeks at the time of the Trojan War. He foretold the duration of the siege, demanded the sacrifice of Iphigeneia, daughter of Agamemnon (king of Mycenae), and advised the construction of the wooden horse with which the Greeks finally took Troy. It had been predicted that he should die when he met his superior in divination; the prophecy was fulfilled when Calchas met Mopsus after the war, at Claros or at Siris in Italy. Beaten in a trial of soothsaying, Calchas died of chagrin or committed suicide.

calcite, the most common form of natural calcium carbonate ($CaCO_3$), a widely distributed mineral known for the beautiful development and great variety of its crystals. It is polymorphous (same chemical formula but different crystal structure) with the minerals aragonite and vaterite and with several forms that apparently exist only under rather extreme experimental conditions. Calcite is the stable form of calcium carbonate at all temperatures and pressures encountered at or near the Earth's surface; because of this, all other forms probably invert to it with geologic time. For detailed physical properties, *see* carbonate mineral (table).

Calcite is the dominant mineral constituent of limestone and its metamorphic equivalent, marble, and is common in the shells of in-



Iceland spar, a variety of calcite
Eric L. Heyer—Grant Heilman

vertebrates. $CaCO_3$ is very soluble in groundwater containing organic acids or dissolved carbon dioxide (CO_2) and is deposited when the CO_2 escapes; this mechanism is responsible for the frequent occurrence of limestone caves and the wide distribution of stalactites and stalagmites in caves, for massive banded deposits of travertine around hot springs, and for spongy calcareous tufa in ordinary streams and springs.

Calcite is the most important mineral in limestones and marbles used in the building, steel, chemical, and glass industries. Iceland spar, first produced in the 17th century from the east coast of Iceland, is used in polarizing prisms such as the Nicol and Ahrens prisms and in polarizing microscopes, polariscopes, and other optical instruments.

Although the name calcite has been used only since 1845, the mineral had long been known by the name calcareous spar, and the transparent variety called Iceland spar was greatly studied. The strong double refraction and perfect cleavage of Iceland spar were described in detail by Erasmus Bartholin in 1669; a study of the same variety led Christiaan Huygens to discover (1678) the laws of double refraction. From an investigation of the cleavage and crystal forms of calcite, R.J. Haüy developed (1781–1801) a theory of crystal structure that played an important part in the evolution of modern structural crystallography. Sir Lawrence Bragg calculated (1924) the refractive indexes of calcite from its atomic arrangement, one of the first such calculations to be made.

calcitonin, also called THYROCALCITONIN, a protein hormone secreted in humans and other mammals by parafollicular cells in the thyroid gland, and in birds, fishes, and other non-mammalian vertebrates by cells of the ultimobranchial bodies, which are discrete calcitonin-secreting glands.

Calcitonin lowers the concentration of calcium in the blood when it rises above the normal value. It has the opposite effect of parathyroid hormone (parathormone).

calcium (Ca), chemical element, one of the alkaline-earth metals of main Group IIa of the periodic table, most abundant metallic element in the human body and fifth most abundant element in the Earth's crust.

Properties, occurrence, and uses. Extensively used by the ancients as the compound lime, the silvery, rather hard but lightweight metal itself was first isolated (1808) by Sir Humphry Davy after distilling mercury from an amalgam formed by electrolyzing a mixture of lime and mercuric oxide. His discovery showed lime to be an oxide of calcium.

Calcium does not occur naturally in the free state, but compounds of the element are widely distributed, constituting 3.63 percent of the igneous rocks and 3.22 percent of the entire Earth's crust. As calcite (calcium carbonate), it occurs in limestone, chalk, marble, dolomite, eggshells, pearls, coral, stalactites, stalagmites, and the shells of many marine animals. As calcium phosphate, it is the principal inorganic constituent of teeth and bones and occurs as the mineral apatite. Calcium is found in many other minerals, such as fluorite, aragonite, and gypsum, and in many feldspars and zeolites.

The human body is 2 percent calcium. The major source of calcium in the human diet is milk and milk products. Rickets occurs, especially in infants and children, when lack of vitamin D impairs calcium absorption from the gastrointestinal tract into the extracellular fluids (*see* calcium deficiency).

Formerly produced by electrolysis of anhydrous calcium chloride, pure calcium metal is made commercially by heating lime with aluminum. (For further information on calcium production, *see* MACROPAEDIA: Industries, Extraction and Processing.)

The metal itself is used as an alloying agent for aluminum, copper, lead, magnesium, and other base metals; as a deoxidizer for certain high-temperature alloys, and for nickel, steel, and tin bronzes; as a getter in electron tubes; as a reducing agent in the preparation of chromium, thorium, uranium, zirconium, and other metals from their oxides; and as a dehydrating agent for organic liquids. Alloyed with lead (0.04 percent calcium), it is employed as sheaths for telephone cables and as grids for storage batteries of the stationary type. Limelights, formerly used in stage lighting, emit a soft, very brilliant white light upon heating a block of calcium oxide to incandescence in an oxyhydrogen flame; hence, the expression "to be in the limelight."

Naturally occurring calcium consists of a mixture of six isotopes: calcium-40 (97 percent), calcium-44 (2.1 percent), calcium-42 (0.64 percent), and smaller proportions of calcium-48, calcium-43, and calcium-46. The metal reacts slowly with oxygen, water vapour, and nitrogen of the air to form a yellow coating of the oxide, hydroxide, and nitride. It burns in air or pure oxygen to form the oxide and reacts rapidly with warm water and more slowly with cold water to produce hydrogen.

Principal compounds. The most important of the calcium compounds is calcium carbonate, $CaCO_3$, the major constituent of limestones, marbles, chalks, oyster shells, and corals (*see* calcite). Calcium carbonate obtained from its natural sources is used as a filler in a variety of products, such as ceramics and glass, and as a starting material for the production of calcium oxide. Synthetic calcium carbonate, called "precipitated" calcium carbonate, is employed when high purity is required, as in medicine (antacid and dietary calcium supplement), in food (baking powder), and for laboratory purposes.

Calcium oxide, also known as lime, or quicklime, CaO, is a white or grayish white solid produced in large quantities by roasting calcium carbonate so as to drive off carbon dioxide. Lime, one of the oldest products of chemical reaction known to man, is used extensively as a building material and as a fertilizer. Large quantities of lime are utilized in various industrial neutralization reactions. A large amount also is used as starting material in the production of calcium carbide, CaC_2. Also known as carbide, or calcium acetylide, this grayish black solid decomposes in water, forming flammable acetylene gas and calcium hydroxide, $Ca(OH)_2$. The decomposition reaction is used for the production of acetylene, which serves as an important fuel for welding torches. Calcium carbide also is used to make calcium cyanamide, $CaCN_2$, a fertilizer component and starting material for certain plastic resins.

Calcium hydroxide, also called slaked lime $Ca(OH)_2$, is obtained by the action of water on calcium oxide. When mixed with water, a small proportion of it dissolves, forming a solution known as limewater, the rest remaining as a suspension called milk of lime. Calcium hydroxide is used primarily as an industrial alkali and as a constituent of mortars, plasters, and cement.

Another important compound is calcium chloride, $CaCl_2$, a colourless or white solid produced in large quantities either as a by-product of the manufacture of sodium carbonate by the Solvay process or by the action of hydrochloric acid on calcium carbonate. The anhydrous solid is used as a drying agent. Calcium hypochlorite, $Ca(ClO_2)$, widely used as bleaching powder, is produced by the action of chlorine on calcium hydroxide. The hydride CaH_2, formed by the direct action of the elements, liberates hydrogen when treated with water.

Calcium sulfate, $CaSO_4$, is a naturally occurring calcium salt. It is commonly known in its dihydrate form, $CaSO_4 \cdot 2H_2O$, a white or colourless powder called gypsum. When gypsum is heated and loses three-quarters of its water it becomes the hemi-hydrate $CaSO_4 \cdot \frac{1}{2}H_2O$, plaster of paris. If mixed with water, plaster of paris can be molded into shapes before it hardens by recrystallizing to dihydrate form. Calcium sulfate may occur in groundwater, causing hardness that cannot be removed by boiling. Calcium phosphates occur abundantly in nature in several forms. For example, the tribasic variety (precipitated calcium phosphate), $Ca_3(PO_4)_2$, is the principal inorganic constituent of bones and bone ash. The acid salt $Ca(H_2PO_4)_2$, produced by treating mineral phosphates with sulfuric acid, is employed as a plant food and stabilizer for plastics.

atomic number	20
atomic weight	40.08
melting point	842–8° C
boiling point	1,487° C
specific gravity	1.55 (20° C)
valence	2
electronic config.	2-8-8-2 or $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

calcium deficiency, condition in which an organism fails to receive or to metabolize an adequate supply of the element calcium, the mineral most likely to be deficient in the average diet. In humans and animals, calcium is the chief supportive element in bones and teeth. Calcium salts make up about 70 percent of bone by weight and give that substance its strength and rigidity. About 99 percent of the calcium in the human body is held in the bones and teeth. The remaining 1 percent of calcium circulates in the bloodstream, where it performs a variety of important functions. It helps to contract muscles and helps regulate the contractions of the heart. It plays a role in the transmission of nerve impulses and in the clotting of blood. Calcium is involved in the stimulation of contractions of the uterus during childbirth and in the production of milk. It also regulates the secretion of various hormones and aids in the functioning of various enzymes within the body.

Physiologically, ingested calcium is absorbed in the small intestine and passes from there either into the bloodstream or ultimately into the bones. The most efficient absorption of calcium is dependent on the presence in the body of vitamin D, which is a key ingredient in various hormones that enable calcium to pass from the digestive system into the blood or bones. Similarly, there are optimal ratios of phosphorus to the amount of calcium consumed that permit calcium to be more completely utilized. Hormonal secretions of the parathyroid and thyroid glands (parathyroid hormone and calcitonin, respectively) also help maintain a calcium equilibrium in the blood. These regulatory mechanisms help to prevent a deficiency in calcium from developing in the bloodstream. When such a deficiency does develop, parathyroid hormone acts to transfer calcium from the bones in order to maintain the mineral's all-important presence in the bloodstream. The result of a mild insufficiency of calcium over the long term may be thinning bones (osteoporosis) or the softening of bony tissue (osteomalacia). The faulty metabolism of calcium during childhood may result in rickets (*q.v.*). Recent research points to calcium deficiency as being a possible cause of hypertension (high blood pressure) and of colon cancer.

Severe calcium deficiency, or hypocalcemia, which is defined as a reduction of calcium levels in the bloodstream below a certain normal range, has its own clinical manifestations. The main syndrome is tetany, which involves sensations of numbness and tingling around the mouth and fingertips and painful aches and spasms of the muscles. A clinically detectable deficiency of calcium is a relatively rare finding and is almost always caused either by a deficiency of parathyroid hormone or of vitamin D in the body, *i.e.,* the two chief regulators of calcium metabolism.

Calcium is plentiful in nature. Food sources high in calcium include milk, cheese, yogurt, and other dairy products; leafy green vegetables such as broccoli, turnips, and collard greens; and canned salmon and sardines.

calcrete, also called HARDPAN, calcium-rich duricrust, a hardened layer in or on a soil. It is formed on calcareous materials as a result of climatic fluctuations in arid and semiarid regions. Calcite is dissolved in groundwater and, under drying conditions, is precipitated as the water evaporates at the surface. Rainwater saturated with carbon dioxide acts as an acid and also dissolves calcite and then redeposits it as a precipitate on the surfaces of the soil particles; as the interstitial soil spaces are filled, an impermeable crust is formed.

calculator, machine for automatically performing arithmetical operations and certain mathematical functions. Modern calculators are descendants of a digital arithmetic machine devised by Blaise Pascal in 1642. Later in the 17th century, Gottfried Wilhelm Leibniz created a more advanced machine, and, especially in the late 19th century, inventors produced calculating machines that were smaller and smaller and less and less laborious to use. In the early decades of the 20th century, desktop adding machines and other calculating devices were developed. Some were key-driven, others required a rotating drum to enter sums punched into a keyboard, and later the drum was spun by electric motor.

The development of electronic data-processing systems by the mid-1950s began to hint at obsolescence for mechanical calculators, and the developments of miniature solid-state electronic devices ushered in new calculators for pocket or desk top that, by the late 20th century, could perform simple mathematical functions (*e.g.,* normal and inverse trigonometric functions) in addition to basic arithmetical operations; could store data and instructions in memory registers, providing programming capabilities similar to those of small computers; and could operate many times faster than their mechanical predecessors. Various sophisticated calculators of this type were designed to employ interchangeable preprogrammed software modules capable of 5,000 or more program steps. Some desk-top and pocket models were equipped to print their output on a roll of paper; others even had plotting and alphabetic character printing capabilities.

calculus, branch of mathematical analysis concerned with the rates of change of continuous functions as their arguments change. Two men are now credited with discovering calculus, Sir Isaac Newton of England and Gottfried Wilhelm Leibniz of Germany. For almost a century, development of the subject was inhibited by a bitter controversy over priority between supporters of Newton and those of Leibniz.

A basic concept of calculus is "limit," an idea applied by the early Greeks in geometry. Archimedes inscribed equilateral polygons in a circle. Upon increasing the number of sides, the areas of the polygons (which he could calculate) approach the area of the circle as a limit. Using this result together with a similar idea involving circumscribed polygons, he was able to find the area of the circle as πr^2, in which r is the radius of the circle and π (pi) is a constant that has a value between $3\frac{1}{7}$ and $3\frac{10}{71}$.

The area of an irregularly shaped plate also can be found by subdividing it into rectangles of equal width. If the number of rectangles is made larger and larger, the sum of their areas (found by multiplying base by height) approaches the required area as a limit. The same procedure can be used to find volumes of spheres, cones, and other solid objects. The beauty and importance of calculus is that it provides a systematic way for the exact calculation of many areas, volumes, and other quantities that were beyond the methods of the early Greeks.

Newton's discovery of calculus, legend says, may very well have been inspired by an apple falling from a tree. As an apple falls, it moves faster and faster; that is, it has not only a velocity but an acceleration. Newton expressed this mathematically by supposing that at any stage of its motion the apple drops a small additional distance Δs (delta s) during a brief additional time interval Δt (delta t). Then the velocity is very nearly equal to the distance Δs divided by the time Δt—*i.e.,* $\Delta s/\Delta t$. The exact velocity v would be the limit of $\Delta s/\Delta t$ as Δt gets closer and closer to zero or, as we say, approaches zero. That is,

$$v = \lim_{\Delta t \to 0} \frac{\Delta s}{\Delta t} = \frac{ds}{dt}.$$

The quantity ds/dt is called the derivative of s with respect to t, or the rate of change of s

with respect to t. It is possible to think of ds and dt as numbers whose ratio ds/dt is equal to v; ds is called the differential of s, and dt the differential of t.

Just as velocity is the rate of change, or derivative, of the distance with respect to time, so the acceleration is the rate of change, or derivative, of the velocity with respect to time. Therefore a, the acceleration, would be

$$a = \frac{dv}{dt} = \lim_{\Delta t \to 0} \frac{\Delta v}{\Delta t},$$

where Δv is the increase in velocity that occurs during the interval Δt. Since a is the derivative of v and v is the derivative of s, a is called the second derivative of s:

$$a = \frac{dv}{dt} = \frac{d}{dt}\left(\frac{ds}{dt}\right) = \frac{d^2s}{dt^2}.$$

To find derivatives of s with respect to t, the dependence of s on t must be known; in other words, s must be expressed as a function of t. Usually this functional dependence is stated as a formula relating s and t. That part of calculus dealing with derivatives is called differential calculus.

Given s as a function of t, the derivative (that is, v) of s can be found. Conversely, if v is known it is possible to work backward to get s. This process of finding what is called the anti-derivative of v is begun by rewriting the equation $v = ds/dt$ as $ds = vdt$. The quantity s is here regarded as the anti-differential of ds, denoted by a special symbol called an integral sign:

$$ds = vdt, \int ds = \int vdt \text{ or } s = \int vdt.$$

The last equation specifies s the integral of v with respect to t. That part of calculus dealing with integrals is called integral calculus. Applications of integral calculus involve finding the limit of a sum of many small quantities, such as the rectangular slices of an irregular plane figure.

calculus of variations, branch of mathematics concerned with the problem of finding a function for which the value of a certain integral is either the largest or the smallest possible. Many problems of this kind are easy to state, but their solutions commonly involve difficult procedures of the differential calculus and differential equations.

A brief treatment of the calculus of variations follows. For full treatment, *see* MACROPAEDIA: Analysis (in Mathematics): *Calculus of Variations.*

The isoperimetric problem—that of finding, among all plane figures of a given perimeter, the one enclosing the greatest area—was known to Greek mathematicians of the 2nd century BC.

The term isoperimetric problem has been extended to mean any problem in the calculus of variations in which a function is to be made a maximum or a minimum, subject to an auxiliary condition called the isoperimetric condition, although it may have nothing to do with perimeters. For example, the problem of finding a solid of given volume that has the least surface area is an isoperimetric problem, the given volume being the auxiliary, or isoperimetric, condition. Another example of an isoperimetric problem from the field of aerodynamics is that of finding the shape of a solid having a given volume that will encounter minimum resistance as it travels though the atmosphere at a constant velocity.

Modern interest in the calculus of variations began when in 1696 Johan Bernoulli of Switzerland proposed a brachistochrone problem. Suppose that a thin wire in the shape of a curve joins two points at different elevations. Suppose a bead is placed on the wire at the higher point and allowed to slide under gravity, starting from rest and assuming no friction. The question is: What should be the shape of the curve so that the bead will reach the lower point in the least time?

The problem was solved independently by Johan Bernoulli, his brother Jakob, and Isaac Newton (1642–1727). The basic idea was to set up an integral for the total time of fall in terms of the unknown curve and then vary the curve so that a minimum time is obtained. This technique, typical of the calculus of variations, led to a differential equation whose solution is a curve called the cycloid.

It is possible to formulate various scientific laws in terms of general principles involving the calculus of variations. These are called variational principles and are usually expressed by stating that some given integral is a maximum or a minimum. One example is Hamilton's principle of least action, of importance in the theory of motion. In this case an integral, called an action integral, is to be minimized. This principle, which leads to Newton's laws of motion as a special case, has also been used as a basis for quantum mechanics. Applications of variational principles also occur in elasticity, electromagnetic theory, aerodynamics, the theory of vibrations, and other areas in engineering and science.

Calcutta, Bengali KALIKATA, city, capital of West Bengal state, and former capital (1772–1912) of British India. The nation's largest metropolitan area and a major port, Calcutta is located on the eastern bank of the Hooghly River, an arm of the Ganges, about 96 miles (154 km) upstream from its mouth at the head of the Bay of Bengal. It is the dominant urban centre of eastern India.

A brief treatment of Calcutta follows. For full treatment, *see* MACROPAEDIA: Calcutta.

Although Calcutta is favourably located for trade, its low, swampy, hot, and humid riverbank location is not ideal for human habitation. Eastward from the river the land slopes away to marshes and swamplands. Similar topography on the western bank has confined the metropolitan area to a strip 3 to 5 miles (5–8 km) wide on either bank, although reclamation projects have expanded the limits of usable land to the east, south, and west of the central city. The city has numerous slum areas, occupied by about one-third of the inhabitants. The city's climate is subtropical, with summer monsoons.

Calcutta is the world's largest processor of jute; also important are food processing, hosiery and footwear production, the manufacture of textiles, and the making of iron and steel goods. The coal mines, tea gardens, and industrial concerns of West Bengal and neighbouring states are managed and financed from Calcutta. Chief exports through the city's port are crude steel, pig iron, coal, machinery, gunnies (jute sacking), sugar, and tea. Calcutta is eastern India's financial headquarters, with many foreign banks, several chambers of commerce, and a stock exchange.

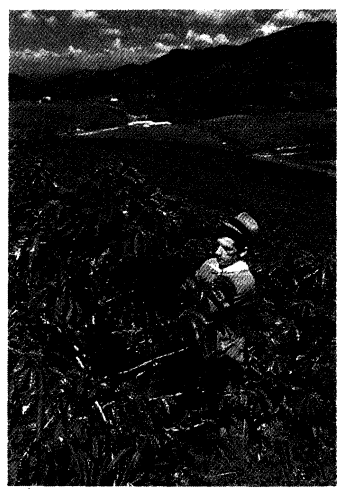
One of the city's chief recreational areas is the Maidan (plain, or park), occupying about 1,300 acres (500 hectares) along the river; major sporting events are held there. Western and Eastern influences mingle in Calcutta's architecture: Victoria Memorial, one of the city's finest buildings, represents a mixture of classical Western and Mughal (Mogul) styles.

Calcutta is a major educational and cultural centre, catering to a cosmopolitan population speaking Bengali, English, Hindi, and Urdu. Higher education is offered by the universities of Calcutta, Jadavpur, and Rabindra Bharati. The Indian Museum is the oldest in India. Other museums offer collections of archaeological and historical artifacts and folk and fine arts. Valuable library collections are housed in the National Library.

Calcutta's streets are mostly narrow and in poor condition. Construction of India's first subway system was begun in Calcutta in 1973; a section in the central area opened in 1986. National highways and railways connect Calcutta to other cities; Sealdah and Howrah stations are the terminals of several railway lines; and air service is provided by the Dum Dum International Airport. Area city, 40 square miles (100 square km); metropolitan area, 533 square miles (1,380 square km). Pop. (1981) city, 3,305,006; metropolitan area, 11,100,000.

Calcutta, University of, state-controlled institution of higher learning founded by the British in India in 1857. Modeled on the University of London, Calcutta was originally a purely affiliating university that offered no actual instruction but was the examining and degree-granting authority for colleges scattered over most of northern India. Since 1904 it has gradually added teaching to its supervisory functions. By the mid-1970s Calcutta was one of the largest universities in the world, with 13 colleges under its direct control and more than 150 affiliated colleges, as well as 16 postgraduate faculties. The faculties of ancient Indian history and culture and of applied mathematics and the institute of radiophysics and electronics are the state-designated centres of advanced study in those fields. The language of instruction is English.

Caldas, *departamento,* west-central Colombia. It is situated in the Cordillera (mountains) Central of the Andes, is bounded by the Magdalena River on the east and the Cauca River on the west, and has an area of 3,046 square miles (7,888 square km). Penetrated by



Coffee plantation in Caldas *departamento,* Colombia
Carl Frank

Spaniards early in the 16th century, Caldas gained prominence as a gold-mining region. It was created a department in 1905.

Coffee is the chief product, but other agricultural products and industry are growing in importance. Mercury, gold, silver, coal, sulfur, zinc, and other minerals are still produced. Caldas is served by railroads, highways (including the Pan-American Highway), and airlines, centring on Manizales (*q.v.*), the departmental capital. Pop. (1985) 838,094.

Caldas da Rainha, town and *concelho* (township), Leiria district, west-central Portugal, north of Lisbon. Its name, meaning "Queen's hot springs," recalls Queen Leonor, who founded a hospital there in 1485. By the end of the 19th century the town had become a popular spa. A tourist centre, Caldas da Rainha is also known for its glazed ceramic pottery. The church of Nossa Senhora do Pópulo, in early 16th-century Manueline style, is notable. Pop. (1981) town, 17,768; *concelho,* 41,483.

Caldecott, Randolph (b. March 22, 1846, Chester, Cheshire, Eng.—d. Feb. 12, 1886, St. Augustine, Fla., U.S.), English artist chiefly known for the gently satirical drawings and coloured book illustrations that won him great popularity.

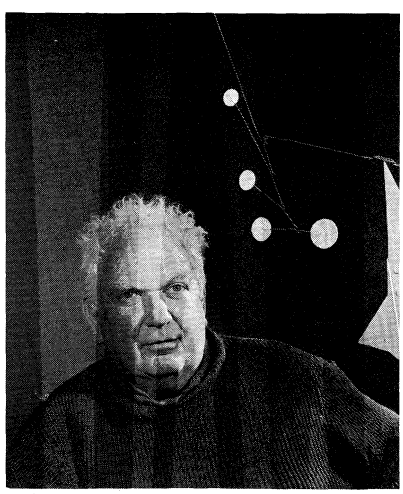
While a bank clerk at Whitchurch, Shropshire, and at Manchester, Caldecott began drawing for local magazines. Through his acquaintance with George Du Maurier he began contributing to the periodical *London Society* in 1871; the next year he settled in London and turned professional, ultimately drawing for *Punch* and *Graphic*, among other periodicals. He increased his skill by painting under Sir Edward Poynter and by sketching and modelling in the studio of J. Dalou.

In 1872 he went with his lifelong friend Henry Blackburn to Germany. His drawings for Blackburn's book, *The Harz Mountains*, fix Caldecott's style in the tradition of Richard Doyle—moderate in distortion and affably satirical. He also illustrated Washington Irving's *Sketch Book* (1875) and *Bracebridge Hall* (1876). These more sophisticated drawings were close to those of Du Maurier and W.P. Frith, though with an original sense of caricature, and they established Caldecott's reputation. His coloured picture books for children included W. Cowper's *John Gilpin* (1878), Oliver Goldsmith's *Elegy on a Mad Dog* (1879) and *The Great Panjandrum Himself* (1885). His works in other media include paintings, metal reliefs, and terra-cottas.

Articles are alphabetized word by word, not letter by letter

Caldecott Medal, annual prize awarded "to the artist of the most distinguished American picture book for children." It was established in 1938 by Frederic G. Melcher, chairman of the board of the R.R. Bowker Publishing Company, and named for the 19th-century English illustrator Randolph Caldecott. It is presented at the annual conference of the American Library Association along with the Newbery Medal for children's literature.

Calder, Alexander (Stirling) (b. July 22, 1898, Lawnton, Pa., U.S.—d. Nov. 11, 1976, New York City), U.S. sculptor best known as the originator of the mobile, a type of kinetic sculpture, the delicately balanced or suspended components of which move in response to motor power or air currents; by contrast, Calder's stationary sculptures are called stabiles. He also produced numerous wire figures, notably for a vast miniature circus.



Calder, photograph by Yousuf Karsh, 1966

© Karsh-Woodfin Camp and Associates

Calder was the son and grandson of sculptors, and his mother was an accomplished painter. Despite growing up in an atmosphere of American academic art, he seems to have had little inclination to become an artist himself. Aside from an unusual amount of travelling and moving around, necessitated in part by his father's health, Calder's youth and interests were typical of middle-class American boys growing up in the early years of the century. His reminiscences of his early activities—which are remarkable for their completeness—have to do largely with family affairs, sports, and relations with his classmates. Perhaps the only indication of his subsequent career lay in his facility for making things and his enjoyment of gadgets.

After study at the Stevens Institute of Technology in Hoboken, N.J., he was graduated in 1919 with a degree in mechanical engineering. For a time he travelled widely and held various engineering jobs. In 1922 he took drawing lessons at a night school in New York City and in 1923 entered the Art Students League, where he was influenced by painters of the New York scene, the so-called Ashcan School, of which the painters John Sloan and George Luks were among the leaders. At this point, his aspirations, like those of many American artists of the time, did not extend much beyond securing a well-paying job in illustration or commercial art. In 1924 he began doing illustrations for the *National Police Gazette*, for which he covered prize fights and the circus.

After several other routine commercial illustrating jobs, Calder decided in 1926 to go to Paris, the world centre for modern art. In Paris, while working on sculpture, he began, for his own amusement, to make toylike animals of wood and wire. Out of these he developed a miniature circus (Whitney Museum of American Art, New York City), performances of which were attended by many of the leading artists and literary figures in Paris. The little circus figures, as well as his interest in continuous line drawings, led Calder to the creation of wire sculptures, such as the figure of a woman seven feet high, entitled "Spring," and "Romulus and Remus," a group that included a she-wolf 11 feet long.

Among the artists he met in Paris through his circus exhibitions, perhaps the most crucial for his subsequent career was the Spanish Surrealist painter Joan Miró. Although Surrealism was reaching its first major peak in the late 1920s, Calder does not seem to have been conscious of the movement; in fact throughout his career he isolated himself from the "art world." With Miró, however, he established an immediate rapport, and a lasting friendship was formed.

In 1930 Calder met the Dutch painter Piet Mondrian and visited his studio, an event that made him suddenly aware of the modern movement in painting and that influenced his work in the direction of the abstract. In the winter of 1931–32 he began to make motor-driven sculptures, consisting of various geometrical shapes. The name mobile was given to them by Marcel Duchamp. Aesthetically, movement, because of the changing relationships among the various elements, gave the sculpture a continually changing composition. The following year, when Calder exhibited similar works that did not move, Jean Arp described them as stabiles, a term that Calder continued to use. Beginning in 1932 most of his mobiles were given their movement by air currents.

In 1931, while fashioning a wedding ring for his marriage, Calder formed an interest in making jewelry. Also in 1931 he produced illustrations for an edition of the *Fables of Aesop*. Illustrations for a number of other books followed in the 1940s.

During the 1930s Calder further developed the concept of the mobile. The first major manifestation of his work was at the Paris World's Fair of 1937, where he created his so-called mercury fountain for the Spanish pavilion. In this sculpture, movement was introduced by a stream of mercury striking a plate that was attached to a swivelling rod. From this point, Calder's reputation expanded continually through annual exhibitions in Europe and America, climaxed by a showing at the Museum of Modern Art in New York City in 1943.

Although Calder's early mobiles and stabiles were on a relatively small scale, he increasingly moved toward monumentality in his later works. One very large stabile organization was an acoustical ceiling, which he designed in 1952 for the auditorium of the Universidad Central de Venezuela in Caracas. In 1961 an exhibition on motion in art, which originated at the Stedelijk Museum in Amsterdam, emphasized the work of Calder and his followers. During the 1960s his accomplishments were recognized through major exhibitions in Kassel, W.Ger.; at the Solomon R. Guggenheim Museum, New York City; and at the Musée d'Art Moderne de la Ville de Paris.

In 1931 Calder was married to Louisa Cushing James, and after their marriage the Calders travelled continually, not only between France and the United States but also to South America and Asia. In 1955 and 1956 they visited India, where Calder created 11 mobiles.

In the 1970s Calder's studio was at Saché, near Tours. There he designed his major stabiles and experimented with free-form drawings and paintings. His normal method with large-scale works was to create a small model, the enlargement of which he supervised at a foundry in Tours. Although Calder lived most of the time in France, he maintained a home and studio in Roxbury, Conn. (H.H.A.)

MAJOR WORKS. "Josephine Baker" (1926; private collection); "Romulus and Remus" (1928; Solomon R. Guggenheim Museum, New York City); "Helen Wills" (1928; collection of the artist); "The Horse" (1928; Museum of Modern Art, New York City); "Spring" (*c.* 1929; Solomon R. Guggenheim Museum); "Portrait of Shepard Vogelgesang" (1930; Shepard Vogelgesang Collection, New York); "Kiki's Nose" (1931; private collection, Paris); "Dancing Torpedo Shape" (1932; Berkshire Museum, Pittsfield, Mass.); "Calderberry Bush" (1932; private collection, New York City); "White Frame" (1934; collection of the artist); "A Universe" (1934; Museum of Modern Art, New York City); "The Circle" (1934; Agnes Rindge Claflin Collection, Poughkeepsie, N. Y.); "Steel Fish" (1934; Virginia Museum of Fine Arts, Richmond, Va.); "Hanging Mobile" (1936; Meric Callery Collection, New York); "Dancers and Sphere" (1936; collection of the artist); "Whale" (1937; Museum of Modern Art, New York City); "Tight Rope" (1937; collection of the artist); "Lobster Trap and Fish Tail" (1939; Museum of Modern Art, New York City); "Spherical Triangle" (1939; collection of the artist); "Thirteen Spines" (1940; collection of the artist); "Black Beast" (1940; collection of the artist); "Hour Glass" (1941; Catherine White Collection, New York); "Cockatoo" (1941; C. Earle Miller Collection, Downingtown, Pa.); "Red Petals" (1942; The Arts Club of Chicago); "Little Tree" (1942; Edgar Kaufmann, Jr., Collection, New York); "Horizontal Spines" (1942; Addison Gallery of American Art, Phillips Academy, Andover, Mass.); "Constellation with Red Object" (1943; Museum of Modern Art, New York City); "The Water Lily" (1945; Pauling Donnelly Collection, Chicago); "Bayonets Menacing a Flower" (1945; Washington University Gallery of Art, St. Louis, Mo.); "Red and White on Post" (1948; collection of the artist); "Jacaranda" (1949; Wallace K. Harrison Collection, New York); "Blériot" (1949; Ida Chagall Collection, Paris); "El Corcovado" (1951; José Luis Sert Collection, Lattingtown, Long Island, N.Y.); "Universe" (1974; Sears Tower, Chicago).

BIBLIOGRAPHY. Alexander Calder, *An Autobiography with Pictures* (1966; rev. ed. 1977), dictated by Calder to his son-in-law Jean Davidson, is perhaps the best picture of the artist as an individual. H.H. Arnason, *Calder* (1967), is a critical biography with photographs by Pedro E. Guerrero

that traces the development of Calder as an artist; H.H. Arnason and Ugo Mulas, *Calder* (1971), is a photographic document with anthology, comments, and quotations from Calder and many friends who knew him throughout his career; Jean Lipman, *Calder's Universe* (1977), is an illustrated biography. This work and the preceding two contain bibliographies by and about the artist.

caldera (Spanish: "caldron"), large bowl-shaped volcanic depression, ranging from a few hundred metres to several kilometres in diameter and rimmed by infacing scarps. Calderas usually, if not always, form by the collapse of the top of a volcanic cone or group of cones because of removal of the support formerly furnished by an underlying body of magma (molten rock). Often this collapse is of a composite cone that rapidly emptied the underlying magma reservoir by voluminous eruptions of pumice and pumiceous ash. At the end of the eruptions the top of the mountain has disappeared, leaving a great hole in its place. It once was believed that the top of the mountain had been blown away by the explosions, but studies showed that only a little of the old rock was thrown out and the rest had dropped down into the void. Later, minor eruptions may build small cones on the floor of the caldera, which may still later fill up with water, as did Crater Lake in Oregon.

Other depressions, of markedly angular, irregular outline, also occur in volcanic districts and commonly are even larger than calderas. Their angular outlines and particularly angular re-entrants (indentations) around their edges indicate that their shape is governed by preexisting tectonic structures (produced by movements of the Earth's crust), such as joints and faults in the underlying older rocks. They therefore are referred to as volcano-tectonic depressions. Their collapse also appears to be at least partly related to the rapid extrusion of large amounts of lava. Examples are the Rotorua-Taupo Basin in New Zealand and the basin of Lake Toba in Sumatra.

Calderdale, westernmost district (borough), metropolitan county of West Yorkshire, England. It has an area of 140 sq mi (364 sq km). Halifax is the district's administrative centre and its largest town. The bleak gritstone Pennine moorlands, with scattered sheep farms and reservoirs, rise to 1,500 ft (457 m) above sea level and are deeply scored by the River Calder and many small tributary creeks. The dale is occupied by 19th-century textile towns between Todmorden and Brighouse. Associated with fine worsted manufactures are engineering and wire making, and there is also carpet manufacture. The sandstone edges of the valleys yield building stone and fireclay at Elland. Pop. (1982 est.) 191,800.

Calderón, Rodrigo, CONDE (count) DE OLIVA, MARQUÉS (marquess) DE SIETE IGLESIAS (b. 1576?, Antwerp—d. Oct. 21, 1621, Madrid), Spanish royal favourite, who enjoyed considerable authority during the ascendancy of the duque de Lerma in the reign of Philip III.

He was the son of an army officer. On the accession (1598) of Philip III, Calderón attached himself to the King's favourite and chief minister, Lerma, by whom he was employed as a secretary. Intelligent and capable, he soon distinguished himself and was repeatedly honoured by the King. There seems little doubt that Calderón exploited his influence for private gain, and he became the main target for the anti-Lerma opposition, headed by the queen, Margarita, for whose death in 1611 he was unjustifiably alleged by his enemies to have been responsible.

The position of Calderón, who was awarded his marquessate in 1614 on returning from a special mission to Flanders, remained strong until Lerma's fall in October 1618. He was then arrested, tortured, and implicated in the murder of a certain Francisco Xuara. After spending more than two years in prison, he was about to be released when Philip III died. This proved fatal for Calderón, for Gaspar de Guzmán, conde de Olivares, the chief minister of the new king (Philip IV), wishing to disassociate his government from the previous regime, caused Calderón's execution. The Spanish saying *Tener más orgullo que don Rodrigo en la horca* ("To be haughtier than Don Rodrigo on the scaffold") derived from his behaviour on that occasion.

Calderón, Serafín Estébanez: *see* Estébanez Calderón, Serafín.

Calderón de la Barca, Pedro (b. Jan. 17, 1600, Madrid—d. May 25, 1681, Madrid), dramatist and poet who succeeded Lope de Vega as the greatest Spanish playwright of the Golden Age. Among his best known secular dramas are *El médico de su honra* (1635; *The Surgeon of His Honour*), *La vida es sueño* (1635; *Life Is a Dream*), *El alcalde de Zalamea* (*c.* 1640; *The Mayor of Zalamea*), and *La hija del aire* (1653; "The Daughter of the Air"), sometimes considered his masterpiece. He also wrote operas and plays with religious and mythological themes.

Early life. Calderón's father, a fairly well-to-do government official who died in 1615, was a man of harsh and dictatorial temper. Strained family relations apparently had a profound effect on the youthful Calderón, for several of his plays show a preoccupation with the psychological and moral effects of unnatural family life, presenting anarchical behaviour directly traced to the abuse of paternal authority.

Destined for the church, Calderón matriculated at the University of Alcalá in 1614 but transferred a year later to Salamanca, where he continued his studies in arts, law, and probably theology until 1619 or 1620. Abandoning an ecclesiastical career, he entered the service of the constable of Castile and in 1623 began to write plays for the court, rapidly becoming the leading member of the small group of dramatic poets whom Philip IV gathered around him. In 1636 the King made him a Knight of the Military Order of St. James. Calderón's popularity was not confined to the court, for these early plays were also acclaimed in the public theatres, and on the death of Lope de Vega (1635) Calderón became the master of the Spanish stage. On the outbreak of the Catalan rebellion he enlisted in 1640 in a cavalry company of knights of the military orders and served with distinction until 1642, when he was invalided out of the army. In 1645 he entered the service of the Duke of Alba, probably as secretary. A few years later an illegitimate son was born to him; nothing is known about the mother, and the idea that sorrow at her death led him to return to his first vocation, the priesthood, is pure surmise. He was ordained in 1651 and announced that he would write no more for the stage. This intention he kept as regards the public theatres, but at the King's command he continued to write regularly for the court theatre. He also wrote each year the two Corpus Christi plays for Madrid. Appointed a prebendary of Toledo cathedral, he took up residence in 1653. The fine meditative religious poem *Psalle et sile* ("Sing Psalms and Keep Silent") is of this period. Receiving permission to hold his prebend without residence, he returned to Madrid in 1657 and was appointed honorary chaplain to the king in 1663.

Aesthetic milieu and achievement. The court patronage that Calderón enjoyed constitutes the most important single influence in the development of his art.

The court drama grew out of the popular drama, and at first there was no distinction in themes and style between the two. The construction, however, of a special theatre in the new palace, the Buen Retiro, completed in 1633, made possible spectacular productions beyond the resources of the public stage. The court plays became a distinctive Baroque genre, combining drama with dancing, music, and the visual arts and departing from contemporary life into the world of classical mythology and ancient history. Thus Calderón, as court dramatist, became associated with the rise of opera in Spain. In 1648 he wrote *El jardín de Falerina* ("The Garden of Falerina"), the first of his zarzuelas, plays in two acts with alternating spoken and sung dialogue. In 1660 he wrote his first opera, the one-act *La púrpura de la rosa* ("The Purple of the Rose"), with all of the dialogue set to music. This was followed by *Celos, aun del aire matan* (1660; "Jealousy Even of the Air Can Kill"), an opera in three acts with music by Juan Hidalgo. As in the Italian tradition, the music was subordinate to the poetry, and all of Calderón's musical plays are poetic dramas in their own right.

Calderón's drama must be placed within the context of the court theatre, with its conscious development of an unrealistic and stylized art form. For two centuries after his death his preeminence remained unchallenged, but the realistic canons of criticism that came to the fore toward the end of the 19th century produced a reaction in favour of the more "lifelike" drama of Lope de Vega. Calderón appeared mannered and conventional: the structure of his plots artificially contrived, his characters stiff and unconvincing, his verse often affected and rhetorical. Although he used technical devices and stylistic mannerisms that by constant repetition became conventional, Calderón remained sufficiently detached to make his characters, on occasion, poke fun at his own conventions. This detachment indicates a conception of art as a formal medium that employs its artistic devices so as to compress and abstract the externals of human life, the better to express its essentials.

In this direction Calderón developed the dramatic form and conventions established by Lope de Vega, based on primacy of action over characterization, with unity in the theme rather than in the plot. He created a tightly knit structure of his own, while leaving intact the formal framework of Lope's drama. From the start he manifested his technical skill by utilizing the characters and incidents of his plots in the development of a dominant idea. As his art matured his plots became more complex and the action more constricted and compact. The creation of complex dramatic patterns in which the artistic effect arises from perception of the totality of the design through the inseparability of the parts is Calderón's greatest achievement as a craftsman. *El pintor de su deshonra* (*c.* 1645; *The Painter of His Own Dishonor*) and *La cisma de Ingalaterra* (*c.* 1627; "The Schism of England") are masterly examples of this technique, in which poetic imagery, characters, and action are subtly interconnected by dominant symbols that elucidate the significance of the theme. Although rhetorical devices typical of the Spanish Baroque style remained a feature of his diction, his verse developed away from excessive ornamentation toward a taut style compressed and controlled by a penetrating mind.

Secular plays. The difficulties that Calderón's art presents to the modern reader have tended to obscure the originality of his themes. Accepting the conventions of the comedy of intrigue, a favourite form on the Spanish stage, he used them for a fundamentally serious purpose: *La dame duende* (1629; *The Phantom Lady*) is a neat and lively example. In *Casa con dos puertas, mala es de guardar* (1629; "A House with Two Doors Is Difficult to Guard") the intrigues of secret courtship

and the disguises that it necessitates are so presented that the traditional seclusion of women on which these intrigues are based is shown to create social disorder by breeding enmity and endangering love and friendship. *No siempre lo peor es cierto* (*c.* 1640; "The Worst Is Not Always True") and *No hay cosa como callar* (1639; "Silence Is Golden") mark the peak of this development: although the conventions of comedy remain, the overtones are tragic. Both plays also implicitly criticize the accepted code of honour. Calderón's rejection of the rigid assumptions of the code of honour is evident also in his tragedies. In the famous *El alcalde de Zalamea,* the secrecy and the vengeance demanded by the code are rejected. This play also presents a powerful contrast between the aristocracy and the people: the degeneration of the aristocratic ideal is exposed, wealth is associated with manual labour, and honour is shown to be the consequence and prerogative of moral integrity regardless of class. Yet Calderón's humanity has been questioned in connection with *El médico de su honra.* The critics who allege that he approves of the murder of an innocent wife because honour demands it overlook the fact that the horror one feels at this deed is precisely what he intended.

A keynote of Calderon's tragic view of life is his deep-seated realization that a man can be responsible through his own wrongdoing for the wrongdoing of another. This realization probably derives from Calderón's own family experience. In *La devoción de la cruz* (*c.* 1625; *Devotion to the Cross*) and *Las tres justicias en una* (*c.* 1637; *Three Judgments at a Blow*), the heart of the tragedy lies in the fact that the greatest sinner is also the most sinned against—in that others, before he was born, had begun to dig his grave. *El pintor de su deshonra* is built on a similar plot.

The fully developed court plays are best represented by *La hija del aire.* This play in two parts dramatizes the legend of Semiramis (the warrior queen of Babylon whose greed for political power led her to conceal and impersonate her son on his accession). It is often considered Calderón's masterpiece. Highly stylized, it conveys a strong impression of violence. It presents, with considerable complexity, the contrast between passion and reason. Passion, in its self-seeking, in its grasping for power and devouring of everything in the urge to domination, breeds disorder and leads to destruction; reason, in its sacrificing of self-interest to justice and loyalty, produces order. This basic contrast underlies the themes of Calderón's last period, its various aspects being expanded in a number of interesting variations, many directly concerned with the positive values of civilization. Though none has the intensity of *La hija del aire,* most exemplify a thoughtful, dignified, and restrained art. Mythological themes predominate, with a more or less allegorical treatment, as in *Eco y Narciso* (1661; "Echo and Narcissus"), *La estatua de Prometeo* (1669; "The Statue of Prometheus"), and *Fieras afemina amor* (1669; "Wild Beasts Are Tamed by Love").

Religious plays. Calderón's vision of the human world in his secular plays is one of confusion and discord arising out of the inevitable clash of values in the natural order. His religious plays round off his view of life by confronting natural values with supernatural ones. The most characteristic of these religious plays, following the tradition established outside Spain by the Jesuit drama, are based on stories of conversion and martyrdom, usually of the saints of the early church. One of the most beautiful is *El príncipe constante* (1629; *The Constant Prince*), which dramatizes the martyrdom of Prince Ferdinand of Portugal. *El mágico prodigioso* (1637; *The Wonder-Working Magician*) is a more complex religious play; *Los dos amantes del cielo* (*The Two Lovers of Heaven*) and *El Joséf de las mujeres* (*c.* 1640; "The Joseph of Womankind") are the most subtle and difficult. The basic human experience upon which Calderón relies for rational support of religious faith is decay and death and the consequent incapacity of the world to fulfill its promise of happiness. This promise is centred in such natural values as beauty, love, wealth, and power that, although true values if pursued with prudence, cannot satisfy the mind's aspiration for truth or the heart's longing for happiness. Only the apprehension of an "infinite Good" can assuage the restlessness of men.

This religious philosophy is given its most moving expression, in terms of Christian dogma, in the *autos sacramentales.* Seventy-six of these allegorical plays, written for open-air performance on the Feast of Corpus Christi, are extant. In them Calderón brought the tradition of the medieval morality play to a high degree of artistic perfection. The range of his scriptural, patristic, and scholastic learning, together with the assurance of his structural technique and poetic diction, enable him to endow the abstract concepts of dogmatic and moral theology with convincing dramatic life. At their weakest the *autos* tend to depend for their effect upon the ingenuity of their allegories, but at their best they are imbued with profound moral and spiritual insight and with a poetic feeling varying from tenderness to forcefulness. *La cena de Baltasar* (*c.* 1630; *Belshazzar's Feast*) and *El gran teatro del mundo* (*c.* 1635; *The Great Theatre of the World*) are fine examples of the early style; the greater complexity of his middle period is represented by *No hay más fortuna que Dios* (*c.* 1652; "There Is No Fortune but God") and *Lo que va del hombre a Dios* (1652–57; "The Gulf Between Man and God"). But his highest achievement in this type of drama is to be found among those *autos* of his old age that dramatize the dogmas of the Fall and the redemption, notably *La viña del Señor* (1674; "The Lord's Vineyard"), *La nave del mercader* (1674; "The Merchant's Ship"), *El nuevo hospicio de pobres* (1675; "The New Hospital for the Poor"), *El día mayor de los días* (1678; "The Greatest Day of Days"), and *El pastor fido* (1678; "The Faithful Shepherd"). Here is found Calderón's most moving expression of his compassionate understanding of human waywardness.

To have found a dramatic form that conveys the doctrines of the Christian faith gives Calderón a special place in literature. But his greatness is not confined to this; the depth and consistency of his thought, his supremely intelligent craftsmanship and artistic integrity, his psychological insight, and the rationality and humanity of his moral standards make him one of the major figures of world drama.

(A.A.P.)

MAJOR WORKS. *Comedias.* Of Calderón's more than 100 *comedias* the following are some of the best known. *La devoción de la cruz* (*c.* 1625; *Devotion to the Cross* in *Four Plays,* trans. by E. Honig, 1961); *La cisma de Ingalaterra* (*c.* 1627); *El purgatorio de San Patricio* (*c.* 1628; *The Purgatory of St. Patrick* in *Calderón's Dramas,* trans. by D.F. MacCarthy, 1873); *El príncipe constante* (1629; *The Constant Prince* in *Six Plays,* trans. by D.F. MacCarthy, rev. by H.W. Wells, 1960); *Casa con dos puertas, mala es de guardar* (1629); *La dama duende* (1629; *The Phantom Lady* in *Four Plays*); *De una causa dos efectos* (*c.* 1631–32); *La banda y la flor* (1632); *Amar después de la muerte* (1633; *Love After Death,* trans. by Roy Campbell, 1960); *La vida es sueño* (1635; *Life Is a Dream,* trans. by Roy Campbell, 1959); *A secreto agravio, secreta venganza* (1635; *Secret Vengeance for Secret Insult* in *Four Plays*); *El médico de su honra* (1635; *The Surgeon of His Honour,* trans. by Roy Campbell, 1960); *Las tres justicias en una* (*c.* 1637; *Three Judgments at a Blow* in *Eight Dramas of Calderón,* trans. by E.E. Fitzgerald, 1906); *El mágico prodigioso* (1637; *The Wonder-Working Magician* in *Six Plays*); *La niña de Gómez Arias* (*c.* 1638); *No hay cosa como callar* (1639); *El alcalde de Zalamea* (*c.* 1640; *The Mayor of Zalamea,* trans. by W.E. Colford, 1958); *El Joséf de las mujeres* (*c.* 1640); *No siempre lo peor es cierto* (*c.* 1640); *El pintor de su deshonra* (*c.* 1645; *The Painter of His Own Dishonor* in *Eight Dramas of Calderón*); *El jardín de Falerina* (1648), the first of Calderón's zarzuelas, plays in two acts with alternating spoken and sung dialogue; *La hija del aire,* 2 parts (1653); *La púrpura de la rosa* (1660), one-act opera; *Celos, aun del aire matan* (1660), three-act opera with music by Juan Hidalgo, some of which has not come to light; *Eco y Narciso* (1661); *Fieras afemina amor* (1669); *La estatua de Prometeo* (1669). For other English translations, see those by D.F. MacCarthy (10 plays and *autos,* 1853–73), rev. by H.W. Wells (1960); and *Eight Dramas of Calderón,* which is freely translated by E.E. Fitzgerald (1906).

Autos sacramentales. Seventy-six of these allegorical plays, written for open-air performance on the Feast of Corpus Christi, are extant. The following are some of the best known: *La cena de Baltasar* (*c.* 1630; *Belshazzar's Feast* in *Six Plays*); *El gran teatro del mundo* (*c.* 1635; *The Great Theatre of the World,* trans. by R.C. Trench, 1856); *No hay más fortuna que Dios* (*c.* 1652); *Lo que va del hombre a Dios* (1652–57); *La viña del Señor* (1674); *La nave del mercader* (1674); *El nuevo hospicio de pobres* (1675); *El pastor fido* (1678); *El día mayor de los días* (1678).

BIBLIOGRAPHY. *Biblioteca de autores españoles,* vol. 7, 9, 12, 14 (1944–45); *Obras completas,* new ed., vol. 1, *Dramas,* vol. 2, *Comedias,* both ed. by A. Valbuena Briones; and vol. 3, *Autos sacramentales,* ed. by A. Valbuena Prat (1960–67). These editions are not scholarly. Annotated editions, of varying quality, are the 5 vol. (1951–56) of *Selected Comedias and Autos* in the *Clásicos Castellanos,* and 3 vol. of *Tragedies,* ed. by F. Ruiz Ramon (1967–69). Scholarly texts are to be found among editions of individual plays, for which see *Calderón de la Barca Studies, 1951–69,* ed. by J.H. Parker and A.M. Fox, pp. 25–59 (1971).

The only attempt at a full biography is E. Cotarelo y Mori, *Ensayo sobre la vida y obras de D. Pedro Calderón de la Barca* (1924). The best general studies are: of the *Autos,* A.A. Parker, *The Allegorical Drama of Calderón* (1943, reprinted 1968), and E. Frutos, *La filosofía de Calderón en sus Autos Sacramentales* (1952); of the *Comedias,* A.E. Sloman, *The Dramatic Craftsmanship of Calderón* (1958), and *Critical Essays on the Theatre of Calderón,* ed. by B.W. Wardropper (1965). Wardropper's study also includes British and American criticism of Calderón's works. The principles of an Anglo-American school of criticism are discussed by R.D.F. Pring-Mill in *Litterae Hispanae et Lusitanae,* ed. by H. Flasche (1968). James E. Maraniss, *On Calderón* (1978), argues that Calderón's themes of love, honour, and purity of descent reflect the circumstances of the dramatist's times.

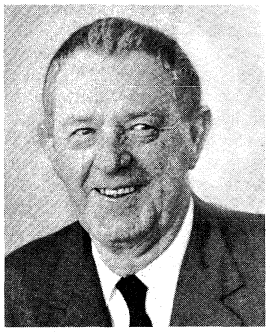
Caldey Island, Caldey also spelled CALDY, Welsh YNYS BŶR, island in Carmarthen Bay of the Bristol Channel, South Pembrokeshire district, Dyfed county, Wales. It lies 2¼ miles (3½ km) south of the port of Tenby. The island is 1½ miles long and 1 mile across at its widest. From at least the 6th century, when it was inhabited by Celtic monks, Caldey has been associated with religious communities; and in 1906 it was bought by Anglican Benedictines, who built the present monastery and abbey. But since 1928 they have been succeeded by Trappists from Belgium, who farm the island and make perfumes from herbs they grow. There are also a small village and a lighthouse on the island. Pop. (1981) 48.

Caldwell, city, seat (1892) of Canyon County, southwestern Idaho, U.S., on the Boise River. It originated (1883) as a construction camp for the Oregon Short Line Railroad and was named for Alexander Caldwell, the railroad president. Lake Lowell (formerly Deer Flat Reservoir), a unit in the Boise Irrigation Project, is to the south. The community developed as a processing and shipping point for diversified farm products but has acquired some

industry, notably, the manufacture of mobile homes. It is the seat of the College of Idaho (1891). Inc. 1890. Pop. (1984 est.) 18,310.

Caldwell, borough, Essex County, northeastern New Jersey, U.S. It lies a few miles northwest of Newark. Settled in the 1780s and incorporated in 1892, it is known as the birthplace of Grover Cleveland, the only U.S. president born (1837) in New Jersey. His birthplace, a clapboarded Presbyterian parsonage, is preserved as a museum and state historic site. Caldwell College, operated by the Sisters of St. Dominic, was established in 1939. The borough is mainly residential and has garden nurseries; airplane engines, plastics, and wire and paper products are manufactured there. Pop. (1984 est.) 7,505.

Caldwell, Erskine (b. Dec. 17, 1903, Coweta County, Ga., U.S.—d. April 11, 1987, Paradise Valley, Ariz.), American author whose unadorned novels and stories about the rural poor of the American South mix violence and sex in grotesque tragicomedy. His works



Caldwell
By courtesy of Little, Brown & Co.

achieved a worldwide readership and were particularly esteemed in France and the Soviet Union.

Caldwell's father was a home missionary who moved frequently from church to church in the clay hills of central Georgia. While accompanying his father, Caldwell acquired a deep familiarity with the mentality and dialect of the impoverished sharecroppers that his father ministered to. After irregular early schooling, he attended Erskine College, Due West, S.C., and the University of Virginia but did not graduate.

He settled in Maine in 1926, determined to work seriously as a writer of fiction. Fame arrived with *Tobacco Road* (1932), a highly controversial novel whose title grew to be a byword for rural squalor and degradation. A dramatization of *Tobacco Road* by Jack Kirkland in 1934 ran for seven and a half years on the New York stage and became a staple of the American theatre, with its tragicomic picture of Jeeter Lester, his family, and his neighbours. Caldwell's reputation as a novelist largely rests on *Tobacco Road* and on *God's Little Acre* (1933), another best-selling novel featuring a cast of hopelessly poor and degenerate whites in the rural South. Among his other more important works are *Trouble in July* (1940); the episodic narrative *Georgia Boy* (1943), a well-told story of boyhood; the literary autobiography *Call It Experience* (1951); and *In Search of Bisco* (1965).

Caldwell provided the text and his wife-to-be, Margaret Bourke-White, provided the photographs for a powerful documentary book about the rural South entitled *You Have Seen Their Faces* (1937). They collaborated on two more such picture-and-text books, one on Czechoslovakia and one on the Soviet Union. Caldwell worked overseas as a journalist during World War II, wrote screenplays in Hollywood, and continued to produce works of fiction and remembrance in the latter part of his career.

Caldwell' s later novels attracted little critical interest. Although his fellow Southern novelist William Faulkner considered him among the five best contemporary American writers, most American critics generally have been more grudging in their praise.

Caldwell, Sarah (b. March 6, 1924, Maryville, Mo., U.S.), American opera conductor, producer, and impresario, noted for her innovative productions of challenging and difficult works.

A talented violinist from an early age, Caldwell was educated at the University of Arkansas and the New England Conservatory of Music, Boston. She then served as chief assistant to Boris Goldovsky at the New England Opera Company for 11 years, and in the meantime she studied and taught opera at the Berkshire Music Center at Tanglewood, Mass. She headed the Boston University Opera Workshop from 1953 to 1957, and in 1957 she founded a permanent opera group, which eventually became known as the Opera Company of Boston, for that city.

As conductor and producer there, Caldwell established a reputation for producing inventive variants of standard works; her company gave the original performance versions of Giuseppe Verdi's *Don Carlos* and Boris Mussorgsky's *Boris Godunov*. She also produced the American premieres of such contemporary operas as Arnold Schoenberg's *Moses und Aron,* Luigi Nono's *Intolleranza,* and Paul Hindemith's *Mathis der Maler.* Her pursuit of meaningful character interpretations and her concern for both musical quality and visual appeal drew to her productions many of the greatest opera singers of the time. In 1976 Caldwell became the first woman conductor of a performance by the Metropolitan Opera in New York City, conducting Verdi's *La Traviata* with Beverly Sills in the title role. She also conducted performances by several major symphony orchestras.

Caldy Island (Wales): *see* Caldey Island.

Caleb, in the Old Testament, one of the spies sent by Moses from Kadesh in south Palestine to spy out the land of Canaan. Only Caleb and Joshua advised the Hebrews to proceed immediately to take the land; for his faith Caleb was rewarded with the promise that he and his descendants should possess it (Numbers 13–14). Subsequently Caleb settled in Hebron (Kiriatharba) after driving out the three sons of Anak; he gave his daughter Achsah to Othniel, his brother, who took nearby Debir (Joshua 15:13–19; *cf.* Joshua 14:6–15; Judges 1:10–20).

The stories of Caleb probably represent the movements of a clan that invaded Palestine from the south, settled in the region of Hebron and southward, and eventually became absorbed in the tribe of Judah. Mention of this clan arises when Caleb is referred to as "the son of Jephunneh the Kenizzite" and when his brother Othniel is called a "son of Kenaz." That this clan was eventually absorbed into the tribe of Judah is indicated by the fact that Caleb is described as being from the tribe of Judah in Numbers 13:6 and 34:19, and that Judah in the later tradition was considered to have given Hebron to Caleb (Judges 1, 10, 20). In the genealogies of 1 Chronicles 2, Caleb is apparently a descendant of Judah. Since the word *caleb* means dog, some scholars believe the dog was originally the totem of the clan.

calèche (carriage): *see* calash.

Caledon River, tributary of the Orange River in southeastern Africa. It rises in the Drakensberg, on the Lesotho–South Africa border, and flows generally southwest, forming most of the boundary between Lesotho and the Orange Free State, South Africa. Maseru, capital of Lesotho, lies on the river. The Caledon leaves Lesotho near Wepener, Orange Free State, and flows through southeastern Orange Free State to join the Orange River near Bethulie after a course of 300 miles (480 km). Its valley has one of the greatest temperature ranges in South Africa and is a prolific corn- (maize-) producing area.

Caledonia, historical area of north Britain beyond Roman control, roughly corresponding to modern Scotland. It was inhabited by the tribe of Caledones (Calidones). The Romans first occupied the district under Agricola in AD 82 after winning a decisive battle at Mons Graupius. They established a legionary fortress at Inchtuthil (near Dunkeld, in Perth and Kinross district, Tayside region) as well as several auxiliary forts in strategic highland passes. But they were forced to evacuate Inchtuthil and all the sites north of the Earn River *c.* AD 90 and all of Scotland during the rule of Trajan (AD 98–117).

Although the frontier between Roman territory and Caledonia was fixed south of the Cheviot Hills by the emperor Hadrian, the Romans subsequently pushed the frontier northward again; about AD 142 they reannexed the Firth of Forth, building the Antonine Wall to guard the new border. They took over the area north of the Cheviot Hills *c.* 180–185 and made temporary military occupations of regions farther to the north in 209 and 296. Excavations of the area have revealed native crannogs (lake dwellings) and weems (underground stone houses) containing Roman objects of trade.

Caledonian Canal, waterway running southwest to northeast across the Great Glen fault of northern Scotland and connecting the Irish Sea with the North Sea. In 1773 James Watt was employed by the British government to make a survey for such a canal, which would link together a chain of freshwater lakes including Ness, Oich, and Lochy. Construction was begun in 1803 under the direction of Thomas Telford, and the canal was opened for navigation in 1822, although it was not completed until 1847. From the northeastern entrance on Moray Firth to the southwestern entrance at Lake Linnhe, the canal's total length is about 60 miles (100 km), that of the artificial channels being about 23 miles (37 km). Formerly of great economic importance, the canal is now used only by fishing and pleasure craft because it is too small to accommodate modern oceangoing vessels.

Caledonian orogeny, an Early Paleozoic episode of mountain building in Europe. Tectonism (deformation of the Earth's crust) folded and thrust segments of the Caledonian Geosyncline and produced a prominent range of mountains that extended from southern Wales through Scotland and through the Scandinavian countries.

All through the Early Paleozoic, relatively minor orogenic episodes affected the Caledonian Geosyncline, but late in the Silurian Period (about 400,000,000 years ago) these minor episodes culminated in a profound orogeny that ended the geosynclinal phase of deposition. The Caledonian orogeny established a northeast–southwest structural trend that is paralleled across northern Europe and can be seen in the Ardennes and Sudeten massifs. Intense Caledonian deformation also affected Early Paleozoic rocks in Spitsbergen and Bear Island; folding and plutonic activity affected the Angaran and Uralian geosynclines of the Soviet Union.

Major changes in European geography resulted from the Caledonian orogeny. A vast land area was produced that included the now elevated Caledonian Geosyncline and the Baltic Shield; the Devonian Old Red Sandstone was deposited on this landmass.

calendar, any system for dividing time over extended periods, such as days, months, or years, and arranging such divisions in a definite order. A calendric system is essential for regulating the basic affairs of civil life—*e.g.*, agricultural, business, and domestic—and for reckoning time for religious observances and scientific purposes.

A brief treatment of calendars follows. For full treatment, *see* MACROPAEDIA: Calendar.

There are several standard units common to virtually all calendric systems. The day is the fundamental unit of computation in any calendar. It is to some extent a natural division of time, but its subdivision into a number of equal intervals of, for example, 24 hours is purely artificial.

The week, too, is an artificial division of time and cannot be correlated with any astronomical or natural phenomena except insofar as it is a closed cycle of days. The seven-day week that is now universally used may have been derived from the mystical significance attached to the number seven. Support for this view may perhaps be derived from the use of the names of gods and goddesses for each of the days (*see* week).

The month is a calendric period derived from lunation, the time interval in which the Moon completes a full cycle of its phases. This period, known as the synodic month, consists of 29.53059 days. As the earliest adopted of the longer calendar periods, it had a significance in religious observance. The age-old Jewish calendar, for instance, is a lunar one, as are the calendric systems still used by Islām and the Christian Church.

The year is based on the length of time it takes the Earth to orbit the Sun. There are several ways to measure this period, but the most common is the tropical year, which is the interval between successive passages of the Sun through the vernal equinox. The year thus computed consists of 365.242199 mean solar days, each of which is 24 hours 3 minutes 56.55 seconds long. The mean solar day is the average time it takes the Sun to cross the meridian twice.

Unfortunately, the tropical year and the synodic month are incommensurable: 12 lunations come to 354.36706 days, almost 11 days less than a tropical year. In addition, neither the tropical year nor the synodic month is evenly divisible by the length of the day. Therefore, to compile or maintain any calendar that keeps in step with the Moon's phases or with the seasons, it is necessary to insert days at appropriate intervals. These extra days are known as intercalations. The most familiar example of an intercalation is the additional day given to February every fourth year—*i.e.*, leap year.

The origin of the calendric system in general use today—the Gregorian calendar—can be traced back to the Roman republican calendar, which is thought to have been introduced by the fifth king of Rome, Tarquinius Priscus (616–579 BC). Although somewhat similar in style to the dating system of the ancient Greeks, this calendar was more likely derived from an earlier Roman calendar—a lunar calendric system of 10 months—that supposedly was devised around 738 BC by Romulus, traditionally the founder of Rome. The Roman republican calendar consisted of 12 months with a total of 355 days. Like its model, it was basically a lunar system, short by 10¼ days of the 365¼-day tropical year. To keep it in step with the seasons, a special month was supposed to be intercalated between February 23 and 24 once every two years; but because of negligence and political interference, the intercalations were made irregularly. As a result, by 46 BC the calendar had become so hopelessly confused that Julius Caesar was forced to initiate a reform of the entire system. Caesar invited the Alexandrian astronomer Sosigenes to undertake this task. Sosigenes suggested abandoning the lunar system altogether and replacing it with a tropical year of 365¼ days. Further, to correct the accumulation of previous errors, a total of 90 intercalary days had to be added to 46 BC, meaning that January 1, 45 BC, occurred in what would have been the middle of March. To prevent the problem from recurring, Sosigenes suggested that an extra day be added to every fourth February. The adoption of such reformatory measures resulted in the establishment of the Julian calendar, which was used for roughly the next 1,600 years.

During that time, however, the disagreement between the Julian year of 365.25 days and the tropical year of 365.242199 gradually produced significant errors. The discrepancy mounted at the rate of 11 minutes 14 seconds per year until it was a full 10 days in 1545, when the Council of Trent authorized Pope Paul III to take corrective action. No solution was found for many years. In 1572 Pope Gregory III agreed to issue a papal bull drawn up by the Jesuit astronomer Christopher Clavius. Ten years later, when the edict was finally proclaimed, 10 days in October were skipped to bring the calendar back in line. The length of the year was redefined as 365.2422 days, a difference of 0.0078 days per year from the Julian count, which produced a discrepancy between them amounting to 3.12 days every 400 years. Clavius had allowed for such a discrepancy in his suggestion that three out of every four centennial years, which would ordinarily be leap years, should be regarded as common years instead. This led to the practice that no centennial year could be a leap year unless it was divisible by 400. Following this rule, 1700, 1800, and 1900 were common years, but 2000 would be a leap year. These reform measures gave rise to an extremely accurate calendric system; the difference between the Gregorian calendar year and the solar year was less than half a minute. The Gregorian calendar, firmly establishing January 1 as the beginning of its year, was widely referred to as the new style calendar, with the Julian known as the old style calendar.

Although the Gregorian calendar is used throughout much of the world today, it was not immediately accepted everywhere. Most of the Roman Catholic states adopted the improved dating system by 1587. Some Protestant states embraced it around the beginning of the 18th century, but a number of others, such as Great Britain and its colonies, did not do so until the 1750s. Japan, China, and the Soviet Union, to name only a few, adopted the Gregorian rules much later. A few dating systems besides the Gregorian calendar still remain in use. The Muslim calendar, for example, has been retained by most Arab countries, while the traditional Hindu and Jewish calendars continue to be used for religious purposes.

calendering, process of smoothing and compressing a material (notably paper) during production by passing a single continuous sheet through a number of pairs of heated rolls. The rolls in combination are called calenders. Calender rolls are constructed of steel with a hardened surface, or steel covered with fibre; in paper production, they typically exert a pressure of 500 pounds per linear inch (89 kilograms per centimetre). Coated papers are calendered to provide a smooth, glossy finish.

Calendering is also widely used in the manufacture of textile fabrics, coated fabrics, and plastic sheeting to provide the desired surface finish and texture.

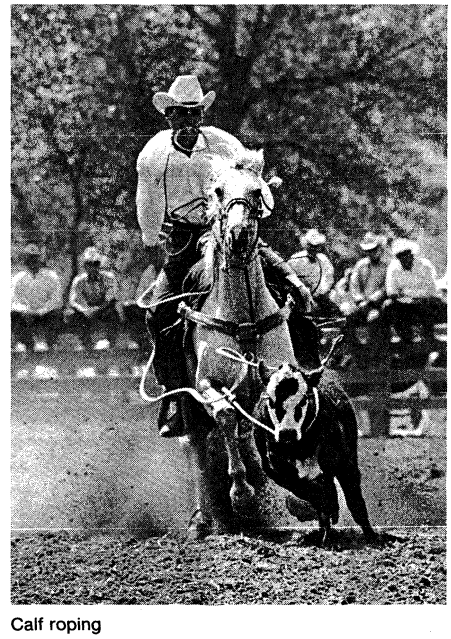
Calepino, Ambrogio (b. *c.* 1440, Bergamo, Lombardy—d. 1510, Bergamo), one of the earliest Italian lexicographers, from whose name came the once-common Italian word *calepino* and English word calepin, for "dictionary." He became an Augustinian monk and compiled a dictionary of Latin and several other languages, published at Reggio nell'Emilia (1502). Later other languages were added until, in an edition published at Basel, Switz. (1590), 11 languages were represented, including Polish and Hungarian.

Caletti-Bruni, Pier Francesco (Italian composer): *see* Cavalli, (Pier) Francesco.

Calexico, city and port of entry, Imperial County, southern California, U.S., located at the southern end of the Imperial Valley and separated only by a fence from Mexicali, Mex. Founded in 1900, Calexico was once a tent town for the Imperial Land Company. It developed as a trade and shipping centre and a port of entry, but tourism is the economic mainstay. Near the city limits is the All-American Canal, which irrigates the valley. The name of the city is a combination of California and Mexico. Inc. 1908. Pop. (1980) 14,421.

calf roping, U.S. rodeo event in which a mounted cowboy chases a calf, lassoes it, dismounts, throws the calf to the ground by hand, and ties up three of its feet with a short rope. He signals completion by raising both hands. The performance is timed, and the contestant with the lowest time wins.

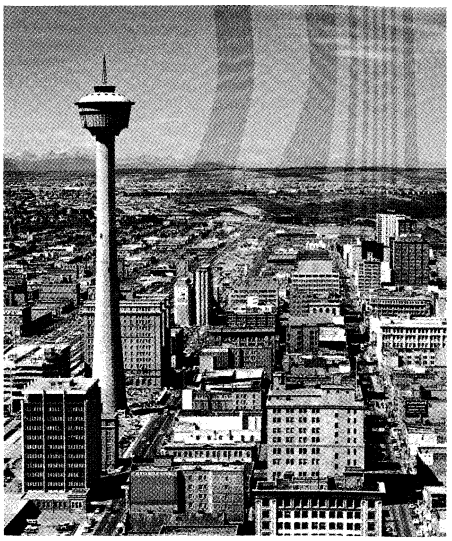
The cowboy's horse must be trained to hold the rope taut without dragging the calf. To start, the cowboy waits in a chute until the calf is released and crosses a line about 10 feet away. If he leaves the chute before the calf crosses the barrier line, he is penalized as much as 10 seconds. If the calf breaks loose before the judges rule the performance completed, the cowboy is disqualified.



Calf roping
E.W. Marugg Photography

calfkill: *see* lambkill.

Calgary, city, southern Alberta, Canada, on the western edge of the Great Plains, at the confluence of the Bow and Elbow rivers, 185 mi (298 km) south of Edmonton. It was founded in 1875 as the North West Mounted Police post of Ft. Brisebois, which was renamed Ft. Calgary in 1876 for a location on the Isle of Mull, Scotland. The arrival of the Canadian Pacific Railway in 1883 aided the community's growth as an agricultural processing and distribution centre, as did the 1904 Western Irrigation District projects in the surrounding area, which thereafter supported a variety of crops and large-scale stock raising.



Downtown Calgary, Alta., dominated by the Calgary Tower
George Hunter

The discovery of the nearby Turner Valley (1914) oil and gas fields, and of the well-known Leduc (1947) fields near Edmonton, greatly stimulated the city's economic expansion. These fields and Calgary's location on the Trans-Canada Highway and two transcontinental railways have made it the second largest metropolitan area in Alberta after Edmonton. Major industries include petroleum refining, flour milling, meat-packing, brewing, lumbering, and the manufacture of building materials and fertilizers. The city is the home of the University of Alberta (1906) and the University of Calgary (1945).

The Calgary Stampede is a world-famous annual exhibition and stampede (rodeo). It was founded in 1912 by Guy Weadick, a former Wyoming cowboy, with the backing of major Alberta cattlemen. The oldest such event in Canada, it has been held annually since 1923. It is a colourful celebration of the Old West, lasting several days, with citizens in Western costume, shows, dancing in the streets, and all the usual, and many unusual, rodeo events. Calgary hosted the Winter Olympic Games in 1988. Inc. town, 1884; city, 1893. Pop. (1986) city, 636,104; metropolitan area, 671,326.

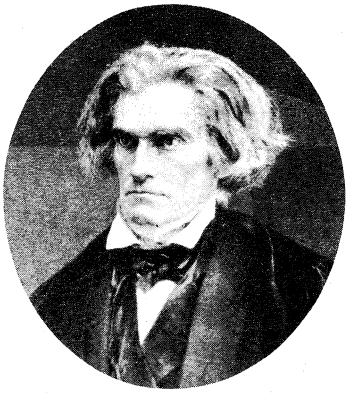
Calheta, Luiz de Vasconcelos e Sousa, 6º conde de (6th count of): *see* Castelo Melhor, Luiz de Vasconcelos e Sousa, 3º conde de.

Calhoun, formerly OOTHCALOGA, city, seat of Gordon County, northwestern Georgia, U.S. It lies near the Oostanaula River, 23 miles (37 km) northeast of Rome. The name was changed from Oothcaloga ("Place of the Beaver Dams") in 1850 to honour U.S. Senator John C. Calhoun of South Carolina. The town was destroyed during the American Civil War (1864) by General William Tecumseh Sherman's Federal army. It is now an agricultural trading centre (dairy, cattle, and poultry); its manufactures include bricks and textiles. Nearby is New Echota, site of the last capital (1825–38) of the eastern Cherokee Indians; the first Indian newspaper, *Cherokee Phoenix,* was printed there in 1828, using the alphabet developed by Sequoyah. Inc. 1852. Pop. (1984 est.) 6,070.

Calhoun, John C(aldwell) (b. March 18, 1782, Abbeville district, S.C., U.S.—d. March 31, 1850, Washington, D.C.), political leader who was U.S. congressman, secretary of war, vice president (1825–32), senator, and secretary of state. He championed states' rights and slavery and was a symbol of the Old South.

Early years. Calhoun was born into a well-to-do Scots-Irish pioneer family that had recently migrated from Pennsylvania to the Carolina Piedmont. Two years after enrolling in a local academy at age 18, he entered the junior class at Yale College, where he was graduated with distinction. After spending a year at a law school at Litchfield, Conn., and further study in the office of a prominent Federalist in Charleston, he was admitted to the bar but abandoned its practice after his marriage in 1811 to his cousin, Floride Bonneau Calhoun, an heiress whose modest fortune enabled him to become a planter-statesman. An ardent Jeffersonian Republican who called for war with Britain as early as 1807, he was elected to the state legislature in 1808 and in 1811 to the national House of Representatives. There he functioned as one of Speaker Henry Clay's main lieutenants, and, in his capacity as chairman of the foreign relations committee, he introduced the declaration of war against Britain in June 1812. His service as majority floor leader during the hostilities led a colleague to call him the "young Hercules who carried the war on his shoulders."

Political career. In the postwar session he was chairman of the committees that introduced the bills for the second Bank of the United States, a permanent road system, and a standing army and modern navy; he also vigorously supported the protective tariff of 1816. Thus, during this period, Calhoun was the intellectual father of U.S. nationalism. In 1817 President James Monroe appointed Calhoun secretary of war, and his distinguished performance in that post, as well as his previous legislative prominence, led his friend John Quincy Adams, then secretary of state, to declare that his Carolina colleague "is above all sectional and factious prejudices more than any other statesman of this Union with whom I have ever acted."



John C. Calhoun, detail of a daguerreotype by Mathew Brady, c. 1849
By courtesy of the Library of Congress, Washington, D.C.

Calhoun had won rapid recognition by his parliamentary skill as one of the leaders of the Republican Party (the old Democratic-Republican Party); yet his eagerness for personal advancement, his glib exuberance in debate, and his egotism aroused an undercurrent of distrust. A former secretary of the treasury, Albert Gallatin, commenting on Calhoun's nomination for president in 1821 by a rump group of Northern congressmen, called him "a smart fellow, one of the first among second-rate men, but of lax political principles and a disordinate ambition not over-delicate in the means of satisfying itself."

To a degree not exceeded by that of any of his contemporaries, Calhoun was consumed by a burning passion to achieve the presidency. He vigorously sought the office three times, and, each time, he thought he had a chance. During each attempt to attain the office, an anonymous eulogistic biography appeared in print. These were largely autobiographies written in the third person.

Champion of states' rights. In the 1830s Calhoun became as extreme in his devotion to strict construction of the Constitution as he had earlier been in his support of nationalism. In the summer of 1831 he openly avowed his belief in nullification, a position that he had three years earlier anonymously advanced in the *South Carolina Exposition and Protest.* Each state was sovereign, Calhoun contended, and the Constitution was a compact among the sovereign states. Therefore, any one state (not the U.S. Supreme Court) could declare an act of Congress unconstitutional. The proponents of the nullified measure, according to the theory, would then have to get an amendment to the Constitution—which requires a two-thirds vote of each house of Congress and ratification by three-fourths of the states—confirming the power of Congress to take such action.

Although the tariff was the specific issue in the nullification crisis of 1832–33, what Calhoun was actually fighting for was protection of the South's "peculiar institution," Negro slavery, which someday might be abolished by a Northern majority in Congress, perhaps with financial compensation to the owners, as the British Parliament decreed in 1833. The tariff, Calhoun put forth in one of his public letters, is "of vastly inferior importance to the great question to which it has given rise . . . the right of a state to interpose, in the last resort, in order to arrest an unconstitutional act of the General Government."

To Calhoun's chagrin, a majority of the Southern states formally and vehemently rejected his abstruse doctrine of nullification. Even Jefferson Davis, who believed in the right of a state to secede from the Union, denied the right of a state to nullify a congressional act.

A genius unto himself, Calhoun lacked the capacity for close friendship and eventually drove most of his associates into active enmity, not least among them President Andrew Jackson. His banishment by Jackson was, however, mainly a matter of bad luck. No one did more to make Jackson president than Calhoun, and his prospects in 1828 were most promising. "I was a candidate for reelection (as vice president) on a ticket with General Jackson himself," he wrote later, "with a certain prospect of the triumphant success of the ticket, and a fair prospect of the highest office to which an American citizen can aspire." But through his wife, Calhoun became involved in a boycott by the wives of the Cabinet members of the wife of the secretary of war, and in the end Jackson fired his whole Cabinet and broke with the vice president. Late in 1832 Calhoun resigned his post, was elected to the U.S. Senate, and vainly debated Daniel Webster in defense of his cherished doctrine of nullification. The last 20 years of his life he spent in the Senate working to unite the South against the radical abolitionist attack on slavery. His efforts were in vain, however. His exuberant defense of slavery as a "positive good" aroused a strong anti-Southern feeling in the free states, and at the same time he never did unify the South.

Assessment. Certainly the American Civil War was too vast an event for the main responsibility to be placed upon any one man, but it may well be argued that Calhoun contributed as much to its coming as did William Lloyd Garrison and Abraham Lincoln.

The man himself is an enigma. A staunch nationalist during the first half of his public life, one who told Alexander Hamilton's son in 1823 that his father's attempt to develop a strong federal government "as developed by the measures of Washington's administration is the only true policy for this country," Calhoun became in the latter part of his career an unwavering champion of states' rights as laid down in the Constitution. Yet he said shortly

before his death, "If I am judged by my acts, I trust I shall be found as firm a friend of the Union as any man in it. . . . If I shall have any place in the memory of posterity it will be in consequence of my deep attachment to it."

After Calhoun's death, his protégé, James H. Hammond, said that

> pre-eminent as he was intellectually above all the men of this age as I believe, he was so wanting in judgment in the managing of men, was so unyielding and unpersuasive, that he never could consolidate sufficient power to accomplish anything great, of himself and [in] due season . . . and the jealousy of him—his towering genius and uncompromising temper, has had much effect in preventing the South from uniting to resist [evil].

Calhoun's two books on government, published posthumously, and his many cogent speeches in Congress have gained him a reputation as one of the country's foremost original political theorists. He preceded Karl Marx in advancing the economic interpretation of history, but most of his basic ideas, particularly that of nullification, he acquired outright from James Madison, who was 30 years his senior. Calhoun is remembered as the defender of minorities, but he had no use for any minority—certainly not labourers or Abolitionists—except the Southern minority. His solution for the problem of the preservation of the Union was to give the South everything it demanded. He was truly devoted both to the Union and to the South, and, fortunately, death took him before he had to choose between them. But with rare insight, in 1850 he told a friend that the Union was doomed to dissolution: "I fix its probable occurrence within twelve years or three Presidential terms."

In his thinking, Calhoun worked the problem back as if from the answer at the end of a mathematics primer. With his objective in mind, he chose a seemingly innocuous premise and then proceeded with hard logic to the desired conclusion. The historian William P. Trent said in the 1890s that he "started with the conclusion he wanted and reasoned back to the premises. . . . Calhoun led thought rather than men, and lacking imagination, he led thought badly."

Calhoun's life was a tragedy in both the Greek and the Shakespearean sense. The gods thirsted after him, but he helped them along. Almost his last words were "The South! The poor South!" The poet Walt Whitman heard a Union soldier say shortly after Appomattox that the true monuments to Calhoun were the wasted farms and the gaunt chimneys scattered over the Southern Confederacy.

(G.M.C.)

BIBLIOGRAPHY. *Writings. Works,* ed. by Richard K. Cralle, 6 vol. (1851–56, reissued 1968); *Papers of John C. Calhoun,* ed. by W. Edwin Hemphill and Clyde N. Wilson (1959–) is in progress; *Annual Report of the American Historical Association for the Year 1899,* vol. 2 (1900), contains his correspondence.

Biographies. Charles M. Wiltse, *John C. Calhoun,* 3 vol. (1944–51), with an excessive pro-Calhoun bias; Margaret L. Coit, *John C. Calhoun: American Portrait* (1950), also laudatory; Gerald M. Capers, *John C. Calhoun, Opportunist: A Reappraisal* (1960), brief and critical; Richard N. Current, *John C. Calhoun* (1963), emphasis on the significance of Calhoun's thought for the present. See also Richard Hofstadter, "Calhoun: The Marx of the Master Class," in *The American Political Tradition and the Men Who Made It,* ch. 4 (1948), an incisive essay; and "From Calhoun to the Dixiecrats," *Social Research,* 16:135–150 (1949).

Calhoun, Lee (b. Feb. 23, 1933, Laurel, Miss., U.S.), U.S. hurdler, the first to win the 100-metre hurdle race in successive Olympic Games.

Calhoun, a student at North Carolina College at Durham, won the gold medal in the 1956 Olympic Games at Melbourne, beating his U.S. teammate Jack Davis, the world-record holder. In 1957 Calhoun was suspended by the Amateur Athletic Union for accepting gifts on a television game show. In 1960 he tied the world record of 13.2 sec, and in the Olympic Games at Rome, Calhoun again won the gold medal. He was also Amateur Athletic Union champion in 1956, 1957, and 1959. Later he became a track coach at Yale University.

Cali, city, capital of Valle del Cauca department, western Colombia, on both sides of the Río Cali at an elevation of 3,327 ft (1,014 m). The city, set in the intermontane sub-tropical Cauca Valley of southwestern Colombia, was founded on July 25, 1536, by Sebastián de Belalcázar. Cali did not develop economically until the 1950s because of its land-locked position; it has since, however, become Colombia's third largest city, after Bogotá and Medellín.

Since 1954 the valley's agricultural and industrial development have been improved by the Cauca Valley Corporation (CVC), an autonomous public body modelled after the Tennessee Valley Authority in the United States. The CVC drained the upper Cauca River, Colombia's second major waterway, to generate electrical power, prevent flooding, and make marginal farmland more suitable for large scale cultivation by irrigation and mechanization. Cali is a major collection and distribution centre for valley products and rivals Bogotá, Barranquilla, and Medellín as an industrial centre.

Local commercially grown agricultural products include sugar cane and coffee, and, more recently, cotton and soybeans. Beef, dairy, and poultry farming are also important.

Printing paper, using locally grown sugar cane bagasse, pharmaceuticals, and chemicals are industrial products.

Cali has been a strategic Colombian transportation centre for the last 400 years and is linked by railroad and highway with major cities of the northeast and the Pacific littoral (Buenaventura). It also possesses a major international airport and a military air base. The capital is a popular tourist locale, attracting many visitors to its annual sugarcane fair and carnival. Cali is an important cultural centre; the Archaeological Museum, Museum of Religious Art, Municipal Theatre, Conservatory of Music, and Institute of Popular Culture are located there. The Western Hemisphere's quadrennial Pan-American games were held at Cali in 1971. Pop. (1981 est.) 1,450,424.

Caliari, Paolo: *see* Veronese, Paolo.

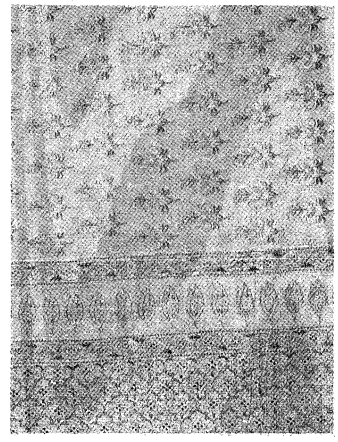
calibre, also spelled CALIBER, in firearms, unit of measure indicating the interior diameter, or bore, of a gun barrel and the diameter of ammunition. In measuring a rifled barrel, calibre is defined as the diameter from the ridges, or lands, formed by the rifling. A weapon's length is sometimes stated in calibres, *i.e.*, the length of the barrel from breechblock to muzzle divided by its bore.

In England, calibre has generally been expressed in thousandths of an inch (*e.g.*, .303), while in the United States, calibre is usually put in hundredths of an inch (*e.g.*, .30). In Europe and most other parts of the world, calibre is expressed in millimetres. Generally, a weapon's calibre is not converted from inches to millimetres or the reverse but is expressed in the measure customary at the gun's place of origin.

caliche (calcareous rock): *see* calcrete.

calico, all-cotton fabric woven in plain, or tabby, weave and printed with simple designs in one or more colours. Calico originated in Calicut, India, by the 11th century, if not earlier, and in the 17th and 18th centuries calicoes were an important commodity traded between India and Europe.

In the 12th century, Hemacandra, an Indian writer, mentions *chhimpa,* or calico prints, decorated with *chhapanti,* or a printed lotus



Detail of an Indian calico print from Gujarāt, 18th century; in the Prince of Wales Museum of Western India, Bombay

P. Chandra

design. The earliest fragments to survive (15th century) have been found not in India but at Fusṭāṭ, in the neighbourhood of Cairo. The examples, resist-dyed (in which parts of the fabric to be left undyed are covered with a substance that resists the dye) and block-printed, are of Gujarāti manufacture. In the Mughal period the chief centres of calico printing were in Gujarāt, Rājasthān, and in Burhānpur, in the Khāndesh region of Madhya Pradesh. Ahmādābād, another centre, specialized in cheaper printed cottons.

In the export trade, patterns pleasing to foreign taste were used, but for home consumption simpler designs, consisting of small flowers and pinecone, diaper (allover), and geometrical patterns, were most popular. Gold tinselling was sometimes used to enhance the sumptuousness of the material. Printed calicoes were generally used for hangings and bedcovers, as well as for dresses in England, but in India the material was generally used only for garments. Saris, the most common article of the Indian woman's dress, were almost always printed.

In calico weaving one set of warp threads is woven one-over and one-under with one set of weft threads. Calico fabrics are usually woven in the gray state; *i.e.,* in the natural colour of the raw cotton staple.

A considerable amount of calico is bleached, dyed, and printed for every conceivable household use and for articles of clothing. Generally, calicoes are in two colours, one for the ground and the other for the figure or design. The ground colour is usually piece-dyed in some solid colour and the design printed on the cloth later by means of a revolving cylinder on which the design has been stamped or cut out. Calico fabrics include an infinite variety of textures and qualities according to the different uses for which they are intended, ranging from fairly fine and sheer to those of coarser and stronger textures.

calico bass, popular North American game and food fish. *See* crappie.

Calicut (India): *see* Kozhikode.

Calidris, bird genus in the family Scolopacidae (order Charadriiformes), which includes the shorebirds known as dunlin, knot, and sanderling (*qq.v.*). Some sandpipers are also classified as *Calidris* (*see* sandpiper).

California, constituent state of the United States of America lying on the Pacific Ocean

and bounded by Oregon on the north, Nevada and Arizona on the east, and the Mexican state of Baja California Norte on the south. The capital is Sacramento. The third largest state in area (after Alaska and Texas), it extends for about 800 mi (1,300 km) from north to south and 250 mi from east to west.

The following article summarizes the administrative history, geography, demographic patterns, economy, and culture of modern California; for additional treatment of its geography and history, *see* MACROPAEDIA: United States of America: *California*.

The earliest inhabitants of California were Indians who, unlike other North American Indian groupings, had no centralized governmental structures. Instead, each group had its own independent territorial and political units that may be termed tribelets. At the time of initial European exploration the major language groupings in the area were the Na-Dené, Hokan, Penutian, and Aztec-Tanoan.

The region received scant attention from Europeans for more than three centuries after its first sighting in 1542 by the Spanish navigator Cabrillo. The Franciscan friar Junípero Serra established the first mission at San Diego in 1769. The 21 missions established by Serra and his successors drew large Indian populations and were centres for farming and ranching. When Mexico became independent from Spain in 1821, the mission properties were parcelled out to political favourites by the government. The first organized group of U.S. settlers arrived by wagon train from Missouri in 1841. In 1846 American settlers at Sonoma seized control and proclaimed an independent California republic. The U.S. flag was raised at Monterey during the same year and following the end of the Mexican War in 1848, the territory was ceded to the United States. The discovery of gold caused immediate, extensive population growth, and in 1850 California became the 31st state.

Physiographically California can be divided into four main regions: (1) the coastal mountain ranges, extending 20 to 40 mi inland; (2) the Sierra Nevada, running 430 mi north to south and rising above 14,000 ft (4,300 m); (3) the Central Valley, containing the San Joaquin and Sacramento rivers; and (4) the Basin and Range Province containing the southeastern deserts. Within 85 mi of each other lie Mt. Whitney and Death Valley, respectively the highest (14,494 ft [4,418 m]) and lowest (282 ft [86 m] below sea level) points in the 48 conterminous states.

The California climate is very diverse owing to the great latitudinal and wide-ranging physiographic extents. The moderate coastal climate has been a major factor in the concentration of settlement along the coast, where temperatures seldom exceed 90° F (32° C) or drop to freezing. The Colorado Desert of southeastern California has summer temperatures up to 130° F (54° C), with annual rainfall averaging 2 to 3 in. (50 to 75 mm). Redwood forests thrive in the northwestern coastal ranges where annual rainfall exceeds 70 in. and annual temperatures average 55° F (13° C). Climate changes rapidly with the altitude extremes, and the coastal cities are only hours away from mountain skiing or desert sports.

Between 1860 and 1960 California's population doubled on the average of once every two decades, and by 1970 it had become the nation's most populous state. Although predominantly white, the ethnic mix is very pronounced. Of the 50 states California has the largest populations of Spanish speakers, American Indians, Chinese, Filipinos, Japanese, Koreans, and Vietnamese, and the second largest populations of blacks and Asian Indians. The urban population exceeds 91 percent, a higher ratio than any other state. More than three-quarters of the population lives in the three largest urban complexes—Los Angeles–Long Beach–Anaheim, San Francisco–Oakland–San Jose, and San Diego.

In economic terms California is more aptly compared with nations than with other U.S. states. The total value of its goods and services is surpassed only by the United States as a whole, the Soviet Union, West Germany, France, and Japan. It is the nation's leading agricultural producer. About 8,000,000 of its 9,500,000 ac (3,250,000 of 3,850,000 ha) of cropland is irrigated. In nearly 50 crop and livestock commodities California production exceeds that of any other state, and for some specialty crops, California is the sole domestic source. Important farm products in which it ranks first are almonds, broccoli, dates, figs, flowers and nursery products, grapes, lemons, lettuce, peaches, prunes, strawberries, sugar beets, tomatoes, walnuts, and eggs. It ranks second in cotton, oranges, rice, milk, turkeys, and wool.

Petroleum and natural gas are the leading mineral resources. Boron, cement, and sand and gravel are also important. The largest manufacturing sector is aerospace-defense. Transportation equipment, processed food, electric and electronic equipment, and machinery are the most important manufactured products. An enormous economic impact is made by the spending each year of millions of tourists from other states and countries.

California has the greatest concentration of motor vehicles in the world and the most extensive system of multilane divided highways. The development of mass transit, however, with the sole exception of the Bay Area Rapid Transit (BART) of the San Francisco area, has been neglected, leaving urban transit wholly to buses and private cars, with the consequence of enormous problems of smog and air pollution. Air service, especially along the coastal corridor, is extensive. Transport of goods is primarily by trucks.

Lavish expenditures have been made to support theatre, dance, symphony, opera, and art. California attracts some of the finest artists and performers, and a great share of those with aspirations to be such. Hollywood, with its movie and television industry, continues to be an international symbol of glamour.

California's higher education system is oriented toward tax-supported, public institutions. Interactions with private industry in the areas of research and development have contributed heavily to its economic growth. The outstanding University of California and California State University systems have a combined enrollment of 500,000. Some 250,000 students are enrolled in private universities, many of them of the highest quality, and another 1,250,000 attend community colleges. Area 158,693 sq mi (411,013 sq km). Pop. (1980) 23,667,826.

California, Gulf of, also called SEA OF CORTÉS, Spanish GOLFO DE CALIFORNIA, or MAR DE CORTÉS, large gulf of the eastern Pacific Ocean in the northwestern coast of Mexico. There are two schools of thought as to the origin of the gulf. One holds that it is structurally a part of the Pacific; the second, that the mountainous peninsula of Baja California is slowly pulling away from the continent as it moves north along the great San Andreas Fault system. Over the last 100,000,000 years; movement has probably totalled 300 mi (480 km). There also may have been some vertical movement forcing the peninsula upward and the gulf downward.

The gulf is about 750 mi long, an average of 95 mi wide (about 200 mi at its mouth), and has a total surface area of 62,000 sq mi (160,000 sq km). It is divided into two sections separated by a narrowing marked by the large islands of Angel de la Guarda and Tiburón. The northern portion is shallow, seldom exceeding 600 ft (180 m) in depth. In the south are several depressions, the deepest of them reaching to more than 10,000 ft. A powerful tidal bore rushing between the two creates the treacherous Salsipuedes Basin, long an obstacle to navigation. The gulf receives the Colorado River through a large delta at its head and the Fuerte, Mayo, Sinaloa, Sonora, and Yaqui rivers across a wide coastal plain from the east. Ports along its shores include La Paz, on Baja California peninsula, and Guaymas, on the mainland Mexican coast. There are many smaller ports that have sport-fishing fleets depending upon game fishing in the gulf. Some pearling is done along the southwest coast.

An expedition commanded by Nuñez de Guzmán and dispatched by the Spanish conquistador Hernán Cortés reached the gulf in 1532 but did not realize that it was a gulf. Three years later Cortés himself led a second party across the gulf to the peninsula beyond. That California was not an island was not proved until 1539 with the voyage of Francisco de Ulloa. It was he who named the gulf Mar Bermejo (Vermilion Sea) because of the impressive red plankton in its waters.

California, University of, state university with campuses at Berkeley (main campus), Davis, Irvine, Los Angeles, Riverside, San Diego at La Jolla, San Francisco, Santa Barbara, and Santa Cruz. The university was established in 1868 in Oakland. In 1873 it moved to Berkeley, where a comprehensive range of graduate and undergraduate courses is now offered. The Davis campus, a farm in 1905 and then part of the College of Agriculture, became a general campus in 1959. The San Francisco campus, originally the university's Medical Center (1873), has schools of medicine, nursing, dentistry, and pharmacy, the university hospital, and various medical clinics and research organizations. The San Francisco Art Institute and Hastings College of the Law, both affiliated with the university, are also there. The Los Angeles branch (UCLA), now the chief rival of Berkeley, was founded in 1919 as the Southern Branch of the university and received its present title in 1927. It is increasingly graduate in character but gives complete university training. Its facilities include schools of law, medicine, and engineering. The Riverside campus, originally the Citrus Experiment Station (1907), became a general campus in 1959. The San Diego campus (at La Jolla), founded as a marine station, became part of the university in 1912. At this campus are the Scripps Institution of Oceanography and Revelle (1964) and Muir (1967) colleges. A total of 12 undergraduate colleges is planned for the San Diego campus. Santa Barbara (1891) became part of the university in 1944. Santa Cruz and Irvine (1965) feature clusters of small, separate liberal arts colleges as units of the parent institutions. The Los Alamos National Laboratory (formerly called Los Alamos Scientific Laboratory), New Mexico, is operated under contract with the federal government.

California Academy of Sciences, in San Francisco, oldest scientific institution in the western United States (incorporated 1853). The complex of buildings in the Golden Gate Park includes a natural history museum (North American Hall), the Steinhart Aquarium with more than 10,000 specimens, a planetarium, a building displaying African wildlife (Simson African Hall), and a wing with tableaus showing the various cultures of the world (Wattis Hall of Man). In addition to its displays of mammals and birds, North American Hall has undisplayed research collections of reptiles, birds, and mammals and an extensive research library (over 70,000 volumes). The collection of over 3,500,000 mounted

insects in the department of entomology is second only to that of the Smithsonian Institution in the United States. Publications include the magazine *Pacific Discovery*.

California Aqueduct, principal water-conveyance structure of the California State Water Project, U.S., running from the Sacramento River Delta east of San Francisco, south through the San Joaquin Valley, and over the summit of the Tehachapi Mountains, a distance of 273 mi (440 km). At this point it divides into east and west branches, the former terminating some 444 mi from the delta. Sizes of channels vary along the aqueduct, a typical section being a concrete-lined canal 40 ft (12 m) wide at the base, with 30 ft average depth of flow. The California State Water Project, begun in 1960, is designed to yield 4,230,000 ac-ft (5,217,705,000 cu m) of water annually to southern California from sources in the northern portion of the state.

California Current, surface oceanic current, southward-flowing continuation of the Aleutian Current along the west coast of North America between latitudes 48° N and 23° N. The California Current's surface velocity is commonly less than 10 in. (25 cm) per second, transporting about 390,000,000 cu ft (11,000,000 cu m) of water per second above 3,300 ft (1,000 m).

The temperature and salinity of its waters vary with seasonal variations in upwelling, insolation, and flow. The maximum ranges in temperature and salinity from its northern to its southern end are 48° to 79° F (9° to 26° C) and 32.5 to 34.5 parts per thousand, respectively. During the summer, when upwelling is most dominant, a countercurrent below 650 ft develops close to the coast. The cold upwelling water brings rich nutrients to the surface and abundant plankton and animal life is supported.

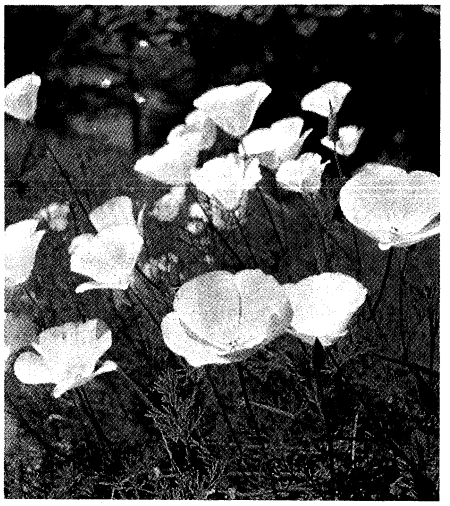
California Institute of Technology, by-name CALTECH, in Pasadena, Calif., a small, select, private university and research institute emphasizing graduate and undergraduate instruction and research in pure and applied science and engineering. It was established as the Throop Polytechnic Institute in 1891 and assumed its present name in 1920. Superbly equipped, and staffed by a faculty of distinguished, creative scientists, Caltech is considered one of the major research centres of the world. Several eminent scientists have worked and taught there, including physicists Robert Millikan, Richard Feynman, and Murray Gell-Mann, astronomer George Ellery Hale, and biochemist Linus Pauling. In 1958 the Jet Propulsion Laboratory at Caltech, operating in conjunction with the National Aeronautics and Space Administration, launched Explorer I, the first U.S. satellite, and subsequently conducted other programs of space and lunar exploration. The astronomical observatories at Palomar Mountain, Mount Wilson, Big Bear Lake, and Las Campanas (Chile) are jointly operated by Caltech and the Carnegie Institution of Washington. Other institute facilities include a seismological laboratory in Pasadena; a marine biological laboratory at Corona del Mar; and a centre near Bishop for the study of radio astronomy.

California laurel (*Umbellularia californica*), also called MYRTLEWOOD, OREGON MYRTLE, or BAY TREE, aromatic evergreen tree of the laurel family (Lauraceae). It occurs on the Pacific coast of North America from Oregon to California and grows about 15 to 25 metres (50 to 80 feet) tall. A handsome tree, it is often grown in gardens and along avenues. The alternate, short-stalked, smooth-edged leaves are oblong or oval and 7.5–12.5 centimetres (3–5 inches) long. When crushed, the leaves have a strong pungent aroma. The yellow-green flowers grow in dense clusters, and the egg-shaped, yellowish-green to purple fruit is about 2.5 cm long.

California laurel (*Umbellularia californica*)
Edward F. Anderson

California nutmeg, also called STINKING NUTMEG, or CALIFORNIA TORREYA (*Torreya californica*), an ornamental evergreen tree of the yew family (Taxaceae), found naturally only in California. Growing to a height of 24 metres (about 79 feet) or more, the tree bears spreading, slightly drooping branches. Although pyramidal in shape when young, it may be round topped in old age. The fissured bark is grayish brown in colour, with orange streaks showing through. The dark-green, rigid leaves are nearly flat and may be 8 centimetres (about 5 inches) long and 3 millimetres (about $^1/_8$ inch) broad, tapering to a spiny point. Leaves, branches, and wood have a pungent, aromatic scent. The aril, or seed covering, is oval, 2 to 3 cm ($^4/_5$ to $1^1/_5$ in.) long, and light green, usually with purple streaks.

California poppy (*Eschscholzia californica*), annual garden plant of the poppy family (Papaveraceae) native to the western coast of North America. It has become naturalized in parts of southern Europe, Asia, and Australia. The flowers, borne on stems 20 to 30 centimetres (8 to 12 inches) long, are usually pale yellow, orange, or cream in the wild, but in cultivation whites and various shades of red and pink have been developed. The foliage is gray green and feathery. The four-petalled, five- to seven-centimetre flowers open only in sunlight. They blossom all summer in northern climes and into the winter in areas with mild winters. Horticultural varieties include tall, dwarf, double, single, and various colours.



California poppy (*Eschscholzia californica*)
Grant Heilman—EB Inc.

californite, jadelike variety of the mineral vesuvianite (*q.v.*).

californium (Cf), synthetic chemical element of the actinide series in Group IIIb of the periodic table, atomic number 98. Not occurring in nature, californium (as the isotope californium-245) was discovered (1950) by Stanley G. Thompson, Kenneth Street, Jr., Albert Ghiorso, and Glenn T. Seaborg at the University of California, Berkeley, as a product resulting from the helium-ion bombardment of curium-242 (atomic number 96) in the 60-inch cyclotron.

All californium isotopes are radioactive; the long-lived isotopes are produced from berkelium-249 or from californium-249. They are: californium-249 (360-year half-life); californium-250 (13-year half-life); californium-251 (800-year half-life); and californium-252 (2.65-year half-life). These isotopes have been used in tracer amounts for investigating the chemistry of californium (which exhibits an oxidation state of +3 in acidic aqueous solution) and for preparing microgram quantities of compounds such as the oxychloride CfOCl, the oxide Cf_2O_3, and the trichloride $CfCl_3$. There is some evidence for a +2 state also. Metallic californium has not yet been prepared.

Californium-252, because 3 percent of its decay occurs by spontaneous fission, is industrially and medically important as a very intense point source of neutrons. One microgram releases 170,000,000 neutrons per minute.

atomic number	98
stablest isotope	251
valence	3
electronic config.	2-8-18-32-28-8-2 or $(Rn)5f^{10}7s^2$

Caligula, byname of GAIUS CAESAR, in full GAIUS CAESAR GERMANICUS (b. Aug. 31, AD 12, Antium, Latium—d. Jan. 24, 41, Rome), Roman emperor from 37 to 41, in succession to Tiberius, who effected the transfer of the last legion that had been under a senatorial proconsul (in Africa) to an imperial legate, thus completing the emperor's monopoly of army command. Accounts of his reign by ancient historians are so biased against him that the truth is almost impossible to disentangle.

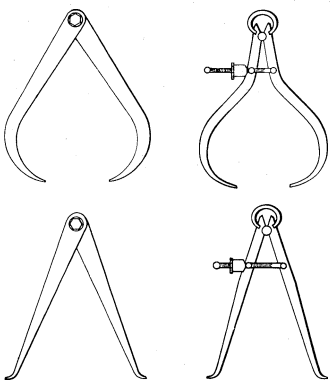
Born Gaius Caesar, he became known as Caligula (Little Boot), a childhood nickname bestowed on him by the soldiers of his father, Germanicus Caesar, nephew and adoptive son of Tiberius. The deaths of his father in AD 19, of his mother, Agrippina the Elder, in 33, and of his two elder brothers, Julius Caesar Nero in 31 and Drusus Caesar in 23, were popularly ascribed to the machinations of Tiberius. Gaius and his three sisters survived. Adopting his father's distinguished name, he became Gaius Caesar Germanicus.

He was severely ill seven months after his accession; after this he restored treason trials, showed great cruelty, and engaged in wild despotic caprice, *e.g.*, he bridged the Bay of Naples with boats from Baiae to Putoli in the summer of 39. In 38 he executed Naevius Sutorius Macro, prefect of the Praetorian Guard, to whose support he owed his accession, and Tiberius Gemellus, grandson of Tiberius, whom he had supplanted in the succession. He made pretensions to divinity and showed extravagant affection for his sisters, especially for Drusilla, who on her death (38) was consecrated Diva Drusilla, the first woman in Rome to be so honoured. Some scholars believe that he intended to establish a Hellenistic-type monarchy after the brother–sister marriages of the Ptolemies of Egypt. Others thought that after his illness he was mad; but much evidence of this is suspect and some—*e.g.*, that he made his horse consul—is untrue. He may have suffered from epilepsy.

Caligula appeared unexpectedly on the Upper Rhine in October 39 and suppressed an incipient revolt, executing Drusilla's widower M. Aemilius Lepidus and Gnaeus Lentulus Gaetulicas, commander of the Upper Rhine armies. After his accession Caligula quickly squandered the vast sums Tiberius had accumulated in the state treasury. To procure the revenues needed to finance his extravagances, he then resorted to the extortion of prominent Roman citizens and the confiscation of their estates.

Early in 40 he marched with an army into Gaul, whose inhabitants he plundered thoroughly. He marched his troops to the northern shoreline of Gaul as a prelude to the invasion of Britain, but then ordered them to collect seashells there, which he called the spoils of the conquered ocean. Caligula pursued his pretensions to divinity further; in the summer of 40 he ordered his statue to be erected in the Temple at Jerusalem, but under the suave persuasion of Herod Agrippa, Caligula countermanded this order. The Roman populace had by now grown weary of this mad tyrant, and several conspiracies were formed against him. In January 41, four months after his return to Rome from Gaul, Caligula was murdered at the Palatine Games by Cassius Chaerea, tribune of the Praetorian guard, Cornelius Sabinus, and others. Caligula's wife Caesonia and his daughter were also put to death. He was succeeded as emperor by his uncle Claudius.

caliper, also spelled CALLIPER, measuring instrument consisting of two adjustable legs or jaws for measuring the dimensions of material parts. The calipers on the right side of the illustration have an adjusting screw and nut and are known as spring calipers; those on the



Calipers

left are an illustration of firm-joint calipers, which are held in place by friction at the joint. Outside calipers measure thicknesses and outside diameters; inside calipers measure hole diameters and distances between surfaces. To check the dimensions of a machined part, the calipers are first adjusted to the required dimension on a ruler or a standard plug or hole gauge; accuracy in calipering depends on the sense of touch of the operator.

A hermaphrodite caliper has one leg bent inward and one straight leg ending in a sharp point; this type of caliper is used for scribing lines at a specified distance from a flat or curved surface.

caliph, also spelled CALIF, Arabic KHALĪFAH ("successor"), ruler of the Muslim community. When Muḥammad died (June 8, 632), Abū Bakr aṣ-Ṣiddīq succeeded to his political and administrative functions as *khalīfah rasūl Allāh,* "successor of the Messenger of God," but it was probably under 'Umar ibn al-Khaṭṭāb, the second caliph, that the term caliph came into use as a title of the civil and religious head of the Muslim state. In the same sense the term was used in the Qur'ān for both Adam and David as the vice-regents of God. Abū Bakr and his three immediate successors are known as the "perfect" or "rightly guided" caliphs (*al-khulafā' ar-rāshidun*). After them the title was borne by the 14 Umayyad caliphs of Damascus and subsequently by the 38 'Abbāsid caliphs of Baghdad, whose dynasty fell before the Mongols in 1258. There were titular caliphs of 'Abbāsid descent in Cairo under the Mamlūks from 1258 until 1517, when the last caliph was captured by the Ottoman sultan Selim I. The Ottoman sultans then claimed the title and used it until it was abolished by the Turkish Republic on March 3, 1924.

After the fall of the Umayyad dynasty at Damascus (750), the title of caliph was also assumed by the Spanish branch of the family who ruled in Spain at Córdoba (755–1031), and it was also assumed by the Fāṭimid rulers of Egypt (909–1171), who claimed to descend from Fāṭimah (daughter of Muḥammad) and her husband, 'Ali.

According to the Shī'ī Muslims, who call the supreme office the "imamate," or leadership, no caliph is legitimate unless he is a lineal descendant of the Prophet Muḥammad. The Sunnīs insist that the office belongs to the tribe of Quraysh (Koreish), to which Muḥammad himself belonged, but this condition would have vitiated the claim of the Turkish sultans, who held the office after the last 'Abbāsid caliph of Cairo transferred it to Selim I.

Consult the INDEX *first*

Caliphate, the political–religious state comprising the Muslim community and the lands and peoples under its dominion in the centuries following the death (AD 632) of the Prophet Muḥammad. Ruled by a caliph (Arabic *khalīfah,* "successor"), who held temporal and sometimes a degree of spiritual authority, the empire of the Caliphate grew rapidly during its first two centuries to include most of Southwest Asia, North Africa, and Spain. Dynastic struggles later brought about its decline, and it ceased to exist with the Mongol destruction of Baghdad in 1258.

The urgent need for a successor to Muḥammad as political leader of the Muslim community was met by a group of Muslim elders in Mecca who designated Abū Bakr, the Prophet's father-in-law, as caliph. Several precedents were set in the selection of Abū Bakr, including that of choosing as caliph a member of the Quraysh tribe. The first four caliphs—Abū Bakr, 'Umar I, 'Uthmān, and 'Ali—whose reigns constituted what later generations of Muslims would often remember as a golden age of pure Islām, largely established the administrative and judicial organization of the Muslim community and forwarded the policy begun by Muḥammad of expanding the Islāmic religion into new territories. During the 630s, Syria, Jordan, Palestine, and Iraq were conquered; Egypt was taken from Byzantine control in 645; and frequent raids were launched into North Africa, Armenia, and Persia.

The assassination of 'Uthmān and the ineffectual caliphate of 'Alī that followed sparked the first sectarian split in the Muslim community. By 661 'Alī's rival Mu'āwiyah I, a fellow member of 'Uthmān's Umayyad clan, had wrested away the caliphate, and his rule established the Umayyad caliphate that lasted until 750. Despite the largely successful reign of Mu'āwiyah, tribal and sectarian disputes erupted after his death. There were three caliphs between 680 and 685, and only by nearly 20 years of military campaigning did the next one, 'Abd al-Malik, succeed in reestablishing the authority of the Umayyad capital of Damascus. 'Abd al-Malik is also remembered for building the Dome of the Rock in Jerusalem. Under his son al-Walīd (705–715), Muslim forces took permanent possession of North Africa, converted the native Berbers to Islām, and overran most of the Iberian Peninsula as the Visigothic kingdom there collapsed. Progress was also made in the East with settlement in the Indus Valley. Umayyad power had never been firmly seated, however, and the caliphate disintegrated rapidly after the long reign of Hishām (724–743). A serious rebellion broke out against the Umayyads in 747, and in 750 the last Umayyad caliph, Marwān II, was defeated in the Battle of Great Zab by the followers of the 'Abbāsid family.

The 'Abbāsids, descendants of an uncle of Muḥammad, owed the success of their revolt in large part to their appeal to various pietistic, extremist, or merely disgruntled groups and in particular to the aid of the Shī'ah, a major dissident party that held that the Caliphate belonged by right to the descendants of 'Alī. That the 'Abbāsids disappointed the expectations of the Shī'ah by taking the Caliphate for themselves left the Shī'ah to evolve into a sect, permanently hostile to the orthodox Sunnī majority, that would periodically threaten the established government by revolt. The first 'Abbāsid caliph, as-Saffāḥ (749–754), ordered the elimination of the entire Umayyad clan; the only Umayyad of note who escaped was 'Abd ar-Raḥman, who made his way to Spain and established an Umayyad dynasty that lasted until 1031.

The period 786–861, and especially the caliphates of Hārūn (786–809) and al-Ma'mūn (813–833), is accounted the height of 'Abbāsid rule. The eastward orientation of the dynasty was demonstrated by al-Manṣūr's removal of the capital to Baghdad in 763 and by the later caliphs' policy of marrying non-Arabs and recruiting Turks, Slavs, and other non-Arabs as palace guards. Under al-Ma'mūn, the intellectual and artistic heritage of Persia was cultivated, and Persian administrators assumed important posts. After 861, anarchy and rebellion shook the empire. Tunisia and eastern Persia came under the control of hereditary governors who made token acknowledgment of Baghdad's suzerainty. Other provinces became less reliable sources of revenue. Shī'ī and similar groups, including the Qarmaṭians in Syria and the Fāṭimids in North Africa, challenged 'Abbāsid rule on religious as well as political grounds.

'Abbāsid power ended in 945, when the Būyids, a family of rough tribesmen from northwestern Persia, took Baghdad under their rule. They retained the 'Abbāsid caliphs as figureheads. The Sāmānid dynasty that arose in Khorāsān and Transoxiana and the Ghaznavids in Central Asia and the Ganges Basin similarly acknowledged the 'Abbāsid caliphs as spiritual leaders of Sunnī Islām. On the other hand, the Fāṭimids proclaimed a new caliphate in 920 in their capital of al-Mahdīyah in Tunisia and castigated the 'Abbāsids as usurpers; the Umayyad ruler in Spain, 'Abd ar-Raḥmān III, adopted the title of caliph in 928 in opposition to both the 'Abbāsids and the Fāṭimids. Nominal 'Abbāsid authority was restored to Egypt by Saladin in 1171. By that time, the 'Abbāsids had begun to regain some semblance of their former power, as the Seljuq dynasty of sultans in Baghdad, which had replaced the Būyids in 1055, itself began to decay. The caliph an-Nāṣir (1180–1225) achieved a certain success in dealing diplomatically with various threats from the East, but al-Musta'ṣim (1242–58) had no such success and was murdered in the Mongol sack of Baghdad that ended the 'Abbāsid line in that city. A scion of the family was invited a few years later to establish a puppet caliphate in Cairo that lasted until 1517, but it exercised no power whatever.

calisthenics, free body exercises performed with varying degrees of intensity and rhythm, which may or may not be done with light hand-held apparatuses, such as rings and wands. The exercises employ such motions as bending, stretching, twisting, swinging, kicking, and jumping as well as such specialized movements as push-ups, sit-ups, and chin-ups.

Calisthenics promote strength, endurance, flexibility, and coordination and augment the body's general well-being by placing controllable, regular demands upon the cardiovascular system. The exercises can function as physique builders or serve as warm-ups for more strenuous sports or exertions.

The exercises arose in the 19th century from the work of the Germans Friedrich Jahn and Adolf Spiess in popularizing gymnastics and were especially expressed by Per Henrik Ling of Sweden as important in the development of education for women. Catherine Beecher, in the United States, was an early advocate of calisthenics and wrote *Physiology and Calisthenics for Schools and Families* (1857). As promoted by Beecher, calisthenics were intended solely for women, but they quickly became an activity for both sexes.

The health benefits of calisthenics were generally recognized by the beginning of the 20th century, and primary and secondary schools throughout the Western world began instituting the exercises as a regular activity. Calisthenics are also a part of military training.

Calistoga, city, Napa County, western California, U.S., just northeast of Santa Rosa, near the head of Napa Valley. Located in an area of natural hot water geysers and mineral and mud springs, it was founded in 1859 as a health spa by Sam Brannan. It supposedly received its name through a promotional twist of its founder's tongue (Calistoga of Sarifornia instead of Saratoga of California!).

The city's "Old Faithful Geyser of California" regularly erupts every 40 minutes. In the vicinity of Mount St. Helena, which lies 8 mi (13 km) northeast, author Robert Louis Stevenson honeymooned by an abandoned silver mine with Fanny Vandegrift Osbourne in the summer of 1880; there he prepared notes for *The Silverado Squatters* (1883). His sojourn is commemorated by a monument, and the area is now a state memorial park. A petrified forest containing giant redwood fossils is located 5 mi west. Calistoga has flourished as a popular resort and acquired important wine industries centred on the Sterling vineyards. Inc. town, 1886; city, 1937. Pop. (1980) 3,879.

Calixtine: *see* Utraquist.

Calixtus, also spelled CALLISTUS, name of Roman Catholic popes and an antipope, grouped below chronologically and indicated by the symbol •.

• **Calixtus I,** SAINT (d. 222, Rome; feast day October 14), pope from 217? to 222, during the schism of Antipope St. Hippolytus. Little was known about Calixtus before the discovery of *Philosophumena* by Hippolytus, a work that is, in part, a pamphlet directed against him.

Calixtus was originally a slave. He was denounced as a Christian by the Jews, who had him sentenced to the Sardinian mines. On his return he was pensioned by Pope St. Victor I. Later he was ordained deacon by Pope St. Zephyrinus and probably became his chief counsellor.

After the death of Zephyrinus (217), Calixtus was elected pope but was opposed by his theological adversary Hippolytus, who attempted to supplant him and who accused him of favouring modalist, or Patripassian, doctrines, both before and after his election. (Calixtus, however, condemned and excommunicated Sabellius [fl. *c.* 215–*c.* 220], the most prominent champion of modalistic monarchianism, called Sabellianism, a heretical doctrine that denied personal distinctions within the Godhead.) Hippolytus also accused him of certain relaxations of discipline: it appears that Calixtus reduced the penitential severities against fornication and adultery, which the church had previously regarded as irremissible except by God.

Calixtus transferred the Roman Christian burial ground from the Via Salaria to the Via Appia (later called the Cemetery of Calixtus, and finally the Cemetery). His own burial place is on the Via Aurelia.

• **Calixtus II,** original name GUIDO, or GUY, OF BURGUNDY, French GUI, or GUY, DE BOURGOGNE (d. Dec. 13/14, 1124, Rome), pope from 1119 to 1124.

A son of Count William I of Burgundy, he was appointed archbishop of Vienne, in Lower Burgundy, in 1088. He became well known as a spokesman of a reform party within the church and as a foe of the policy of the Holy Roman emperor Henry V. When Pope Gelasius II died at Cluny, Calixtus was elected by the cardinals there to succeed him. He held a synod at Reims that condemned lay investiture and excommunicated Henry and the antipope Gregory VIII. In 1120 Calixtus was able to enter Rome in triumph. The German princes soon forced Henry to reconcile with Calixtus, and the Concordat of Worms (1122) terminated the investiture controversy. Calixtus called the first Lateran Council (1123), which ratified the Concordat, securing peace between church and empire for the next 35 years. His bull *Etsi Judaeis* (1120) gave a considerable measure of protection to Roman Jews.

• **Calixtus (III),** original name GIOVANNI DI STRUMA, English JOHN OF STRUMA (fl. late 12th century), antipope from 1168 to 1178, who reigned with the support of the Holy Roman emperor Frederick I Barbarossa.

Calixtus was elected as Antipope Paschal III's successor, in opposition to Pope Alexander III. He was Frederick's protégé until the Treaty of Anagni (1176), which ended the schism in Alexander's favour with the proviso that Calixtus should have an abbacy to compensate for his deposition. Calixtus ignored the treaty and remained obstinate even after the conclusion of the Peace of Venice (1177) between Frederick and the Lombards. In August 1178, however, he submitted to Alexander, who treated him generously.

• **Calixtus III,** original name ALFONSO DE BORJA, Italian ALFONSO DI BORGIA (b. Dec. 31, 1378, near Játiva, Kingdom of Aragon—d. Aug. 6, 1458, Rome), pope from 1455 to 1458.

As a member of the Aragonese court, he reconciled King Alfonso V with Pope Martin V, who appointed (1429) Calixtus bishop of Valencia; Pope Eugenius IV made him cardinal in 1444.

As a compromise between the influential Colonna and Orsini families of Rome, Borgia was chosen pope on April 8. (He was thought unlikely to reign long in view of his advanced age.) Calixtus made a crusade to recover Constantinople from the Turks the first order of his pontificate, but he failed despite heroic efforts. He was successful, however, in raising a pontifical fleet that relieved many of the Aegean islands.

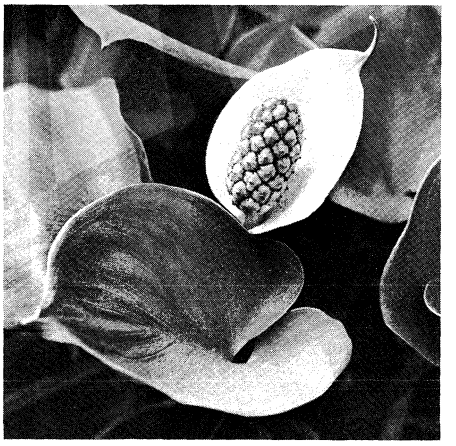
The repulse of the Turks from Belgrade on Aug. 6, 1456, was commemorated by Calixtus when he instituted the feast of the Transfiguration (1457), ordering that it be observed on that day. His pontificate revised St. Joan of Arc's trial by proclaiming her innocence. His personal life was blameless, but he followed the fashion of his time in showering favours

Calixtus III, commemorative medallion by Andrea Guacialoti

By courtesy of the National Gallery of Art, Washington, D.C., the Samuel H. Kress Collection

on his nephew, Rodrigo Borgia, whom he made cardinal and generalissimo of the papal forces and who later became Pope Alexander VI.

calla, either of two distinct kinds of plants of the arum family (Araceae). The genus *Calla*



Arum lily (*Calla palustris*)

Ingmar Holmasen

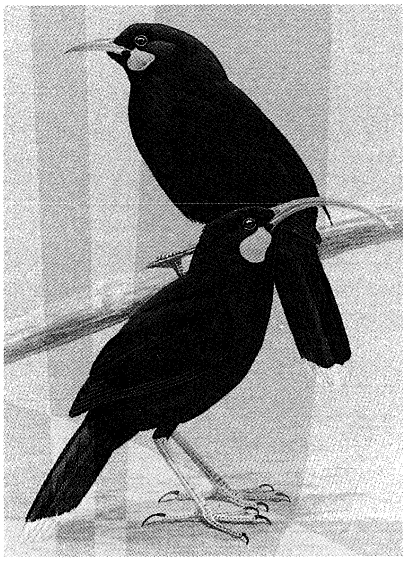
contains one species of aquatic wild plants, *C. palustris*, the arum lily, water arum, or wild calla. As a common name calla is generally given to several species of *Zantedeschia*, often called calla lilies. *C. palustris* occurs widely in wet places in cool, north temperate and subarctic regions. A handsome plant, it has heart-shaped leaves; showy, white, floral leaves (spathes); and clusters of brilliant red berries. The juice of *C. palustris* is violently poisonous. The plant grows readily in mud or shallow water along pond edges or water courses.

Calla (*Zantedeschia aethiopica*)

Javier Palaus Soler—Ostman Agency

Among the calla lilies, all native to South Africa, the most important is the common florist's calla (*Zantedeschia aethiopica*), a stout herb with a fragrant, brilliantly white spathe and arrow-shaped leaves that spring from a thick rootstock. It is a popular indoor plant grown commercially for cut flowers. The golden, or yellow, calla lily (*Z. elliottiana*), with more heart-shaped leaves, and the pink, or red, calla lily (*Z. rehmannii*), with a rosy-purplish spathe, are also grown. The spotted, or black-throated, calla lily (*Z. albomaculata*), with white-spotted leaves, has a whitish to yellow or pink spathe that shades within to purplish brown at the base.

Callaeidae, songbird family, order Passeriformes, collectively called wattlebirds (a name also applied to certain honeyeaters).



Male (top) and female huia (*Heteralocha acutirostris*)
Painting by John P. O'Neill

Callaeids are found only in the deep forests of New Zealand. They are long-tailed, strong-footed, and weak-winged and have fleshy wattles at the corners of the mouth. They eat fruits and occasionally insects, taken on the ground. They build loose, shallow nests, lined with ferns, on ledges or in hollows.

The three callaeid species are the kokako (*q.v.; Callaeas cinerea*), the saddleback (*q.v.; Creadion carunculatus*), and the huia (*Heteralocha acutirostris*). The first two are rare and in danger of extinction; the huia has been extinct since the early 19th century.

The huia was noteworthy for the extreme sexual dimorphism in the shape of the strongly tapered bill, the male's being nearly straight, the female's curving downward. The adaptive value of this differentiation is uncertain, but some authorities believe that the birds engaged in cooperative feeding, the male chiseling rotten wood and the female probing for grubs that were exposed.

Callaghan, (Leonard) James (b. March 27, 1912, Portsmouth, Hampshire, Eng.), British Labour Party politician who was prime minister from 1976 to 1979.

Owing to poverty, Callaghan entered the civil service at age 17 as a tax officer. By 1936 he had become a full-time trade-union official. After serving as a lieutenant in naval intelligence during World War II, he entered Parliament in 1945, representing the Welsh constituency of Cardiff South.

Between 1947 and 1951 Callaghan held junior posts at the Ministry of Transport and at the Admiralty. When Harold Wilson's Labour government was formed in 1964, Callaghan was named chancellor of the Exchequer. In this capacity he helped secure in 1966–67 international agreement to a system called Special Drawing Rights, which in effect created a new kind of international money. He resigned from the Exchequer in 1967, when he was forced to devalue the pound sterling. He then served as home secretary until 1970. In Wilson's second government in 1974, Callaghan was named foreign secretary; and in 1976, upon Wilson's resignation, Callaghan succeeded him as prime minister, largely because the Parliamentary Labour Party considered him the least divisive candidate.

Throughout his ministry (1976–79), Callaghan, a moderate within the Labour Party, tried to stem the increasingly vociferous demands of Britain's trade unions. He also had to secure the passage of unpopular cuts in government spending early in his ministry. His reassuring public manner came to be criticized as complacency when a series of labour strikes in 1978–79 paralyzed hospital care, refuse collection, and other essential services. In March 1979 his government was brought down by a vote of no confidence passed in the House of Commons, the first such occurrence since 1924. At the subsequent general election Callaghan's party was defeated. On Oct. 15, 1980, he resigned as leader of the Labour Party, to be succeeded by Michael Foot.

Callaghan, Morley (Edward) (b. Sept. 22, 1903, Toronto), Canadian novelist and short-story writer.

Callaghan attended the University of Toronto (B.A., 1925) and Osgoode Hall Law School (LL.B., 1928). He never practised law, but became a full-time writer in 1928 and won critical acclaim for his short stories collected in *A Native Argosy* (1929). Later collections of stories include *Morley Callaghan's Stories* (1959) and *No Man's Meat and The Enchanted Pimp* (1978).

The first of more than 10 novels, *Strange Fugitive* (1928), describes the destruction of a social misfit, a type that recurs in Callaghan's fiction. A second characteristic element in his later works is the emphasis on Christian love as an answer to social injustice, as in *Such Is My Beloved* (1934), *They Shall Inherit the Earth* (1935), *The Loved and the Lost* (1951), and *A Passion in Rome* (1961). He published little in the 1940s, turning his hand to playwriting and to work with the Canadian Broadcasting Company. Notable among his later works are *That Summer in Paris* (1963), a memoir of Callaghan's days in Paris and his friendship with F. Scott Fitzgerald and Ernest Hemingway, and *A Fine and Private Place* (1975), the story of an author who wants artistic recognition in his own country. The critic Edmund Wilson referred to Callaghan as the most unjustly neglected writer in the English language.

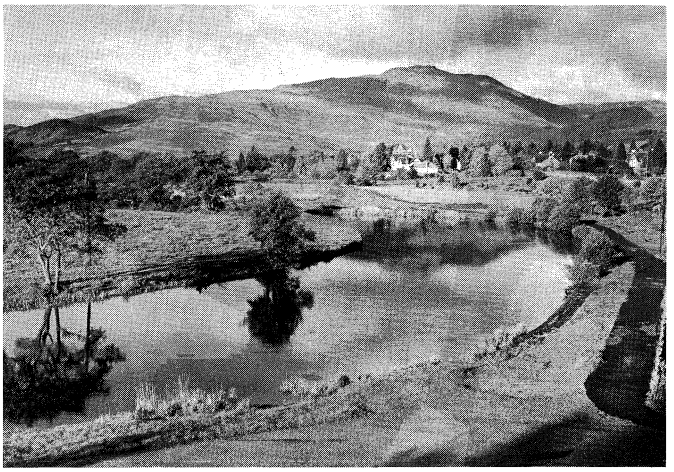
Callahan, Harry (Morey) (b. Oct. 22, 1912, Detroit), American photographer noted for his innovative photographs of commonplace objects and scenes.

Callahan had no formal training in photography and first developed an interest in it in 1938. He remained an uninspired hobbyist until 1941, when he saw photographs by the landscape photographer Ansel Adams. He then began to seek his own photographic style.

Most of Callahan's career was spent teaching photography. In 1946 László Moholy-Nagy and Arthur Siegel invited him to join the teaching staff of the Institute of Design (from 1949 part of the Illinois Institute of Technology) in Chicago, and from 1949 to 1961 he was head of the photography department there. From 1961 until 1976 he helped develop a photography department at the Rhode Island School of Design in Providence, where he had a wide influence as a teacher.

Callahan's primary subjects were landscapes, cityscapes, and varied, unconventional portraits of his wife and daughter. He tended to avoid literal representations in his work, preferring instead to emphasize quietly lyrical abstract design. The Museum of Modern Art in New York City presented a major retrospective exhibition of his work in 1976, and in 1980 two collections of his photographs—*Water's Edge* and *Harry Callahan: Color 1945–1980*—were published.

Callander, small burgh, district of Stirling, Central region, Scotland, on the River Teith.



The River Teith at Callander, Central region, Scotland
Kenneth Scowen, F.I.I.P., F.R.P.S.

It is a tourist centre on an important entry point into the Highlands, near Ben Ledi (2,873 ft [876 m]), the Trossachs, and Loch Katrine. This romantic and scenic region was described in Sir Walter Scott's *Lady of the Lake.* Pop. (1981) 3,176.

Callao, city and principal commercial seaport of Peru, located within the 57-sq-mi (148-sq-km) Callao constitutional province, directly west of Lima. The mostly urbanized area of the constitutional province is part of the Lima–Callao metropolitan area. Callao's port has one of the few good natural harbours along the Pacific coast of South America. Located south of the Río Rímac, the port's anchorage is protected by the large offshore island of San Lorenzo (a submarine base and naval station) and by a long promontory. The harbour has been given further protection by breakwaters. A modern maritime terminal was opened in 1935; a dry dock, 570 ft (175 m) in length, was constructed in 1938; a major ore and cargo pier and a petroleum jetty were in use by 1969; and further modernization was undertaken in the 1970s.

Callao was founded in 1537 by Francisco Pizarro. As the leading shipping point for the gold and silver taken by the Spanish conquerors from the Inca Empire, the port was frequently assaulted by pirates and European rivals of Spain. It was pillaged by Sir Francis Drake in 1578. A tidal wave following an earthquake demolished the city in 1746, but it was rebuilt about three-quarters of a mile from the original site. Shortly thereafter, an extensive fortification, the Real Felipe fortress, was constructed; it withstood a number of sieges by Spanish forces during the wars of independence. Simón Bolívar landed there in 1823, and three years later it was the scene of the final surrender of Spain.

The first railroad in South America was opened between Callao and Lima in 1851. The city was bombarded by a Spanish fleet in 1866; and in 1881, during the War of the Pacific, it was occupied by Chilean forces, who restored it to Peru in 1883 under the Treaty of Ancón. Rebuilding of the city and port was necessary after a severe earthquake in 1940.

Leading exports from Callao include minerals, refined metals, fish meal, and fish oil; chief imports include wheat, machinery, and lumber. Notable among the city's many and varied industries are breweries, shipbuilding yards, and fish-meal factories. Agricultural products grown in the province are chiefly for the local market and include vegetables, fruits, and corn (maize).

The constitutional province has few cultural or architectural attractions. It is the site of the Jorge Chávez International Airport and of the national military and naval schools and a technical university. Pop. (1984 est.) constitutional province, 491,000; Lima–Callao metropolitan area, 5,887,600.

Callas, Maria, original name MARIA CECILIA SOPHIA ANNA KALOGEROPOULOS (b. Dec. 2, 1923, New York City—d. Sept. 16, 1977, Paris), operatic soprano who revived classical coloratura roles in the mid-20th century with her lyrical and dramatic versatility.

Accompanied by her mother, she left the U.S. in 1937 to study at the Athens Conservatory with soprano Elvira de Hidalgo. She sang locally in *Cavalleria Rusticana* and *Boccaccio* and returned to the United States in 1945. She auditioned for the Metropolitan Opera, but soon left for Italy where she performed in *La Gioconda* (Verona, 1947). She joined La Scala and quickly won acclaim as Elvira in *I puritani,* and as *Tosca, Norma,* and *Lucia.* She made her U.S. debut as Norma at the Chicago Opera on Nov. 1, 1954, and repeated it at the Metropolitan Opera in New York City on Oct. 29, 1956.

Callas, known for roles that were particularly vocally demanding, sang French, German, and Italian opera. Although some critics faulted her technique, most conceded to her an excellent coloratura range with strong, clear quality and an unparalleled and charismatic acting ability. Unfamiliar operas of Bellini, Rossini, Donizetti, and Cherubini enjoyed new popularity because of her skillful performances. She played large stages throughout the United States and Europe, although her volatile temperament brought her much notoriety. After a final operatic performance as Tosca at Covent Garden in London (July 1965), Callas made the film *Medea* (1970) and taught opera at Juilliard (1972) before a last U.S. and European concert tour (1972–73). By the time of her retirement, she had performed more than 40 different roles and had recorded more than 20 complete operas.

Callendar, H(ugh) L(ongbourne) (b. April 18, 1863, Hatherop, Gloucestershire, Eng.—d. Jan. 21, 1930, London), British physicist who made notable contributions to thermometry, calorimetry, and knowledge of the thermodynamic properties of steam. Callendar in 1886 described a precise thermometer based on the electrical resistivity of platinum; since then, platinum resistance thermometers have been prescribed for the determination of temperatures between the defined points of internationally recognized temperature scales. Later he developed the electrical continuous-flow calorimeter, which measures the heat-carrying properties of liquids. In 1915 he published *The Callendar Steam Tables* and in 1920 *Properties of Steam and Thermodynamic Theory of Turbines.* The tables are still widely used by engineers and scientists.

Callendar became professor of physics at McGill University, Montreal, in 1893; at University College, London, in 1898; and at the Royal College of Science (later part of the Imperial College of Science and Technology), London, in 1902.

Callendar effect, climatic change brought about by man-made increases in the concentration of atmospheric carbon dioxide (CO_2), primarily through the processes of combustion. The actuality of such changes was proposed in 1938 by the English scientist G.S. Callendar, son of H.L. Callendar. *See also* greenhouse effect.

Calles, Plutarco Elías (b. Sept. 25, 1877, Guaymas, Sonora, Mexico—d. Oct. 19, 1945, Mexico City), military and political leader who modernized the revolutionary armies and later became president of Mexico. He was the founder of the Partido Nacional Revolucionario (PNR; National Revolutionary Party), which became the major Mexican political party (renamed in 1938 the Partido de la Revolución Mexicana and in 1946 the Partido Revolucionario Institucional).

Calles
By courtesy of the Organization of American States

He began his career as an elementary schoolteacher but joined the struggle of Francisco Madero against the dictatorship of Porfirio Díaz in 1910. Calles was an extremely gifted organizer and leader and was a general in the battles, first against Victoriano Huerta, who had assassinated Madero, and then against Pancho Villa and his rebel forces.

In 1917 Calles became governor of Sonora. Appointed secretary of commerce, labour, and industry under Pres. Venustiano Carranza, he resigned to support the candidacy of Alvaro Obregón and was instrumental in overthrowing Carranza in 1920. Calles served as secretary of foreign relations in the provisional government of Adolfo de la Huerta (1920) and then as secretary of the interior under President Obregón (1920–24).

In 1924 Calles was elected president. Though he was becoming increasingly conservative, he sponsored agrarian, labour, and educational reforms. His term was marked also by difficulties with the Roman Catholic Church and the United States. He applied the constitutional provisions that limited the number of clergy and prohibited church schools. The church, as a consequence, held no public religious services for three years until the dispute was arbitrated in 1929. He approved legislation that restricted alien ownership of land and regulated the petroleum industry; both of these actions angered the United States.

President-elect Obregón was assassinated in 1928, and for the next six years Calles was the real power behind three puppet presidents. His base was the PNR, which he had organized in 1929; its support of a candidate was tantamount to election. In those six years the more radical aspects of the revolution were methodically curbed. By 1934, however, when left-wing groups had begun to control the PNR, Calles was forced to support their candidate for president, Lázaro Cárdenas. This misalliance deteriorated into an open break, and Calles was forced into exile. He lived in California until 1941, when he was permitted to return to Mexico.

Callias (fl. mid-5th century BC), diplomat and a notable member of one of the wealthiest families of ancient Athens.

Callias is usually credited with negotiating the peace treaty of 450/449 between the Greeks and the Persians—called the Peace of Callias. This treaty officially concluded the long but intermittent Greco-Persian Wars. Callias is said to have distinguished himself in the Greek victory over the invading Persians at Marathon (490) and to have won the chariot race at the Olympic games three times. In addition to his probable role in negotiating the Peace of Callias, he seems to have helped formulate the Thirty Years' Treaty between Athens and Sparta in 446/445.

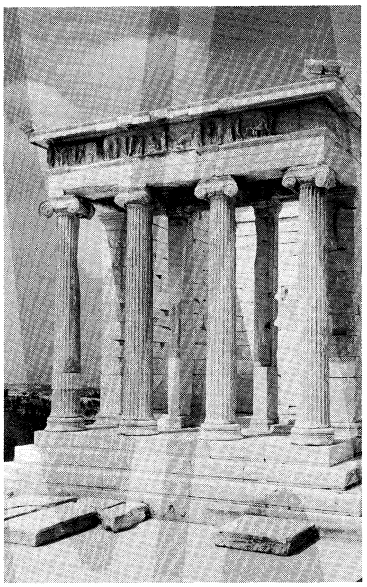
Callias (fl. 5th–4th century BC), Athenian ridiculed by the comic poets for his youthful extravagance; later in life he was a successful military commander and diplomat. The grandson of the Callias described above, he was the butt of jokes in the plays of Aristophanes and other poets and was attacked by the orator Andocides in his speech "On the Mysteries." But Callias was on friendly terms with the Athenian philosphers, and his home was the scene of Xenophon's *Symposium* and Plato's *Protagoras.* In 390, during the Corinthian War (Sparta versus Athens and her allies, 395–387), he commanded the heavy infantry that helped Iphicrates annihilate a Spartan regiment near Corinth. In 371 Callias headed an embassy to Sparta that was credited with devising a treaty to end a seven-year war between Sparta and Athens.

Callicrates, also spelled KALLIKRATES (fl. 5th century BC), Athenian architect who designed the Temple of Athena Nike on the Athenian Acropolis and, with Ictinus, the Parthenon.

It is known from an inscription of 449 BC (the year of the signing of peace with Persia) that the Senate commissioned Callicrates to construct a temple to Athena Nike (also known as the Wingless Victory) on the Athenian Acropolis. Callicrates designed the temple to be of pentelic marble, small in size, and Ionic in order; it was to be built on the bastion of the southwestern corner of the Acropolis. Construction finally began in 427 BC, and the temple was completed in 424 BC.

Callicrates and Ictinus were the architects of the Parthenon, the largest Doric temple on the Greek mainland. According to the inscription on the building, the construction was begun in 447 BC. The building was completed and dedicated in 438 BC at the Panathenaea (a festival held in honour of Athena every four years on the Athenian Acropolis).

On the basis of stylistic similarities a small Ionic temple (destroyed 1778) on the bank of the Ilissos River, in Athens, was attributed to Callicrates, and a Doric temple to Apollo, built by the Athenians on the island of Delos, may be his work. *The Architects of the Parthenon,* by Rhys Carpenter, suggests that Callicrates was also responsible for the Hephaesteum, the temple of Poseidon at Sunion, the temple of



Temple of Athena Nike, Acropolis, Athens, by Callicrates, *c.* 425 BC
A.F. Kersting

Ares at Acharnae, and the temple at Rhamnous.

Callide Valley, valley in eastern Queensland, Australia, a southeast–northwest corridor extending for 70 miles (110 km) west of the Calliope Range. Its principal settlement is Biloela. Cotton, grains, and dairy pastures are irrigated from subartesian sources and dams on the seasonal Callide Creek. The economic importance of the valley lies in its substantial deposits (discovered in 1890) of bituminous coal. Opencut mining, centred on the towns of Callide and Biloela, began in 1948; the coal supplies the local Cal Cap thermal electric power station and is also shipped to the port city of Gladstone.

Callières, François de (b. May 14, 1645, Torigni-sur-Vire, Fr.—d. March 5, 1717, Paris), French diplomatist and author whose book *De la manière de négocier avec les souverains* (1716; *The Practice of Diplomacy*) was considered a model introduction to the subject of diplomacy.

Between 1670 and 1700 Callières was sent on many diplomatic missions, notably as a French plenipotentiary to the Dutch United Provinces for discussions preliminary to the Peace of Rijswijk (1697), which ended the War of the Grand Alliance. King Louis XIV rewarded Callières by appointing him Cabinet secretary (1698). Callières's treatise sets forth the qualifications, duties, conduct, and methods of the ideal negotiator. Although the treatise condones the judicious use of flattery and bribery, it warns against trickery as prejudicial to the confidence that an envoy must inspire.

calligraphy, the art of beautiful or elegant handwriting as exhibited by the correct formation of characters, the ordering of the various parts, and harmony of proportions.

A brief treatment of calligraphy follows. For full treatment, *see* MACROPAEDIA: Writing.

Calligraphy offers a wide range of aesthetic possibilities. In the Islāmic world, calligraphy has traditionally been held in high regard, and in cultures using Chinese or Chinese-influenced writing, in which individual characters themselves can be aesthetic objects, calligraphy is revered as highly as painting or sculpture.

Greek writing. Early Greek forms of handwriting (up to about the 8th century AD) are chiefly of two functional types: the sort of writing used to copy books and that used for documents or letters. The book hands (traditionally, although often inaccurately, called uncials) are generally the more stylized and are usually written in clear, distinct capital letters. The documentary styles are much more various, reflecting the kinds of texts (private letters, official documents, etc.) for which they were used and the diverse nature of those who used them. They are also characterized as "cursive," having a rounded, flowing quality that comes with writing speedily.

The period of the Byzantine Empire produced several major developments in Greek handwriting, among them the invention of minuscules (lowercase letters). From the 12th to the 15th century, Greek handwriting showed a mixture of styles: the formal, rather stereotyped hand used in liturgical writings, and the more personal, occasionally mannered hands used in personal and scholarly writings. Both were to be major influences in the development of printing type styles during the Renaissance.

Latin writing. From its first appearance in the 1st century AD until the 4th century, Roman writing showed two forms: rustic capitals, so called only in comparison to the monumental lettering of Roman stone inscriptions, which served as the book hand, and cursive capitals, which were the business hand. Rustic capitals gave way to uncials and similar book hands, while cursive writing for documents led to the development of minuscule letter forms. Under Charlemagne's rule in the 8th and 9th centuries, and more specifically under the leadership of the English cleric Alcuin, abbot of St. Martin's at Tours, several important scripts were developed, notably the Carolingian minuscule.

The humanist literary movement of the 14th to 16th centuries produced two scripts that influenced all subsequent handwriting and printing: the so-called roman and italic styles.

For 200 to 300 years after the invention of printing, European calligraphy was increasingly distinguished by bold and frequently extravagant ornamentation; manuscripts were written as much to show off a hand as to impart information. A revival of more traditional forms occurred in the late 19th century and carried into the 20th.

Arabic writing. The writing of Arabic was strongly influenced by Islām. The high esteem accorded the copying of the Qur'ān, and the aesthetic energy that was devoted to it, raised calligraphy to the status of an art. Arabic calligraphy, unlike that of most cultures, influenced the style of monumental inscription. Numerous distinctive styles of calligraphy were developed for particular purposes and in different parts of the Islāmic world. One of the most striking was the *tuğra,* a royal cipher designed for the sultan and affixed to royal decrees by a court calligrapher.

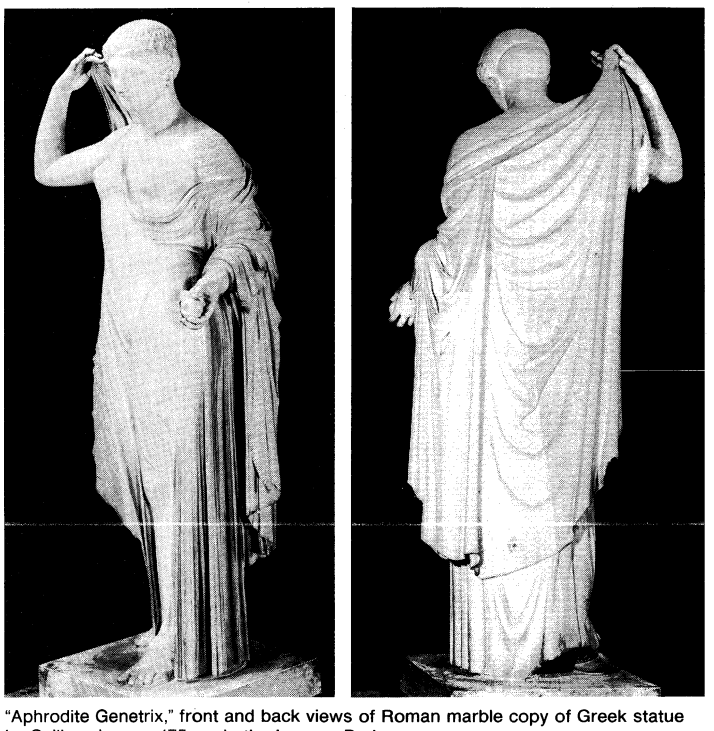
Oriental writing. In China, Japan, and, to a lesser extent, Korea, calligraphy is similarly given high status as an art form. From its beginnings (*c.* 1700 BC) to the present, Oriental calligraphy has been a rich and varied form of artistic expression. In Japan calligraphic contests are held yearly, with people of all ages and professions competing to have their work displayed in public exhibition.

Chinese calligraphy went through four stages before the present-day script known as regular script emerged. The *chia-ku-wen* and the *chin-wen* (bone-and-shell script and bronze script, respectively), named for the materials on which they were written, were used until the 3rd century BC, when the emperor Ch'in Shih Huang Ti ordered the development of a new unified script called the *hsiao chuan,* or small seal style. The fourth step was an attempt to make faster writing possible. *Li shu,* the official, or proper, style, was specifically developed for clerical use. Because of the speed with which the *li shu* could be written, differences in brushstrokes were inevitable, thus allowing, inadvertently, an opportunity for creativity, which was enlarged in the *k'ai shu* (*chen shu*), or regular style.

The *k'ai shu* has survived essentially unchanged for the past 2,000 years. Affording a maximum of latitude to the calligrapher, it is well-suited to reflect a wide variety of individual styles.

Japanese writing employs a mixture of kanji (Chinese characters) and the more native hiragana script, a rich combination of forms from which Japanese master calligraphers have created a highly personal art form.

Callimachus (fl. late 5th century BC), Greek sculptor, perhaps an Athenian, reputed to



"Aphrodite Genetrix," front and back views of Roman marble copy of Greek statue by Callimachus, *c.* 475 BC; in the Louvre, Paris
Cliche Musees Nationaux, Paris

have invented the Corinthian capital after witnessing acanthus leaves growing around a basket placed upon a young girl's tomb.

Although no sculptures by Callimachus survive in the original, he was reported to have carved the golden lamp that burned perpetually in the Erechtheum (completed in 408). Callimachus was noted and criticized by his contemporaries for the overelaboration of draperies and other details in his sculptures. Viewed in this light, the elaborate carving that characterizes the Corinthian capital may well be his invention. Modern scholars have attributed to Callimachus the "Aphrodite Genetrix," a Roman replica of which is in the Louvre. He has also been linked with a series of reliefs of dancing Maenads, such as the Roman copy now in the Metropolitan Museum of Art, New York City, which are notable for their sensuously modeled limbs set off by voluminous, rippling draperies.

Callimachus (b. *c.* 305 BC, Cyrene, North Africa—d. *c.* 240), Greek poet and scholar, the most representative poet of the erudite and sophisticated Alexandrian school.

Callimachus migrated to Alexandria, where King Ptolemy II Philadelphus of Egypt gave him employment in the Alexandrian library, the most important in the Hellenistic world. Of Callimachus' voluminous writings, only fragments survive, many of them discovered in the 20th century. His most famous poetical work, illustrative of his antiquarian interests, was the *Aetia* (*Causes*), probably produced *c.* 270. This work is a narrative elegy in four books, containing a medley of recondite tales from Greek mythology and history by which the author seeks to explain the legendary origin of obscure customs, festivals, and names. The structure of the poem, with its short episodes loosely connected by a common theme, became the model for the *Fasti* and *Metamorphoses* of the Roman poet Ovid. Of his elegies for special occasions, the best known is the *Lock of Berenice,* a polished piece of court poetry later freely adapted into Latin by Catullus.

Callimachus' other works include the *Iambi,* 13 short poems on occasional themes; the *Hecale,* a small-scale epic, or epyllion, which set a new poetic fashion for concise, miniaturistic detail; and the *Ibis,* a polemical poem that was directed against the poet's former pupil Apollonius of Rhodes, whose grand-scale epic *Argonautica* marked a rebellion against his master's canon of taste. Callimachus himself insisted on the exercise of consummate literary craftsmanship and virtuosity within poems of relatively short length. In the *Hymns,* Callimachus adapted the traditional religious form of the Homeric Hymns to an original and purely literary use. The *Epigrams,* of which some 60 survive, treat a variety of personal themes with consummate artistry. Of his prolific prose works, certainly the most famous was the *Pinakes* ("Tablets") in 120 books. This work consisted of an elaborate critical and biographical catalog of the authors of the works held in the library at Alexandria. Discoveries in the 19th and 20th centuries of ancient Egyptian papyruses confirm the fame and popularity of Callimachus; no other Greek poet except Homer is so often quoted by the grammarians of late antiquity. He was taken as a model by many Roman poets, notably Catullus.

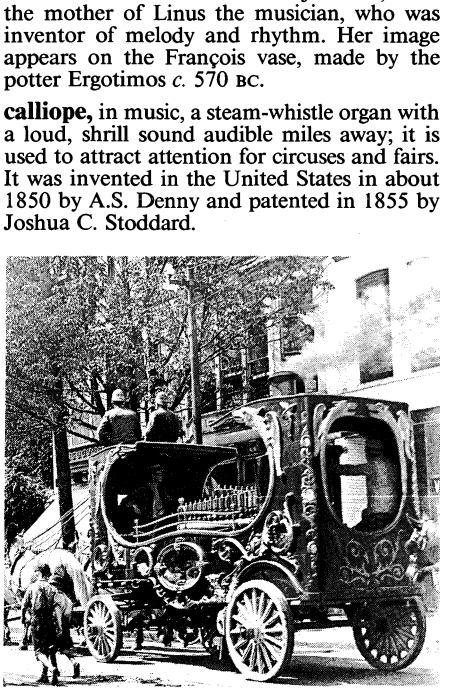
Callinicus OF HELIOPOLIS, Callinicus also spelled KALINNIKOS (b. Heliopolis, Syria; fl. AD 673), architect who is credited with the invention of Greek fire, a highly incendiary liquid that was projected from "siphons" to enemy ships or troops and was almost impossible to extinguish.

Born in Syria, Callinicus was a Jewish refugee who was forced to flee the Arabs to Constantinople (now Istanbul). The ingredients of Greek fire were kept a state secret, known only by the Byzantine emperor and Callinicus' family, which manufactured it. The precise composition is still unknown, but it is generally accepted that it was a mixture of naphtha, pitch, sulfur, possibly saltpetre, and some unknown ingredients. First used in the Battle of Cyzicus (*c.* AD 673) by the Byzantines against a Saracen fleet off Constantinople, Greek fire proved to be instrumental in that Byzantine victory.

Callinus (fl. mid-7th century BC, Ephesus, Ionia, Asia Minor), Greek elegiac poet, the few surviving fragments of whose work reflect the troubled period when Asia Minor was invaded by the Cimmerians, a race originating in what was later South Russia. The longest fragment is an appeal to young men to cast off their cowardly sloth and prepare to fight, and if necessary die, in defense of their country. While the poem's vocabulary and imagery are Homeric, the phrasing is sometimes fresh and original.

Calliope, also spelled KALLIOPE, in Greek mythology, foremost of the nine Muses, patron of epic poetry. At the behest of Zeus, the king of the gods, she judged the dispute between the goddesses Aphrodite and Persephone over Adonis. In most accounts she and King Oeagrus of Thrace were the parents of Orpheus, the lyre-playing hero. She was also loved by the god Apollo, by whom she had two sons, Hymen and Ialemus. Other versions present her as the mother of Rhesus, king of Thrace and a victim of the Trojan War; or as the mother of Linus the musician, who was inventor of melody and rhythm. Her image appears on the François vase, made by the potter Ergotimos *c.* 570 BC.

calliope, in music, a steam-whistle organ with a loud, shrill sound audible miles away; it is used to attract attention for circuses and fairs. It was invented in the United States in about 1850 by A.S. Denny and patented in 1855 by Joshua C. Stoddard.

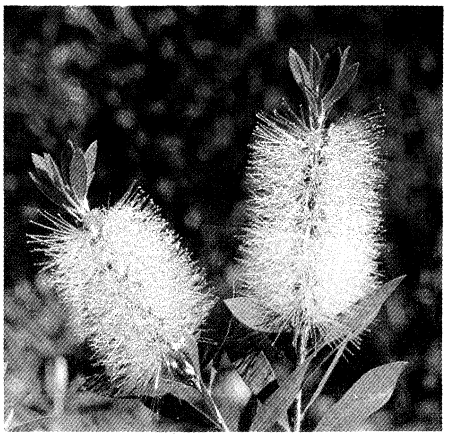


Steam calliope in a parade, Decatur, Ill., 1908
By courtesy of the Circus World Museum, Baraboo, Wis.

The calliope consists of a boiler that forces steam through a set of whistle pipes. Either a keyboard or a pinned cylinder (like that of a barrel organ or music box) controls the entry of steam into the proper pipes.

calliper (measuring instrument): *see* caliper.

Callistemon, genus of shrubs and trees, of the family Myrtaceae, native to Australia. They have spikes of showy flowers and are commonly called bottlebrushes. The plants are often cultivated outdoors in western North America and in colder regions in greenhouses. *C. lanceolatus* (sometimes *C. citrinus*), one of the most commonly cultivated species, grows from 3 to 6 metres (10 to 20 feet) tall and has



Bottlebrush (*Callistemon lanceolatus*)
Hal Harrison from Grant Heilman—EB Inc.

lance-shaped leaves and bright-red stamens (male parts).

Callisthenes OF OLYNTHUS (*c.* 360–327 BC), Greek historian, appointed to attend Alexander the Great as historian of his Asiatic expedition on the recommendation of his uncle and former tutor, Aristotle. Callisthenes offended Alexander by censuring him for the adoption of certain Oriental customs and was thrown into prison, where he died. His death was commemorated by his friend Theophrastus in *Callisthenes or a Treatise on Grief.* Callisthenes wrote a history of Greece from the peace of Antalcidas (386) to the Phocian War (355); a history of the Phocian War; an account of the Asiatic expedition; and other works, all of which have perished. It is known that he alluded to the story of Alexander's divine birth, and may have been the first to do so.

Callisto, in Greek mythology, a nymph, or else a daughter of either Lycaon of Arcadia or of Nycteus or Ceteus. Callisto was one of the goddess Artemis' huntress companions and swore to remain unwed. But she was loved by Zeus and, in several variations of the legend, was turned into a she-bear either by Zeus (to conceal his deed from Hera) or by Artemis or Hera (who were enraged at her unchastity). Callisto was then killed during the chase by Artemis, who, owing to the machinations of the jealous Hera, mistook Callisto for a real bear. Zeus then gave Arcas, his child with Callisto, to the Titaness Maia to raise. He then placed Callisto among the stars as the constellation Ursa Major (Great Bear). An alternative legend has it that Arcas was transformed into the constellation Arctophylax just as he was about to kill his mother during a hunt.

Callisto, outermost of the four Galilean satellites of Jupiter. It has a diameter of 4,800 kilometres (2,980 miles) and orbits the planet at a mean distance of about 1,880,000 km (1,165,600 mi). The bulk density of Callisto is only 1.83 times the density of water, or about one-half that of the Earth's moon, which indicates that Callisto is about half rock and half ice. The surface of the Jovian satellite, however, does not exhibit large amounts of pure water ice. Near-infrared spectra of the surface show water-ice bands, but they are very weak. Moreover, Callisto's surface is comparatively dark, as if the ice were contaminated with much dark material.

Callisto appears to be the most heavily cratered of all of Jupiter's satellites, and an analysis of the distribution of its craters supports the hypothesis that they were produced about 4,000,000,000 years ago, when all bodies of the solar system came under heavy meteoroid bombardment. Internal activity has not substantially altered the surface cratering on Callisto as it has in the case of the other Galilean satellites. Besides a large number of

intermediate-sized craters (with diameters of a few tens of kilometres), Callisto's most prominent landforms are multiringed structures that measure many hundreds of kilometres in diameter. These structures are probably caused by very large impacts; analogous features are found on Mercury and the Earth's moon, but with important differences resulting from different crustal composition. The surface of Callisto is basically devoid of significant relief, probably because of thermal softening of the ice-rich crust early in its history.

To make the best use of the Britannica, consult the INDEX *first*

Callistus, Greek CALLISTOS (d. 1363, Constantinople), patriarch of Constantinople, theologian, and hagiographer, an advocate of a Byzantine school of mystical prayer that he upheld by the authority of his office and by his writings.

A monk of Mt. Athos, the Greek Orthodox monastic centre, Callistus became a disciple of the method of prayer known as Hesychasm. He was a disciple of St. Gregory Palamas of Mt. Athos and St. Gregory of Sinai, founder of the monastery on Mt. Paroria, Bulgaria, who, as proponents of Hesychasm, integrated a coordinated discipline of controlled breathing, concentration, and prayer.

After succeeding to the patriarchal throne in June 1350, Callistus convened, in the following year, a synod in Constantinople that vindicated Hesychasm as the preeminent method of Orthodox contemplative prayer. He was forced to resign his office in 1353 because he refused to crown Matthew Cantacuzenus emperor to succeed his father. After the abdication of the elder Cantacuzenus in 1354, Callistus returned as patriarch and, in his strongly conservative outlook, reorganized the parish system of churches under the surveillance of an exarch (patriarchal deputy). Attempting to strengthen patriarchal control over the various Orthodox churches, he excommunicated the Serbian tsar, Stefan Dušan (*c.* 1354), for establishing an independent patriarchate.

The anti-Hesychasts in their historical accounts depicted Callistus as a power-mad tyrant and obstinate reactionary. He spread Hesychast doctrine particularly through the writing of biographies of St. Gregory of Sinai and of the Bulgarian Theodosius of Tŭrnovo. Some of his sermons and conferences were discovered early in the 20th century.

Callistus I–III and (III) (popes and antipope): *see* Calixtus I–III and (III).

Callot, Jacques (b. 1592/93, Nancy, Fr.—d. March 24, 1635, Nancy), French printmaker who was one of the first great artists to practice the graphic arts exclusively. His innovative series of prints documenting the horrors of war greatly influenced the socially conscious artists of the 19th and 20th centuries.

Callot's career was divided into an Italian period (*c.* 1609–21) and a Lorraine (France) period, from 1621 until his death. He learned the technique of engraving under Philippe Thomassin in Rome. About 1612 he went to Florence. At that time Medici patronage expended itself almost exclusively in *feste,* quasi-dramatic pageants, sometimes dealing in allegorical subjects, and Callot was employed to make pictorial records of these mannered, sophisticated entertainments. He succeeded in evolving a naturalistic style while preserving the artificiality of the occasion, organizing a composition as if it were a stage setting and reducing the figures to a tiny scale, each one indicated by the fewest possible strokes. This required a very fine etching technique. His breadth of observation, his lively figure style, and his skill in assembling a large, jostling crowd secured for his etchings a lasting popular influence all over Europe.

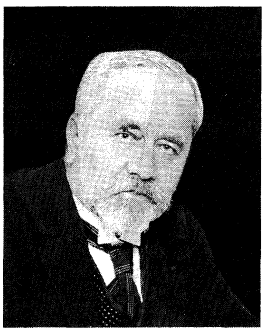
Callot also had a genius for caricature and the grotesque. His series of plates of single figures—for example, the "Balli di Sfessania" ("Dance of Sfessania"), the "Capricci di varie figure," and the "Hunchbacks"—are witty and picturesque and show a rare eye for factual detail.

With a few exceptions, the subject matter of the etchings of the Lorraine period is less frivolous, and Callot was hardly employed at all by the court at Nancy. He illustrated sacred books, made a series of plates of the Apostles, and visited Paris to etch animated maps of the sieges of La Rochelle and the Île de Ré. In his last great series of etchings, the "small" (1632) and the "large" (1633) "Miseries of War," he brought his documentary genius to bear on the atrocities of the Thirty Years' War. Callot is also well-known for his landscape drawings in line and wash and for his quick figure studies in chalk.

callus, also spelled CALLOUS, small area of thickened skin, caused by continued friction, pressure, or other physical or chemical irritants. In response to mild but repeated injury, the cells of the epidermis, the outermost horny layer of the skin, become more active, giving rise to a localized increase in horny tissue on the surface of the skin. Calluses are most frequently seen on the hands and feet. They are usually yellowish-white, flat, and painless. When a callus is conical in shape, penetrating into the deeper layer of the skin and causing pain when pressed, it is called a corn.

callus, bony and cartilaginous material forming a connecting bridge across a bone fracture during repair. Within one to two days after injury, a provisional callus forms, enveloping the fracture site. Bone-forming cells in the periosteum (the bone layer where new bone is produced) proliferate rapidly, forming collars around the ends of the fracture, which grow toward each other to unite the fragments. The definitive callus forms slowly as the cartilage becomes ossified. Two to three weeks after injury, strong bony extensions (trabeculae) join the fractured bone ends, and the organized aspect of bone gradually recurs. The callus is resorbed over a period of months.

Calmette, Albert (Léon Charles) (b. July 12, 1863, Nice, Fr.—d. Oct. 29, 1933, Paris), French bacteriologist, pupil of Louis Pasteur, and codeveloper with Camille Guérin of the tuberculosis vaccine Bacillus Calmette-Guérin



Calmette
Harlingue—H. Roger-Viollet

(BCG). He also described a diagnostic test for tuberculosis, known as Calmette's reaction.

Calmette graduated in medicine in 1886 in Paris. In 1891 he founded the Pasteur Institute at Saigon, Indochina, where he discovered a protective serum against snake venom. After his return to France, he founded and became director (1896–1919) of the Pasteur Institute at Lille. There in 1908 he discovered that virulent bovine tubercle bacilli became less virulent when cultured on a bile-containing medium. These attenuated bacilli were still able to confer a certain amount of immunity against infection with either bovine or human tubercle bacilli. This avirulent strain was used to make BCG, which was introduced about 15 years later for the vaccination of children against tuberculosis. Although widely used in Continental Europe, the vaccine was not adopted in the United States and Great Britain until after Calmette's death—not until U.S. studies in 1940 and a trial sponsored by the British Medical Research Council (reported in 1956) indicated BCG's substantial protective action against tuberculosis.

calomel, also called HORN MERCURY, MERCUROUS CHLORIDE, or MERCURY(I) CHLORIDE (Hg_2Cl_2), a very heavy, soft, white, sweetish-tasting halide mineral, formed by the alteration of other mercury minerals, such as cinnabar or amalgams. Calomel is found with native mercury, cinnabar, calcite, limonite, and clay, at Moschellandsberg, W.Ger.; Avala, Yugos.; Zimapán, Mex.; and Brewster County, Texas. For detailed physical properties, *see* halide mineral (table).

Once the most popular of cathartics, calomel has been used in medicine since the 16th century. The recognition of its potential toxicity (because of disassociation into mercury and mercuric chloride), together with the development of superior and safer cathartics, led to a decline in its use in internal medicine. It is still used in some salves and ointments.

Solutions of potassium chloride (KCl) saturated with calomel give constant electromotive forces (EMF's) against a mercury electrode. There are three standard calomel electrodes that are commonly used as references in electrochemical investigation: saturated KCl, giving an EMF (against the normal hydrogen electrode at 25° C, or 77° F) of −0.2420 volts; 1 molar KCl, −0.2810 volts; and 0.1 molar KCl, +0.338 volts.

Calonne, Charles-Alexandre de (b. Jan. 20, 1734, Douai, Fr.—d. Oct. 29, 1802, Paris), French statesman whose efforts to reform the structure of his nation's finance and administration precipitated the governmental crisis that led to the French Revolution of 1789.

The son of a magistrate of Douai, Calonne held various legal and administrative posts in French Flanders and in Artois before becoming intendant of Metz (1768) and of Lille (1774). His financial genius and court connections led to his appointment as controller general of finance in November 1783. At that time the French government was heavily in debt from the aid it had provided the colonists during the American Revolution (1775–83). Calonne reconstituted a sinking fund (1784) to pay off the debt, and in 1785 he reformed the gold coinage. He soon discovered, however, that major reforms were necessary to save France from bankruptcy. In August 1786 he submitted to King Louis XVI a far-reaching plan of reform that involved increasing the taxation of the privileged noble and clerical orders through a proportional tax on land.

Realizing that the Parlements (high courts of justice) would reject his proposals, Calonne submitted them instead to a special Assembly of Notables—nobles, clergy, and magistrates—which convened on Feb. 22, 1787. Nevertheless, the intrigues of his political opponents and the antagonism of the higher clergy and magistrates in the assembly thwarted his efforts. His revelation of the annual deficit of more than 100,000,000 livres and the failure of his reform schemes ensured the summons of the Estates-General in August 1788, which in turn led directly to the French Revolution. In April 1787 Louis XVI dismissed Calonne from office, and four months later he withdrew to England.

After the outbreak of the Revolution, Calonne devoted himself to the cause of counterrevolution. From exile he severely criticized

the National Assembly's efforts to abolish most of France's feudal institutions. He was chief adviser to the émigrés (nobles in exile) from December 1790 until the fall of the monarchy in August 1792. In 1802, during Napoleon Bonaparte's Consulate regime,

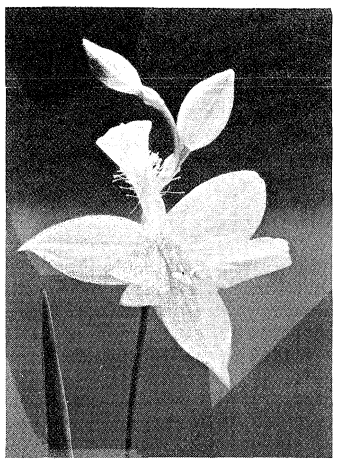
Calonne, detail of an engraving by Bréa, 18th century, after a portrait by Élisabeth Vigée-Lebrun

By courtesy of the Bibliotheque Nationale, Paris; photograph, Giraudon—Art Resource/EB Inc.

Calonne returned to France; he died soon thereafter. P. Jolly's *Calonne* was published in 1949.

Caloocan, chartered city on Dagatdagatan Lagoon (Manila Bay), Rizal province, central Luzon, Philippines, adjacent to northern Manila. Founded in 1762 by Augustinians, it became a municipality in 1815. Caloocan suffered much damage during World War II, as it was on the route used both by the Japanese in 1942 and by the U.S. forces in 1945 to enter Manila. Now part of Greater Manila, it is a growing centre of industrialization as well as a residential suburb. Processed foods, textiles, and engineering products are its main industries. Inc. city, 1961. Pop. (1980) 467,816.

Calopogon, genus of about four species of terrestrial orchids, family Orchidaceae, found in bogs and swamps of North America and the West Indies. The lip of the grass-pink, or swamp-pink (*Calopogon pulchellus*), flower is covered with many yellow hairs. The flowers of most species bear the lip uppermost, range in colour from lavender and deep pink to white, and are about 2.5 centimetres (1 inch)



Grass-pink (*Calopogon pulchellus*)

Mary W. Ferguson

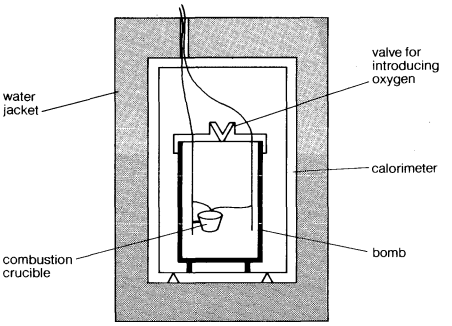
wide. There are one or two ribbed leaves per corm (swollen stem base) and several flowers on each flower spike.

caloric theory, explanation, widely accepted in the 18th century, of the phenomena of heat and combustion in terms of the flow of a hypothetical weightless fluid called caloric. The idea of an imaginary fluid to represent heat was useful in explaining many but not all aspects of heat phenomena. It was a step toward the present conception of energy—that it remains constant through many physical processes and transformations—but it was also a deterrent to clear scientific thinking. The caloric theory remained influential until the mid-19th century, by which time many kinds of experiments, primarily with the mechanical equivalent of heat, forced a general recognition that heat is a form of energy transfer.

calorie, unit of energy (or heat) commonly used in the nutritional measurement of foods. Before 1925 the calorie was defined as the quantity of energy necessary to raise the temperature of one gram of water from 15° to 16° C (59° to 60.8° F), which is very nearly equal to the modern unit, defined since 1948 as 4.184 absolute joules. Dieticians loosely use the kilocalorie, sometimes called the kilogram calorie, or large Calorie (equal to 1,000 calories) in measuring the calorific, heating, or metabolizing value of foods. Thus, the "calories" counted for dietary reasons are in fact kilocalories, with the "kilo-" prefix omitted.

Another artificial calorie, the International Table calorie, is used in engineering steam tables. One IT calorie is equal to 1/860 international watt hour, or 0.00116298 watt hour.

calorimeter, device for measuring the heat developed during a mechanical, electrical, or chemical reaction or the heat capacity of materials. Calorimeters have been designed in



Schematic diagram of bomb calorimeter

From *McGraw-Hill Encyclopedia of Science and Technology*, Copyright (1971); used with permission of McGraw-Hill Book Co.

great variety; one in widespread use consists typically of an enclosure in which the reaction takes place, surrounded by a liquid, such as water, that absorbs the heat of the reaction and thus increases in temperature. Measurement of this temperature rise and a knowledge of the weight and heat characteristics of the container and liquid permits the total amount of heat generated to be calculated. Heat units are expressed in a relatively small unit called the joule, equivalent in electrical units to a watt-second, or the amount of heat dissipated in one second in an electrical circuit being fed a power of one watt. The calorie is also used as a unit of heat and is equal to 4.184 joules.

Precision calorimeters are very carefully designed to minimize heat losses and to account for any losses that do occur. Bomb calorimeters of the type shown in the illustration have been developed to the point that heats of combustion of organic materials can be measured with results reproducible within 0.01 percent.

Caloris, large basin measuring about 1,300 kilometres (810 miles) in diameter, centred in the northern hemisphere of the planet Mercury. It was discovered in 1974 by the U.S. Mariner 10 planetary probe. The Caloris basin was created by the impact of a large meteorite early in Mercury's geologic history. The interior of the circular structure is occupied by fractured plains that may be composed of either impact melt or lava extruded shortly after the impact. These plains first underwent compressional deformation, which resulted in the formation of concentric and radial ridges about 500–700 metres (1,640–2,296 feet) high on their surface. Compression was followed by extension, superposing fault-bounded troughs (graben) on the ridges and plains.

The central plains are surrounded by a 1,300-km-diameter ring of mountains 1–2 km (0.6–1.2 mi) high. A steep escarpment faces inward toward the basin. The more gentle backslope is covered by ejecta from the cratering event. Radial valleys and ridges produced by ejecta extend about 1,000 km (620 mi) away from the mountainous ring. This ejecta itself is covered in places by smooth or hummocky plains of probable volcanic origin.

The creation of the Caloris basin was a catastrophic event in Mercury's history. Besides the tectonic and volcanic disturbances produced by rapid collapse of the original impact crater, the ejecta blanket buried a substantial area of the planet's surface. It is also speculated that the shock waves from the impact were focused on the opposite side of the planet, producing a distinctive area of hilly terrain crisscrossed by straight valleys.

Calotes, also called RAINBOW LIZARD, genus of arboreal (tree-dwelling) lizards of the family Agamidae, remarkable for their extreme colour changes when excited. They are found in gardens and forests of India, Southeast Asia, and some Pacific islands. The taxonomy is uncertain; about 30 species, differing primarily in scale arrangement, are recognized.

Calotes are typically green, with long legs and tails, and have bodies that are flattened from side to side. They range in total length from 30 to 60 centimetres (12 to 24 inches). Their food consists of insects and other small invertebrates. During territorial fights and courtship the males display a throat dewlap (hanging fold of skin) and a crest along the back. These turn red when the lizard is victorious in combat or during courtship.

calotype, also called TALBOTYPE, early photographic technique invented by William Fox Talbot of Great Britain in the 1830s. Making use of earlier work by Sir John Herschel and J.B. Reade, Talbot succeeded in developing the latent image produced on paper by the camera obscura (*q.v.*) by using gallonitrate of silver. Talbot's process, which he patented in 1841, was superior to the daguerreotype in that the negative image could be reproduced on paper as a positive any number of times.

Calprenède, Gaultier de Coste, seigneur de La: *see* La Calprenède, Gaultier de Coste, seigneur de.

Caltagirone, town, Catania province, southeast central Sicily, Italy, in the foothills of the Monti (mountains) Iblei, north-northwest of Ragusa. Although excavations have revealed remains of Siculan, Greek, and Roman settlements, the town's classical name is unknown. The name Caltagirone is derived from Qal'at al-Genun (the castle of Genun, the Saracen chieftain who built it). The town was badly damaged by the earthquake of 1693 and by air raids in 1943. Its churches and other notable buildings date from the 18th century. The civic museum has a rich archaeological collection.

Joined to Catania by road and rail, Caltagirone is now known for its ceramics and terracotta industries. Sulfur is mined, and agriculture, especially cereals, vines, olives, and cork trees, is important in the district. Pop. (1984 est.) mun., 37,034.

Caltanissetta, city, capital of Caltanissetta province, central Sicily, Italy, in the mountains west of the Fiume (river) Salso at an altitude of 1,929 ft (588 m) west of Catania. It is sometimes identified with the ancient cities of Gibil-Habib or Sabucino, but recorded history

does not begin until the Norman occupation (1086). The name is believed to be derived from the ancient Nissa and the Arabic prefix *qal'at* (castle). In World War II Caltanissetta was damaged during heavy fighting in 1943. The centre of the city is the Piazza Garibaldi, and the modern quarter is to the west. The castle of Pietrarossa has Greek, Arabic, and Norman remains. The abbey of S. Spirito is Norman; the cathedral (consecrated 1622) and the Palazzo Moncada are in the Baroque style; and there are 19th-century Neoclassical palaces. The city has a civic museum with a rich archaeological collection, and it is an episcopal see.

An agricultural market centre, Caltanissetta is also a centre of the Sicilian sulfur industry and has an institute of mineral technology. Pop. (1981 prelim.) mun., 60,713.

Cālukya DYNASTY, also spelled CHALUKYA, either of two ancient Indian dynasties. The Western Cālukyas ruled as emperors in the Deccan from AD 543 to 757 and again from *c.* 975 to *c.* 1189. The Eastern Cālukyas ruled in Veṅgi (in eastern Andhra Pradesh) from *c.* 624 to *c.* 1070.

Pulakeśin I, a petty chieftain of Pattadakal in the Bijāpur district, whose reign began in 543, took and fortified the hill fort of Vātāpi (modern Bādāmi) and seized control of the territory between the Krishna and Tungabhadra rivers and the Western Ghāts. After military successes farther north, his son Kīrtivarman I (reigned 566–597) secured the valuable Konkan coast. The family then turned its attention to the fertile coastal regions to the northwest and east of the peninsula. Pulakeśin II (reigned *c.* 610–642) acquired parts of Gujarāt and Mālwa and defied the North Indian ruler Harṣa of Kannauj; the boundary between them was fixed on the Narmada (Narbada) River. About 624, Pulakeśin II took the kingdom of Veṅgi from the Viṣṇukuṇḍins and gave it to his brother Kubja Viṣṇuvardhana, the first Eastern Cālukya.

In 641–647 the Pallavas ravaged the Deccan and captured Vātāpi, but the Cālukya family recovered by 655 and extended its power in Gujarāt. By 660 they had acquired land in Nellore district. Vikramāditya I (reigned 655–680) took Kāñcī (Kānchipuram), then the Pallava capital, in *c.* 670. Another Cālukya ruler, Vikramāditya II (reigned 733–746) again captured, but spared, the city in 742. His successor, Kīrtivarman II, was replaced by the Rāṣṭrakūṭa dynasty in 757.

When the last Rāṣṭrakūṭa fell, about 975, Taila founded the second Western Cālukya dynasty, named after the more central capital, Kalyāṇī. His great achievement was to subdue the Paramāra dynasty of Mālwa.

The Cōḷa (Chola) king, Rājarāja I, invaded the south Deccan *c.* 993 and repeated Cōḷa invasions of the plateau occurred until *c.* 1021. After many vicissitudes the Cālukya dynasty was supplanted by the Kalacuri family under Bijjala, who usurped the throne in *c.* 1156 and reigned until 1167. The Cālukya dynasty was restored in the person of Someśvara IV, who, however, lost the empire in 1189 to the Yādavas (or Sevunas) of Devagiri, the Hoysaḷas of Dōrasamudra, and the Kākatīyas of Warangal—the rulers of the Telugu-speaking parts of the Deccan.

The descendants of Kubja Viṣṇuvardhana constantly had to fight for the riches of Veṅgi and were pawns in the struggle between the Deccan emperors and the Cōḷa kings. The Cōḷas eventually adopted the family, and the two countries were united under Rājendra II (Kulottuṅga I), whose reign began in 1070.

calumet: *see* sacred pipe.

Calumet City, city, in Cook County, northeastern Illinois, U.S., between the Little Calumet and Grand Calumet rivers, 4 mi (6 km) southeast of Lake Calumet. Settled in 1868, it was called West Hammond until 1924, when it was renamed for the waterways (Calumet being the name of the peace pipe of the American Indians). It developed as a residential-industrial suburb of the Gary–Chicago metropolitan area. During the 1930s and 1940s several nightclubs—most of them on State Street, known as "the strip"—attracted notoriety as places of entertainment for conventioneers visiting Chicago and were a source of municipal discord. The city is now primarily residential, with some light manufacturing. Inc. village, 1893; city, 1924. Pop. (1980) 39,673.

Calumet District, heavily industrialized area, mostly in Lake County, northwestern Indiana, U.S., along the southern shore of Lake Michigan, adjacent to southeastern Chicago. Following the establishment of steel plants in Gary at the end of the century, the area developed from a swampy sand dune waste into a major sector of the Chicago industrial web, comprising one of the world's foremost industrial complexes with mammoth steel mills, oil refineries, chemical plants, and other industries. Occupying nearly 90 sq mi (230 sq km) with a population of more than 300,000, it comprises the contiguous cities of Gary, Hammond, East Chicago, and Whiting (*qq.v.*) in Indiana and Calumet City in Illinois. The district is crossed by the Grand Calumet and Little Calumet rivers whose channels connect with the Calumet River and Calumet Harbor (in South Chicago), while the Calumet Sag Channel connects with the Illinois Waterway system. Port facilities are available at Gary, Burns Harbor (east of Gary), and East Chicago.

Calusa, extinct North American Indian tribe that inhabited the southwest coast of Florida from Tampa Bay to Cape Sable and Cape Florida, together with all the outlying keys. According to some authorities their territory also extended inland as far as Lake Okeechobee. Their linguistic affiliation is not certain. Their estimated population in 1650 was 3,000 living in 50 villages. The Calusa relied more on the sea than on agriculture for their livelihood. They made tools and weapons of seashells and fishbones. Their dwellings were of wood, built on piles, and their sacred buildings were erected on flat-topped mounds. They were fierce fighters and accomplished seamen, paddling their dugout canoes around the Florida coast. In their early period there is evidence of sacrifice of captives and of cannibalism.

The Calusa also journeyed to Cuba and other Caribbean islands, trading in fish, skins, and amber. During the 16th century they defended their shores from a succession of Spanish explorers. One theory of their disappearance is that they emigrated to Cuba during the 18th century as a result of recurring invasions by the Creek (*q.v.*) and English. The Seminole (*q.v.*), who moved into Florida early in the 19th century, maintained that the remnants of the Calusa went west with them when they were removed to Oklahoma.

călușari, Romanian ritual dance for men. *See* Morris dance.

Calvados, *département,* Basse-Normandie region, northern France, fronting the English Channel in the Baie de Seine between the Cotentin peninsula and the Seine Estuary. With an area of 2,137 sq mi (5,536 sq km), it was formed in 1790 from the districts of Bessin, Cinglais, Hiémois, the Campagne de Caen, and Auge and the western part of Lieuvin. Its name derives from a reef off Asnelles, which had been named after the "Salvador," a ship of the Spanish Armada believed to have been wrecked on the rocks in 1588. The *département* is backed on the south and west by the low Normandy hills and is drained by several rivers, including the Aure, Orne, Dives, and Touques.

Calvados is chiefly a stock-raising area. Its damp, mild climate is conducive to rich pastures, especially in Bessin and Auge, where dairying is important and large quantities of butter and cheese are produced. In Campagne de Caen and Lieuvin, corn, sugar beets, and fodder crops are raised. Cider brandy (known as calvados) is distilled from locally grown apples. Building stone used in many historic buildings in England as well as in northern France was quarried in the Caen district. Iron ore, mined south of Caen, is processed locally. Tourism is a major source of income, and Deauville and Trouville are among several coast resorts.

Calvados is divided into four *arrondissements*, and the centres are: Caen, Lisieux (*qq.v.*), Bayeux, and Vire. Caen, the departmental capital, is the seat of a court of appeal and the centre of an *académie* (academic district). The *département* forms the diocese of Bayeux. At Falaise, in the south, is the castle of the first dukes of Normandy, the birthplace of William I the Conqueror, of England.

Omaha Beach, that section of the Normandy coast where units of the U.S. First Army landed on June 6, 1944, and from which they penetrated into France during World War II, is on the shores of Calvados between Grandcamples-Bains (west) and Port-en-Bessin (east), northwest of Bayeux. Pop. (1982) 589,559.

Calvary (site of Jesus' Crucifixion): *see* Golgotha.

Calvé, Emma, original name ROSA EMMA CALVET (b. Aug. 15, 1858, Decazeville, Fr.—d. Jan. 6, 1942, Millau), operatic soprano famed for her performances in the title role of Georges Bizet's *Carmen.*

She spent her early years in Spain. She studied principally under Mathilde Marchesi, one of the most influential voice teachers of the era. A fine actress, she trained herself by long observation of the performances of Eleanora Duse. After her debut at Brussels (1882) as Marguerite in Charles Gounod's *Faust,* she won fame for her portrayals of Santuzza in Pietro Mascagni's *Cavalleria rusticana* and as Ophelia in Ambroise Thomas' *Hamlet.* Her interpretation of Carmen, noted for its dramatic realism, was long considered the model. In 1925 she retired from the stage to teach. She wrote an autobiography, *Sous tous les ciels j'ai chanté* (1940; "I've Sung under Every Sky").

Calvert, Cecilius: *see* Baltimore Cecilius Calvert, 2nd Baron.

Calvert, Charles: *see* Baltimore, Charles Calvert, 3rd Baron.

Calvert, George: *see* Baltimore, George Calvert, 1st Baron.

Calvert, Leonard (b. *c.* 1606, England—d. June 9, 1647, St. Mary's, Md.), first governor of Maryland colony. Leonard Calvert was the younger brother of Cecilius Calvert and the son of George Calvert, 1st Lord Baltimore. Upon George Calvert's death in 1632, Cecilius inherited the family title and also became proprietor of the newly chartered Roman Catholic colony of Maryland. Leonard Calvert was thereupon deputized as governor of the colony, and in November 1633 he sailed from England in the ships "Ark" and "Dove" with 17 gentlemen and their wives and about 200 others. The emigrants landed in Maryland the following spring and established a settlement at St. Mary's on Chesapeake Bay. In accordance with his brother's instructions, Governor Calvert initially attempted to administer the new colony under feudalistic precepts with the assistance of only two commissioners. In February 1635, however, he summoned the

first assembly to meet, and in the following years the proprietor in England, acting through Governor Calvert, and the colonial assembly struggled for the power to initiate legislation. Although the aristocratic governor initially tried to restrict the legislative powers of subsequent assemblies, he did submit in 1638 to the legislature's proposals that he govern according to the laws of England, and the right of initiative in legislation soon afterward passed to the assembly.

In 1638 Governor Calvert seized the trading post on Kent Island that had been established and was still claimed by William Claiborne, a prominent Virginia trader. Claiborne, who had been hostile toward Maryland since its founding, later joined with Richard Ingle in 1644 to instigate a successful rebellion of Protestants in the colony that forced Governor Calvert to flee to Virginia. Two years later, however, Calvert returned from Virginia with an armed force and reinstated proprietorial rule in Maryland.

Calvin, John, French JEAN CALVIN, or CAUVIN (b. July 10, 1509, Noyon, Picardy, Fr.—d. May 27, 1564, Geneva), theologian, ecclesiastical statesman, and one of the most important Protestant Reformers of the 16th century. The theological, ecclesiastical, and political ideas that he advanced in many publications, a model church that he created and directed in the city of Geneva, and the assistance he provided to the political and intellectual leaders of several countries profoundly influenced the development of Protestantism in many parts of Europe and in North America.

A brief account of the life and works of John Calvin follows. For a full biography, *see* MACROPAEDIA: Calvin and Calvinism.

Calvin attended elementary school in Noyon, the Collège de la Marche and the Collège de Montaigu in Paris (after 1523), and the University of Orléans; then he returned to Paris (1531) to study. After writing a learned study of Seneca's *De clementia* ("Concerning Clemency"), Calvin converted to Protestantism. In 1534 he left Paris and settled in Switzerland, where he wrote the *Institutes of the Christian Religion* (1536), a comprehensive and systematic manual of Protestant dogmatic theology. On his way to Strassburg in 1536, he stopped at Geneva and became the major figure in this centre of Reformed Protestantism.

Calvin's later treatises included *Instruction in Faith* (1537), *Commentary on Romans* (1539), *Psychopannychia* (1542), and *Short Treatise on the Lord's Supper* (1545).

Calvin, Melvin (b. April 8, 1911, St. Paul, Minn., U.S.), American biochemist who received the 1961 Nobel Prize for Chemistry for his discovery of the chemical pathways of photosynthesis.

After receiving his Ph.D. from the University of Minnesota (1935), he spent two years as a fellow of the Rockefeller Foundation at the University of Manchester, England. In 1937 Calvin joined the faculty of the University of California at Berkeley, where in 1946 he became director of the bioorganic chemistry group at the Lawrence Radiation Laboratory; in 1971 he became university professor of chemistry. Calvin began his work on photosynthesis in the mid-1940s. For his studies he developed a system of using the radioactive isotope carbon-14 as a tracer element in the green alga *Chlorella.* By arresting the plant's growth at various stages and measuring the tiny amounts of radioactive compounds present, Calvin was able to identify most of the reactions involved in the intermediate steps of photosynthesis. His research also included work in radiation chemistry, organic chelate compounds, and processes leading to the origin of life.

Calvinism, in Protestant Christianity, the theology developed and advanced by John Calvin. The term also is used to identify the development of some of Calvin's doctrines by his followers, and also doctrines and practices derived from the works of Calvin and his followers that became the distinguishing characteristics of the Reformed and Presbyterian churches.

A brief treatment of Calvinism follows. For full treatment, *see* MACROPAEDIA: Calvin and Calvinism.

In his theology, Calvin sought to hold in balance the full range of biblical teaching, arranged in a coherent pattern but not with absolute logical precision. He often refused to make conclusions that his followers were willing to make. Calvinism in its second form began to develop after Calvin's death in 1564. Certain developments, never postulated by him, tended to produce a more legalistic pattern in doctrine and discipline. Calvin's successor at Geneva, Theodore Beza, reverted to the medieval Scholastic practice of discussing predestination (the doctrine that some persons are elected to be saved) under the heading of God and Providence, whereas Calvin had eventually related it to the Person and work of Christ. Thus, a powerful element of speculative determinism was introduced into the doctrine. Beza also emphasized literalism in the inspiration of the Bible, which led him to believe that the only true ministry of the church must be presbyterian and not episcopal. Beza and his followers in England (Thomas Cartwright) and Scotland (Andrew Melville) emphasized church discipline exercised by presbyterian organization as being fundamental to the church's existence. The Five Articles of the Synod of Dort (1618–19) represented a powerful definition of this post-Calvin "Calvinism" and included the proposition that Christ died only for the elect (chosen), a statement that Calvin himself did not formally propose.

The deterministic element in Beza's Calvinism was modified by the introduction of covenant theology, which emphasized the successive covenants made by God with man (from Adam through Moses to Christ) in which man is to respond in obedience in daily life to God's commandments in the moral law, through the covenant of grace in Christ. The Westminster Confession (1646), for many years the standard creed of English-speaking Presbyterians, was influenced by covenant theology. Another modification of Calvin's original theology was the pietistic and pragmatic concern for personal salvation that developed among English Puritans.

Calvinism also refers to the theological emphasis and forms of church organization, worship, and discipline that became widespread in the 16th century and produced the Reformed and Presbyterian churches. This emphasis is reflected in the various confessions, catechisms, and statements of faith of the Reformed and Presbyterian churches.

Calvino, Italo (b. Oct. 15, 1923, Santiago de las Vegas, Cuba—d. Sept. 19, 1985, Siena, Italy), Italian journalist, short-story writer, and novelist, whose whimsical and imaginative fables made him one of the most important Italian fiction writers in the mid- and late 20th century.

Calvino left Cuba for Italy in his youth. He joined the Italian Resistance during World War II and after the war settled in Torino (Turin), obtaining his degree in literature while working for the Communist periodical *L'Unità* and for the publishing house of Einaudi. From 1959 to 1966 he edited, with Elio Vittorini, the left-wing magazine *Il Menabò di letteratura.*

Two of Calvino's first fictional works were inspired by his participation in the Italian Resistance: the Neorealistic novel *Il sentiero dei nidi di ragno* (1947; *The Path to the Nest of Spiders*), which views the Resistance through the experiences of an adolescent as helpless in the midst of events as the adults around him; and the collection of stories entitled *Ultimo viene il corvo* (1949; *Adam, One Afternoon, and Other Stories*).

Calvino turned decisively to fantasy and allegory in the 1950s, producing the three fantastic tales that brought him international acclaim. The first of these fantasies, *Il visconte dimezzato* (1952; "The Cloven Viscount," in *The Nonexistent Knight & the Cloven Viscount*), is an allegorical story of a man split in two—a good half and an evil half—by a cannon shot; he becomes whole through his love for a peasant girl. The second and most highly praised fantasy, *Il barone rampante* (1957; *The Baron in the Trees*), is a whimsical tale of a 19th-century nobleman who one day decides to climb into the trees and who never sets foot on the ground again. From the trees he does, however, participate fully in the affairs of his fellow men below. The tale wittily explores the interaction and tension between reality and imagination. The third fantasy, *Il cavaliere inesistente* (1959; "The Nonexistent Knight," in *The Nonexistent Knight & the Cloven Viscount*), is a mock epic chivalric tale, written with the techniques of Neorealism. These three novels were reissued as a trilogy with the title *I nostri antenati* (1960; "Our Ancestors.").

Among Calvino's later works of fantasy is *Le cosmicomiche* (1965; *Cosmicomics*), a stream-of-consciousness narrative that treats the creation and evolution of the universe. In the later novels *Le città invisibili* (1972; *Invisible Cities*), *Il castello dei destini incrociate* (1973; *The Castle of Crossed Destinies*), and *Se una notte d'inverno un viaggiatore* (1979; *If on a Winter's Night a Traveler*), Calvino uses playfully innovative structures and shifting viewpoints in order to examine the nature of chance, coincidence, and change.

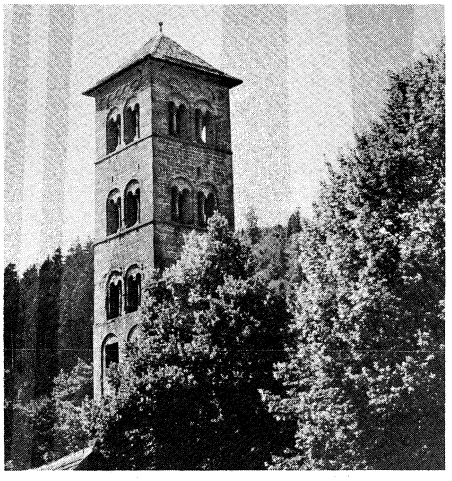
Calvo Doctrine, a body of international rules regulating the jurisdiction of governments over aliens and the scope of their protection by their home states, as well as the use of force in collecting indemnities.

The doctrine was advanced by the Argentine diplomat and legal scholar Carlos Calvo, in his *International Law of Europe and America in Theory and Practice* (1868). It affirmed that rules governing the jurisdiction of a country over aliens and the collection of indemnities should apply equally to all nations, regardless of size. It further stated that foreigners who held property in Latin American states and who had claims against the governments of such states should apply to the courts within such nations for redress instead of seeking diplomatic intervention. Moreover, according to the doctrine, nations were not entitled to use armed force to collect debts owed them by other nations. A Calvo clause in a contract between the government of a Latin American state and an alien stipulates that the latter agrees unconditionally to the adjudication within the state concerned of any dispute between the contracting parties.

The Calvo Doctrine was essentially restated by the Drago Doctrine, articulated by the Argentine foreign minister Luis María Drago in 1902. Venezuela then was indebted to Great Britain, Germany, and Italy, which threatened armed intervention to collect. Drago advised the United States government that "The public debt cannot occasion armed intervention nor even the actual occupation of the territory of American nations." This statement against European intervention in the Americas squared with U.S. policy, as set forth in the Monroe Doctrine (1823) and the Roosevelt Corollary (1904); the U.S. government assented to the modified Drago version at the second Hague Peace Conference (1907) in the

form adopted as the Porter Convention on the Limitation of the Employment of Force for the Recovery of Contract Debts. Although the United States opposed European intervention in the Americas, it reserved for itself the right, frequently used, to intervene with armed force in any Latin American state where conditions seemed to menace U.S. interests.

Calw, city, Baden-Württemberg *Land* (state), southwestern West Germany. Situated in the Nagold Valley, the city was established in 1075 and was the residence of the family of



The Eulenturm (tower-chapel), Calw, W.Ger.
De Wys Inc.

the counts of Calw until the 13th century. During the late 14th century Calw came under the rule of the counts of Württemberg, a local family. During the 17th and 18th centuries Calw became the major industrial city of (former) Württemberg state. A headquarters for the tool industry, the city also manufactures machinery, textiles, wood, paper, and leather products. Health spas are a tourist feature.

In 1975 Calw annexed the neighbouring village of Hirsau (about 2,200 inhabitants), known for its monastery, founded *c.* 830. The original structure fell to ruins in the 10th century but was rebuilt in 1065 under the direction of William of Hirsau (abbot 1069–91), who began the Ordo Hirsaugiensis, a religious order. The monastery was the starting point for comprehensive monastic reform in Germany. Laid to ruins by the French in 1692, the monastery's remnants were converted into a Roman Catholic church and museum during the 1950s. Pop. (1983 est.) 22,790.

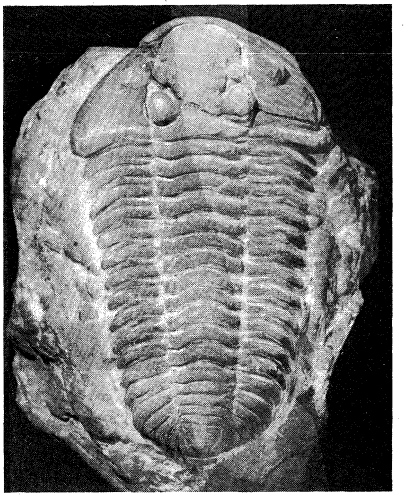
Calycerales, small and economically unimportant order of dicotyledonous flowering plants containing one family (Calyceraceae) and four genera (*Boöpis*, 30 species; *Calycera*, 10; *Acicarpha*, 10; and *Moschopsis*, 8) distributed in Central and South America, with one species (*A. tribuloides*) occurring as a roadside weed in Florida.

Plants of this group are small herbs, occasionally somewhat woody near the base, with alternating leaves and with flowers in dense heads surrounded by a series of small, green, leaflike bracts (an involucre). The flowers are bisexual or separately male and female, have an inferior, one-chambered ovary (*i.e.*, the other floral parts arise at the upper end of the female structure) with one ovule, and have a four- to six-part, sometimes leafy, calyx (fused sepals) and a tubular or more open corolla (fused petals) of four to six lobes. The anthers (male pollen-producing structures) number four to six and arise from near the mouth of the corolla in positions alternating with the corolla lobes.

The family Calyceraceae has been placed in the bellflower or teasel orders (Campanulales and Dipsacales, respectively), but recent opinion favours placing it in its own order. Its relationships are considered to be closest to the bellflower order; but it is recognized as having ties with the sunflower, or aster, order (Asterales) as well.

Calydon, ancient Aetolian town, in Greece, located on the Euenus (Évinos) River about six miles east of modern Mesolóngion. According to tradition, the town was founded by Calydon, son of Aetolus; Meleager and other heroes hunted the Calydonian boar there (*see* Meleager); and Calydonians participated in the Trojan War. The Achaeans controlled the town in 389 BC, but after the Battle of Leuctra (371), it was restored to the Aetolians by the Theban general Epaminondas. The Roman emperor Augustus moved its inhabitants to his new city Nicopolis Actia (31 BC). Two miles of the town's walls remain along the Évinos; a temple of Artemis Laphria (the Forager) has been excavated.

Calymene, genus of trilobites (extinct arthropods) dating from the Ordovician Period (the Ordovician began 500,000,000 years ago and



Calymene
By courtesy of the trustees of the British Museum (Natural History); photograph, Imitor

lasted 70,000,000 years). Well known in the fossil record, *Calymene* remains have been found in which impressions or actual remains of appendages are preserved. *Calymene* and its close relative *Flexicalymene* are frequently preserved as tightly rolled fossils. The rolling may be either a death position or a defensive one that the animal assumed to protect its soft, vulnerable underside.

Calypso, in Greek mythology, the daughter of the Titan Atlas (or Oceanus or Nereus), a nymph of the mythical island of Ogygia. She entertained the Greek hero Odysseus for seven years but could not overcome his longing for home even by a promise of immortality. At last the god Hermes was sent by Zeus, the king of the gods, to ask her to release Odysseus. According to later stories she bore Odysseus a son Auson, or Latinus, and twins, Nausithous and Nausinous.

calypso, a type of folk song primarily from Trinidad though sung elsewhere in the southern and eastern Caribbean islands. The subject of a calypso text, usually witty and satiric, is a local and topical event of political and social import, and the tone is one of allusion, mockery, and double entendre.

The calypso tradition, popularized abroad in the late 1950s, dates back to the early 19th century. During the carnival season before Lent, groups of slaves led by popular singers, or *shatwell*, wandered through the streets singing and improvising veiled lyrics directed toward unpopular political figures.

Today the carnival season, running from New Year's Day to the first day of Lent, features nightly shows in which performers sing freshly invented verses. By the end of the season, only the best liked calypsos (about 50) remain in the repertory, and the most popular singer is chosen "king."

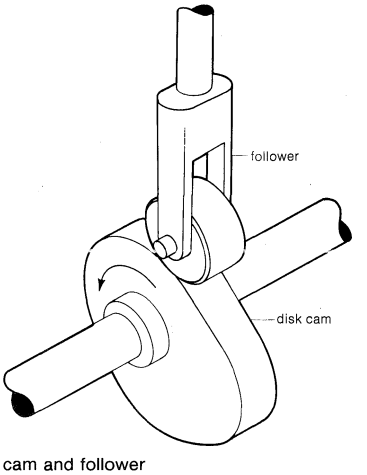
The poetic form follows that of the ballad: four-line refrains follow eight-line strophes (stanzas). The simple rhyme scheme is amply compensated for by the highly imaginative, original use of language. The singer-poet, who adopts a catchy stage name (*e.g.*, The Mighty Spoiler; Lord Melody; Attila the Hun), incorporates Spanish, Creole, and African phrases into a lowbrow idiom utilizing newly invented colloquial expressions, as *bobol* (graft), *pakoti* (unfaithfulness), and *graf* (girl). The exaggeration of local speech patterns, distorting the normal accentuation of the text, is matched by offbeat (syncopated) rhythm in the music, a familiar calypso trademark. The calypso singer either sets his verse to a stock melody or invents a simple tune of his own.

Favourite accompanying instruments are the *shak-shak* (maraca), guitar, *cuatro* (a string instrument), and *tamboo-bamboo* (bamboo poles of various lengths struck on the ground). Since World War II tuned oil drums, played together in orchestras called steel bands, have been very popular.

Calzabigi, Ranieri (b. Dec. 23, 1714, Livorno, Tuscany—d. July 1795, Naples), Italian poet, librettist, and music theorist who exerted an important influence on Christoph Willibald Gluck's reforms in opera, in which, according to Gluck, the function of music was "serving poetry by means of expression and by following the situation of the story, without interrupting the action or stifling it with a useless superfluity of ornaments . . . ."

While in Vienna during February 1761, Calzabigi was introduced to Gluck; on the following October 17 a performance was given of their first work of collaboration, the dramatic ballet *Le Festin de pierre* (*Don Juan*). Gluck later composed the music for the dance drama *Semiramide* (1765) to Calzabigi's scenario. Together they wrote the three Italian reform operas: *Orfeo ed Euridice* (1762), *Alceste* (1767), and *Paride ed Elena* (1770); in each, they aimed for simplicity, truth, and naturalness (demands that primarily affected the libretto) in the tradition of the classical drama, emphasizing the purely human element. Calzabigi, whom Gluck credited as being the chief stimulus to opera reform, returned to Italy in 1780.

cam, machine component that either rotates or moves back and forth (reciprocates) to create a prescribed motion in a contacting ele-



Disk cam and follower

ment known as a follower. The shape of the contacting surface of the cam is determined by the prescribed motion and the profile of the follower; the latter is usually flat or circular.

Cams are made in a variety of forms, such as: (1) a rotating disk or plate with the required profile; (2) a plate with a groove cut on its face to fit a roller on the follower (face cam); (3) a cylindrical or conical member with a follower groove cut around the surface; (4) a cylinder with the required profile cut in the end (end cam); (5) a reciprocating wedge of the required shape.

Cam–follower mechanisms are particularly useful when a simple motion of one part of a machine is to be converted to a more complicated prescribed motion of another part, one that must be accurately timed with respect to the simple motion and may include periods of rest (dwells). The motion of the camshaft in an automobile engine, for example, is a simple rotation that bears a fixed ratio to the crankshaft speed, whereas the valve motion produced by the cams is accurately timed relative to the crankshaft rotation and includes dwells during which the valves remain closed. Cams are essential elements in automatic machine tools, textile machinery, sewing machines, printing machines, and many others. If the follower is not restrained by a groove on the cam, a spring is necessary to keep the follower in contact with the cam.

Cam, Diogo (Portuguese explorer): *see* Cão, Diogo.

Cam Oum (Vietnamese leader): *see* Deo van Tri.

Cam Ranh, city, Phu Khanh *tinh* (province), south central Vietnam. It is situated on a peninsula enclosing Cam Ranh Bay, an inlet of the South China Sea. Cam Lam (Ba Ngoi), on the western shore of the bay, was the area's major port and naval base during French colonial days. The United States military intervention in South Vietnam in 1965 created new installations and airfields, many of them at Cam Ranh. Pop. (1972 est.) 114,975.

Cam Ranh Bay, Vietnamese VINH CAM RANH, a two-part deepwater inlet on the South China Sea, south central Vietnam. It is approximately 20 mi (32 km) long from north to south and up to 10 mi wide. It has been called the finest deepwater shelter in Southeast Asia.

The Binh Ba Bay, or outer bay, with Dao (island) Binh Ba lying off the tip of Mui (point) Cam Linh, offers some protection to ships at anchor, but the mile-wide strait that opens into the inner bay of Cam Linh provides year-round protection from monsoons and typhoons. On the western shore of Cam Linh is the site of the former French naval base and port of Ba Ngoi (now Cam Lam). On the opposite, or Mui Cam Linh, side is the city of Cam Ranh and former U.S. air and naval installations.

In 1905 the two roadsteads sheltered the fleet of the Russian admiral Z.P. Rozhestvensky en route to the naval battle of Tsushima. In 1941 the bay was seized by Japanese forces, which withdrew in 1945. In 1965 the U.S. military built a vast supply-base complex and airfields over much of the 100-sq-mi (260-sq-km) peninsula, turning them over to South Vietnam in 1972. They were captured by Vietnamese Communist forces in April 1975.

Camacho, Manuel Ávila (president of Mexico): *see* Ávila Camacho, Manuel.

Camagüey, province, east central Cuba, bounded on the north by the Atlantic Ocean, on the west by Ciego de Ávila province, on the east by Las Tunas province, and on the south by the Caribbean Sea. It was established in 1879 as Puerto Príncipe; the province of Ciego de Ávila was separated from Camagüey province in 1976. It has an area of 5,460 sq mi (14,142 sq km) and is Cuba's largest province. Camagüey's early importance as a cattle-raising area has continued, with about 1,000,000 head grazing the wide, gently rolling savannas. After 1900, cultivation of sugarcane expanded until the province became a leading sugar producer. Although its population grew rapidly after 1925, it has remained sparsely peopled. Its northern coast consists of large cays composing the eastern part of the Archipiélago de Camagüey and has no bays of importance except Nuevitas, at the eastern end. The Southern coast is swampy and without good natural harbours. The eastern half of the cays of the Jardines de la Reina (Gardens of the Queen), off the southern coast, are administered as part of the province. Highways and two railroads traverse the province, linking Camagüey (*q.v.*) city, the provincial capital, with neighbouring Nuevitas, Ciego de Ávila city, and Florida, as well as with Havana to the west and Santiago de Cuba to the east. Pop. (1981 est.) 683,889.

Camagüey, city, capital of Camagüey province, east central Cuba. Founded in 1514 as Santa María de Puerto Príncipe, at the site of present-day Nuevitas, the city was moved inland in 1528 to the Indian village of Camagüey. The prosperity of the colonial city led to a raid by buccaneers in 1668.

Because of the great production of livestock, sugarcane, and other agricultural products and of chromite in the province, Camagüey has become the largest interior city of Cuba. It retains many traces of colonial architecture, and the old part of the city contains narrow, irregular streets interrupted by small plazas. Parts of the original cathedral (1617) appear to have survived alterations. An important communications, trading, and industrial centre, Camagüey is on the central highway and is connected by rail with Havana (354 mi [570 km] northwest), Santiago de Cuba (165 mi southeast), and the port of Nuevitas (45 mi northeast). The city also has a branch of the University of Havana, a thermal power plant, and an international airport. Pop. (1981 prelim.) 245,235.

camaieu, painting technique by which an image is executed either entirely in shades of a single colour or in several tints unnatural to the object, figure, or scene represented. When a picture is monochromatically rendered in gray, it is called grisaille (*q.v.*); in yellow, cirage. Originating in the ancient world, camaieu was used in miniature painting to simulate cameos and in architectural decoration to simulate relief sculpture.

Camaiore, town, Lucca province, Toscana (Tuscany) region, north central Italy, at the foot of the Apuan Alps, northwest of Lucca. Manufactures include explosives, hemp, and hosiery. Medieval monuments include the Collegiata (dating from 1278) with a 14th-century campanile, the church of S. Michele (11th century), and a Romanesque Benedictine abbey (12th century). Camaiore also has a small museum of religious art. Pop. (1981 prelim.) mun., 30,293.

Camaldolese, member of CONGREGATION OF MONK HERMITS OF CAMALDOLI, an independent offshoot of the Benedictine order, founded about 1012 at Camaldoli near Arezzo, Italy, by St. Romuald as part of the monastic-reform movement of the 11th and 12th centuries. The order combined the solitary life of the hermit with an austere form of the common life of the monk. The monastery and the hermitage formed one unit. Beginners resided in the monastery; the proficient and more perfect, in the judgment of the abbot or prior, lived in the hermitage. This ideal union of monastery and hermitage was not always followed, and independent foundations of both types were made; the two branches were reunited in 1935. A reform group, known as the Congregation of Monte Corona, was founded in 1523 and still exists, although its numbers are few.

camanachd (stick game): *see* shinty.

Camār, widespread caste in northern India whose hereditary occupation is tanning leather; the name is derived from the Sanskrit word *carmakāra,* or "skin worker." The more than 150 subcastes are characterized by well-organized *pañcāyats* (governing councils). Because their work obliged them to handle dead animals, the Camārs have suffered from the stigma of being considered a very polluted caste. Their settlements are normally outside the caste Hindu villages. Each settlement has its own headman (*pradhān*), and larger towns have more than one such community headed by a *pradhān.* They allow widow remarriage, with either the husband's younger brother or a widower of the same subcaste. A segment of the caste follows the teaching of the saint Śiva Nārāyaṇa (*see* Satnāmī sect) and aims at purifying their customs in order to raise their social prestige. While many still follow their traditional calling of tanning, many more are part of the regular agricultural labour force.

Câmara, Helder Pessoa (b. Feb. 7, 1909, Fortaleza, Braz.), Roman Catholic prelate whose progressive views on social questions brought him into frequent conflict with Brazil's military rulers after 1964.

He was ordained a priest in 1931. In close collaboration with Msgr. Giovanni Montini (later Pope Paul VI), Câmara founded the National Conference of Brazilian Bishops in October 1952, shortly before he was named auxiliary bishop of Rio de Janeiro, and he also cooperated in the organization of CELAM (Latin-American Conference of Bishops). As general secretary of the Brazilian Conference for 11 years, Câmara encouraged the Brazilian church to take an active role in promoting social change. His interest in the shanty-town slums of Rio de Janeiro and his television sermons earned him renown as a champion of the poor. While attending the second Vatican Council, Câmara advocated a church that distributed its riches. In 1964, two weeks after the military coup that ousted Pres. João Goulart, Pope Paul named Câmara archbishop of the poverty-stricken archdiocese of Olinda and Recife, where he immediately instituted social programs and spoke in favour of reform in weekly radio broadcasts. Government authorities began to harass him actively in 1966, interfering with his ministry in the slums and condoning, possibly instigating, machine-gun attacks on his residence. In a famous speech in Pernambuco in August 1967 Câmara angered local landlords and army officers by warning that only the social action of the Church could ward off a violent revolution by the dispossessed. Câmara attacked the disparity in wealth between developed and underdeveloped nations, and, at home, the prevalence of an "internal colonialism" which fostered disrespect for basic human rights.

Câmara has been the recipient of several peace prizes. His collected sermons and speeches on social issues were published as *Revolução dentro da paz* (1968; *Revolution through Peace,* 1971).

Camargo, Marie (-Anne de Cupis de) (b. April 15, 1710, Brussels—d. April 20, 1770, Paris), ballerina of the Paris Opéra remembered for her numerous technical innovations. She reputedly established the ballet's basic leg position as turned-out 90° from the hip. A rival of Marie Sallé, Camargo was noted for her speed and agility and for her perfection of the entrechat and cabriole, jumping steps previously executed chiefly by men. To obtain the necessary freedom of movement and to display her rapidly moving feet, she became

the first danseuse to shorten her ballet skirts to calf length, to remove the heels from ballet slippers, and to wear close-fitting drawers (that evolved into ballet's basic "tights") while dancing.

Camargo studied in Paris under Françoise Prevost and danced in Brussels and Rouen before her Paris Opéra debut in 1726 in *Les Caractères de la danse.* Her success provoked the jealousy of her aging teacher, Prevost, who relegated her to the ensemble. She soon won an unexpected triumph, however, by improvising a spectacular solo when another dancer failed to enter on cue. Camargo went on to consolidate her success, setting fashion trends in shoes and coiffures and eventually dancing in 78 ballets and operas. Among her many admirers was the Comte de Clermont, with

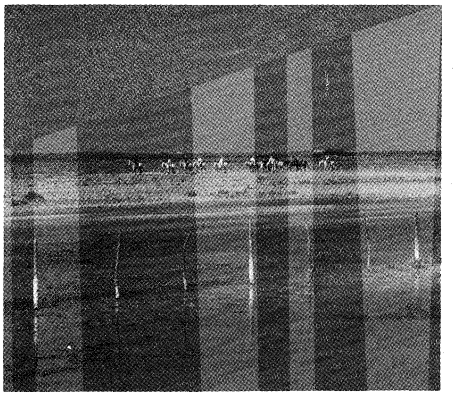
Marie Camargo, portrait by Élisabeth Vigée-Lebrun, *c.* 1780; in the Musée Cognacq-Jay, Paris
J.E. Bulloz

whom she lived when she temporarily retired from the stage (1735–41). Her final retirement was in 1751.

Camargo Society, group credited with keeping ballet alive in England during the early 1930s. Named after Marie Camargo, the brilliant 18th-century ballerina, the society was formed in 1930 by Philip J.S. Richardson, the editor of *Dancing Times,* the critic Arnold Haskell, and other patrons to stimulate interest in creating a national ballet. For the next three years the group annually commissioned three or four ballets on a subscription basis. The productions used mainly native talent, relying heavily on dancers from the small Rambert and de Valois groups and on young and unknown choreographers. In 1933 the Camargo Society's repertoire was incorporated into the Vic-Wells (now the Royal) Ballet.

Camargue, delta region (300 sq mi [780 sq km]), Bouches-du-Rhône *département,* southern France, between the Grand and Petit Rhône channels. In the northern part of the delta, the alluvium has emerged as dry land; in the south, the highest ground is along the embankments of present and former watercourses; in the intervening basins are marshes and shallow lagoons that dwindle in the Mediterranean sun. In cooler months the Camargue is swept by the mistral, the powerful, episodic, cold northern wind that blows down the Rhône Valley.

Sparsely populated, with barely 10,000 inhabitants, the region was formerly entirely wild, with roaming herds of bulls (raised for Provençal bullfights) and wild Camargue horses. The conquest of the northern Camargue began at the end of the 19th century with the appearance of vineyards, followed by forage crops and grains. The great free-roaming



Camargue region, France
Perrin-Atlas Photo

herds of cattle and horses the region is known for are still found, especially around Vaccarès in what became the Camargue regional park (203,000 ac [82,000 ha]). The growing of rice developed after World War II in an attempt to meet national demand. A very costly program extended rice culture to some 81,500 ac (33,000 ha) by 1961, but cultivation later shrank to less than a quarter of that. The salt that is so intimately a part of the marsh soils is exploited in the southeast between Vaccarès and the Rhône River. A nature reserve at Vaccarès protects rare species such as flamingos and egrets. The Camargue is also a centre of pilgrimage (Saintes-Maries-de-la-Mer) and of tourism.

Camarines Norte, province, Bicol Peninsula, southeastern Luzon, Philippines. It has a crescent-shaped area of 816 sq mi (2,112 sq km) that borders on the Philippine Sea to the north. The province includes the 12 offshore Calagua Islands and several small islets in San Miguel Bay (east). In the mountainous western section, lumbering and gold mining are the chief industries, while the lowland of the central eastern coast is an agricultural area (coconuts, bananas, abaca, rice). Fishing is also an important industry. Daet, on the coastal lowland, is the provincial capital and the province's commercial centre; it has several rice mills. Paracale in the north is located in the main mining district. Other population centres include Capalonga, Larap, and Labo. Pop. (1980) 308,007.

Camarines Sur, province, Bicol Peninsula, southeastern Luzon, Philippines. It has an area of 2,034 sq mi (5,267 sq km). Its coasts border on San Miguel Bay and the Philippine Sea (north), Lagonoy Gulf (southeast), and Ragay Gulf (west). The province includes Lahuy, Quinalasag, and Butauanan islands off the northern coast; it has three national parks—Bicol, Caramoan, and Libmanan Cave. The terrain is characterized by scattered volcanic peaks separated by agricultural lowlands in which rice, coconuts, and abaca are grown. Lumbering and fishing are also important. Pili is the provincial capital; Naga and Iriga, both chartered cities, are the commercial and political centres of the peninsula. Libmanan, Nabua, Sipocot, and Garchitorena are other important population centres. Pop. (1980 est.) 1,099,346.

Cambacérès, Jean-Jacques-Régis de, DUC (duke) DE PARME (b. Oct. 18, 1753, Montpellier, Fr.—d. March 8, 1824, Paris), statesman and legal expert who was second consul with Napoleon Bonaparte and then archchancellor of the empire. As Napoleon's principal adviser on all juridical matters from 1800 to 1814, he was instrumental in formulating the Code Napoléon, or Code Civil (1804), and subsequent codes. Often consulted on other matters of state, he tried to exert a moderating influence on the Emperor.

Member of a family long associated with the law, Cambacérès became counsellor in the Cour des Aides at Montpellier in 1774 and president of the criminal court there in 1791. Elected to the Convention in 1792, he voted at the trial of Louis XVI for the sentence of death to take effect only if France were invaded. He kept clear of party quarrels and concerned himself mainly with judicial and legislative matters. The two successive drafts for a civil code that he and Philippe-Antoine Merlin produced were not enacted. After November 1794 he became a member of the Committee of Public Safety and occupied himself with foreign affairs, being instrumental in concluding the peace treaties of 1795 with Tuscany, Prussia, the Dutch, and Spain. When the Convention was dissolved he became a member of the Council of Five Hundred. A third draft of a civil code on which he also collaborated was not debated. Because he was not reelected in May 1797, he turned to his private law practice. Then in July 1799 he was appointed minister of justice.

Having discreetly assisted Bonaparte and Emmanuel Sieyès to organize the coup d'etat of 18 Brumaire, year VIII (Nov. 9, 1799), that overthrew the Directory, Cambacérès became second consul the following December. In 1802 he rendered substantial help in establish-

Cambacérès, engraving by J.M. Gaillar after a painting by Charles-Ange Boily
By courtesy of the Bibliotheque Nationale, Paris

ing the life consulate for Bonaparte. He was made archchancellor of the empire in 1804 and created duke of Parma in 1808. Presiding over the Senate and, as a rule, over the Council of State, he exercised extended powers during Napoleon's absences.

Excluded from public life at the restoration of the Bourbon monarchy (1814), Cambacérès reluctantly returned to it in the Hundred Days, at Napoleon's bidding, when he directed the Ministry of Justice and presided over the Chamber of Peers. Exiled at the Second Restoration, he lived in Belgium until 1818, when he was allowed to return to France.

Cambay, also called KHAMBHĀT, town, Kheda district, east central Gujarāt state, west central India, at the head of the Gulf of Cambay and the mouth of the Mahi River. The town was mentioned in 1293 by Marco Polo, who referred to it as a busy port. It was still a prosperous port in the late 15th century, when Muslims controlled Gujarāt. As the gulf silted up, however, the port became insignificant. The town was capital of the princely state of Cambay, which was incorporated into Kaira (later Kheda) district in 1949. Cambay has become a commercial centre, trading in cotton, grains, tobacco, textiles, and carpets. The textile industry is prominent, and salt, matches, and stone ornaments are also manufactured. Petroleum has been discovered in the area, and development was begun in the 1970s. Cambay is a rail terminus and is served by a main highway. Pop. (1981) 68,791.

Cambay, Gulf of, trumpet-shaped gulf of the Arabian Sea, indenting northward the coast of Gujarāt state, western India, between Bombay and the Kāthiāwār Peninsula. It is 120 mi (190 km) wide at its mouth between Diu and Damān, but it narrows to 15 mi a short distance away. The gulf receives many rivers, including the Sābarmati, Mahi, Narmada (Narbada), and Tāpti. Its shape and its orientation in relation to the southwest monsoon winds account for its high tidal range (40 ft [12 m]) and the high velocity of the entering tides (6 to 7 knots). Shoals and sandbanks are treacherous to navigation, and all the gulf ports have suffered from silting caused by tides and flood torrents from the rivers.

On the eastern side of the gulf are Bharūch, one of the oldest Indian ports, and Surat, identified with early European commercial contacts with India. Cambay is at the head of the gulf. Although the importance of the gulf ports has been only local, the discovery and exploration of oil, particularly near Bharūch, around the head of the gulf, and in the offshore Bombay High field, has caused a commercial revival in the region.

Cambert, Robert (b. 1628, Paris—d. 1677, London), first French composer of opera.

He was a pupil of Jacques Chambonnières and in 1666 became superintendent of music to the dowager queen, Anne of Austria. In 1659 he collaborated with the poet Pierre Perrin in his first stage work, the *Pastorale d'Issy*. In 1669 Louis XIV granted Cambert and Perrin the exclusive right to produce operas. They founded the first Académie Royale de Musique and opened it in 1671 with their masterpiece, the five-act pastoral opera *Pomone*. In 1672, however, Jean-Baptiste Lully obtained the royal "opera privilege," and Cambert went to England. Two of his operas were performed in London, and he founded a short-lived Royall Academy of Musick in Covent Garden. He was thought to have been poisoned by a servant.

Cambio, Arnolfo di (Italian sculptor and architect): *see* Arnolfo di Cambio.

cambium, in plants, layer of actively dividing cells between xylem (wood) and phloem (bast) tissues that is responsible for the secondary growth of stems and roots (secondary growth occurs after the first season and results in increase in thickness). Theoretically, the cambium is a single layer of cells, called initial cells; practically, it is difficult to distinguish the initials from their still undifferentiated daughter cells, and several cell layers are collectively called the cambium, or cambial zone. Cambial cells divide to produce new xylem cells toward the central axis of the stem and new phloem cells toward the outside. The cambium originates from undifferentiated cells that have retained their embryonic capacity for continued growth and differentiation. A cambium may also form within callus tissues—masses of cells that grow over the injured surface of a wound, leading to healing.

Cambodian language: *see* Khmer language.

camboge (resin): *see* gamboge.

Cambon, (Pierre-) Joseph (b. June 10, 1756, Montpellier, Fr.—d. Feb. 15, 1820, near Brussels), financial administrator who attempted, with considerable success, to stabilize the finances of the French Revolutionary government from 1791 to 1795.

Cambon was a prosperous businessman in Montpellier when the Revolution broke out in 1789. As a deputy to the Legislative Assembly (October 1791–September 1792), he specialized in financial matters. Elected to the National Convention, which succeeded the Legislative Assembly in September 1792, he at

Joseph Cambon, engraving by Jean-Baptiste Vérité
By courtesy of the Bibliotheque Nationale, Paris

first sided with the moderate Girondin faction against the more radical Montagnards (deputies from the Club of the Jacobins). On Dec. 15, 1792, he secured passage of a decree for the expropriation of the property of the nobility and the church in territories conquered by French armies. The measure posed a threat to the other regimes of Europe, and within three months France was at war with most of the European powers.

Cambon voted with the majority of the deputies for the death of King Louis XVI (January 1793), and he served on the first Committee of Public Safety (April 6–July 10, 1793). Although he soon sided with the Jacobins in advocating stringent economic controls, he opposed the arrest of the Girondist leaders during the Jacobin coup d'etat of June 2, 1793. By this time Cambon was in charge of the committee on finance and the treasury. He fought inflation by reducing the quantity of assignats (paper currency issued by the Revolutionary government) in circulation, and, on Aug. 24, 1793, he instituted the *Grand Livre de la dette publique* ("Great Book of the Public Debt"), a register of all the state's creditors. Nevertheless, his independent position as head of finances was threatened by the Jacobin leader Robespierre, who sought to concentrate all authority in the second Committee of Public Safety. Hence, Cambon assisted the group of conspirators that brought about Robespierre's downfall on 9 Thermidor (July 27, 1794). In the ensuing Thermidorian reaction against the Jacobins, Cambon was removed from the financial committee (April 1795); he went into hiding until the amnesty of 4 Brumaire (Oct. 26, 1795). For the next 20 years, Cambon lived quietly on his estate near Montpellier. He was elected to Napoleon's legislature of the Hundred Days (March–July 1815) and then exiled in 1816 after King Louis XVIII was restored to power. Raoul Arnaud's *Cambon* was published in 1926.

Cambon, Jules (-Martin) (b. April 5, 1845, Paris—d. Sept. 19, 1935, Vevey, Switz.), French diplomat who played an important role in the peace negotiations between the United States and Spain (1898) and was influential in the formation of French policy toward Germany in the decade before World War I.

Educated in law, Cambon entered the prefectorial administration after service in the Franco-German War (1870–71). In June 1878 he was appointed prefect of Constantine (Algeria) and then served as secretary general of the prefecture of Paris and prefect of the *départements* of Nord (1882) and Rhône (1887). In January 1891 he returned to Algeria as governor general.

After a conspicuously successful term in Algeria, Cambon was appointed ambassador to the United States (October 1897) and helped negotiate the peace after the Spanish-American War. Ambassador to Spain (1902–07) and to Germany (1907–14), he was concerned in the disputes between France and Germany at Algeciras (1906) and after the Agadir crisis (1911). Together with his brother Paul, who was ambassador to Great Britain, he laboured to avoid war with Germany. When the hostilities began (1914) he returned to Paris to become secretary general of the Foreign Ministry (1915). During the Versailles peace conferences he served as chairman of the commissions for Greek, Czech, and Polish matters. In 1918 he was elected to the Académie Française and during 1919–31 served as chairman of the Council of Ambassadors, which was designed to supervise the application of the Versailles peace agreements.

Cambon, (Pierre-) Paul (b. Jan. 20, 1843, Paris—d. May 29, 1924, Paris), French diplomat who as ambassador to England (1898–1920) was instrumental in the formation of the Anglo-French alliance, the Entente Cordiale.

A law graduate (1870) and an ardent Republican, Cambon served as secretary to the future statesman Jules Ferry, then mayor of Paris. Sent to the *département* of Bouches-du-Rhône as secretary general of the prefecture (April 1871), he later served in several other *départements*.

In February 1882 Ferry arranged for Cambon's appointment as resident minister in Tunisia, where he successfully organized the French protectorate. After his ambassadorship to Spain (from August 1891), he was transferred to Turkey, but he failed in his efforts to negotiate a British withdrawal from Egypt. In August 1898, amid the severe tensions of the Fashoda crisis, Cambon became ambassador to Great Britain. His first years there were spent in smoothing over Anglo-French relations and were crowned by the signing of the agreement of April 8, 1904, often called the Entente Cordiale. Its immediate effect was to strengthen France's position in its conflicts over Morocco (1905–06 and 1911) with Germany, and in the long run it prepared the way for the alliance against the Central Powers in World War I. During that war Cambon continued to play a vital role in cooperation between the two allies. After service as a representative on the Turkish commission of the Versailles Conference (February 1920), he resigned his ambassadorship (December 1920) and in retirement was elected to the Académie des Sciences Morales et Politiques.

Camborne-Redruth, locality, Kerrier district, county of Cornwall, England, covering an area of 35 sq mi (91 sq km), within which the main occupation for centuries has been tin mining. Ancillary industries include the making of mining machinery, and there is a School of Metalliferous Mining at Camborne, the administrative headquarters of the district. The area is distinguished for its inventors, including Richard Trevithick (first railway passenger locomotive), William Bickford (miner's safety fuse), and William Murdock (gas lighting). Pop. (1981 prelim.) 46,482.

Cambrai, town, Nord *département,* Nord-Pas-de-Calais region, northern France, on the Escaut River, south of Roubaix. Called Camaracum under the Romans, the place had an obscure history until the 10th century. It suffered barbarian invasions and the unwelcome authority of foreign prelates until citizens obtained rights from the bishop in 1227. At one time the town and its region (Cambrésis) constituted a duchy, but it was long the pawn of contending rulers. The League of Cambrai was an alliance (1508) against Venice formed by Pope Julius II, Louis XII, Ferdinand the Catholic of Aragon, and the emperor Maximilian I. The treaty between the Holy Roman emperor Charles V and Francis I of France was signed at Cambrai in 1529. Its bishops were made counts by Henry I in the 10th century and dukes in 1510. Occupied by the Germans during both world wars, the town, twice ravaged, has been revived. Before 1914

it had a prosperous textile economy based on the fabric cambric. It now serves as the centre of a farming district rich in sugar beets, flax, grain, cattle feed, cattle, and dairy products. Industry includes textiles, building and construction equipment, woodworking, and food processing (beer and confections). Pop. (1982) 35,070.

Cambrai, League of, an alliance of Pope Julius II, the Holy Roman emperor Maximilian I, Louis XII of France, and Ferdinand II of Aragon, formed Dec. 10, 1508, ostensibly against the Turks but actually to attack the Republic of Venice and divide its possessions among the allies. Mantua and Ferrara, both of which had lost possessions to Venice, were included in the league and were promised that their territories would be restored. Despite pledges to the contrary, the four allies were unable to act together because of their individual ambitions. The only significant military operation was the French victory over Venice on May 14, 1509, at Agnadello, east of Milan, on territory ceded to Venice by France a few years earlier. The Pope, who had not joined the league until March, recovered the cities in the Romagna that Venice had seized following the death of Pope Alexander VI; Maximilian took Verona, Vicenza, and Padua in Lombardy; and Ferdinand received back territory in Apulia, in southern Italy, including the port of Brindisi. The league collapsed in 1510, when the Pope switched sides and joined with Venice, while Ferdinand, satisfied with his gains, became neutral. By October 1511 Pope Julius had succeeded in bringing Ferdinand into alliance with Venice in the Holy League (*q.v.*) directed against French power in Italy. Venice subsequently fell into decline in international affairs, despite the failure of the other powers to dismember its small empire.

Cambrai, Treaty of, also called PAIX DES DAMES (Aug. 3, 1529), agreement ending one phase of the wars between Francis I of France and the Habsburg emperor Charles V; it temporarily confirmed Spanish (Habsburg) hegemony in Italy. After a series of successes, Charles had defeated the French forces at Pavia in Italy in 1525 and forced Francis to sign the punitive Treaty of Madrid. Fearful of Charles's growing power, England, Venice, and the Pope, who had been allied with Charles, then changed sides. In 1528, after Charles's Protestant mercenaries had sacked Rome, France declared war and invaded Milan and Naples. The defection of the Genoese fleet to the empire, however, made victory impossible, and both sides were exhausted and short of funds. The subsequent treaty is called the Paix des Dames (Ladies' Peace) because it was negotiated by Louise of Savoy, mother of Francis, who had acted as regent during his absences, and Margaret of Austria, aunt of Charles and regent of the Netherlands. Francis renounced his claims in Italy and his rights as overlord in Flanders and Artois. In exchange, Charles agreed not to advance his claims to Burgundy at that time but instead accepted money as ransom for the two French princes he held. Francis abandoned his allies and received the possessions of Charles de Bourbon and the prince of Orange. The Italian Wars resumed, however, as France made three unsuccessful invasions of Italy in an attempt to replace Spain as the dominant power in the peninsula. France finally abandoned the effort in 1559, with the Peace of Cateau-Cambrésis.

Cambrian Period, interval of geologic time during which rocks of the Cambrian System were formed, and the oldest of the 11 periods in the Earth's geologic history. Several geologic epochs are encompassed within a period, which is in turn encompassed by a larger unit of geologic time known as an era. The Cambrian Period follows Precambrian time and precedes the Ordovician Period, and is the earliest period of the Paleozoic Era. Estimates of the time interval of the Cambrian Period vary from about 70,000,000 to 90,000,000 years, according to the level at which the base of the Cambrian is drawn, but there is general agreement that it ended about 500,000,000 years ago. A brief treatment of the Cambrian Period follows.

For full treatment, *see* MACROPAEDIA: Geochronology.

The Cambrian is the oldest period of Phanerozoic time (from the end of the Precambrian time to the present), and its beginning marks the still unexplained worldwide appearance in the geological record of marine animals with calcareous shells. The Cambrian System was named by the English geologist Adam Sedgwick in 1835 for Cambria (Wales) and is generally divided into the following ascending succession of series: the Comley, St. David's, and the Merioneth, which correspond respectively to Lower, Middle, and Upper Cambrian. The Caerfai Series, sometimes used as an alternative name for the Comley Series, is inadequately founded and its relative age has not been established adequately by means of fossils. A fourth series, the Tremadoc, is considered variously as the latest series in the Cambrian Period or as the earliest in the Ordovician Period. International agreement has not yet been reached on the Cambrian–Ordovician boundary, but there is considerable support for considering the Tremadoc Series as Ordovician.

Plate tectonic theory currently interprets Cambrian palaeogeography in terms of a small proto-Atlantic, or Iapetus Ocean, the opposing sides of which were formed by two continental masses, Gondwanaland and Laurentia. England, Wales and eastern Ireland, together with Europe, Africa, parts of the Middle East, India, South America, Antarctica and the easternmost Appalachian mountains of North America, formed Gondwanaland and were the site of largely clastic (mechanically derived) sedimentation, with subsidiary carbonates (limestones). In contrast, extensive developments of limestones are found in Laurentia, which comprised most of North America (including the western Appalachians), Greenland, Spitzbergen, northwestern Scotland and the western parts of Ireland and Norway. Marine fossils in the limestones of Laurentia differ from those of Gondwanaland and there are problems in correlating the two rock successions. The Lower and Middle Cambrian divisions of North America differ slightly from British divisions and the Upper Cambrian is divided into three successive stages, Dresbachian, Franconian, and Trempealeauan; the last-named is claimed by some to be at least partly equivalent to the Tremadoc Series of Wales. Other continental areas in the Cambrian comprised Baltica (including northernmost Europe, Scandinavia, and the Baltic region), Siberia, and Mongolia (including northern China). The palaeogeographic relationships of these is not known precisely, but evaporites in Siberia suggest warm temperatures and high evaporation there. The rocks of Baltica generally lack limestones and suggest deposition in cool water; fossils, particularly in the Upper Cambrian, indicate a marine connection with Wales, England, and the eastern Appalachians.

Only marine fossils are known from Cambrian rocks; most are invertebrates, but fragments of Agnatha (jawless fishes) have been reported from the late Cambrian of Wyoming in the U.S. The only plants represented are algae. Trilobites (distant relatives of the horseshoe crab) were the dominant animal group during the Cambrian, at the end of which they underwent marked extinctions at the family level on a worldwide scale. The degree of trilobite organization in older Cambrian strata suggests a long period of earlier evolution that is not represented in the fossil record. Most trilobites inhabited benthonic (shallow marine) environments, but some adapted to life in sea surface waters that were so poorly oxygenated that a bottom-living fauna could not survive. The fossil remains of planktonic (passively floating) or nektonic (free-swimming) trilobites will often facilitate the correlation of rock sequences in widely separated areas. Other animal groups are found, even in the Lower Cambrian, and include early representatives of the brachiopods, mollusks and echinoderms. Archaeocyathids are marine organisms, superficially resembling sponges, found only in Lower and Middle Cambrian rocks. They are stratigraphically valuable and, in association with stromatolites (algal deposits), often form reef-like masses (bioherms), particularly in the U.S.S.R. and Australia. Cambrian graptolites (a now extinct group of small colonial animals), unlike those of the Ordovician, lived attached to the sea floor and their fossil remains are unsuitable for correlating rocks separated by long distances. Some appear to have evolved rapidly to a planktonic mode of life at the beginning of the Tremadoc Series, in which they become important as zonal fossils. The Middle Cambrian Burgess Shale of the southern Canadian Rocky Mountains preserved more than 100 genera of animals because of their entombment by mud sliding down the sloping seafloor adjacent to the continent edge. The fauna, only one-third of which had mineralised hard parts, emphasizes the variety of Cambrian life that is not normally preserved and includes what may be a primitive chordate.

cambric, lightweight, closely woven, plain cotton cloth first made in Cambrai, Fr., and originally a fine linen fabric. Printed cambric was used in London by 1595 for bands, cuffs, and ruffs. Modern cambric is made from choice American or Egyptian cotton, with both warp and weft or filling, yarns ranging from 60 to 80 in size (count), and is usually lightly calendered to produce a slight gloss on one side.

Cambric may be bleached or dyed in the piece. Lower qualities have a smooth, bright finish. It is light in weight, well adapted to sewing, has good body, is well sized, and presents a neat, appealing hand and finish. Since cambric launders easily and well, it is ideal for handkerchiefs, children's dresses, slips, underwear, and nightgowns.

French cambric is woven of superior cotton yarns; it is fine textured and is used in neckwear and scarves when dyed or printed. Irish cambric is an all-linen, plainwoven cloth used for underwear, dresses, and handkerchiefs. Soft, kid-finished cambric is used for dress linings.

Cambridge, city, Regional Municipality of Waterloo, southeastern Ontario, Canada, 55 mi (90 km) west-southwest of Toronto. Cambridge was created in 1973 from the consolidation of the city of Galt, the towns of Hespeler and Preston, and parts of the townships of Waterloo and North Dumfries. Galt was founded *c.* 1817 and, along with Dumfries Township, became the home of large numbers of Scottish immigrants. Hespeler and Preston were settled in the early 1800s, largely by Mennonites from Pennsylvania. These settlements developed primarily as milling towns, producing flour, lumber, and textiles. Hespeler also became a quarrying centre, and sulfur springs at Preston made the town a well-known health resort. All later developed heavy-metal and machine industries. The city of Cambridge lies in one of Ontario's most heavily industrialized areas and produces a variety of manufactured goods. Pop. (1981) 77,183.

Cambridge, district (city), county of Cambridgeshire, England, on the east bank of the

River Cam. With an area of 16 sq mi (41 sq km), it is the home of the internationally known Cambridge University.

Originally a fording place, Cambridge possesses earthworks, including Castle Hill, and Roman remains. Later there was another settlement at Market Hill. Two monastic foundations date from the 11th and 12th centuries, respectively—Barnwell Priory and a Benedictine nunnery, replaced in 1496 by Jesus College.

Cambridge received its first charter in 1207; the uninterrupted existence of public officers since the Middle Ages is noteworthy. It also has an interesting guild history, Corpus Christi College having been founded by guilds in 1352. The Midsummer fair, dating from the early 16th century, is still held.

University and college buildings provide most of the outstanding architectural features. The beauty of the city is enhanced by many commons and open spaces, including the Backs, landscaped gardens through which the River Cam winds behind the Old Schools (the main line of colleges) and under a series of magnificent bridges. East of the Cam, which was used extensively for water transport in the past, is King's Parade, a street where the 15th-century Church of St. Mary the Great and a line of attractive shops face the Senate House (1722–30) and King's College, with its chapel (1446–1515). The chapel is one of the finest monuments of medieval architecture.

Other noteworthy churches include St. Benet's with its Saxon tower, the restored Norman Holy Sepulchre Church (one of only four round churches in England), and St. Edward's Church. The Fitzwilliam Museum (*q.v.*; 1837–41) is in Trumpington Street, a continuation of King's Parade. West of the river is the red brick University Library (1931–34). The Cambridge and County Folk Museum is near Magdalene College in Castle Street.

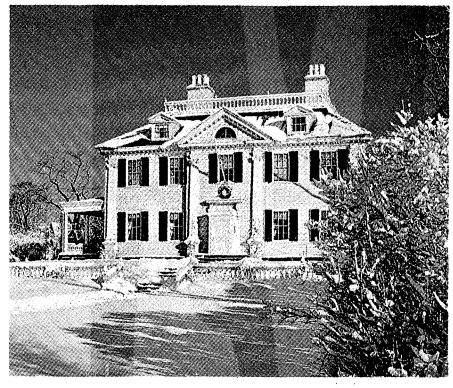
Old Trinity Church, Cambridge, Md.
Milt and Joan Mann from CameraMann

with the addition of deepwater facilities and the completion in 1964 of the Marine Terminal, the city was opened to world commerce. Boatbuilding, food processing, seafood canning, lumbering, and light manufacturing are among its economic assets. Old Trinity Church (1675, restored 1960), Meredith House (1760), and other colonial landmarks are nearby. The Blackwater National Wildlife Refuge is 10 mi (16 km) south. Inc. town, 1793; city, 1884. Pop. (1980) 11,703.

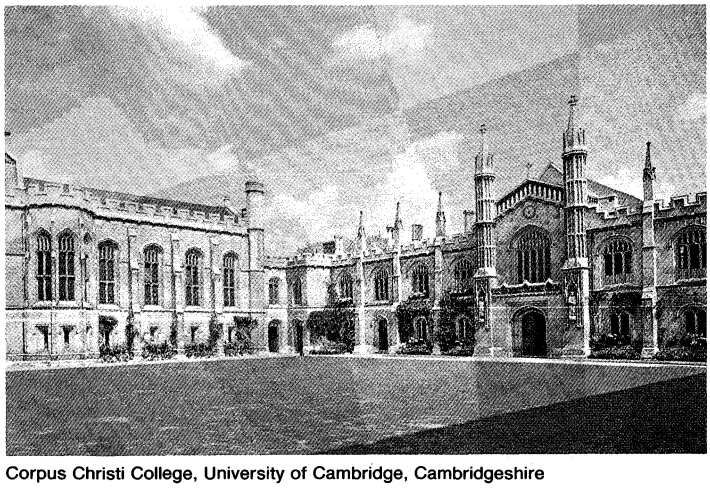
Cambridge, city, co-seat (with Lowell) of Middlesex County, eastern Massachusetts, U.S., on the Charles River, opposite (north of) Boston. Originally settled as New Towne in 1630 by the Massachusetts Bay Company, it was organized as a town in 1636 when it became the site of Harvard College (later Harvard University); it was renamed for Cambridge, Eng., in 1638 and became county seat in 1643. The old part of Cambridge (around Harvard Square) is regarded as a symbol of American culture and history. It was there that the general synods of the New England churches met in 1637 and 1647 to settle disputed points of doctrine, and from there that the Rev. Thomas Hooker's congregation departed for Connecticut in 1636. At the outbreak of the Revolutionary War the first American army camped at what is now Cambridge Common, where George Washington assumed leadership of the Continental forces on July 3, 1775. The first Massachusetts Constitutional Convention met in Cambridge in 1779–80.

Industrial development was slow. Stephen Day (Daye) had set up the first printing press in the Colonies at Cambridge in 1639 (forerunner of the city's modern publishing and printing industry), and the first books to be printed in America came from this press. After completion (1912) of subway connections to Boston, the city experienced rapid industrial expansion. Diversified products include scientific instruments, electrical machinery, chemicals, rubber goods, leather, and fabricated metals. Scientific and industrial research has become a major activity, stimulated by the presence of Harvard University and also the Massachusetts Institute of Technology (founded in Boston in 1861 and moved to Cambridge in 1916). Cambridge is also the seat of Radcliffe College (1879), Lesley College (1909), and the Episcopal Divinity School (1867). The headquarters of the Smithsonian Astrophysical Observatory, formerly in Washington, D.C., was moved to Cambridge in 1955. The John F. Kennedy Memorial Library was dedicated in 1978. The city's population reached a peak of 120,740 in 1950 but thereafter declined; this was attributed to the movement of people and industry to the suburbs.

Cambridge has been home to many notable people, and its Mount Auburn Cemetery contains the graves of the poet Henry Wadsworth Longfellow; the poet-diplomat James Russell Lowell; the physician-author Oliver Wendell Holmes; Mary Baker Eddy, the founder of Christian Science; and the actor Edwin Booth. The Craigie-Longfellow House (built 1759) served as Washington's headquarters 1775–76, was Longfellow's home (1837–82), and has been designated Longfellow National Historic Site. Inc. city, 1846. Pop. (1980) 95,322.



Longfellow's house, Cambridge, Mass.
Arthur Griffin—EB Inc.



Corpus Christi College, University of Cambridge, Cambridgeshire
Shostal—EB Inc.

Cambridge has good rail and road access to London, about 60 mi (97 km) south. Factories, located on the outskirts, include printing and instrument-making works as well as agriculturally based industries. In addition to its other administrative offices, the city serves as headquarters of the district of South Cambridgeshire (*q.v.*). Pop. (1982 est.) 101,100.

Cambridge, city, seat (1687) of Dorchester County, eastern Maryland, U.S., on the Choptank River's south bank near Chesapeake Bay's Eastern Shore. Bisected by Cambridge Creek (a natural harbour), it was founded in 1684 as a plantation port and named (1686) for the English city. For more than two centuries it handled small coastwise traffic, but

Cambridge, EARLS, MARQUESSES, AND DUKES OF, titled English nobility of several creations, grouped below chronologically and indicated by the symbol •.

• **Cambridge, Edmund of Langley, earl of:** *see* York, Edmund of Langley, 1st duke of.

• **Cambridge, James Hamilton, earl of:** *see* Hamilton, James Hamilton, 3rd marquess and 1st duke of.

• **Cambridge, William Hamilton, earl of:** *see* Hamilton, William Hamilton, 2nd duke of.

• **Cambridge, George Augustus, marquess and duke of:** *see* George II *under* George (Great Britain).

• **Cambridge, Adolphus Frederick, 1st duke of** (b. Feb. 24, 1774, London—d. July 8, 1850, London), British field marshal, seventh son of King George III.

Having studied at the University of Göttingen, he served in the Hanoverian Army and with the British Army in the Low Countries, being severely wounded in 1793. He was created earl of Tipperary and duke of Cambridge in November 1801 and became a privy councillor in 1802. In 1813 he was promoted field marshal and in 1816, after the electorate of Hanover had been raised to the rank of a kingdom, the Duke was appointed viceroy. He held this position until the separation of Great Britain and Hanover in 1837.

• **Cambridge, George William Frederick Charles, 2nd duke of** (b. March 26, 1819, Hannover, Hanover—d. March 17, 1904, London), field marshal and commander in

chief of the British Army for 39 years; he was the only son of Adolphus Frederick, the youngest son of King George III of England.

After brief service in the Hanoverian army, Cambridge became a colonel in the British Army in 1837. At the beginning of the Crimean War (1854–56) he commanded the 1st Division and by the end of the war had taken part in all the major battles; his leadership, however, was not particularly distinguished. After the war, Cambridge was promoted to general and appointed commander in chief—his meteoric rise being accounted for by the fact that Queen Victoria was his cousin. Though responsible to Parliament for military administration, Cambridge as commander represented the crown and, therefore, exercised considerable independence in discipline, appointments, and promotions, in all of which he favoured social standing and seniority rather than ability.

The Crimean War had revealed glaring defects in the British military system, but the staunchly traditionalist Cambridge vigorously opposed reform. After 1868, when Gladstone became prime minister, the Duke was forced to yield to a series of changes distasteful to him: the commander in chief was made subordinate to the war minister, the purchase of commissions was abolished, and the short-service system was adopted. Further reforms were introduced over his objections in 1881. Unable to adjust to changing conditions, he was forced to resign in 1895.

Cambridge, Richard Owen (b. Feb. 14, 1717, London—d. Sept. 17, 1802, Twickenham, Middlesex, Eng.), poet and essayist who entertained many of his most brilliant contemporaries in the world of literature and politics. He was author of *The Scribleriad,* a mock epic poem satirizing false learning, whose hero is the fictitious literary hack "Martinus Scriblerus," originally the witty creation of Jonathan Swift, Alexander Pope, and John Arbuthnot. Educated at Eton and the University of Oxford, he spent his life as a country gentleman. *See also* Scriblerus Club.

Cambridge, University of, English autonomous institution of higher learning at Cambridge, Cambridgeshire, Eng., on the River Cam 50 mi (80 km) north of London. Cambridge was an important town long before the university existed. The site was once occupied by the Romans and was later fortified by William the Conqueror. The university traces its history back to the year 1209, when a number of students from Oxford migrated there. In 1284 the first college, Peterhouse, modeled after Merton College at Oxford, was founded by Hugo de Balsham, Bishop of Ely. In the next 300 years most of the other colleges were founded. Cambridge received formal recognition as a *studium generale* from Pope John XXII in 1318.

Cambridge remained fairly insignificant until about 1502, when a professorship of divinity was founded—the oldest in the university. In 1511 Desiderius Erasmus went to Cambridge and did much to inculcate the new learning of the Renaissance there. In 1546 Henry VIII founded Trinity College, which was and still remains the largest of the Cambridge colleges.

The university was formally incorporated in 1571, adapting itself to the pattern set down by Oxford and the University of Paris. The main course of study was based on the traditional trivium (Latin grammar, rhetoric, and logic) and quadrivium (arithmetic, geometry, music, and astronomy). Degrees in such areas as divinity, law, and medicine could be obtained after further study.

Another important event in the academic rise of the university occurred in 1669, when Isaac Newton arrived to teach mathematics. He remained for 30 years, raising the study of mathematics at Cambridge to a preeminent position that still persists. When the first honours examination in the university came into being in the 18th century it was primarily mathematical. Called the tripos, after the three-legged stool used formerly at disputations, it remained the only honours examination until the institution of a classical tripos in 1824.

Toward the end of the 19th century enrollment increased markedly; in 1873 the university's first college for women, Girton, was established. The period following World War I was remarkable for the number of distinguished men who held appointments; among them were the physicists Sir Joseph John Thomson and Lord Rutherford, the economist J.M. Keynes, and the historian G.M. Trevelyan. Among the university's famous students in the past are John Milton, William Wordsworth, and Charles Darwin.

Like the university itself, the colleges are self-governing and are legally independent of the university. No one can become a student in the university except through membership in one of these institutions, and no one can remain a student in one of the institutions without being enrolled in the university.

The colleges and collegiate institutions of the university are: Christ's (1505), Churchill (1960), Clare (1326), Clare Hall (1966), Corpus Christi (1352), Darwin (1964), Downing (1800), Emmanuel (1584), Fitzwilliam (1869), Girton (1869), Gonville and Caius (1348), Homerton (1977), Hughes Hall (1885), Jesus (1496), King's (1441), Lucy Cavendish (1965), Magdalene (1542), New Hall (1954), Newnham (1871), Pembroke (1347), Peterhouse (1284), Queens' (1448), Robinson (1977), St. Catherine's (1473), St. Edmund's House (1896), St. John's (1511), Selwyn (1882), Sidney Sussex (1596), Trinity (1546), Trinity Hall (1350), and Wolfson (1965).

Departments of the university are architecture and the history of art, classics, divinity, English, languages, music, Oriental studies, economics and politics, education, history, law, philosophy, engineering, geography and geology, mathematics, physics, chemistry, archaeology and anthropology, biology, and clinical medicine.

Many of the college buildings are rich in history and tradition. The mulberry tree under which Milton is reputed to have written *Lycidas* is on the grounds of Christ's College; Samuel Pepys's Library, housed in the original cases, is at Magdalene College. Two of the colleges contain chapels designed by Christopher Wren—Pembroke and Emmanuel.

The university library with well over 3,000,000 volumes is one of a handful in the country that is entitled to a copy of every book published in Great Britain. Noteworthy collections include the Acton Library of medieval, ecclesiastical, and modern history, the W.G. Aston Japanese library, the papers of Charles Darwin, and the Wade Chinese collection.

The Fitzwilliam Museum contains, among other things, important collections of Egyptian, Greek, and Roman antiquities; medieval and modern manuscripts; and paintings of European masters.

Cambridge Agreement (Aug. 26, 1629), pledge made in Cambridge, Eng., by English Puritan stockholders of the Massachusetts Bay Company to emigrate to New England if the government of the colony could be transferred there. The Company agreed to their terms, including transferral of the company charter. Control of the corporation was shifted to the signers of the agreement, and John Winthrop was appointed governor. The following year, he and a large number of Puritan followers settled in the Boston area.

Cambridge critics, group of critics who were a major influence in English literary studies from the mid-1920s and who established an intellectually rigorous school of critical standards in the field of literature. The leaders were I.A. Richards and F.R. Leavis of Cambridge University and Richards' pupil William Empson. In the 1920s Cambridge was distinguished in many fields; Ernest Rutherford's scientific work in the Cavendish Laboratory, John Maynard Keynes's economic theories, and, especially, Ludwig Wittgenstein's ventures in philosophy, linguistic analysis, and semantics shaped the approach of the Cambridge critics to literature. C.K. Ogden, originator of Basic English, was associated with Richards in linguistic studies (*The Meaning of Meaning,* 1923) at Cambridge. These critics' treatment of literature was based upon a close examination of the literary text, as exemplified in two seminal books by Richards, The *Principles of Literary Criticism* (1924) and *Practical Criticism* (1929), and upon the relation of literature to social issues as part of a larger criticism of life, treated by Leavis in such books as *Culture and Environment* (1933) and *The Great Tradition* (1948), a work on the English novel. Leavis' quarterly *Scrutiny* (1932–53) was devoted to both aspects, and its contributors—among them L.C. Knights, Denys Thompson, and Leavis' wife, Q.D. Leavis (*Fiction and the Reading Public,* 1932)—made notable contributions to criticism. William Empson's *Seven Types of Ambiguity* (1930) and *The Structure of Complex Words* (1951) demonstrated the scope of criticism stemming from linguistic analysis. Cambridge criticism conformed to no special type, but its analytical bent, astringency, and disdain of merely appreciative writing sprang from its creators' formidable training and interests in philosophy, linguistics, psychology, and social sciences and from their immense reading in literature.

Cambridge Flag: *see* Grand Union Flag.

Cambridge Platform, basic document of New England Congregationalism, prepared in Cambridge, Mass., in 1648. It provided for all the details of church government, including the principle that was basic to Congregationalism, the autonomy of the local congregation. In doctrinal matters, the Cambridge Platform incorporated the Westminster Confession, the creedal statement of Presbyterianism that was completed in England in 1646.

To make the best use of the Britannica, consult the INDEX *first*

Cambridge Platonists, group of 17th-century English philosophico-religious thinkers who hoped to reconcile Christian ethics with Renaissance Humanism, religion with the new science, and faith with rationality. Their leader was Benjamin Whichcote, who expounded in his sermons the Christian Humanism that united the group. His principal disciples at Cambridge were Ralph Cudworth, Henry More, and John Smith; Joseph Glanvill was an Oxford convert. Nathanael Culverwel, Richard Cumberland, and the mystic Peter Sterry at Cambridge and John Norris at Oxford were influenced by Cambridge Platonism without wholly accepting its moral and religious ideals.

Educated as Puritans, the Cambridge Platonists reacted against the Calvinist emphasis on the arbitrariness of divine sovereignty. In their eyes, Thomas Hobbes, the political philosopher, and the Calvinists both erred in supposing that morality consists in obedience to a will. Morality, the Platonists said, is essentially rational; and the good man's love of goodness is at the same time an understanding of its nature, which not even God can alter through sovereign power. Against both William Laud, archbishop of Canterbury, and the Calvinists, they denied that ritual, church government, or detailed dogmas are essentials of Christianity.

To be a Christian is to participate in divine wisdom and to be free to choose whatever forms of religious organization prove helpful. The width of their tolerance won them the nickname "latitude men"; and they were often condemned as Unitarians or atheists because they stressed morality so far above dogma.

Their metaphysics derives from Renaissance Platonism, which interpreted Plato in a Neoplatonic light. They learned much from Descartes's critique of Empiricism; but, fearing that the new "mechanical" theories might undermine the religious world view, they supported (against Descartes) a teleological interpretation of natural processes.

Cambridgeshire, county of eastern England. Of ancient origin, the shire, or county, was greatly enlarged by the government reorganization of 1974 to embrace the former county of Huntingdon and two other administrative units, the Soke of Peterborough and the Isle of Ely. Its area is 1,316 sq mi (3,408 sq km), and it comprises six administrative districts: East Cambridgeshire, Fenland, Huntingdon, Peterborough, South Cambridgeshire, and the city of Cambridge. Cambridge serves as the county town, or seat.

The arm of the North Sea today known as The Wash formerly extended much farther inland than at present. Lying between sea and land, this area belonged sometimes to one and sometimes to the other, filling with deposits of peat, silt, and sea clay. It was encircled by a rim of low hills. The present county comprises much of this rim, together with the southern half of the inlet, now drained and reclaimed to form the Fens (*q.v.*). Here and there low ridges, which break the flatness of the Fens, represent former islands. The largest of them, the Isle of Ely, formed a safe retreat for Englishmen opposed to William I the Conqueror and his invading Normans; with this opposition the name of Hereward the Wake is associated.

Prehistoric tracks ring the Fens, and drainage was begun by the Romans. The county's major relics of the past are the splendid cathedrals of Ely and Peterborough, a host of ancient churches—ranging from Saxon churches at Wittering and Barnack to 15th-century churches at Godmanchester and St. Neot's—and the university buildings in the city of Cambridge.

The county is crossed by two major rivers, the Nen and the Great Ouse, with its tributary the Cam. As these have been progressively regularized and embanked, the surface of the county has become available for agriculture. Crop specialization is well developed, with cereals grown on the chalky eastern rim. Cereals, potatoes, sugar beets (processed at Ely), and vegetables are grown on the Fens; and fruits for canning and jam making are produced on the slopes of the islands and around Wisbech.

Apart from widely scattered food industries, the county's main manufacturing centre is Peterborough, whose recent expansion both in population and in engineering industries has been remarkable. Cambridge possesses light industries, including scientific instruments. The hilly rim along the southern edge of the county falls within the residential commuter belt both of Cambridge itself, with its large university population, and of London, 40–50 mi (70–80 km) to the south. Pop. (1982 est.) 598,600.

Cambyses, Old Persian KAMBUJIA, name of ancient Persian rulers, grouped below chronologically and indicated by the symbol •.

• **Cambyses I** (fl. 6th century BC), ruler of Anshan *c.* 600–559 BC. Cambyses was the son of Cyrus I and succeeded his father in Anshan (northwest of Susa in Elam) as a vassal of King Astyages of Media. According to the 5th-century-BC Greek historian Herodotus, Cambyses married a daughter of Astyages, by whom he became the father of Cyrus II the Great.

• **Cambyses II** (fl. 6th century BC), Achaemenid king of Persia (reigned 529–522 BC), who conquered Egypt in 525; he was the eldest son of King Cyrus II the Great by Cassandane, daughter of a fellow Achaemenid. During his father's lifetime Cambyses was in charge of Babylonian affairs. In 538 he performed the ritual duties of a Babylonian king at the important New Year festival, and in 530, before Cyrus set out on his last campaign, he was appointed regent in Babylon.

The conquest of Egypt, planned by Cyrus, was the major achievement of Cambyses' reign. The invasion took place during the reign of Psamtik III. Cambyses received assistance from Polycrates of Samos; from Phanes, a Greek general in the Egyptian army who gave him valuable military information; and from the Arabs, who provided water for the crossing of the Sinai Desert. After Cambyses had won the Battle of Pelusium (525) in the Nile Delta and had captured Heliopolis and Memphis, Egyptian resistance collapsed.

While in Egypt, Cambyses planned expeditions against Ethiopia, the Oasis of Amon (modern Wāḥat Sīwah), and Carthage. He himself set out against Ethiopia, but, after annexing the northern part of the country, he ran short of supplies and had to return. A detachment sent out from Thebes captured al-Kharijah (Kharga) Oasis but perished in a sandstorm before reaching the Oasis of Amon. The attack on Carthage was never attempted.

The 5th-century-BC Greek historian Herodotus accused Cambyses of many atrocities in Egypt, attributing them to madness, but contemporary Egyptian sources suggest that his accusations must largely be discounted. At least at the beginning of his rule, Cambyses pursued a conciliatory policy.

According to a later Achaemenid king, Darius I the Great, Cambyses, before going to Egypt, had secretly killed his brother, Bardiya, whom Herodotus called Smerdis. The murdered prince was, however, impersonated by Gaumata the Magian, who in March 522 seized the Achaemenid throne. Cambyses, on his return from Egypt, heard of the revolt in Syria, where he died in the summer of 522, either by his own hand or as the result of an accident.

Camden, town, eastern New South Wales, Australia, on the Nepean section of the Hawkesbury River, in the Southern Highlands. The locality, originally known as Cowpastures, was renamed Camden Park in 1805, after the 2nd earl Camden, secretary of state for the colonies at that time, by John Macarthur, who bred merino sheep in Australia. The village, surveyed in 1836, was proclaimed a municipality in 1889. At that time, dairying was rising to prime importance in the district's economy, a position that it still holds. Other activities include coal mining, livestock raising, and the cultivation of fruits, grapes, and vegetables. The Hume Highway from Sydney, 35 mi (56 km) northeast, passes through the town. Pop. (1981) 9,000.

Camden, inner borough of Greater London, to the north of Westminster and the City, the historic core of London. It extends some 5 mi (8 km) from High Holborn to the northern heights of Hampstead Heath and covers an area of 8 sq mi (21 sq km).

Various medieval manors in the southern part, which were the properties of the landed gentry, have names associated with these families. The country estates are characteristic of the district of Bloomsbury, which was developed in Georgian times for town houses. When the railways came in the 19th century, terminals were established, notably at King's Cross and Euston.

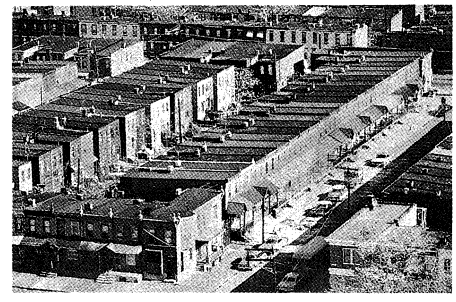
In the southern part of Camden, Hatton Garden is the centre of the diamond, gold, and silver trades. Nearby in Clerkenwell are remnants of watch, clock, and precision instrument crafts. Camden Town still retains furniture and piano-making trades.

Noteworthy 19th-century buildings include St. Pancras Church (1822), the British Museum (1823–47), and University College (1828). Research institutes and colleges of the University of London and its Senate House (1932) are located in Bloomsbury. The 620-ft- (189-m-) high Post Office Tower and new office complexes are later landmarks.

Between Euston Road and the heights of Hampstead, railway stations and marshalling yards, together with congested Victorian housing, offer striking contrasts with the expensive residential areas in the north of the borough, including the "villages" of Hampstead and Highgate that have been surrounded by the northward spread of London. Pop. (1982 est.) 175,900.

Camden, city, seat (1843) of Ouachita County, south central Arkansas, U.S., on a bluff overlooking the Ouachita River. First settled in 1783, it was known as Écore á Fabre (for a French pioneer). After 1824 steamboats docked at the site. It was incorporated in 1844 and was renamed by Thomas Woodward for his hometown in Alabama. Following the Civil War railways became the main carriers, but in 1926 the river channel was deepened by a series of locks and dams, and the boat trade was revived. Camden is now a shipping point for timber, pulpwood, and paper and has a diverse manufacturing economy. There are local deposits of kaolin clay (used in pottery and chinaware), lignite, sand and gravel, and oil. Southern Arkansas University-Technical Branch (1975) was formerly the Southwest Technical Institute (1967). White Oak Lake State Park and the Poison Spring Battleground Historical Monument are to the northwest. Pop. (1980) 15,356.

Camden, city, seat (1844) of Camden County, New Jersey, U.S., on the Delaware River, there bridged to Philadelphia, Pa. In 1681, the year before Philadelphia was founded, William Cooper built a home near the Cooper River where it enters the Delaware and named the tract Pyne Point. Settlement, largely by Quakers, was slow. A townsite was laid out by Jacob Cooper, a descendant of William, in 1773. It was named for Charles Pratt, 1st Earl Camden, whose opposition to British taxation policies made him popular with the American colonists. The development of the new village was impeded by the American Revolution,



Row houses, Camden, N.J.
Milt and Joan Mann from CameraMann

and Camden was often held by the British when they occupied Philadelphia. After 1800, growth was spurred by increased ferry services and the advent of the railroad. Further expansion followed the Civil War, when important industries were introduced. A steel pen company was established in Camden in 1858; the Campbell Soup Company plant was opened there in 1869 and started marketing

condensed soups in 1897. The Victor Talking Machine Company, founded in 1894 and purchased by the Radio Corporation of America (RCA) in 1929, developed the phonograph in Camden. Shipbuilding on the waterfront dates from 1899, and the city produces a broad spectrum of manufactures.

The "boxlike" row houses which were built for workers in the 1930s are architecturally unique. The poet Walt Whitman lived in Camden from 1873 until his death in 1892; his home is maintained as a state historic site, and he is buried in Harleigh Cemetery. Camden is the site of an urban campus (1950) of Rutgers State University and of Camden County College. Inc. 1828. Pop. (1970) 102,-551; (1980) 84,910.

Camden, city, seat (1791) of Kershaw County, in north central South Carolina, U.S. Founded by English settlers along the Wateree River about 1733/34, the community prospered after the opening of Joseph Kershaw's store in 1758. Originally known as Pine Tree Hill, it changed its name in 1768 to honour Lord Camden, a British supporter of the colonial cause. During the Revolutionary War, Lord Cornwallis' troops decisively defeated the Americans under Gen. Horatio Gates on Aug. 16, 1780, at Camden. Later the city was reoccupied by the Americans under Gen. Nathanael Greene, but he was driven from his camp on nearby Hobkirk Hill by British troops on April 25, 1781. The British, however, were soon obliged to withdraw from the area. After the Revolution, Camden enjoyed a period of prosperity as a cotton and resort centre. During the Civil War it was a Confederate supply base and was occupied and burned by Gen. William T. Sherman's Union troops in February 1865. It subsequently developed as an agricultural centre and has benefitted from industrialization, producing artificial fabrics and finished textiles.

Camden is known for equestrian sports, and its Springdale Course is the scene of the annual Carolina Cup and International Colonial Cup steeplechases. Inc. 1791. Pop. (1980) 7,462.

Camden, Battle of (Aug. 16, 1780), in U.S. War of Independence, British victory in South Carolina, sometimes called the most crushing defeat ever inflicted upon an American army.

After the fall of Charleston, S.C., to the British in May 1780, the American general Horatio Gates marched upon the British stronghold at Camden with a force of 1,400 regulars and more than 2,000 militia. With his army weakened by hunger and dysentery, Gates was surprised north of Camden by a British force of 2,200 troops under Lord Cornwallis. At the first attack, the untried colonial militia fled, and the regulars were soon surrounded and almost wiped out.

Though only 324 British were killed, the Americans suffered more than 2,000 casualties and lost large amounts of military supplies. While enhancing the reputation of Cornwallis, the battle ruined the career of Gates, who was replaced. The victory opened the way to a subsequent British invasion of North Carolina. The British stopped a second American attack on Camden under Gen. Nathanael Greene on April 25, 1781, at Hobkirk's Hill (*q.v.*) but, worn down by colonial guerrilla harassment, they burned and evacuated the town the following month.

Camden, Charles Pratt, 1st Earl (baptized March 21, 1714, London—d. April 18, 1794, London), English jurist who, as chief justice of the court of common pleas (1761–66), refused to enforce general warrants (naming no particular person to be arrested). As lord chancellor of Great Britain (1766–70), he opposed the government's North American colonial policy of taxation without parliamentary representation.

Pratt (created Baron Camden in 1765 and

1st Earl Camden, detail of an oil painting by Sir Nathaniel Dance-Holland; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Earl Camden in 1786) was a school friend and political ally of the statesman William Pitt the Elder, 1st earl of Chatham. In 1763, as chief justice, he granted a writ of habeas corpus to John Wilkes, who, in the periodical *North Briton,* had referred to a speech by King George III as a lie and had been arrested for sedition on a general warrant. In the cases of *Wilkes* v. *Wood* (1763) and *Entick* v. *Carrington* (1764–65), he firmly declared general warrants unlawful.

In his first speech in the House of Lords (1765), Camden attacked the Stamp Act, one of the colonists' grievances that led to the American Revolution. His continued opposition to the colonial taxation policy resulted in his dismissal as lord chancellor.

Camden, John Jeffreys Pratt, 2nd Earl and 1st Marquess, 1ST EARL OF BRECKNOCK (b. Feb. 11, 1759, near Chislehurst, Kent, Eng.—d. Oct. 8, 1840, near Sevenoaks, Kent), lord lieutenant (viceroy) of Ireland from 1795 to 1798, when his repressive actions touched off a major rebellion against British rule.

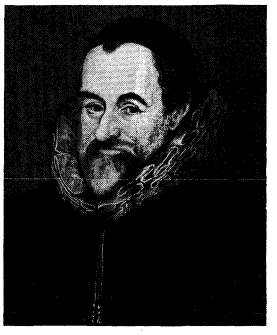
Lord Camden, detail of an engraving by G. Adcock after a portrait by John Hoppner

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

After serving as a lord of the British Admiralty (1782–89) and Treasury (1789–94), Camden went to Dublin in March 1795 as lord lieutenant. He soon aroused the hostility of Roman Catholics by his negative attitude toward their "emancipation" (representation in the Irish Parliament), and he also had to reckon with the Society of United Irishmen, which comprised mainly Presbyterians from Ulster who sought an invasion of Ireland by France. The Irish militia suppressed discontent; in March 1798 the leaders and papers of the United Irishmen were seized, and martial law was proclaimed. The rebellion that began on May 23, 1798, was crushed by late June, whereupon Camden resigned. Subsequently, he was secretary of state for war and the colonies (1804–05), lord president of the council (1805–06, 1807–12), and chancellor of the University of Cambridge (from 1834).

Camden, William (b. May 2, 1551, London—d. Nov. 9, 1623, Chislehurst, Kent, Eng.), English antiquary, a pioneer of historical method, and author of *Britannia,* the first comprehensive topographical survey of England.

Educated at Christ's Hospital and St. Paul's School, he was admitted to Magdalen College, Oxford, but moved first to Broadgates Hall (later Pembroke College) and then to Christ Church, becoming B.A. in 1573. In 1571 he had moved to London and in 1575 was appointed second master of Westminster School



William Camden, oil painting by or after Marcus Gheeraerts the Younger; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

and in 1593 headmaster. In 1595 he published a Greek grammar. In 1589 he was granted the prebend of Ilfracombe and in 1597 was appointed Clarenceux king-of-arms. He was thereby relieved of a schoolmaster's chores and given more time for writing.

From the time he left Oxford, Camden had devoted his leisure to antiquarian studies and spent his vacations travelling the country, collecting material for his *Britannia* (1586), a topographical survey of England in Latin. Camden planned to write a general history of England but published only a number of medieval chronicles (*Anglica, Hibernica, Normannica, Cambrica, à veteribus scripta;* 1602) and some of his commonplace collections (*Remaines;* 1605). In 1607 he began his *Annales rerum Anglicarum et Hibernicarum regnante Elizabetha,* a history of the reign of Queen Elizabeth I. The first volume, which took the story down to 1588, was published in 1615. The second, completed in 1617, was not published until two years after Camden's death. Camden's work has been the basis of most later accounts of the reign. Some criticism has been levelled at his treatment of the Mary Queen of Scots episode, and it was alleged that he altered his account to please James I.

Camden suffered from poor health, and in 1618 he retired to Chislehurst, Kent. Before his death he founded a chair of history at Oxford University. The Camden Society, founded in 1838, published many historical documents and was merged with the Royal Historical Society in 1897.

Camden was an active member of the Society of Antiquaries, founded *c.* 1585, which laid the foundations for the school of 17th-century historians. Camden was the first to realize the importance of ancient languages in the study of place names and to make known the existence of Romano-British coins.

Camden Town group, group of English Postimpressionist artists who met on a weekly basis in the studio of the painter Walter Sickert in Camden Town (an area of London).

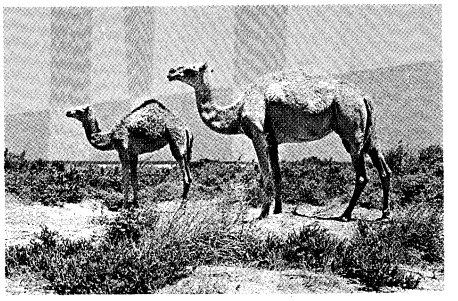
Upon Sickert's return from Venice in 1905 to London, Harold Gilman, Frederick Spencer Gore, Lucien Pissarro (son of French Impressionist painter Camille Pissarro), Augustus John, Henry Lamb, J.B. Manson, Robert Bevan, Walter Bayes, and Charles Ginner, all recent visitors to Paris, assembled unofficially at Sickert's studio. There they participated in an active dialogue about the developments in contemporary French art. Their meetings brought a sense of French bohemianism into the English art world of the time. When they were joined in 1908 by the critic Frank Rutter, he proposed that the group organize itself after the French Salon des Indépendants. The Allied Artists Association was then created, completely independent of the established art societies such as the Royal Academy. The association held its exhibits of French and English Postimpressionism at Albert Hall. In 1911 Sickert's circle officially became the Camden Town group. At the three important exhibitions held at the Carfax Gallery and sponsored by the Camden Town group in the years 1911 and 1912, early French Fauve and Cubist paintings were introduced.

"North London Girl," oil painting by Frederick Spencer Gore, a member of the Camden Town group, c. 1911–12; in the Tate Gallery, London
By courtesy of the Tate Gallery, London

The Camden Town artists knew the Impressionist technique well but were also open to the influence of such Postimpressionists as Gauguin and Cézanne. Since the group were primarily interested in pictorial structure, they particularly turned to Cézanne for encouragement. Their subject matter was derived from the everyday life of an English industrial town. Despite a somewhat expressive use of colour, their paintings remained realistic and conservatively modern, reflecting an incomplete understanding of the revolution that was beginning in Paris. The Camden Town group was absorbed in 1913 by the London group, a combination of several smaller groups of contemporary English artists.

camel, either of two domestic animals of the genus *Camelus,* family Camelidae (order Artiodactyla). Camels are valued as pack or riding animals and for their wool, milk, hides, and meat. They are known only in domestication but are probably little changed from their wild ancestors.

Distinguished by the fatty humps on their backs—one hump in the Arabian camel, or dromedary (*C. dromedarius*), two humps in the Bactrian camel (*C. bactrianus*)—camels are long-limbed and have soft, widespreading, two-toed feet that enable them to walk on sand or snow. The animals run with a characteristic pacing gait, the legs on each side moving in unison. In adaptation to unfavourable environments, camels have double rows of protective eyelashes, haired ear openings, the ability to close the nostrils, and keen senses of sight and smell. When kneeling, the animals are supported by horny pads on the chest and knees.



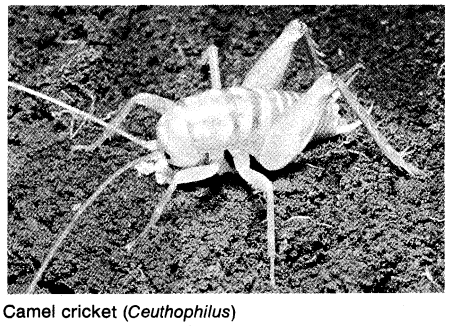
Arabian camels (*Camelus dromedarius*)
Ernst A. Weber—Photo Researchers

The Arabian camel is native to India, the Middle East, and north Africa. It is longer-legged than the Bactrian camel, has a shorter coat, and in general is more lightly built. It stands about 2 metres (7 feet) tall at the shoulder and ranges in colour from white to black. Herds of wild Arabian camels, descended from domestic stock, also inhabit the Australian outback. The Bactrian camel is found in the highlands of central Asia; herds in remote areas may be the only true wild camels. The Bactrian stands about 2 m at the top of the humps; it is usually brown and in winter has an especially thick, shaggy coat.

Camels are docile when properly trained and handled, but, especially in the rutting season, are liable to fits of rage. They spit when annoyed and can bite and kick dangerously.

If necessary, camels can subsist on coarse, sparse food such as thorny plants and dried grasses. They store fat in their humps, drawing on the reserves in adverse conditions. They do not store water in the misnamed "water cells" of the stomach, but they can fast and go without drinking for several days. Camels lose their body water slowly and can regain lost weight in ten minutes by drinking as much as 25 gallons of water.

camel cricket, also called CAVE CRICKET, any insect of the family Rhaphidophoridae (order Orthoptera) of about 300 species. It has a short, thick body and long legs and ranges from brown to gray and white in colour.



Camel cricket (*Ceuthophilus*)
William E. Ferguson

It is called camel cricket because of its humpbacked appearance and cave cricket because it is found in caves, beneath logs, and in other dark and moist places. The wingless camel cricket produces no sound.

camel hair, animal fibre obtained from the camel and belonging to the group called specialty hair fibres (*q.v.*). The most satisfactory textile fibre is gathered from camels of the Bactrian type; fibre taken from the Arabian (dromedary) camel is generally shorter and coarser. The modern Bactrian camel, possessing a coat resistant to both heat and cold, was developed by crossbreeding the ancient Bactrian, unsuited to hot climates, and the dromedary, unsuited to cold.

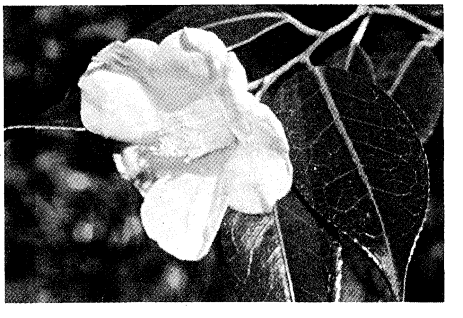
Camel hair is not usually gathered by shearing or plucking; it is most often collected as the animal sheds its coat. Much of the hair falls off in clumps during the molting season, when warm weather makes the heavy covering unnecessary, and the animal also rubs off additional hair throughout the year. The annual yield from each animal is about 5 pounds (2¼ kilograms). "Trailers" are frequently employed to follow caravans, collecting the falling hair in baskets. The fleece is usually purchased by travelling dealers at towns along caravan routes for export to London and other marketing centres. Much fleece is sold through Soviet agencies.

The camel has a protective outer coat of coarse fibre that may grow as long as 15 inches (40 centimetres). The fine, shorter fibre of the insulating undercoat, 1.5–5 inches long, is the product generally called camel hair, or camel hair wool. Both types of fibre are shed at the same time, and combing, frequently by machine, separates the desirable down from the coarse outer hairs. Cleaning and combing may reduce the final yield by as much as 50 percent.

The fine fibre has a diameter of 5–40 microns (a micron is about 0.00004 inch) and is usually a reddish-tan colour. The scales of the epidermis, or outer layer, of the fibre are indistinct; the cortex is composed of long, thin cells with regular striations and containing colour pigment; and many fibres possess a medulla, or central canal, usually in broken form. Camel-hair fibre has greater sensitivity to chemicals than wool fibre does. Its strength is similar to that of wool having similar diameter but is less than that of mohair.

Fabric made of camel hair has excellent insulating properties and is warm and comfortable. Camel hair is mainly used for high-grade overcoat fabrics and is also made into knitting yarn, knitwear, blankets, and rugs. The coarse outer fibre is strong and is used in industrial fabrics such as machine beltings and presscloths employed in extracting oil from oilseeds. Major producers include China, Mongolia, and Afghanistan. The United States, West Germany, and the United Kingdom are important consumers.

Camellia, genus of about 80 species of East Asian evergreen shrubs and trees, belonging to the tea family (Theaceae), most notable for three ornamental flowering species and for *C. sinensis* (sometimes called *Thea sinensis*), the source of tea. The common camellia (*C. japonica*) is the best known, particularly for its double (many-petalled) cultivated varieties, whose overlapping petals range in colour from white through pink to red and variegated. In the wild form five to seven petals surround a mass of yellow stamens, with sepals dropping as the petals open. The tree has glossy green, oval leaves about 10 centimetres (4 inches)



Camellia japonica
Yoshio Kobayashi—EB Inc.

long and reaches a height of about 9 metres (30 feet).

A similar but shorter species, *C. reticulata,* has flowers to 15 cm wide and dull green leaves. *C. sasanqua,* a loose straggling shrub with slightly fragrant, 5-cm-wide flowers, can tolerate dryness and alkaline soils. It blooms in autumn and frequently is grown as a wall or hedge plant.

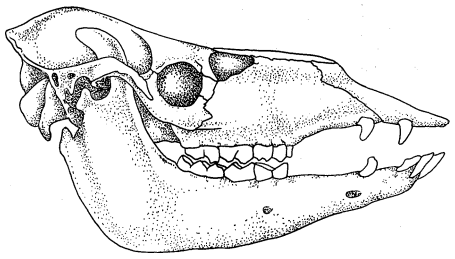
The tea plant (*C. sinensis*) reaches 9 m but in cultivation is kept to a low, mounded shrub, often pruned back to encourage development of young leaves. The flowers are fragrant, yellow-centred, white, and about 4 cm wide.

A domestic oil used in China and Japan is pressed from the seeds of *C. oleifera* and several other species. *See also* tea.

Camelops, extinct genus of large camels that existed from the late Pliocene Epoch to the end of the Pleistocene Epoch (between 3,500,000 and 10,000 years ago) in western North America from Mexico to Alaska. *Camelops* is unknown east of the Mississippi River.

Six species are currently recognized, but the taxonomy of this genus is in need of revision. A true camel, it resembled the slightly smaller existent Arabian camel (*C. dromedarius*) in structure; it had long robust legs and a long neck and probably had a single hump because it only has elongated spines on the vertebrae over its anterior back.

Camelops became extinct in North America near the close of the Pleistocene, as did many



Skull of *Camelops*

Reprinted from *Vertebrate Paleontology* by A.S. Romer, by permission of the University of Chicago, copyright 1933, 1945, 1966; all rights reserved

large mammals. The cause of this large-scale extinction is unknown, but it may be related to environmental change or possibly to the arrival of early man in the Americas.

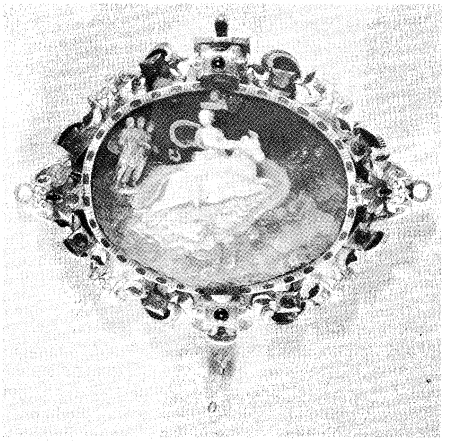
Camelot, in Arthurian legend, the seat of King Arthur's court. It is variously identified with Caerleon, Monmouthshire, in Wales, and, in England, with the following: Queen Camel, Somerset; the little town of Camelford, Cornwall; Winchester, Hampshire; and, especially since archaeological excavations begun in 1967, Cadbury Castle, South Cadbury, Somerset.

Camembert cheese, classic cow's-milk cheese of Normandy, named for a village in that region; its characteristic creamy, ivory-coloured interior and downy white surface, resembling that of Brie, result from the *Penicillium camemberti* mold with which the curd is treated. Camembert curd is customarily shaped in disks of 4.5 inches (11 centimetres) in width and 1.5 inches in thickness; by the action of the mold, it ripens within six to eight weeks. The flavour varies from mild to strong as the cheese ripens.

Camembert is exported worldwide and imitated in many countries, though the prototype from Normandy, which dates to the late 17th century, remains unparalleled. The cheeses from farms near Vimoutiers are especially prized.

Camenae, in Roman religion, goddesses who were perhaps originally water deities, having a sacred grove and spring located outside the Porta Capena at Rome. Believed able to cure diseases and prophesy the future, the Camenae were offered libations of water and milk. From the 2nd century BC they were identified with the Muses.

cameo, hard or precious stone carved in relief, or imitations of such stones in glass (called pastes) and mollusk shell. The cameo



"The Rape of Europa," cameo in gold and enamel frame, 16th–17th century; in the Kunsthistorisches Museum, Vienna

By courtesy of the Kunsthistorisches Museum, Vienna

is usually a gem (commonly agate, onyx, or sardonyx) having two different coloured layers, with the figures carved in one layer so that they are raised on a background of the other. The cameo is the converse of the intaglio, which consists of an incised, or sunken, engraving in the same class of materials.

Cameos exist in large numbers from the early Sumerian period (*c.* 3100 BC) to the decline of Roman civilization, from the Renaissance, and from the Neoclassical period in the 18th century. Greek cameos, made with coloured quartz, were purely decorative (as opposed to intaglios, which were used as seals) and reached a high artistic level. Roman cameos, chiefly of sardonyx, onyx, and glass paste, usually were carved with portraits and mythological scenes and were often signed by the artists. (*See* Gemma Augustea; Grand Camée de France.) Because of increased interest in classical civilization, the art of cameo engraving was again perfected in the Renaissance. Cameos were used to commemorate personages, as in ancient days; for example, in 16th-century England, cameos were made with the head of Queen Elizabeth to celebrate the victory over the Spanish Armada. In the 18th and 19th centuries, cameos adorned such jewelry as diadems, belts, brooches, and bracelets.

cameo glass, glassware decorated with figures and forms of coloured glass carved in relief

"The Immortality of the Arts," cameo glass dish carved by Frederick Carder after a design by La Mercie, Stevens and Williams, Brierley Hill, England, 1887; in the Corning Museum of Glass, N.Y.

By courtesy of the Corning Museum of Glass, Corning, N.Y.

against a glass background of a contrasting colour. Such ware is produced by blowing two layers of glass together. When the glass has cooled, a rough outline of the desired design is drawn on its surface and covered with a protective coating of beeswax. The glass is then etched down to the inner layer, leaving the outline of the design in relief. The details of the design are carved by hand or with rotary tools.

Fine cameo glass was produced by the Romans in the 1st century AD, as exemplified by the famous Portland Vase (*q.v.*). Roman glass engravers created such pieces by manually cutting away chunks of opaque white glass to a darker background glass layer. In 1876 John Northwood, an English glassmaker, created a reproduction of the Portland Vase. This achievement inspired other glass engravers to make cameo glassware and initiated a revival of that glass form. Also about this time Émile Gallé began producing articles of cameo glass in France. His pieces featured graceful natural forms, including representations of flowers and animals.

cameo incrustation (glass): *see* crystallo ceramie.

camera, in photography, device for recording an image of an object on a light-sensitive surface; it is essentially a light-tight box with an aperture to admit light focussed onto a sensitized film or plate. Though there are many types of cameras, all include five indispensable components: (1) the camera box, which holds and protects the sensitive film from all light except that entering through the lens; (2) film, on which the image is recorded, a light-sensitive strip usually wound on a spool, either manually or automatically, as successive pictures are taken; (3) the light control, consisting of an aperture or diaphragm and a shutter, both often adjustable; (4) the lens, which focusses the light rays from the subject onto the film, creating the image, and which is usually adjustable by moving forward or back, changing the focus; and (5) the viewing system, which may be separate from the lens system (usually above it) or may operate through it by means of a mirror.

Historically, the camera grew out of the camera obscura, which was adapted to making a permanent image by Joseph-Nicéphore Niepce and Louis-Jacques-Mandé Daguerre of France in the 1820s and 1830s. Many improvements followed in the 19th century, notably flexible film, developed and printed outside the camera. In the 20th century a variety of cameras was developed for many different purposes, including aerial photography, document copying, and scientific research. *See also* photography.

camera lucida (Latin: "light chamber"), optical instrument invented in 1807 by William Hyde Wollaston to facilitate accurate sketching of objects. It consists of a four-sided prism mounted on a small stand above a sheet of paper. By placing the eye close to the upper edge of the prism so that half the pupil of

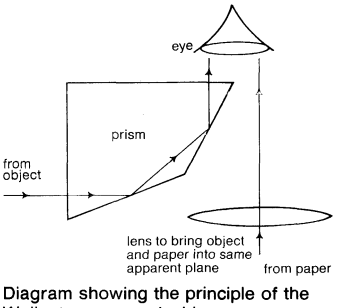


Diagram showing the principle of the Wollaston camera lucida

the eye is over the prism, the observer is able to see a reflected image of an object situated in front of the prism, apparently lying on the paper. He can then trace the image with a pencil. In its original form the camera lucida was extremely difficult to focus properly, and a weak spectacle lens was added between the prism and the paper. A later form, developed about 1880 for use with a microscope, substituted two diagonal mirrors for the prism; one transparent mirror was positioned above the microscope eyepiece and the second at a short distance above the paper.

camera obscura, ancestor of the photographic camera. The Latin name means "dark chamber," and the earliest versions, dating to antiquity, consisted of small darkened rooms with light admitted through a single tiny hole.

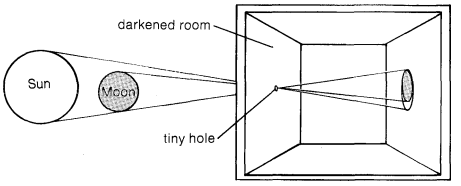


Diagram illustrating a solar eclipse through a simple camera obscura

The result was that an inverted image of the outside scene was cast on the opposite wall, which was usually whitened. For centuries the technique was used for viewing eclipses of the Sun without endangering the eyes and, by the 16th century, as an aid to drawing; the subject was posed outside and the image reflected on a piece of drawing paper for the artist to trace. Portable versions were built, followed by smaller and even pocket models; the interior of the box was painted black and the image reflected by an angled mirror so that it could be viewed right side up. The introduction of a light-sensitive plate by J.-N. Niepce created photography.

Camerarius, Joachim (b. April 12, 1500, Bamberg, Bavaria—d. April 17, 1574, Leipzig), German classical scholar and Lutheran theologian who mediated between Protestants and Catholics at the Reformation.

He joined the humanist circle of Helius Eobanus Hessus at Erfurt in 1518 and later became the pupil and friend of Philipp Melanchthon at Wittenberg (1521). He was made professor of classics at Tübingen in 1535. In 1541 Duke Ulrich of Württemberg summoned him to reorganize the University of Leipzig.

His classical publications include editions with commentaries of Sophocles, Herodotus, Homer, Plautus, and Xenophon, as well as Latin translations of Greek authors. He also wrote a catechism about the classics in Latin verse (*Praecepta honestatis atque decoris puerilis,* 1528) and Latin biographies of Hessus (1553) and Melanchthon (1566). He was present with Melanchthon at the reading of the *Confutatio pontificia* at Augsburg in 1530, and also at a diet there in 1555. In the same year he was the mediator in the dispute over Osiander at Nürnberg. Maximilian II summoned him to Vienna in 1568 to give advice and to order Austrian church affairs.

His posthumously published *Epistolarum familiarum libri vi* (1583) and *Epistolarum familiarum libri v posteriores* (1595) are valuable sources for the period.

Camerarius, Rudolph Jacob (b. Feb. 17, 1665, Tübingen, Ger.—d. Sept. 11, 1721, Tübingen), botanist who demonstrated the existence of sexes in plants.

Professor of natural philosophy at the University of Tübingen, Camerarius was one of the first workers to perform experiments in heredity. He contributed particularly toward establishing sexuality in plants by identifying and defining the male and female reproductive parts of the plant and also by describing their function in fertilization. He showed that pollen is required for this process. He described his findings in the form of a letter to a colleague, *De sexu plantarum* (1694; "On the sex of plants"), and in *Opuscula botanica* (1697; "Botanical Works").

Camerata, Florentine society of poets and musicians whose theories and musical experiments led in 1597 to the composition of the first opera, *Dafne,* by Jacopo Peri and the poet Ottavio Rinuccini. The Camerata fell into three groups, the earliest of which met *c.* 1576–82 under the patronage of Count Giovanni Bardi. Although they were more conservative than the later Camerata, their efforts to revive ancient Greek music were an important factor in the evolution of monody, expressive solo song with simple chordal accompaniment.

The two subsequent, somewhat rival groups were composed largely of members of Bardi's Camerata and were led by the composers Jacopo Corsi and Emilio de' Cavalieri. Their experiments with monody were directed toward a revival of ancient Greek drama, in which, they felt, music and poetry were closely united. Other leading members of the Camerata were the theorists Girolamo Mei and Vincenzo Galilei (father of the astronomer Galileo) and the composer Giulio Caccini.

Cameron, Duncan (b. 1764, Glenmoriston, Inverness, Scot.—d. May 18, 1848, Williamstown, Canada West), fur trader who became involved in a rivalry with the Hudson's Bay Company over the settlement of the Red River region of western Canada.

As a child, Cameron emigrated with his family from Scotland to Schenectady, N.Y. He moved to Williamstown during the American Revolution (1775–83). In 1784 he entered the service of the North West Company, a fur-trading firm working in the Nipigon department north of Lake Superior. About 1800 he was elected a partner in the company, and until 1807 he headed its operations at Nipigon. He was in charge of the stations at Lake Winnipeg, 1807–11, and Rainy Lake, 1811–14. He then took over the Red River depot in what is now Manitoba, where he had to cope with a rival colony established by Thomas Douglas, 5th earl of Selkirk, who controlled the Hudson's Bay Company. He tried to eject the colonists; but in 1816, after attacking Ft. Gibraltar, Cameron was captured by officers of the Hudson's Bay Company and sent to England for trial. There he won acquittal and damages for false imprisonment. He returned to Canada about 1820 and settled at Williamstown; in 1824 he was elected to represent Glengarry in the Legislative Assembly of Upper Canada.

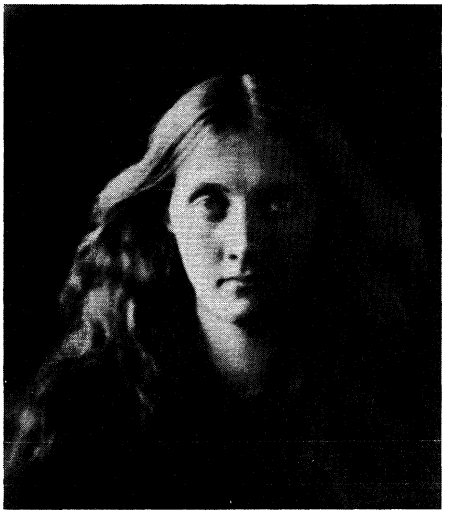
Cameron (of Lochiel), Sir Ewen (b. February 1629—d. February 1719), Scottish Highland chieftain, a strong supporter of the Stuart monarchs Charles II and James II of England. A man of enormous bulk, Lochiel became renowned for his feats of strength and ferocity in combat.

He was born into the ancient clan Cameron, of which he became chief about 1647. After the execution of King Charles I by the English Parliament in January 1649, Lochiel joined the Royalist cause, and in 1653 he fought with distinction in the Earl of Glencairn's uprising on behalf of Charles I's son Charles II. Even after Glencairn had stopped his resistance, Lochiel continued to harass the forces of the English general George Monck. He came to terms with Monck in 1658 and accompanied him on the march on London that brought Charles II to the throne (1660). He was knighted by Charles in 1681.

Following the overthrow of Charles's brother, James II, by William and Mary in 1688, Lochiel joined the uprising of Scottish "Jacobites"—as James's adherents were called—and played a key role in the victory over William's forces at Killiecrankie Pass, Perthshire (July 17, 1689). Although Lochiel was too old to join the Jacobite uprising of 1715, his sons led the Camerons into battle. An incident in which Lochiel slew a foe by biting into his neck was used by Sir Walter Scott as a model for the description of the fight between Roderick Dhu and FitzJames in canto V of *The Lady of the Lake.*

Cameron, Julia Margaret (b. June 11, 1815, Calcutta—d. Jan. 26, 1879, Kalutara, Ceylon), British photographer, considered one of the greatest portrait photographers of the 19th century.

In 1848, she moved to England with her husband, a retired colonial official, and her family, settling in 1860 on the Isle of Wight to be



"Mrs. Herbert Duckworth," by Julia Margaret Cameron
George Eastman House Collection

near the poet Alfred Lord Tennyson. Around 1863, she received a camera as a gift. She converted a chicken coop into a studio and a coal bin into a darkroom and began making portraits. Among her sitters were her friends the poets Tennyson and Henry Wadsworth Longfellow, the astronomer Sir John Herschel, the writer Thomas Carlyle, and the scientist Charles Darwin. Especially noteworthy are her sensitive renderings of female beauty, as in the portraits "Ellen Terry" (1864) and "Mrs. Herbert Duckworth" (1867).

Like many Victorian photographers, Mrs. Cameron made allegorical and illustrative studio photographs in imitation of the popular Romantic and Pre-Raphaelite paintings of the day. At Tennyson's request, she illustrated his *Idylls of the King* with her photographs. These photographs show the influence of the painter George Frederic Watts, her friend and mentor for more than 20 years.

Mrs. Cameron was often criticized for poor technique. Some of her pictures are out of focus, her plates are sometimes cracked and often display her fingerprints. But in her portraits, she was interested in spiritual depth, not technical perfection, and they are considered among the finest in the medium.

In 1875, she and her husband left for Ceylon. Nearly destitute, they took with them a cow, Mrs. Cameron's photographic equipment, and two coffins, in case they should not be available in the East. She continued to photograph and, according to legend, her dying word was "Beautiful!"

Cameron, Richard (b. *c.* 1648, Falkland, Fife, Scot.—d. July 22, 1680, Airds Moss,

Ayrshire), Scottish Covenanter, founder of a religious sect called Cameronians.

Cameron was schoolmaster of his native village until he became chaplain and tutor to Sir William Scott of Harden. In 1673 he began to preach in the open air, under the influence of the Covenanter John Welch, and refused to recognize the rule of the "uncovenanted" King Charles II or to accept the King's indulgence, which suspended the laws against nonconformists. The number of his followers was severely reduced by their defeat at Bothwell Bridge (1679), though many joined him in exile in Holland.

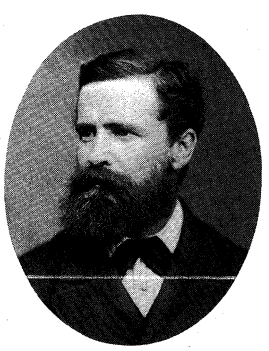
Cameron returned at the end of the year and on June 22, 1680, he and his friends, including Donald Cargill, Thomas Douglas, and David Hackston, issued the Sanquhar Declaration, calling for war on Charles II and the exclusion of the Catholic James, duke of York. With only a small group of men he was easily taken and killed by royal troops at Airds Moss in Ayrshire in the summer of 1680. The prayer he had made before the brief fighting became one of the Covenanters' songs: "Lord, spare the green and take the ripe."

Cameron, Simon (b. March 8, 1799, Maytown, Pa., U.S.—d. June 26, 1889, Donegal Springs, Pa.), U.S. senator, secretary of war during the U.S. Civil War, and a political boss of Pennsylvania. His son James Donald Cameron (1833–1918) succeeded him in the Senate and as a political power in his state.

With only slight formal schooling, Cameron was successful in various businesses before he entered the Senate, where he served for 18 years (1845–49; 1857–61; 1867–77). In 1860, as Pennsylvania's favourite-son candidate for nomination for president at the Republican National Convention, he threw his support to Abraham Lincoln, thereby gaining a seat in Lincoln's Cabinet. He administered the War Department with such favouritism that Lincoln replaced him with Edwin M. Stanton (Jan. 11, 1862), and he was censured for his conduct by the House of Representatives. Lincoln then appointed him minister to Russia, from which post he resigned (Nov. 8, 1862).

Cameron returned to the Senate in 1867, serving as chairman of the Foreign Relations Committee from 1872. He wielded such power in Republican circles that he was able to obtain the appointment of his son as secretary of war by Pres. Ulysses S. Grant. When, however, the new president, Rutherford B. Hayes, refused to continue the younger Cameron in office in 1877, the elder resigned his Senate seat to enable his son to succeed him.

Cameron, Verney Lovett (b. July 1, 1844, Radipole, near Weymouth, Dorset, Eng.—d. March 27, 1894, near Leighton Buzzard, Bedfordshire), British explorer, the first to cross equatorial Africa from sea to sea.



Verney Cameron
The Mansell Collection

Cameron entered the British navy in 1857, taking part in the Abyssinian campaign of 1868 and in the suppression of the east African slave trade. In 1872 the Royal Geographical Society chose him to lead an expedition to bring help to the explorer David Livingstone, who was lost in East Africa, and also to explore on his own. Soon after leaving Zanzibar the expedition met Livingstone's servants bearing his body. At Ujiji on Lake Tanganyika Cameron recovered some of Livingstone's papers. Exploring the southern half of the lake, he established its outlet at the Lukuga River, a Congo tributary. He then traced the Congo–Zambezi watershed for hundreds of miles and reached the west coast of Africa near Benguela, Angola, on Nov. 7, 1875.

He wrote *Across Africa* (1877) and for the rest of his life was associated with developing commercial projects in Africa. Claiming to have originated the idea of a "Cape to Cairo" railway, which Cecil Rhodes endeavoured to develop, Cameron also advocated an African–Asian railway from Tripoli, Libya, to Karachi. He visited West Africa with Sir Richard Burton, with whom he wrote *To the Gold Coast for Gold* (1883).

Cameron Highlands, resort area of northwest Pahang state, West Malaysia (Malaya), in the Main Range, near the border with Perak state. It comprises a cool highland plateau (altitude 4,750 ft [1,448 m]), developed by the British in the 1940s as a hill station and named for William Cameron, who explored the area in 1885. Its hotels are predominantly European in architecture. Hundreds of floral species rare to the tropics thrive in the mean annual temperature of 64° F (18° C), considerably cooler than in the lowlands. Jungle paths lead to Robinson Falls, scenic hilltops, and aboriginal villages. The resort is approached by road from Tapah, in Perak.

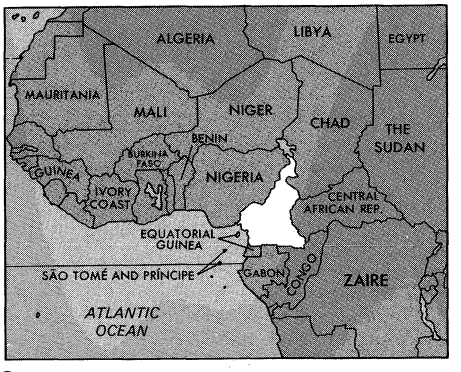
Chinese market gardens are terraced on the hillsides, producing temperate-zone crops (strawberries, cabbages, tomatoes, lettuces) that are sold in the large lowland towns. Large local tea estates export much of their crop. The main residential areas are Ringlet, Tanah Rata (site of an experimental agricultural station), and Brinchang. A hydroelectric project diverts the headwaters of the Telom and Bertam rivers into the Bantang Padang Valley (Perak). Pop. (1980 prelim.) 20,247.

Tropical vegetation in the Cameron Highlands, Malaysia
Mort Beebe—Photo Researchers

Cameronian, any of the Scottish Covenanters who followed Richard Cameron in adhering to the perpetual obligation of the two Scottish covenants of 1638 and 1643 as set out in the Queensferry Paper (1680), pledging maintenance of the chosen form of church government and worship. After Cameron's death, the Cameronians began in 1681 to organize themselves in local societies all over the south of Scotland, and by 1690 they numbered several thousand. Their three ministers left them, but in 1706 John Macmillan became their minister and carried out an active itinerant ministry. The name Macmillanite came to supersede Cameronian. Under his leadership Macmillanites set up a presbytery in 1743 at Braehead, called the Reformed Presbytery. They grew in Scotland and had considerable effect on Scottish communities overseas. They still refused to take any part in the civil affairs of an "uncovenanted" nation. In 1863 they decided to refrain from disciplining those who exercised the franchise. In 1876 the majority united with the Free Church in Scotland and thus became incorporated in 1929 in the reunited Church of Scotland.

In the British Army, the Cameronians (Scottish Rifles) are a direct descendant of the Cameronian guard, which was first used to restore order in the Highlands after the Battle of Killiecrankie (1689).

Cameroon, officially UNITED REPUBLIC OF CAMEROON, French RÉPUBLIQUE UNIE DU CAMEROUN, country lying at the junction of Western and Central Africa, covering an area



Cameroon

of 179,562 sq mi (465,064 sq km). The capital is Yaoundé. The triangle-shaped country, facing the Gulf of Guinea to the southwest, is bordered by Nigeria to the northwest, Chad to the northeast, the Central African Republic to the east, and the Congo to the south. The population in 1984 was estimated at 9,506,000.

The article that follows is a summary of significant detail about Cameroon. Fuller treatment is provided in the following MACROPAEDIA articles. For geography and history, *see* Western Africa; for information about the country in its continental setting, *see* Africa; for information about major cultural manifestations, *see* African Arts.

For currrent history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the *Britannica Book of the Year.*

The land. Cameroon has four topographical regions. The southern region, extending from the Sanaga River to the southern border, consists of coastal plains and a densely forested plateau with an average elevation of slightly less than 1,000 ft (300 m). The central region, which extends from the Sanaga River north to the Bénoué River, rises progressively to the north with elevations of between 2,500 ft and 4,500 ft. In the north the savanna plain slopes downward toward the Lake Chad basin. To the west the relief is mountainous, the volcanic peak of Cameroon Mountain rising to the highest elevation in Western Africa—13,353 ft. Of the two main rivers, the Sanaga drains about 52,000 sq mi southwestward into the Atlantic Ocean, and the Bénoué flows westward into the Niger River basin in Nigeria; it is navigable during several months of the year. The country, lying wholly within the tropics, has a hot climate throughout the year; average annual temperatures range between 70° and 82° F (21° and 28° C), although they are lower at higher elevations. Rainfall decreases from south to north. Along the coast the average annual rainfall is about 150 in. (3,800 mm); in the central plateau region it decreases to 60 in. The two dry seasons in the south extend from December to February and from July to September; the one dry season in the north runs from October to April.

The hot, humid south supports dense tropical rain forests including mahogany, ebony, and obeche trees; there are also orchids and fern trees. The central region has a mixed deciduous and evergreen forest. North of that the vegetation is wooded savanna. Cameroon has varied fauna that includes buffalo, elephant, hippopotamus, various antelopes, kudu, giraffe, monkey, baboon, lion, leopard, and many kinds of birds.

Only about 13 percent of the total land area is arable, and more than half of it is forested. About 18 percent of the land is available as pasture. In the early 1980s, Cameroon's mineral reserves included about 220,000,000 tons (200,000,000 metric tons) of iron ore (30 percent Fe), about 880,000,000 tons of bauxite, and important deposits of aluminum, copper, nickel, chromium, and gold.

The people. More than two-thirds of Cameroon's population is younger than 29 years of age. The average population density is 54 persons per sq mi (21 per sq km), but densities vary from region to region, the highest occurring in the western mountains, where they may exceed 700 persons per sq mi; the southeast and Adamaua Plateau are the most sparsely populated regions.

According to UN estimates for 1970–75 the birth and death rates were among the highest in the world (44.4 and 22 per 1,000 population, respectively). The natural rate of increase was thus 22.4 per 1,000; but the average annual growth of population between 1976 and 1981 was even higher, at 2.6 percent. Until recently no measures were taken to limit the birth rate and mortality. The urban population, comprising less than one-third of the total, is concentrated mostly in the south, where the capital, Yaoundé, and the main port, Douala, as well as most of the other towns are located.

The country has been described as a racial crossroads because of its more than 100 different ethnic groups. The major ethnic groups are Fang, comprising one-fifth of the total population; Bamileke, also approximately one-fifth; Doula, about one-sixth; and the Fulani and other smaller groups. Pygmies, locally known as Babinda, live in the southern forests. The official languages are French and English, though local languages continue in use. More than one-half of the population continues to adhere to traditional religious beliefs. Christianity was introduced by Europeans during the colonial period, and the north is predominantly Muslim.

The economy. Cameroon has a developing market economy based largely on agriculture. Since independence in 1960 the country has experienced steady economic growth, augmented by the exploitation of petroleum deposits during the late 1970s. Economic progress is threatened, however, by dramatic population increases foreseen for the early 21st century. The gross national product (GNP) reached $6,010,000,000 by the 1980s; GNP per capita was $670.

Agriculture accounts for about one-third of the GNP and employs more than four-fifths of the work force. Production is diversified, which has helped shield Cameroon from fluctuations in the world price of any single crop. Cocoa, coffee, cotton, and bananas are produced for export, primarily by small farmers, while cash crops of rubber and palm oil are produced on plantations. Staple crops include corn (maize), beans, peanuts (groundnuts), millet, and sorghum. Production of these foods in the early 1980s was recovering from the effects of drought in the early 1970s, but full agricultural self-sufficiency is unlikely.

Timber production is growing. More than one-half of total production is exported as logs, but the share of processed wood products in exports increased with the establishment of a pulp factory in 1980.

Industry accounts for approximately one-quarter of the GNP and employs almost one-tenth of the work force. The sector is dominated by raw-materials processing. A large aluminum manufacturing complex at Edéa has been expanded considerably. Industries established after 1976 include a pulp and paper mill, a tire factory based on local rubber, a fertilizer plant, a tannery, and an oil refinery. Petroleum production reached approximately 3,300,000 tons (3,000,000 metric tons) annually in the early 1980s, and plans for a liquefied natural gas plant were finalized. Dam sites at Edéa provide most of Cameroon's electricity, with the local aluminum smelter consuming about four-fifths of total production.

A liberal investment code and well-conceived development plans attract considerable foreign investment, primarily from France, and foreign financial assistance is of major importance to the nation's development effort. Cameroon is heavily dependent on foreign trade; the majority of manufactured goods are imported as are many raw materials for industry. Exports include petroleum, coffee, cocoa and cocoa products, timber, and aluminum. Chief trading partners include France, the United States, The Netherlands, and West Germany.

Administrative and social conditions. Cameroon is a unitary republic with a strong presidential system of government. Its 1972 constitution vests executive power in the president, who is directly elected to a five-year term. The president governs with the assistance of a Cabinet headed by the prime minister. Legislative power is vested in the unicameral National Assembly, consisting of 120 members directly elected to five-year terms. In certain areas the Assembly may delegate its authority to the president, who may then legislate by decree. Cameroon, a de facto one-party state, is governed by the Union Nationale Camerounaise (Cameroon National Assembly). The judicial system is headed by the Supreme Court.

A social security system has been established, although its provisions are limited in coverage and levels of support. Health conditions are poor, as reflected in the average life expectancy of 45 years and the infant mortality rate of about 160 per 1,000 live births. With health services concentrated in the larger cities, much of the rural population does not have access to modern medical care. Nutritional deficiency diseases are prevalent among young children.

Only about 40 percent of the population is literate, although expanding education facilities and enrollments are increasing this proportion. Education in public schools is free, and the government subsidizes private education. Higher education is available at the Federal University of Cameroon.

The government publishes the only daily newspaper and owns and operates all the radio stations.

Cultural life. Each major ethnic group of the country has developed its own culture based on traditional arts and customs. The country's rich musical diversity is represented by the drum rhythms of the people of the southern forest and the flute music of the northern people. A great diversity of crafts are also produced, including the worked leather goods of the Muslim Fulani, the distinctive pottery of the Kirdi and Matakani of the western mountains, and the brass pipes of the Tikar people. The less traditional Western arts of literature and cinema also flourish; the novelist Mongo Beti is internationally known.

History. The earliest inhabitants of Cameroon were probably the Pygmies, also known as the Baguielli and Babinga, who still inhabit the southern forests. Bantu speakers were among the first groups that invaded Cameroon from equatorial Africa, settling in the south and later in the west. They were followed by the Muslim Fulani from the Niger Basin in the 11th and 19th centuries, who settled in the north. The first Europeans to arrive on the shores of Cameroon were the Portuguese in the early 1470s. By 1520 the Portuguese had established sugar plantations and a prosperous slave trade. In the early 1600s they lost control of the slave trade to the Dutch. In 1807 the British declared the slave trade illegal, and in 1827, receiving permission from the Spanish to use Fernando Po island as a base, began policing coastal waters. The slave trade was gradually phased out by the 1840s. The British, interested in establishing a protectorate, started settling the mainland. Early in 1884 a German representative, Gustav Nachtigal, urged local chiefs to sign treaties with Germany instead of Britain, and in late 1884 the Germans extended their protectorate over Cameroon. In World War I joint action by French and British troops forced the Germans to retreat to Spanish (Equatorial) Guinea. In 1919 Cameroon was divided by the London Declaration into French and British administrative zones. The League of Nations conferred mandates on France and Britain for the administration of the two zones in 1922. In 1946 the mandates were renewed as United Nations trusteeships. In 1960 the French trust territory became an independent republic and a member of the United Nations. A year later the southern part of the British trust territory voted for union with the new Federal Republic of Cameroon and the northern part for union with Nigeria. A unitary government was established in 1972. Ahmadun Ahīdjo, who had been president of Cameroon since its independence, resigned in 1982.

Cameroon, Mount, French MONT CAMEROUN, volcanic massif of southwestern Cameroon, rising to a height of 13,435 ft (4,095 m) and extending 14 mi (23 km) inland from the Gulf of Guinea. It is the highest peak in sub-Saharan West and Central Africa and the westernmost extension of a series of hills and mountains that form a natural boundary between northern Cameroon and Nigeria.

Buea, Cameroon, the capital of Southwest province, lies on the southeastern slope of the mountain, and the port of Victoria lies at its southern foot. The side of the mountain facing the sea has a mean annual rainfall of 400 in. (10,000 mm) and is one of the wettest places in the world. The mountain's rich volcanic soils support bananas, rubber, oil palms, tea, and cocoa. Valleys are used as pasture.

The Englishman Sir Richard Burton (1821–90) climbed its summit in 1861. Still active, the volcano last erupted in 1959.

Camiguin, mountainous island and province in the Mindanao Sea, 6 mi (10 km) off the northern coast of Mindanao, Philippines. The island is often considered the most beautiful of the Philippine archipelago. Near Macajalar and Gingoog bays, it was part of Misamis Oriental province until 1967. It has an area of 89 sq mi (230 sq km). Since 1948, eruptions of volcanic Mt. Hibok-Hibok (4,363 ft [1,330 m]) have caused mass emigrations to the nearby mainland. The main agricultural products are rice, bananas, and corn (maize). Mambajao, the provincial capital and chief port, is on the northeastern coast. Catarman and Mahinog are smaller population centres. Pop. (1980) 57,126.

Camilla, in Roman mythology, legendary Volscian maiden who became a warrior and was a favourite of the goddess Diana. According to the Roman poet Virgil, her father, Metabus, was fleeing from his enemies with the infant Camilla when he encountered the Amisenus (Amazenus) River. He fastened the child to a javelin, dedicated her to Diana, and hurled her across the river. He then swam to the opposite bank, where he rejoined Camilla.

Living among shepherds and in the woods, Camilla became a skilled hunter and resolute warrior through her father's tutelage in the rustic arts. She became the leader of a band of warriors that included a number of maidens, and fought in a battle against the Roman hero Aeneas; but she was killed by Arruns, an Etruscan, as she was chasing a retreating soldier.

Camillus OF LELLIS, SAINT, Italian SAN CAMILLO DE LELLIS (b. May 25, 1550, Bucchianico, Kingdom of Naples [now in Italy]—d. July 14, 1614, Rome; canonized 1746; feast day July 14), founder of the Ministers of the Sick. Along with St. John of God, Camillus became patron of the sick.

The son of an impoverished nobleman, Camillo became a soldier of fortune and an inveterate gambler. In 1575 he was converted and became a servant and later an assistant at St. James's Hospital for incurables in Rome, where he had been a patient with an ulcerated leg and rupture that impeded him his whole life. Camillo was ordained in 1584, and in 1586 he obtained approval for the congregation of priests he had founded, devoted to hospital service. There originally were 12 members, without vows, working in the Hospital of the Holy Spirit in Naples, but in 1591 Pope Gregory XIV approved their becoming a religious order called Ministers of the Sick, wearing a red cross on the cassock. By the time of Camillo's death there were nearly 300 members. Camillo was general of the order until 1607. He insisted on the utmost care for both the soul and the body of his patients. Though his own health worsened, he exhausted himself for charity.

Camillus, Marcus Furius (d. 365 BC), Roman soldier and statesman who came to be honoured after the sack of Rome by the Gauls (*c.* 390) as the second founder of the city.

Camillus, bronze statue; in the Museo Nuovo in the Palazzo dei Conservatori, Rome

Alinari—Art Resource/EB Inc.

Camillus celebrated four triumphs and served five times as dictator of Rome. His greatest victory was as dictator in 396 BC, when he conquered the Etruscan city of Veii. He was again appointed dictator in 390, when the Gauls had captured Rome, and he is said to have defeated the invaders. That victory, however, was probably invented to counterbalance Rome's defeat by the Gauls at the Allia River the same year. Thereafter he fought successfully against the Aequi, Volsci, Etruscans, and Gauls.

Although a patrician conscious of his class interest, he introduced pay for the army at the siege of Veii, and, realizing the need to make concessions to the plebeians, he accepted the Licinian–Sextian reform laws in 367. Although Roman writers may have exaggerated his achievements, Camillus clearly played a dominant role in Rome's recovery in the decades after the Gallic sack of the city.

Camino Real (Spanish: Royal Road), highway that in the 16th century connected the cities of Gijón, León, and Madrid, Spain; in Spain it has come to mean any important highway. In California a coastal highway called El Camino Real was built during the Spanish period (1542–1821) and finally extended 600 miles (970 km) from San Diego to Sonoma. It connected the 21 missions and 4 presidios (forts) built beside or near it from *c.* 1769 to *c.* 1823. The present Pacific Highway between San Diego and San Francisco closely parallels the old Camino Real.

Camisard, any of the Protestant militants of the Bas-Languedoc and Cévennes regions of southern France who, in the early 18th century, organized an armed insurrection in opposition to Louis XIV's persecution of Protestantism. Camisards were so called probably because of the white shirts (Languedocian *camisa,* French *chemise*) that they wore to recognize one another in night fighting.

Having ended religious toleration by revoking the Edict of Nantes in 1685, Louis sought to impose Roman Catholicism on all his subjects. Thousands of Protestants emigrated; those who remained were subjected to severe repression. In the first years of the 18th century, a wave of religious enthusiasm swept the strongly Protestant Cévennes. Prophets predicted the end of persecution, and many felt the time had come to destroy the Catholics. The murder (July 1702) of the Abbé du Chayla, who was considered a harsh Catholic persecutor, marked the start of the rebellion. The program of the Camisards was to sack and burn churches and drive off or even kill priests. The movement's offensives were conducted by popular leaders: Jean Cavalier was a baker's apprentice; Pierre Laporte, called Rolland, a sheep gelder. The Camisards fought successfully, even to the point of holding royal armies in check. Their tactics of ambush and night attacks, their knowledge of the mountains in which they operated, and the support of the local populace all were factors in their favour.

In response the government adopted a policy of extermination: hundreds of villages were burned and their populations massacred. In 1704 negotiations failed because the government was willing to grant amnesty but not religious toleration for the Protestants. These terms were rejected by most of the Camisards, and the war continued. By 1705, with many of the Camisard leaders captured and executed, the revolt lost its force. Sporadic fighting continued until 1710, and the royal government's attempts to stamp out Protestantism in the area continued throughout the first half of the 18th century.

Camões, Luís (Vaz) de, English LUÍS VAZ DE CAMOËNS, or CAMOENS (b. *c.* 1524/25, Lisbon—d. June 10, 1580, Lisbon), Portugal's great national poet, author of the epic poem *Os Lusíadas* (1572; *The Lusiads*), which describes Vasco da Gama's discovery of the sea route to India. Camões had a permanent and unparalleled impact on Portuguese and Brazilian literature alike, due not only to his epic but also to his posthumously published lyric poetry.

Life. What little information there is about Camões in a strict biographical sense falls into three categories: statements by his first biographers in the 17th century, a few documents unearthed in the 19th century and scant subsequent research, and very abstract allusions (some chronologically uncertain) to his own life in his works. Successive biographers have woven the few concrete facts known about

Camões, portrait miniature painted in Goa, 1581; in a private collection

By courtesy of the Museu Nacional de Arte Antiga, Lisbon

Camões' life into a bewildering complexity of fantasy and theory that is unsupported by concrete documentary evidence.

It is supposed that Camões was born in Lisbon around 1524 or 1525, when Portuguese expansion in the East was at its peak. Research has shown him to be a member of the impoverished old aristocracy but well-related to the grandees of Portugal and Spain. A tradition that Camões studied at the University of Coimbra or that he followed any regular studies, for that matter, remains unproved, though few other European poets of that time achieved such a vast knowledge of both classical and contemporary culture and philosophy. He is supposed to have been, in his youth, in territories held by the Portuguese in Morocco, but it is uncertain whether he had been exiled or was there because it was simply the place for a young Portuguese aristocrat to start a military career and to qualify for royal favours. It is also assumed that his youth in Lisbon was less than subdued. King John III pardoned him in 1553, when he was under arrest for taking part in a street brawl in which a royal officer was assaulted. The pardon hints that Camões would go to India in the king's service, but none of his wanderings for nearly 17 years there has been documented. He was certainly there, judging from references in his works that reveal an intimate knowledge of the area's social conditions. He surely did not make his fortune there, since he complains often in his poetry about his bad luck and the injustices he met with. While in the East, he took part in one or two military naval expeditions and, as he alludes to it in his epic, underwent shipwreck in the Mekong Delta. His years in the East can be assumed to have been like those of thousands of Portuguese scattered at the time from Africa to Japan, whose survival and fortunes were, as he says, always hanging from divine providence's very thin thread. Diogo do Couto, a 16th-century historian of the Portuguese East, who never included Camões among the nobles he carefully listed for every skirmish, did note, however, that he found "that great poet and old friend of mine" stranded penniless in Mozambique and helped to pay his trip back to Lisbon.

Camões returned to Portugal in 1570, and his *Os Lusíadas* was published in Lisbon in early 1572. In July of that year he was granted a royal pension, probably in recompense for both his service in India and his having written *Os Lusíadas*. His mother, a widow, survived him and had the pension renewed in her name. Documents related to payments due and to the renewal are known, and through them the date of his death in 1580 has been accepted. It is not certain that he died of anything more than premature old age brought on by illnesses and hardships.

Literary works. Camões' poetical works may conveniently be discussed under three headings: lyric, epic, and dramatic.

The first edition of Camões' *Rimas* was published in 1595, 15 years after his death. The editor, Fernão Rodrigues Lobo Soropita, had exercised scrupulous care in collecting the poems from manuscript songbooks, but even so he could not avoid the inclusion of some apocryphal poems. The increasing fame of Camões' epic during the early 17th century also swept the lyrics into fame, and in the 17th century many efforts, not all of them praiseworthy, were made to unearth more poems. Prominent in this enterprise, but in a manner condemned by modern criticism, was Manuel de Faria e Sousa. Even in the 19th century, the Visconde de Juromenha added to the already excessive collection of lyrics, introducing into his edition of 1860–69 many poems from the songbooks, which were still comparatively unstudied. As a result the sonnets increased from 65 in the first edition to 352 in the Juromenha edition; the total number of poems, including sonnets, sextets, odes, octets, eclogues, elegies, and the Portuguese forms known as *canções, redondilhas, motos, esparsas,* and *glosas* had risen from 170 in the first edition to 593 by 1860.

With the work of Wilhelm Storck and Carolina Michaelis de Vasconcelos in the late 19th and early 20th centuries, there began a critical reaction which led to the elimination of many apocryphal poems. Although a complete restoration of Camões' lyrics appears impossible, scholars continue the work of purifying the texts. Fortunately there are sufficient authentic poems to confirm Camões' position as Portugal's finest lyric poet. If he had remained at the Portuguese court, he would not have reached this high pinnacle despite his consummate artistry. But he exchanged the vanity and superficiality of court life for the hardships of a soldier's life in Africa and India, and the exchange immeasurably enriched his poetry. For he no longer needed to conform to the standards of brevity required in court circles, and, more important still, so profound was the anguish he experienced because of his exile from home and the trials he underwent in the East that his anguish became an integral part of his being, enabling him to give to "yearning fraught with loneliness" (*saudade-soledade*) a new and convincing undertone unique in Portuguese literature. His best poems vibrate with the unmistakable note of genuine suffering and deep sincerity of feeling. It is this note that places him far above the other poets of his era.

Although the *canções* and elegies show the poet's full powers, the *redondilhas* must not be underestimated. In the production of these elegant trifles Camões was inimitable. He rejuvenated the ancient art of glossing by the apparent spontaneity and simplicity, the delicate irony, and the piquant phraseology of his verses and so raised courtly grace in poetry to its highest level. These poems also show a Camões who could be happy and carefree.

In their efforts to discover who inspired most of Camões' lyric poems, critics have made, on very slender grounds, many contradictory suggestions of various women who may have figured in the poet's life. But the real muse, if the poet had one, remains an enigma. Nor should it be forgotten in trying to resolve these questions that Camões himself said in one of his sonnets, *"em várias flamas variamente ardia"* ("I burnt myself at many flames").

The title of Camões' epic poem, *Os Lusíadas,* is taken from the word *Lusiads,* which means "Portuguese" and is in turn derived from the ancient Roman name for Portugal, Lusitania. The work extols the glorious deeds of the Portuguese and their victories over the enemies of Christianity: victories not only over their fellowman but also over the forces of nature as motivated by the inimical gods of classical mythology. The courage and enterprise of Portuguese explorers had inspired the idea of a national epic during the 15th century, but it was left to Camões in the 16th century to put it into execution. It is impossible to say for certain when he decided to do so or when he actually began to write his epic. *Os Lusíadas* describes the discovery of the sea route to India by Vasco da Gama. The 10 cantos of the poem are in ottava rima and amount to 1,102 stanzas in all. After an introduction, an invocation, and a dedication to King Sebastian, the action, on both the historical and the mythological levels, begins. Da Gama's ships are already under way in the Indian Ocean, sailing up the coast of East Africa, and the Olympian gods gather to discuss the fate of the expedition (which is favoured by Venus and attacked by Bacchus).

The voyagers spend several days in Melinde on the east coast of Africa, and at the king's request Vasco da Gama relates the entire history of Portugal from its origins to the inception of their great voyage (Cantos III, IV, and V). These cantos contain some of the most beautiful passages in the poem: the murder of Inês de Castro, who becomes a symbol of death for the sake of love; the battle of Aljubarrota; the vision of King Manuel I; the description of St. Elmo's fire and the waterspout; and the story of Adamastor, the giant of classical parentage who, as the Cape of Good Hope, tells da Gama he will lie in wait to destroy the fleets coming back from India.

When they re-embark the poet takes advantage of leisure hours on board to narrate the story of the Doze de Inglaterra (Canto VI, 43–69). In the meantime, Bacchus, ever ready to impede the progress of the Portuguese in the East, convokes a council of the sea gods and incites them to arrange the shipwreck of the Portuguese fleet. This is prevented by Venus (Canto VI, 85–91), and Vasco da Gama is able to reach Calicut (Kozhikode, now in Kerala state, southwestern India), the end of his voyage. There his brother, Paulo da Gama, receives the king's representative on board and explains the significance of the characters depicted on the banners that adorn the captain's ship (Cantos VII and VIII). On their homeward voyage the mariners chance upon the island that Venus has created for them, and the nymphs reward them for their labours. One of the nymphs sings of the future deeds of the Portuguese (Cantos IX and X), and the entertainment ends with a description of the universe given by Thetis and Vasco da Gama, after which the sailors embark once more and the nymphs accompany them on their homeward journey.

In *Os Lusíadas* Camões achieved an exquisite harmony between classical learning and practical experience, delicate perception and superb artistic skill, expressing through them the gravity of thought and the finest human emotions. The epic was his eulogy of the "dangerous life" (*vida perigosa*) and was a stern warning to the Christian monarchs, who, idling their time away in petty struggles, were failing to unite against the encroaching conquests of Islām in southeastern Europe. Realistic descriptions in the poem of sensual encounters, battles, and storms and other natural phenomena transcend the thrust of classical allusions that permeate the work and make for the high-flown yet fluent style of the poem. *Os Lusíadas* reveals an astonishing command of language and variety of styles and provides a fascinating portrait of an extraordinary man and poet.

In his dramatic works Camões tried to combine national and classical tendencies. In his comedy *Anfitriões* he accentuated the comic aspect of the myth of Amphitryon; in the comedy *El Rei-Seleuco* he reduced the situation found in Plutarch to pure farce; and in *Filodemo* he developed the *auto,* a kind of morality play, which Gil Vicente had earlier made popular. But Camões seems to have regarded comedy as unimportant, as a mere curiosity and a recreation to which he could give only transitory attention. Nevertheless, by imposing classical restraint on the Vicentian *auto,* by increasing the importance of the plot, by transferring the comic element from the characters to the action, and by refining the farce, Camões indicated a possible means of rejuvenating 16th-century comedy in Portugal. Later dramatists, unfortunately, were incapable of following the lead he had given. Drama, however, is the least important aspect of Camões' poetry. It was his epic and his lyrics, among which are some of the loveliest ever written, that made him one of the greatest poets of 16th-century Europe and have given him a lasting claim to fame.

MAJOR WORKS. *Poetry. Os Lusíadas* (1572; *The Lusiads,* trans. by Sir Richard Fanshawe, 1655); *Rhythmas de Luís de Camões* (1595; *Camoens: The Lyricks,* trans. by Richard Burton, 2 vol., 1884).

Plays. Anfitriões and *Filodemo,* in *Primeira Parte dos Autos e Comèdias Portuguesas,* by António Prestes, Luís de Camões, *et al.* (1587); *El Rei-Seleuco,* in *Rimas* (1645).

Editions. The editions of Camões' works in Portuguese and other languages are in the hundreds, and his bibliography is immense. The best modern edition of *Os Lusíadas* in the original language is still by Augusto Epifânio da Silva Dias, *Os Lusíadas,* 2 vol. (1916–18). The Portuguese text with commentary and introduction in English, *Os Lusiadas,* ed. by Frank Pierce (1973), is more compact. The best contemporary edition of the lyric works, if unsatisfactory, is Álvaro J. da Costa Pimpao, *Rimas,* new ed. (1961). The best modern English translation of *Os Lusíadas* is by Leonard Bacon, *The Lusiads of Luiz de Camõens* (1950).

BIBLIOGRAPHY. *Biographies.* A monumental biography is Friedrich Wilhelm Storck, *Luis de Camoens Leben* (1890). The most prudent, shorter biography (in English), though outdated, remains Aubrey F.G. Bell, *Luis de Camões* (1923); and the best debunking of all the biographical myths is António Salgado, Jr.'s, introduction to his edition of the *Obra Completa* (1963).

Critical studies. The numerous articles by Carolina Michaelis de Vasconcellos are still scattered in learned reviews from the 1880s to the 1920s and, with some of her other works, remain the starting point of any Camonian scholarship. Other studies include: Theophilo Braga, *Camões: Época e Vida* (1907) and *Camões, a Obra Lírica e Épica* (1911); F. Rebelo Gonçalves, *Dissertações Camonianas* (1937); Hernani A. Cidade, *Luís de Camões,* 2nd ed., 3 vol. (1952–56); Cecil M. Bowra, *From Virgil to Milton* (1945); Jorge de Sena, *A Poesia de Camões* (1951), *Uma Canção de Camões* (1966), *Os Sonetos de Camões* (1969), and *A Estrutura de "Os Lusíadas"* (1970); António J. Saraiva, *Luís de Camões* (1959); A. Bartlett Giamatti, *The Earthly Paradise and the Renaissance Epic* (1966); and Roger Bismut, *La Lyrique de Camões* (1971).

camomile: *see* chamomile.

Camorra, Italian secret society of criminals that grew to power in Naples during the 19th century. Its origins are uncertain, but it may have existed in Spain as early as the 15th century and been transported thence to Italy. As the Camorra grew in influence and power,

its operations included criminal activities of various kinds, such as smuggling, blackmail, extortion, and road robberies. The corrupt Bourbon regime did not interfere with the society; indeed, members of the Camorra were taken into the police service, and the organization became entrenched among both Neapolitan municipal employees and the army.

After the unification of Italy (1861), severe repressive measures were inaugurated against the society; these continued for several decades, culminating in an intensive series of manhunts, beginning in 1882. Thereafter, the Camorra steadily lost ground; its decline was climaxed by the defeat of all its candidates in the Neapolitan election of 1901.

Although greatly weakened, the society was not yet extinct. In 1911 popular attention was drawn to the fact of its survival by a famous murder case in which some 20 alleged Camorristi were brought to trial. Among them was the man reputed to be its chief, who was extradited from the United States. The severe sentences that were passed on those convicted dealt a shattering blow to the organization. Many Camorristi fled to the United States, where, according to some sources, they carried on bloody feuds with the Mafia until about 1920, when that organization absorbed the surviving Camorra members. *See also* Mafia.

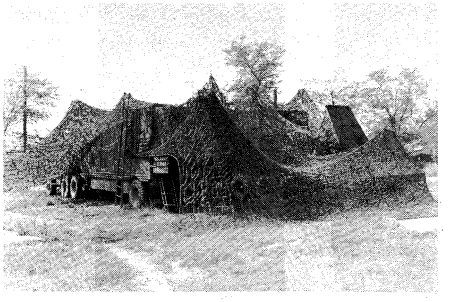
camouflage, in military science, the art and practice of concealment and visual deception in war. It is the means of defeating enemy observation by concealing or disguising installations, personnel, equipment, and activities. Conventional camouflage is restricted to passive defensive measures. The surface camoufleur, for example, does not try to prevent aerial surveillance by jamming the enemy's radar but rather seeks to deceive the enemy by proffering misleading visual information.

Both concealment and deception adversely affect the enemy's intelligence effort. The withholding of information compels him to increase his surveillance efforts, and thus to divert from combat a greater number of personnel and machines. The receipt of incorrect reports may confuse the enemy and may thus contribute to indecision on the part of the enemy commander, costing him critical time and resources and even leading him to make wrong decisions.

Conventional camouflage does not try to obviously impair the enemy's gathering of information but rather seeks to give false information to the enemy without arousing his suspicions. Countermeasures, on the other hand, do impair the ability of the sensing device to "see" and are not concerned with whether the enemy is aware of this action as long as his ability to detect is destroyed. For example, the dropping of tinfoil from aircraft in flight and the launching of diversionary guided missiles are designed to confuse, divert, and saturate air defense systems; they are normally considered countermeasures rather than camouflage.

Camouflage, from the French word *camoufler* ("to disguise"), came into English usage during World War I when air warfare was introduced. The development of military aircraft exposed enemy positions to aerial reconnaissance, which could be used for purposes of directing artillery fire and anticipating potential offensives. Each major army therefore organized a camouflage service of specially trained troops to practice the art of deception. By World War II the increased capabilities of aircraft for long-range bombing threatened warring countries in their entirety, not just the front lines, thus increasing both the importance and the scope of camouflage. At the same time, camouflage concepts were broadened to include active deception of the enemy as well as passive concealment against observation and aerial photography.

In World War II practically everything of military significance was camouflaged to some degree using such materials as mottled, dull-coloured paint patterns, cloth garnishing, chicken-wire, netting, and the use of natural foliage: these disguises were intended to make a weapon, vehicle, or installation indistinguishable from the surrounding vegetation and terrain when viewed from the air. Almost all tactical vehicles carried camouflage nets and were painted in greenish, grayish, or brown colours. All military personnel received training in camouflage fundamentals during basic training.



Camouflaged communications centre
By courtesy of the U.S. Army

Dummies, displays, and decoys were widely used during World War II to accomplish various objectives. In Great Britain and Germany entire airfields and large manufacturing plants were camouflaged to protect them against aerial attack. False targets were also set up to divert enemy bomber attacks from real targets. At the close of the war the British air ministry reported that:

> A network of 500 dummy cities, airfields, shipyards and other targets so realistic they blazed at night under enemy attack caused thousands of tons of German bombs to drop harmlessly on open fields during the Battle of Britain. Mock airfields drew even more raids than the real ones—443 compared with 434 on actual installations. The fields appeared so genuine that Allied pilots had to exercise great care to avoid trying to land on them.

In evaluating German camouflage in World War II, the United States Strategic Bombing Survey reported that:

> Protective concealment was practiced with greater variety of materials, probably with greater ingenuity, and certainly with greater expenditures of manpower, than had been used by any warring nation previously. One of these ambitious camouflage projects was undertaken in Hamburg where the inner basin of the Alster, measuring roughly 500 by 450 yards, surrounded by the main business district, was covered to make it appear like terrain.

In the Second Battle of el-Alamein (1942), the British commander Bernard L. Montgomery surprised the German commander Erwin Rommel by using dummies combined with a feint. Montgomery's intention to force a gap through the German defensive system in the northern sector was masked by a long-term deception designed to make the Germans think that the attack was to take place in the southern sector. By skillful use of dummy material, Montgomery shifted his tanks and other equipment to the north without any visible decrease of strength in the south. These deceptions kept Rommel guessing where the actual British attack would take place during the battle, which was won by the British.

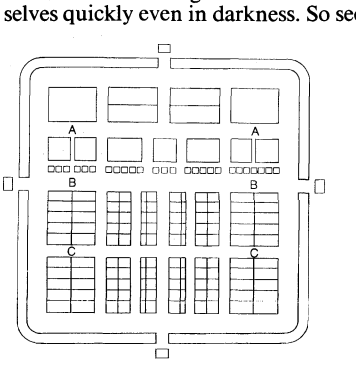
Another notable use of dummies was in the elaborate simulation of an entire army in England prior to the Normandy invasion in an effort to confuse the Germans about where the invasion force would land. During this time German reconnaissance aircraft often reported "loaded fleets in British ports and large-size mechanized units in the field." These displays in reality consisted of pneumatic decoys made to resemble different types of weapons and concentrations of landing craft, tanks, trucks, and artillery. Dummy assault boats drew some of the defensive fire during the actual assault on the Normandy beaches. The protective concealment provided by smoke was also effective during World War II. Land and sea movements, fleets at anchor, and preparations for river crossings were all temporarily hidden by blankets of smoke, some extending for miles. The 60-mile- (100-kilometre-) long smoke screen along the Rhine River that covered the reorganization of the Allied 21st Army group and its subsequent crossing of the river in March 1945 was probably the greatest smoke cover ever produced.

The Korean War (1950–53) brought little change in camouflage techniques. But a variety of new detection devices appeared in the 1950s and '60s that were used to notable effect in the Vietnam War. The Communist guerrilla units in that conflict used stealth, natural concealment, and camouflage very effectively, and sophisticated electro-optical sensing devices were often used by American aircraft to pinpoint these elusive forces' presence in the dense vegetation of combat zones. American aircraft and drones were equipped with television, radar, infrared scanning devices, acoustic detection, and high-speed photographic equipment with multiple filters. American ground battle area surveillance equipment included television, radar, and aids to night vision.

Camouflage research and development have meanwhile provided new techniques, materials, and equipment for countering such surveillance devices. Improved pneumatic devices were produced to simulate items of military equipment such as trucks, armoured vehicles, artillery, and guided missiles. Other materials were developed to simulate bridges, convoys, bivouac areas, airstrips, marshaling yards, post activities, and supply dumps. Computers have now become a standard tool of analysts seeking to piece together large masses of photographic and other data in an effort to distinguish between real and dummy/decoy activities by an enemy.

camp, in military service, an area for temporary or semipermanent sheltering of troops. In most usage the word camp signifies an installation more elaborate and durable than a bivouac but less so than a fort or billet.

Historically, the camps of the Roman legions are especially noteworthy. However long or short the encampment, the Romans always built a rampart of ditches, earth walls, and wooden palisades, within which the space was divided into headquarters, supply, and troop areas in accordance with an unvarying plan; a surprise attack always found the troops in familiar surroundings and able to orient themselves quickly even in darkness. So secure were



Plan of a Roman camp showing transport, baggage, supply, and headquarters services on either side of avenue (A); tents of tribunes and centurions, each opposite his own command, along avenue (B); and the Roman legion separated from the allied legion by avenue (C)

Roman camps that many of them formed the nuclei of future cities in France, England, and elsewhere.

The development of firearms rendered the fortified camp largely obsolete; camps tended to be unprotected except for security pickets and patrols and were situated behind established fighting fronts. In the Vietnam War, however, the fortified base camp was revived by both sides, with the North Vietnamese installations equipped with deep bombproof shelters.

Consult the INDEX *first*

Camp, Walter Chauncey (b. April 7, 1859, New Britain, Conn., U.S.—d. March 14, 1925, New York City), sports authority best known for selecting the earliest All-America teams in U.S. college football but, more importantly, for his role in developing the U.S. game as distinct from Rugby football.

As an undergraduate and then as a medical student at Yale (1876–81), Camp played halfback, served as team captain (at that time equivalent to head coach), and became a member of the Intercollegiate Football Association. From 1880 this ruling body accepted various innovations proposed by Camp: the 11-man team, the quarterback position, the scrimmage line, offensive signal calling, and the requirement that a team give up the ball after failing to advance a specified yardage in a certain number of downs (plays from scrimmage). In 1883 he secured the adoption of a scale of numerical values for scoring by touchdown, try for point after touchdown, field goal, and safety. Although he was an executive of a watch-manufacturing firm from 1883, Camp coached the Yale football team from 1888 through 1892, his teams winning 67 games while losing only 2.

From 1889 through 1896, Camp and Caspar Whitney probably collaborated in choosing the annual All-America football team, the original idea of which seems to have been Whitney's. From 1897 through 1924 the teams were announced (in the magazine *Collier's, the National Weekly* from 1898) under the name of Camp alone. On his death he was succeeded as All-America selector by the noted sportswriter Grantland Rice.

Camp David, formerly (until 1953) SHANGRI-LA, retreat of U.S. presidents, in Catoctin Mountain Park, a unit of the National Park Service on a spur of the Blue Ridge Mountains, in Frederick County, northern Maryland, U.S., just west of Thurmont, and 70 mi (113 km) northwest of Washington, D.C. The retreat, comprising a scenic mountainous area of 200 ac (81 ha), is surrounded by maximum-security fencing and is closed to the public. It was established as "Shangri-La" in 1942 by Pres. Franklin D. Roosevelt and made an official presidential retreat by Pres. Harry S. Truman in 1945. Pres. Dwight D. Eisenhower renamed it Camp David in 1953 for his grandson. The retreat is administered by the Office of the Military Assistant to the President and includes a presidential office and living quarters, swimming pool, and meeting hall. Since the meeting there in World War II between President Roosevelt and British prime minister Winston Churchill, it has been the scene of a number of high-level presidential conferences with foreign heads of state. In September 1978, through the intervention of Pres. Jimmy Carter, the retreat was the site of an historic peace agreement (known as the Camp David accords) between Egyptian president Anwar el-Sadat and Israeli prime minister Menachem Begin.

camp meeting, type of outdoor revival meeting held on the U.S. frontier during the 19th century by various Protestant denominations. Camp meetings filled an ecclesiastical and spiritual need in the unchurched settlements as the population moved west. The origin is obscure, but historians have generally credited James McGready (*c.* 1760–1817), a Presbyterian, with inaugurating the first typical camp meetings in 1799–1801 in Logan County, Kentucky. Other ministers who associated with McGready spread his methods throughout the Southwest.

As the name implies, those who attended such meetings came prepared to camp out, gathering at the prearranged time and place from distances as great as 30 to 40 miles away. Families pitched their tents around a forest clearing where log benches and a rude preaching platform constituted an outdoor church that remained in almost constant session for three or four days. As many as 10,000 to 20,000 people were reported at some meetings. People came partly out of curiosity, partly out of a desire for social contact and festivity, but primarily out of their yearning for religious worship. Activities included preaching, prayer meetings, hymn singing, weddings, and baptisms. Theology of the preachers varied, but a sudden conversion experience was usually emphasized.

Often the occasion for wild enthusiasm and hysteria in the early years, camp meetings acquired a bad reputation among conservative churchmen. The Presbyterian Church refused to participate after 1805. Nevertheless, they were an important part of the frontier ministries of the Methodists, Baptists, Shakers, Disciples, and Cumberland Presbyterians. The Methodist Church profited most by their popularity and gradually institutionalized them into its system of evangelism. By 1811 the Methodist bishop Francis Asbury reported in his journal that over 400 camp meetings were held annually along the frontier from Georgia to Michigan.

Camp meetings affected the religious and social life of the frontier in various ways. The emphasis on a sudden conversion experience tended to reduce doctrinal preaching to a minimum, break down the old creedal standards, and undermine the concept of a learned pastoral ministry. The individualistic and activistic attitudes in Protestantism stressed in camp meetings agreed with the character of frontier life and eventually pervaded the religious outlook of rural America. Camp meetings lingered as summer Bible conferences into the 20th century, but their significance passed after 1890, along with the frontier society that created them.

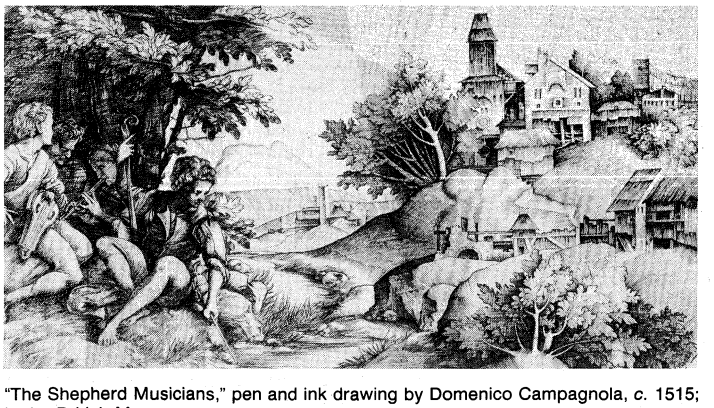
Campā, city of ancient India, the capital of the kingdom of Aṅga (a region corresponding with the eastern part of modern Bihār state), identified with two villages of that name in Bhāgalpur district, on the south bank of the Ganges, east of Monghyr. Nothing is known of the archaeological remains at the site.

Campā is often mentioned in early Buddhist literature as a city of importance and was one of the six great cities of northern India in the Buddha's time (6th–5th centuries BC). It was a centre for foreign trade, and it gave its name to a kingdom later founded in Annam.

Campagna di Roma, lowland plain surrounding the city of Rome in Lazio (Latium) region, central Italy. Occupying an area of about 800 sq mi (2,100 sq km), it is bounded on the northwest by the Tolfa and Sabatini mountains, on the northeast by the Monti (mountains) Sabini, on the southeast by the Alban Hills (Colli Albani), and on the southwest by the Tyrrhenian Sea. Abandoned to marsh and malaria in the Middle Ages, the district was transformed by major reclamation works in the late 19th and early 20th centuries and now supports cereals, fodder, fruit and vegetables, and livestock. Uncontrolled building development and abandonment of many small farms were changing the once purely agricultural character of the Campagna in the 1980s.

Campagnola, Domenico (b. *c.* 1484, Padua, Republic of Venice—d. *c.* 1563), painter and printmaker and one of the first professional draftsmen.

A pupil, and possibly a relative, of the Paduan engraver Giulio Campagnola, he did not follow Giulio's stipple technique in his own work, preferring a looser touch and picturesque effect. Early in his career, he is known to have assisted the Venetian painter Titian with a series of frescoes in Padua, and Titian's brilliant use of colour and pioneering composition based on movement remained a great influence on his style. He was chiefly active around Padua, where he decorated many of the churches and palaces with frescoes. He is also renowned as an engraver and as a cutter and designer of woodcuts. He was a prolific draftsman, usually working in pen and ink, and was among the first to make his drawings ends in themselves rather than preparatory studies. His drawings have often been wrongly attributed either to Titian or to Giorgione.



"The Shepherd Musicians," pen and ink drawing by Domenico Campagnola, *c.* 1515; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

Campagnola, Giulio (b. *c.* 1482, Padua, Republic of Venice—d. after 1514), painter and engraver who anticipated by more than two centuries the development of stipple engraving. Much of his significance derives from this engraving technique: a system of delicate flicks and dots with the engraving tool, by which he achieved subtle nuances in his modelling. His only recognized work consists of his engravings; his mature style was most influenced by

"St. John the Baptist," engraving by Giulio Campagnola
By courtesy of the Art Institute of Chicago

the lyrical Venetian painter Giorgione, after whose works he engraved several prints.

campaign furniture, variety of portable furniture made for travel. Most of the surviving examples date from the 19th century and were made for Napoleon's campaigns; they include such items as small chests, folding seats, and washstands in three tiers resting on metal supports that could be unscrewed so that all the parts could be packed easily.

Case furniture was usually teak, with sunken swivel brass handles, brass angle pieces to protect the corners, and short, turned (shaped on a lathe) feet that could be removed for transport. Perhaps the best known piece of campaign furniture was the Wellington Chest, named after the first Duke of Wellington. It had 6 to 12 drawers of equal depth. The right-hand side of the frame, which overlapped the drawers, was hinged and fitted with a lock.

Campaldino, Battle of (June 11, 1289), battle between Florence and Arezzo, an episode in the struggles among rival Tuscan towns and in the contest between the Guelfs and Ghibellines (pro-papal and pro-imperial parties in Italy). The battle marked the beginning of the hegemony of the Florentine Guelfs over Tuscany.

Florence, encouraged to fight by Guelf partisans exiled from Arezzo by Ghibellines in 1287, was aided by its allies (Pistoia, Lucca, Bologna) and by a small contingent from Charles II of Naples, leader of the Guelf party in Italy. A cavalry charge decided the battle in favour of Florence. Among the Florentines who fought at Campaldino was the poet Dante.

Campaña, Pedro (Flemish painter): *see* Kempeneer, Pieter de.

Campanella, Roy, byname CAMPY (b. Nov. 19, 1921, Homestead, Pa., U.S.), U.S. professional National League (NL) catcher for the Brooklyn Dodgers, whose career was cut short as a result of an automobile accident.

Campanella began playing semiprofessional baseball on the Nicetown, Philadelphia, sandlots when he was 13, and at 15 he was signed to play in Negro leagues. He batted and threw right-handed. He joined the Dodgers in 1948 and was their regular catcher from 1949 until an automobile accident after the 1957 season left him paralyzed. During his playing career he was named the NL most valuable player three times (1951, 1953, 1955) and was recognized as the best fielding catcher in the league in the 1950s. Also known for his hitting, in 1953 he led the league in runs batted in (142), and hit 41 home runs. He played in five World Series (1949, 1952–53, 1955–56). His autobiography, *It's Good to Be Alive*, was published in 1959. He was elected to the Baseball Hall of Fame in 1969.

Campanella, Tommaso, original name GIOVANNI DOMENICO CAMPANELLA (b. Sept. 5, 1568, Stilo, Kingdom of Naples—d. May 21, 1639, Paris), Platonic philosopher, Italian poet, and writer who sought to reconcile Renaissance Humanism with Roman Catholic theology. He is best remembered for his socialistic work *La città del sole* (1602; "The City of the Sun"), written while he was a prisoner of the Spanish Inquisition (1599–1626).

Entering the Dominican order in 1583, at which time he adopted the name Tommaso, he was influenced by the work of Italian philosopher Bernardino Telesio (1509–88), an opponent of Scholastic Aristotelianism. Without permission from his order, Campanella went in 1589 to Naples, where his *Philosophia sensibus demonstrata* (1591; "Philosophy Demonstrated by the Senses") was published. Reflecting Telesio's concern for an empirical approach to philosophy, it stressed the necessity for human experience as a basis for philosophy. The work resulted in his arrest, trial, and imprisonment for heresy. His release months later was granted on the condition that he return to Calabria, but he went instead to Padua, where he met Galileo, whose work he later defended in *Apologia pro Galilaeo* (1616). There, he was arrested, charged with sodomy (1593), acquitted, and then charged with having engaged a Jew in a debate over matters of Christian faith. Sent to Rome for trial, in 1596 he renounced the heresy of which he had been accused.

Campanella's interest in pragmatism and in political reform were already evident in such early writings as *De monarchia Christianorum* (1593; "On Christian Monarchy") and *Dialogo politico contra Luterani, Calvinisti ed altri eretici* (1595; "Political Dialogue Against Lutherans, Calvinists, and Other Heretics"), in which he asserted that sinful humanity can be regenerated through a religious reformation founded on establishment of a universal ecclesiastical empire. These abstractions yielded to a more limited, though still utopian, plan of reform after his return to Stilo in 1598, where the misery of the people moved him deeply. In accordance with this plan, Campanella became in 1599 the spiritual leader of a plot to overthrow Spanish rule in Calabria. The plot was discovered and he was arrested and taken to Naples. Forced under torture to confess his leadership in the plot, he feigned madness to escape death and was sentenced to life imprisonment.

In prison Campanella reverted to Catholic orthodoxy and wrote his celebrated utopian work, *La città del sole.* His ideal commonwealth was to be governed by men enlightened by reason, with every man's work designed to contribute to the good of the community. Private property, undue wealth, and poverty would be nonexistent, for no man would be permitted more than he needed.

During Campanella's prison term of 27 years, he also wrote lyric poems, of which only a few survive—in *Scelta* (1622; "Selections"). Considered by some critics to be the most original poetry in Italian literature of the period, the collection includes madrigals, sonnets, conventional love poems, and metaphysical hymns. His *Metafisica* (1638) expounds his theory of metaphysics based on a trinitarian structure of power, wisdom, and love. In the 30 books of the *Theologia* (1613–14) he reconsidered Catholic doctrines in the light of his metaphysical theory.

After release from prison in 1626, he tried in vain to get his new ideas accepted by Rome. Discovery of an anti-Spanish plot in Naples in 1634 caused him to flee to France, where he was welcomed by King Louis XIII and Cardinal de Richelieu.

BIBLIOGRAPHY. R. De Mattei, *La politica di Campanella* (1927); A. Corsano, *Tommaso Campanella* (1944); F. Grillo, *T. Campanella in America* (1954); N. Badaloni, *Tommaso Campanella* (1965).

Campani, Giuseppe (b. 1635, Castel San Felice, Italy—d. July 28, 1715, Rome), Italian optical-instrument maker who invented a lens-grinding lathe.

Of peasant origin, Campani left his birthplace as a young man to study in Rome. There he learned to grind lenses and, with his two brothers, invented a silent night clock that, when presented to Pope Alexander VII, brought him fame. Thereafter, he became a full-time lens grinder for about 50 years, constructing telescopes and lenses for important persons and for the Royal Observatory in Paris. In 1664 he developed his lens-grinding lathe, with which he made superior lenses for telescopes. He also improved telescope tubes, constructing them of wood rather than of cardboard covered with leather; though somewhat unwieldy, these designs proved durable, and wooden telescopes continued in use until the 19th century. With his own instruments he observed the moons of Jupiter and the rings of Saturn in 1664–65, and his findings were published. Subsequently, he devised a screw-barrel microscope that could be adjusted by rotating it within a threaded ring. That device supplanted sliding barrel types held only by friction, permitting far more precise adjustment.

Campania, region, southern Italy, on the Tyrrhenian Sea between the Garigliano (Lower Liri) River and the Golfo (gulf) di Policastro (south); it comprises the provinces of Avellino, Benevento, Caserta, Napoli, and Salerno, with a total area of 5,249 sq mi (13,595 sq km). The region is mountainous and hilly, the Appennino Napoletano in the extreme east giving way to the slightly lower uplands of the Matese and Monti Picentini, with the Cilento mountain area extending to the coast in the south. The coastal lowlands north of Naples (the Volturno River Basin and the Terra di Lavoro) and south of Salerno (the plain of the lower Sele River) are separated by the volcanic regions around the Bay of Naples—the Campi Flegrei and Vesuvius—and by the Monti Lattari, stretching inland from the Sorrento peninsula. The only rivers of any size are the Volturno and the Sele with their tributaries. Among the intermontane basins, Benevento is the most important.

Ancient Campania, although its boundaries were extended several times, was smaller than the present region, remaining limited to the area between the Volturno (ancient Volturnus) and the Sorrento peninsula. Early settled by Greek colonists and by the Etruscans, the region was dominated by the city of Capua (*q.v.*; modern Santa Maria Capua Vetere) after its foundation in the 6th century BC. Campani, the Roman name for the inhabitants of Capua and later those of the Campanian plain, is actually pre-Roman and appears with terminations (suffixes) inscribed in Oscan (an ancient Italic dialect) on coins struck for or by the Samnites, the conquerors of Campania in the late 5th century BC. Samnite Capua became the ally of Rome about 340 BC, and the whole region was Romanized by the end of the 4th century and later flourished as a *colonia* and then a region of the Roman Empire. Cumae, Nola, and Puteoli (modern Pozzuoli; *qq.v.*) were important ancient centres. After the fall of Rome, Campania was occupied

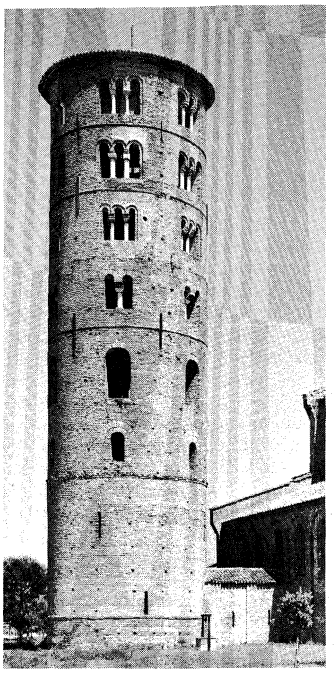
successively by the Goths, Byzantines, and Lombards. Conquered by the Normans in the 11th century and incorporated in the Kingdom of Sicily in the 12th century, it became part of the Kingdom of Naples after the Wars of Sicilian Vespers against the French in 1282. Campania was united with Italy in 1860.

The major farming areas of Campania are the fertile and intensively cultivated coastal lowlands, characterized by interculture, with plots of land producing cereals on the ground, fruit on the trees along the edges of the plots, and grapes from vines trailing between the trees. Chief crops are fruit (apricots, apples, peaches, nuts, citrus, and grapes), early vegetables, and flowers and such industrial crops as tobacco and hemp. Campanian wines, especially those from Vesuvius (Lacrima Christi), Isola d'Ischia (Epomeo), and the Sorrento peninsula, are famous throughout Italy. Fishing is important in the Bay of Naples, Procida and Torre del Greco being the leading ports. Campania is the only region of southern Italy with a major concentration of industry, most of it centred on Naples, the regional capital, and some around Salerno (*q.v.*). Metallurgy, chemicals, machinery and tools, textiles, agricultural industries (canning, flour milling, macaroni, tobacco), and shipbuilding are the main branches. In Naples and its suburbs there is a flourishing artisan industry working coral, pearls, tortoise shell, leather, and lace. The tourist trade in Naples, on the Sorrento peninsula, and on the islands of Capri and Ischia (*see* Capri, Island of; and Ischia, Island of) is an important source of income. Naples is a leading Italian port and is also the centre of the transportation system connecting to all parts of Italy. Internal coastal communications in the region are relatively easy, but the highly dissected character of the interior made road and rail travel "across the grain," in the west–east direction, difficult until the construction of the Autostrada del Sole. Pop. (1983 est.) 5,513,462.

Campanian Stage, standard, worldwide division of Upper Cretaceous rocks and time (the Cretaceous Period began about 136,000,000 years ago and lasted about 71,000,000 years). The Campanian Stage follows the Santonian Stage and precedes the Maestrichtian Stage. Chalk deposits dominate the Maestrichtian record in much of northern Europe and in Great Britain, where it is represented by the Upper Chalk. Several zones representing shorter spans of time within the Campanian are recognized and are characterized by species of the ammonite cephalopod (mollusk) genus *Baculites.*

campanile, bell tower, usually built beside or attached to a church; the word is most often used in connection with Italian architecture. The earliest campaniles, variously dated from the 7th to the 10th century, were plain round towers with a few small, round-arched openings grouped near the top. Typical examples of this type stand beside the churches of S. Apollinare in Classe and S. Apollinare Nuovo, Ravenna. Round campaniles appeared occasionally in later periods; the famous Leaning Tower of Pisa (begun in 1174), which is sheathed in a series of superimposed arcades, is a more elaborate version of this type.

From the 10th century onward, most campaniles were based on a square ground plan, which seems to have been developed simultaneously in Rome and Lombardy. This type was generally decorated with projecting vertical strips, known as lesenes, and with ranges of arcaded cornices that divided the tower into several stages. The roof, particularly in early examples, was usually a pyramid of low pitch, invisible from the ground. This Roman type of campanile prevailed, with minor variations,



Campanile, S. Apollinare in Classe, Ravenna
GEKS

throughout the Middle Ages, as seen at Sta. Prassede (1080) and Sta. Maria in Trastevere (*c.* 1140).

Campaniles in Lombardy basically resembled the Roman type, but their elements were usually more complex and elaborate. The top story was developed into a kind of crown to the whole composition, and a pyramidal or (occasionally) conical spire was added. This increasing emphasis on verticality can be seen in the early 14th-century campanile of Florence, designed by Giotto, Taddeo Gaddi, and others, in which the belfry stage is enlarged to approximately twice the height of any other.

It was mainly around Venice that the possibilities of this development were fully realized. Venetian campaniles consisted of tall, square, slim shafts, frequently tapered, rising to open belfries at the top. The belfry, which had one or two rows of arcading, was often made of stone, although the rest of the tower was brick. Above the belfry cornice rose the spire, sometimes square, as in the famous 320-foot campanile at St. Mark's in Venice (lower portion 10th and 12th centuries, belfry story 1510, the whole rebuilt in 1908 in exact imitation of the original), and sometimes octagonal.

Campanile, St. Mark's Cathedral, Venice, begun 10th century
From *Italy Builds* by G.E. Kidder Smith

Campaniles of this mature type continued to be built in the region of Venice long into the Renaissance period; but elsewhere in Italy, as the Renaissance preference for other forms (particularly domes) developed, they became obsolete and remained so until the early 19th century. Then, an Italian Romanesque revival made Lombardic-style churches with their characteristic campaniles an alternative to the eclectic Neo-Gothic churches in northern Europe (an English example is Christ Church, Streatham, begun 1840). Later in the century, under the influence of the critic John Ruskin, the Venetian form of campanile became popular; it may be said to have inspired the tower at Westminster cathedral (by J.F. Bentley, 1897). It was characteristic of 19th-century eclecticism, however, that the revived campanile form was not limited to its original uses but appeared also in connection with factories, country houses, blocks of flats, markets, and collegiate buildings—sometimes with bells, sometimes with clocks, and often with neither but simply for picturesque effect.

Twentieth-century building materials greatly encourage the construction of freestanding forms, and the campanile once again became a common type of tower for churches and other nonresidential buildings.

Campanulales, the bellflower order of flowering plants, belonging to the class called dicotyledon (*q.v.*; characterized by two seed leaves). Its members are mostly herbaceous and perennial and are of chiefly ornamental value. Seven families, 105 genera, and about 2,000 species are placed in Campanulales. The most familiar plants are those in the bellflower (Campanulaceae) and the lobelia (Lobeliaceae) families. They account for at least 60 genera and 1,500 species of this order.

A brief treatment of Campanulales follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

Members of the Campanulales grow at elevations ranging from sea level to 13,000 feet (4,000 metres). The bellflower family grows in mountainous areas of temperate regions in both hemispheres; some lobelias are native to the temperate Northern Hemisphere, but a larger number are found in the milder areas of the Southern Hemisphere and in the tropics. Representatives of the other, smaller families are mainly Australian.

The diversity in distribution of this order is matched by the diversity of habitats. In the genus *Campanula,* for instance, many species prefer sunny locations, but others grow best in shady woodlands and *C. aparinoides* of North America is found in marshes. The majority of bellflower species thrive on soils derived from limestone, but *C. loeflingii* of Portugal grows in somewhat acidic, sandy soils. *Lobelia siphilitica* and related species grow in open, sunlit fields saturated with water. On the other hand, species of *Nemacladus* are annuals in the deserts of the southwestern U.S.

Of the 40 genera and 700 species belonging to the Campanulaceae family, 17 genera are favoured for their beauty. The Adriatic (*Campanula elatines*) and the willow (*C. persicifolia*) bellflowers, with origins in Europe and northern Asia, have yielded several cultivars ranging in colour from white to blue. The tussock bellflower (*C. carpatica*) of the Carpathian Mountains forms clumps 45 centimetres (18 inches) tall. Species native to eastern North America but also grown in gar-

dens are the bluebell (*C. rotundifolia*) and the tall bluebell (*C. americana*). The creeping bellflower (*C. rapunculoides*) is a notorious garden weed. Of more than 100 species in the genus *Wahlenbergia* (widely distributed from western Europe to the Southern Hemisphere), eight are under cultivation; the trailing bellflower (*Cyananthus*) of the Himalayas is known for its mat-forming species.

Among the few food plants produced by the Campanulaceae are the rampion (*Campanula rapunculus*), eaten as a vegetable in parts of Europe, and some robust members of the bellflower family—especially *Canarina, Clermontia,* and Centropogon—that produce edible berries.

Only *Lobelia* of the family bearing its name is widely known. The cardinal flower (*L. cardinalis*) displays a brilliant red corolla in contrast with the blue or white colours of the majority of related species.

Indian tobacco (*Lobelia inflata*) is native to eastern and central North America; it has a tobacco taste and was used as an emetic by indigenous Indians. This and other lobelias yield an alkaloid, lobeline, useful as a remedy against nicotine addiction.

Campanulales reproduces almost universally by seeds. The elongated, upper portion of the leafy stem becomes an inflorescence (flower cluster) as a flower bud arises in the axil (angle between stem and petiole) of a leaf. The inflorescence is a raceme (if flowers are stalked) or a spike (if flowers are unstalked).

A generalized flower of this group possesses five green, partly united sepals, which form the calyx. Characteristically, the five petals form a corolla tube, which may be closed, typically bell-shaped, or widely spreading. Fewer than five stamens (male) develop in some genera. Three elongate carpels form a closed structure, the pistil (female); it is differentiated into a swollen, basal ovary containing ovules and a slender style that ends in a three-lobed pollen-receptive stigma. Flower parts arise atop the ovary.

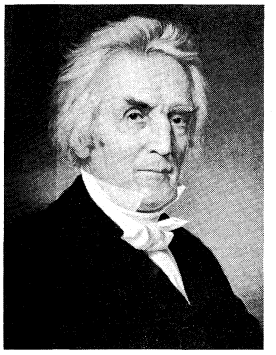
The matured ovary (or fruit) ripens dry; it is a capsule and releases its seeds by opening longitudinally or in other ways. Seeds are numerous in the bellflower and lobelia families, but few in the remaining groups.

The corolla of the bellflower family is radially symmetrical (petals alike in shape and size), but in the lobelias, one half of the corolla is the mirror-image of the other half (bilateral symmetry). In the Campanulaceae, pollen is released from the anthers while flowers are still in bud and the stigma is unreceptive; stiff hairs on the centrally placed style hold the pollen grains until the corolla opens. Insects, attracted to the nectar at the base of the style, brush against the pollen and carry it to older flowers in which the stigma has become receptive. Cross-pollination is effected in this manner. In Hawaiian species of *Clermontia,* the curving corolla tube matches the bill of the pollinating bird, the honey-creeper.

Campaspe River, river in central Victoria, Australia. It rises in the Eastern Highlands 50 miles (80 km) northwest of Melbourne and flows northward past Kyneton, beyond which it is dammed to form the Eppalock Reservoir. It continues past Elmore to enter the Murray River near Echuca after a course of 105 miles (170 km). The river is part of Goulburn Irrigation System. Its drainage basin covers about 1,500 square miles (3,900 square km). The agricultural areas along its banks support sheep, dairy cattle, timber, wheat, and grapes. Sir Thomas Mitchell reached the river in 1836 and named it after the favourite mistress of Alexander the Great.

Campbell, Alexander (b. Sept. 12, 1788, near Ballymena, County Antrim, Ire.—d. March 4, 1866, Bethany, W.Va., U.S.), American clergyman, writer, and founder of the Disciples of Christ and Bethany College.

He was the son of Thomas Campbell (1763–1854), a Presbyterian minister who emigrated in 1807 to the United States, where he promoted his program for Christian unity. In 1809 Alexander and the remainder of the family also went to the United States. There he



Alexander Campbell, oil painting by James Bogle, 1859; in the Campbell Homestead, Bethany, W.Va.

By courtesy of the T.W. Phillips Memorial Library, Bethany College, West Virginia

espoused his father's program and emerged as the leader of a movement for religious reform. He began preaching without a salary in 1810 and soon settled in what is now Bethany, W. Va. He and his followers accepted Baptism by immersion in 1812 and joined the Baptists the next year, but tension on other issues led to their dissociation from the Baptists in 1830.

In 1832 his followers, known as Disciples of Christ, or Christians (nicknamed Campbellites), joined Kentucky "Christians," followers of Barton W. Stone, to form the Disciples of Christ (Christian Church). Campbell presented a rationalistic and deliberative Christianity that was based on the New Testament and was opposed to both speculative theology and emotional revivalism. He exercised his leadership through preaching, addresses, and extensive debates with the Roman Catholic bishop of Cincinnati, John Purcell, the social reformer Robert Owen, and others.

Campbell founded (1823) and edited the *Christian Baptist* (later the *Millennial Harbinger*). Among some 60 volumes that he wrote or edited are *The Living Oracles,* a version of the New Testament first issued in 1826, and a hymnal. He was also a member of the Virginia Constitutional Convention in 1829. In 1840 he founded Bethany College and was its president until his death. His managerial ability as well as his scientific farming methods brought him wealth, and his home became a public attraction.

BIBLIOGRAPHY. H.L. Lunger, *The Political Ethics of Alexander Campbell* (1954); D.R. Lindley, *Apostle of Freedom* (1957).

Campbell, Archibald: *see* Argyll, Archibald Campbell, 1st marquess and 8th earl of; Argyll, Archibald Campbell, 9th earl of; Argyll, Archibald Campbell, 10th earl and 1st duke of; Argyll, Archibald Campbell, 5th earl of; Argyll, Archibald Campbell, 3rd duke of.

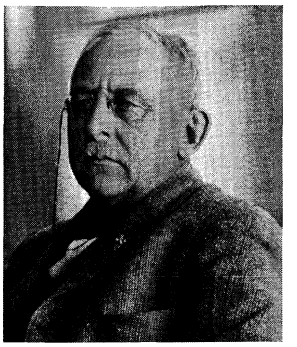
Campbell, Sir Colin: *see* Clyde, Colin Campbell, Baron.

Campbell, Donald Malcolm (b. March 23, 1921, Horley, Surrey, Eng.—d. Jan. 4, 1967, Coniston Water, Lancashire), British motorboat and automobile driver who emulated his father, Sir Malcolm Campbell, in setting world's speed records on land and on water.

The first to complete an officially timed run in a jet-propelled hydroplane (July 23, 1955, Ullswater Lake, Cumberland), he established that day a watercraft speed mark of 202.32 miles per hour (325.60 kilometres per hour). Eventually he raised that record to 276.33 mile/h (444.6 km/h) on Dec. 31, 1964, at Dumbleyung Lake, Australia. In a jet-powered automobile he set a speed record for Class A land vehicles (unlimited size, four wheels): 403.1 mile/h (649 km/h) on July 17, 1964, at Lake Eyre Salt Flats, Australia. Once more making an attempt to break the water speed record, Campbell was exceeding 300 mile/h (480 km/h) on Coniston Water when his jet-propelled boat was wrecked and he was killed.

Campbell, Douglas Houghton (b. Dec. 16, 1859, Detroit—d. Feb. 24, 1953, Palo Alto, Calif.), American botanist known for his research concerning modes of sexual reproduction in mosses and ferns. His work intensified a controversy surrounding the evolutionary origin of the Tracheophyta (vascular plants).

A professor of botany at Indiana University, Bloomington (1888–91), Campbell moved to the newly founded Stanford University, Palo



Douglas Campbell

By courtesy of William R. Taylor and the Hunt Institute, Pittsburgh

Alto (1891–1925), where he organized and directed the department of botany. He was an authority on the morphology and life cycles of ferns, mosses, and liverworts and on the geographical distribution of plant life. His best-known works are *The Structure and Development of Mosses and Ferns* (1895), which remained a standard college text for nearly half a century, and *Evolution of the Land Plants* (1940), which summarized his phylogenetic arguments.

Campbell was a strong proponent of the view that the vascular plants originated on land, as a now extinct member of the class Psilopsida, from a primitive bryophyte (a member of a phylum that includes the liverworts, hornworts, and mosses). Evidence that he produced in support of his argument, however, was insufficient to stem a growing consensus among botanists favouring independent algal origins for Bryophyta and Tracheophyta, and the question remains unresolved.

Campbell, E(lmer) Simms (b. Jan. 2, 1906, St. Louis, Mo., U.S.—d. Jan. 27, 1971, White Plains, N.Y.), first black American cartoonist to publish his work in general circulation magazines on a regular basis.

Campbell won a nationwide contest in cartooning while still attending high school. He later studied at the University of Chicago and the Art Institute of Chicago. He then worked as a railroad dining car waiter, amusing himself by drawing caricatures of the passengers, one of whom liked his work and gave him a job in a commercial art studio in St. Louis.

Campbell later moved to New York City, where he gradually established himself as a regular contributor to various humour magazines while working for an advertising agency. In 1933 the magazine *Esquire* was established, and Campbell became its foremost cartoonist, with as many as a dozen drawings in an issue. His work was also published in *Cosmopolitan, The New Yorker,* and *Playboy.* He is best-known for his representations of voluptuous women, frequently in a harem setting.

Campbell, Henry: *see* Campbell-Bannerman, Sir Henry.

Campbell, John: *see* Argyll, John Campbell, 2nd duke of; Breadalbane and Holland, John Campbell, 1st earl of.

Campbell, John Archibald (b. June 24, 1811, Washington, Ga., U.S.—d. March 12, 1889, Baltimore, Md.), American jurist and Supreme Court justice (1853–61). He also was assistant secretary of war for the Confederacy.

At age 11 Campbell entered Franklin College (now the University of Georgia), and after graduating at age 14 he entered the U.S. Military Academy. Called home upon the death of his father, Campbell then began to study law. He was admitted to the bar at age 18 (by a special act of the legislature) and soon moved to Alabama, where he married. In addition to maintaining a large private practice, Campbell served two terms in the Alabama legislature.

At age 41 Campbell was appointed to the U.S. Supreme Court. He was known as a strict constructionist, and his views on states' rights were decidedly Jeffersonian. His tenure was also notable for his concurring opinion in the Dred Scott decision, which made slavery legal in all the territories and fanned the flames of sectional controversy that led to the Civil War. Though he opposed as imprudent the Southern states' secession from the Union, Campbell resigned his Supreme Court appointment in 1861 and cast his lot with the South. In 1862 the Confederate president, Jefferson Davis, appointed him assistant secretary of war for the Confederacy, a position that he held until the South was defeated. When he was released from Fort Pulaski, where he had been held for four months on false charges, Campbell—who had lost his possessions in the war—moved to New Orleans and established a law practice there. He made his home in New Orleans for the remainder of his life, arguing a number of cases before the U.S. Supreme Court.

Campbell, John McLeod (b. May 4, 1800, Kilninver, Argyllshire, Scot.—d. Feb. 27, 1872, Roseneath, Dumbartonshire), Scots theologian, intellectual leader, and author.

Campbell entered the University of Glasgow at the age of 11, remaining until he was 20. After studying divinity at Edinburgh he became a clergyman in 1821. He was appointed to the parish at Row in 1825 and while there began to preach that salvation was guaranteed for all believers. This led in 1831 to his being declared a heretic by the General Assembly of the Scottish church, which closed its pulpits to him, depriving him of a living.

Campbell went into the highlands as an evangelist for two years but then acquired an independent congregation in Glasgow, where he remained for 26 years. His major treatise, *The Nature of the Atonement* (1856), went through five editions in his lifetime, and among his other works were *Christ the Bread of Life* (1851) and *Thoughts on Revelation* (1862). Campbell's religious opinions had great influence in Scotland.

Campbell, John W(ood), (Jr.) (b. June 8, 1910, Newark, N.J., U.S.—d. July 11, 1971, Mountainside, N.J.), American science-fiction writer, considered the father of modern science fiction.

Campbell, who spent his childhood reading widely and experimenting with science, began writing science fiction while in college. His first published story, "When the Atoms Failed" (1930), contained one of the earliest depictions of computers in science fiction.

Through the early 1930s Campbell wrote stories of outer space but also began writing a different kind of science fiction under the pseudonym of "Don A. Stuart" (derived from his wife's name, Dona Stuart). In these stories, technology was secondary to the development of characterization and mood. One such story is "Twilight" (1934), in which machines work on incessantly, long after man is gone. These popular works prompted much imitation.

Campbell's influence on other science fiction writers continued when he turned his attention in 1937 to editing *Astounding Stories,* later titled *Astounding Science Fiction,* then *Analog.* The magazine's contributors, including Isaac Asimov and Robert A. Heinlein, dominated the field in the mid-20th century. It was partly because of Campbell's influence that science fiction came to address major social issues.

Campbell, Joseph (b. March 26, 1904, New York City—d. Oct. 31, 1987, Honolulu), prolific American author and editor whose works on comparative mythology examined the universal functions of mythology in various human cultures and examined the mythic figure in a wide range of literatures.

Reading American Indian folklore as a child, Campbell later revived his interest in the subject while working on his M.A. in English literature. Discovering that many themes in Arthurian legend resembled the basic motifs in American Indian folklore, he pursued the problem of mythological archetypes after joining the faculty of literature at Sarah Lawrence College, Bronxville, N.Y. In his essay "The Hero," in *Where the Two Came to Their Father* (1969), he compared the concept of the hero in American Indian mythology with that in the mythology of other peoples. *The Hero With a Thousand Faces* (1949) is another work examining the archetype of the hero. Campbell's major work is a vast study of world mythology, *The Masks of God,* 4 vol. (1959–67). Other books by Campbell include *Flight of the Wild Gander* (1969), a collection of his essays; *Myths To Live By* (1972); *The Mythic Image* (1975; with M.J. Abadie); and *The Way of the Animal Powers,* vol. 1 (1983), a historical atlas of world mythology. He was also the editor of *Myths, Dreams, and Religion* (1971).

Campbell, Mrs. Patrick, *née* BEATRICE STELLA TANNER, married name (from 1914) MRS. GEORGE CORNWALLIS-WEST (b. Feb. 9, 1865, London—d. April 9, 1940, Pau, Fr.), English actress known for her portrayals of passionate and intelligent characters.

She debuted on the stage in 1888 (four years after she married Patrick Campbell), and her first notable role was as Paula Tanqueray in Sir Arthur Wing Pinero's play *The Second Mrs. Tanqueray* in 1893. Two years later she played Juliet to Sir Johnston Forbes-Robertson's Romeo and afterward appeared with him frequently. In 1907 she was a memorable Hedda Gabler in Henrik Ibsen's play of the same name and in 1914 played Eliza Doolittle in *Pygmalion,* a part her friend George Bernard Shaw wrote especially for her. In 1914 she remarried (her first husband having died in 1900), this time to Major George Frederick Myddleton Cornwallis-West.

She also achieved great success as Mélisande in Maurice Maeterlinck's *Pelléas and Mélisande,* Lady Macbeth in *Macbeth,* Mrs. Alving in Ibsen's *Ghosts,* Magda in Hermann Sudermann's *Magda,* Clytemnestra in Sophocles' *Electra,* and Anastasia in the play based on G.B. Stern's *Matriarch* in 1929. She made her film debut at the age of 68 in *Riptide* and subsequently appeared in several other motion pictures.

Her correspondence with Shaw, edited by Alan Dent, was published in 1952.

Campbell, Robert (b. Feb. 21, 1808, Glenlyon, Perth, Scot.—d. May 9, 1894, Manitoba, Can.), Canadian frontier trader in the service of the Hudson's Bay Company (1830–71), who was one of the first explorers of the Yukon region.

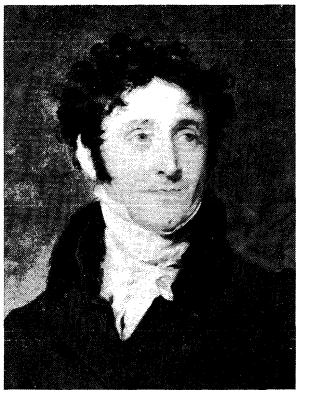
Between 1840 and 1852, when Campbell left the territory, he explored the headwaters of the Yukon River and also the Pelly (a Yukon tributary) and Liard rivers. In 1842, at Frances Lake (now in eastern Yukon Territory), he established the first of several Hudson's Bay Company fur-trading posts in the Yukon. On leaving the region he traveled on snowshoes 3,000 miles (4,800 km) to Montreal.

Campbell, (Ignatius) Roy (Dunnachie) (b. Oct. 2, 1901, Durban, S.Af.—d. April 22, 1957, near Setúbal, Port.), poet whose vigorous extrovert verse contrasted with the uneasy self-searching of the more prominent socially conscious English poets of the 1930s.

Campbell led an adventurous life—much of it in France, Spain, and Portugal—and followed a variety of occupations, including bullfighting. He fought with the Nationalists in the Spanish Civil War and during World War II served in East and North Africa until disabled. Five years before his death in an automobile crash, he had settled in Portugal.

Campbell's first long poem, *The Flaming Terrapin* (1924), which won him immediate recognition, exalts the instinctive vital force that brings forth intelligent human effort out of apathy and disillusionment. *The Wayzgoose* (1928) is a satire on South African intellectuals; and *The Georgiad* (1931) is a savage attack on the Bloomsbury group in England. Campbell's lyrical works include *Adamastor* (1930), *Flowering Reeds* (1933), and *Talking Bronco* (1946). Campbell translated, brilliantly, a number of Spanish, Portuguese, and French writers and wrote two autobiographical books, *Broken Record* (1934) and *Light on a Dark Horse* (1951).

Campbell, Thomas (b. July 27, 1777, Glasgow—d. June 15, 1844, Boulogne, Fr.), Scottish poet, remembered chiefly for his sentimental and martial lyrics; he was also one of the initiators of a plan to found what became the University of London.



Thomas Campbell, detail of a portrait by Sir Thomas Lawrence; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

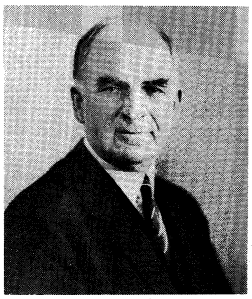
Campbell went to Mull, an island of the Inner Hebrides, as a tutor in 1795 and two years later settled in Edinburgh to study law. In 1799 he wrote *The Pleasures of Hope,* a traditional 18th-century survey in heroic couplets of human affairs. It went through four editions within a year.

He also produced several stirring patriotic war songs—"Ye Mariners of England," "The Soldier's Dream," "Hohenlinden," and, in 1801, "The Battle of the Baltic." With others he launched a movement in 1825 to found the University of London, for students excluded from Oxford or Cambridge by religious tests or lack of funds.

Campbell, William Ellsworth: *see* Chung Ling Soo.

Campbell, William Wallace (b. April 11, 1862, Hancock County, Ohio, U.S.—d. June 14, 1938, San Francisco), U.S. astronomer

known particularly for his spectrographic determinations of the radial velocities of stars; *i.e.*, their motions toward the Earth or away



William Wallace Campbell
By courtesy of the Lick Observatory Archives, Santa Cruz, Calif. and the Niels Bohr Library, Pittsburgh

from it. He also discovered many spectroscopic binary stars and in 1924 published a catalog listing more than 1,000 of them.

To include measurements of radial velocities of stars visible only from the Southern Hemisphere, Campbell sent a 36-inch telescope, equipped with spectrograph, to Santiago, Chile. Combining data from Lick Observatory, Mt. Hamilton, California, and from Santiago, he determined the direction and speed of the Sun's motion in the Galaxy as well as the average random velocities of stars of various spectral types. He led seven solar eclipse expeditions from Lick and brought back a wealth of material on the Sun's corona and flash spectrum.

Campbell joined the staff at Lick Observatory in 1890, after two years as an instructor in astronomy at the University of Michigan, Ann Arbor. He became director of Lick in 1901. From 1923 to 1930 he was president of the University of California. He was president of the National Academy of Sciences from 1931 to 1935.

Campbell, William Wilfred (b. June 1, 1861, Berlin, Ont.—d. Jan. 1, 1918, near Ottawa), Canadian poet, best remembered for his first volume of poetry, *Lake Lyrics and Other Poems* (1889), which celebrates the scenery of the Lake Huron–Georgian Bay country near his home.

Campbell was educated at the University of Toronto, ordained (1885), and, upon retiring from the ministry (1891), employed until his death by the civil service in Ottawa. His works are informed by a missionary zeal for the cul-

William Wilfred Campbell, 1905
By courtesy of the Public Archives of Canada

ture of the British "race" and an interest in primitive mythology uncommon in his day. His other books of verse are *The Dread Voyage* (1893), *Beyond the Hills of Dream* (1889), *The Collected Poems* (1905), and *Sagas of Vaster Britain* (1914). Campbell's output includes verse plays, descriptive studies of Canadian life, and two historical novels. He edited an edition of *The Oxford Book of Canadian Verse* (1913). W.J. Sykes edited his *Poetical Works* (1923).

Campbell-Bannerman, Sir Henry, original name HENRY CAMPBELL (b. Sept. 7, 1836, Glasgow—d. April 22, 1908, London), British prime minister from Dec. 5, 1905, to April 5, 1908. His popularity unified his own Liberal Party and the unusually strong Cabinet that he headed. He took the lead in granting self-government to the Transvaal (1906) and the Orange River Colony (1907), thereby securing the Boers' loyalty to the British Empire despite their recent defeat by the British in the South African War (1899–1902).

A member of the House of Commons from 1868, Campbell-Bannerman (who in 1871 added his mother's family surname to that of his father) served as financial secretary to the War Office (1871–74, 1880–82), parliamentary and financial secretary to the Admiralty and spokesman for the Admiralty in the Commons (1882–84), chief secretary for Ireland (1884–85), and secretary of state for war (1886, 1892–95). On June 21, 1895, he induced the Duke of Cambridge, a cousin of Queen Victoria, to retire as commander in chief of the armed forces. During his 39-year tenure the Duke had blocked army reform, and the Queen, recognizing the necessity of the change, rewarded Campbell-Bannerman with a knighthood. At the same time, however, a Commons vote, taken with few Liberals present, on a Conservative motion to

Campbell-Bannerman
BBC Hulton Picture Library

reduce Campbell-Bannerman's salary resulted in a defeat for the government and the resignation of the 5th Earl of Rosebery's ministry.

On Feb. 6, 1899, Campbell-Bannerman was elected leader in the Commons of the badly divided Liberal Party. During the South African War he at first pursued a middle course between the imperialists and the antiwar "pro-Boers" among the Liberals. On June 14, 1901, however, he exacerbated party disunity by condemning the British "methods of barbarism in South Africa." The Liberal imperialists' threatened secession from the party was averted, and the end of the war a year later eased party tensions, as did Campbell-Bannerman's "step by step" approach to the divisive issue of Irish Home Rule.

After the resignation of the Conservative prime minister Arthur James Balfour late in 1905, Campbell-Bannerman accepted the post from King Edward VII, whose friend he had become. His Cabinet included two future prime ministers, Herbert Henry Asquith (afterward 1st earl of Oxford and Asquith), who had been a Liberal imperialist, and David Lloyd George, who had been "pro-Boer," and also included the first person from the working class ever to attain Cabinet rank in Great Britain, John Elliot Burns. The general election of January 1906 produced a large Liberal majority in the Commons, but much of the Campbell-Bannerman legislative program was nullified by the House of Lords. He obtained, however, the peers' approval of the Trades Disputes Act of 1906, which gave labour unions considerable freedom to strike. Self-government for the Transvaal and the Orange River Colony was conceded by letters patent, over which the Lords had no control.

In 1907 Campbell-Bannerman's health began to fail, and, 17 days before his death, he resigned in favour of Asquith. *The Life of The Right Hon. Sir Henry Campbell-Bannerman, G.C.B.*, 2 vol. (1923), was written by J.A. Spender. The standard work is John Wilson's *CB: A Life of Sir Henry Campbell-Bannerman* (1973).

Campbell Hill, highest point (1,549 ft [472 m]) in Ohio, U.S. It lies in Logan County, just east of Bellefontaine, in the west central part of the state. Located in a scenic recreational area of springs and smoke-blue morainal hills rich in Indian lore, it was named for Edward Campbell, who once owned the land. Zane Caverns, Indian Lake, and a skiing area are nearby.

Campbell Island, outlying volcanic island of New Zealand, in the South Pacific Ocean, 400 mi (644 km) south of South Island. It has an area of 41 sq mi (106 sq km) and is high and rugged, rising to 1,867 ft (569 m) at Mt. Honey, and gradually levelling off to the north. Cliffs border the west and south coasts, while the east is deeply indented by Perseverance and North East harbours. The island has a cold, humid, windy climate. It was discovered in 1810 by the sealing ship "Perseverance." The island's large herds of fur seals were quickly decimated, but it remained a port of call for whalers until the 1890s. Sheep, unsuccessfully introduced in 1896, destroyed much of the natural vegetation. A meteorological station was established in 1941. The island is administered by the New Zealand commissioner for crown lands. Pop. (1981) 10.

Campbell River, district municipality, at the mouth of the Campbell River on the east coast of Vancouver Island, southwestern British Columbia, Canada. It is a centre for lumbering and paper mills and a popular vacation centre renowned for salmon fishing (based on its Tyee Club [Tyee is an Indian word for large Chinook salmon]). Elk Falls and Strathcona provincial parks and the John Hart hydroelectric installations are nearby. The village (founded 1904) and river were named for Samuel Campbell, British naval surgeon of the "Plumper," stationed there 1857–61. Inc. village, 1947; district municipality, 1964. Pop. (1981) 15,832.

Campbell Soup Company, U.S. manufacturer incorporated in 1922, but dating to a canning firm first established in 1869. It is one of the largest manufacturers of prepared foods, especially canned soups, canned spaghetti, and blended vegetable juice. It is also a major producer of canned bean products, canned macaroni products, tomato juice, frozen foods, and bakery products and has smaller operations in candy manufacturing, pet-food processing, fast-food restaurants, and retail garden centres. Headquarters are in Camden, N.J.

In 1869 Joseph Campbell (died 1900), a fruit merchant, and Abram Anderson, an icebox manufacturer, formed a partnership in Camden to can tomatoes, vegetables, preserves, and other products. In 1876 Anderson left the partnership, and Campbell joined with Arthur Dorrance to form a new firm, which in 1891 was named the Jos. Campbell Preserve Company (incorporated 1901). In 1894 Campbell retired, and three years later Dorrance's nephew, J.T. Dorrance (1873–1930), joined the company and introduced the idea of condensed soups. The soups with the familiar red and white label appeared in 1898 and, after winning the Gold Medallion at the Paris Exposition in 1900, were further labelled with the medallion thereafter.

In 1905 Joseph Campbell Company became the new corporate name, changed to Campbell Soup Company in 1922 upon reincorporation. J.T. Dorrance had become president in 1914; his brother Arthur C. Dorrance became president of Franco-American Food Co., when acquired in 1921, and president of Campbell Soup in 1930. After World War II the company began gradually to diversify, acquiring producers of juice, frozen foods, bakery goods, and several fast-food chains. It also established subsidiary Campbell Soup manufacturers in several foreign countries.

Campbellsville, city, Taylor County, central Kentucky, U.S., near the juncture of the Bluegrass, Pennyroyal, and Knobs regions, 70 miles (113 km) south-southeast of Louisville. Founded in 1817 and named for Adam Campbell, an early settler, it became the seat of Taylor County at its formation in 1848; before that it was in Green County. The locality developed as a market for livestock and field crops, chiefly tobacco, and later acquired light manufacturing, with underwear as the major product. Campbellsville College was founded in 1906. The site of the Civil War battle of Green River, at Tebbs Bend (July 4, 1863), is 10 miles south. The Abraham Lincoln Birthplace National Historic Site is 30 miles northwest. Inc. 1824. Pop. (1984 est.) 9,816.

Campbellton, city, Restigouche County, northern New Brunswick, Canada, on the Restigouche Estuary (there bridged to Pointe-à-la Croix, Quebec). It is overlooked by the Sugarloaf Mountain, the focus of a provincial park. Founded *c.* 1793 as Martin's Point by Scottish fishermen, it was renamed in 1833 for Sir Archibald Campbell, lieutenant governor of the province. The English defeated the French offshore in the Battle of the Restigouche (1760), the last naval engagement of the French and Indian Wars. The head of river navigation, Campbellton developed as a pulpwood- and lumber-shipping port. It was largely rebuilt after a disastrous fire in 1910. Its salmon fisheries attract many anglers. Inc. town, 1888; city, 1958. Pop. (1981) 9,818.

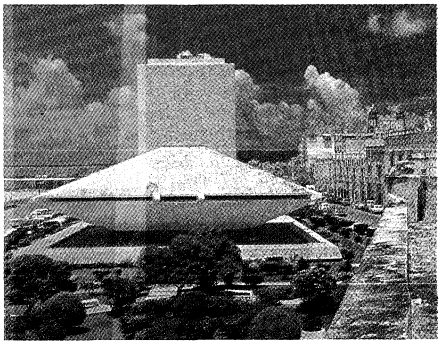
Campbelltown, city within the Sydney metropolitan area, eastern New South Wales, Australia. In 1810 it was proclaimed the town of Airds by Gov. Lachlan Macquarie, who renamed it in 1820 after his wife, Elizabeth Campbell. In 1882 it became a municipality and absorbed the historic villages of Glenfield, Macquarie Fields, Ingleburn, and Minto. St. Peter's Anglican Church dates from 1823, St. John's Catholic Church from 1841. Macquarie Field House (1840s) is one of the finest examples of Regency-style architecture in Australia. The main occupations are poultry and dairy farming and the manufacture of cotton goods and electrical items. Pop. (1981) 91,525.

Campbeltown, small royal burgh and seaport, Argyll and Bute district, Strathclyde region, southwestern Scotland. Campbeltown is the main centre of the Kintyre Peninsula, which is 40 miles (65 km) in length and protrudes into the Atlantic. By sea, it is 83 miles (134 km) southwest of Glasgow, and there is a direct air link from Machrihanish Airport (4 miles [6 km] west-northwest of the town). Campbeltown, originally known as Dalruadhain, was the seat of the Dalriadan kings. St. Ciaran (Kieran), one of the Twelve Apostles of Ireland, landed there in the 6th century, after which the site was renamed Kilkerran, afterward Kinlochkerran. Later, James V transferred the territory from the MacDonalds to the Campbells of Argyll, who gave it their family name. No memorial of its antiquity has survived, but a finely sculptured granite Celtic cross (*c.* 1500) stands in the marketplace, and there are ruins of an old chapel. Campbeltown became a royal burgh in 1700. Its main industries are herring fishing, coal mining, whisky distilling, and, more recently, textiles and tourism. Pop. (1980) 6,098.

Campeador, el (Spanish hero): *see* Cid, the.

Campeche, state, southeastern Mexico, on the Yucatán Peninsula. It is bounded north and east by the state of Yucatán, from which it seceded in 1857; northwest by the Gulf of Mexico; east by Quintana Roo; and south by Guatemala. Named after the ancient Mayan province of Kimpech (Campech), it comprises much of the western portion of the peninsula. Its 19,619-square-mile (50,812-square-kilometre) territory lies on a low, level limestone plain broken at the north by low hills. The northern half is arid or semiarid and marked by deep grottoes and caverns that hold the principal supply of water for agriculture and livestock raising. East and south of Campeche city, the state capital, excessive rainfall and high temperatures produce tropical rain forest, much of which is unhealthful and uninhabitable. Rivers running through the southern part of the state drain into Términos Lagoon, at the gulf entrance to which is the chief depot of the area, Ciudad del Carmen. Forest products (primarily hardwoods and chicle) yield much of the state's income, but there is also some commercial fishing. The area is linked to central Mexico by ship, railroad, highway, and air. Pop. (1985 est.) 533,315.

Campeche, port city on the Gulf of Mexico and capital of Campeche state, southeastern Mexico. It lies on the western extremity of a fertile plain in a natural amphitheatre formed by hills encircling the Bay of Campeche. The Spanish town was founded in 1540 on the site of a Mayan village (Kimpech), the remains of which are still visible. In the 18th century, Campeche de Baranda was opened as one of three ports on the gulf and thrived on its monopoly of Yucatán Peninsula trade, mainly exports of dyewood and salt. At various times



State government building, Campeche, Mex.
Ray Halin—Photo Researchers

in the early 19th century, Campeche was the capital of Yucatán; it became the capital of the newly created Campeche state in 1863. Although its economic importance has declined, especially with the displacement of vegetable dyes by chemical dyes, Campeche still exports dyewood, cotton, rice, sugarcane, tobacco, and guitars. Its greatest economic importance today, however, lies in its proximity to the offshore oilfields of the Bay of Campeche, for which it is a service centre. It is noted for its colonial churches, old citadel, and walls erected for protection against 17th-century pirates. The city is the site of the University of the Southeast (1954). Campeche is linked by railroad, highway, and air to Mérida and cities in central Mexico. Pop. (1980) 128,434.

Campeche, Bay of, also called GULF, or SOUND, OF CAMPECHE, Spanish BAHÍA, or GOLFO, or SONDO, DE CAMPECHE, bay, southern Mexico, bounded east by the Yucatán Peninsula, south by the Isthmus of Tehuantepec, and west by southern Veracruz. An inlet of the Gulf of Mexico, the bay, which covers an area of about 6,000 square miles (15,540 square km), cannot be entered by vessels drawing more than 9 feet (3 m). Rivers flowing into the bay include the Papaloápan, Coatzacoalcos, Grijalva, Usumacinta, and Candelaria. Términos Lagoon and other lagoons and swamps dot the low-lying shores of the bay. Highways connect the major port cities of Veracruz, Coatzacoalcos, Ciudad del Carmen, and Campeche. Major offshore oilfields were developed in the bay by Mexico during the 1970s, and the bay became the highest oil-producing region in Mexico in the early 1980s. International attention was drawn to the area in mid-1979, when the Ixtoc 1 well blew out and released an estimated 3,000,000 barrels of crude oil into the Gulf of Mexico, some of which washed up onto beachfronts in Texas, 600 miles distant, before the well was finally capped early the next year. The spill was one of the worst in history, and the Mexican government spent an estimated $132,000,000 to bring it under control. Gas and oil pipelines connect the region to Coatzacoalcos on the coast near the city of Minatitlán, where there are pipeline connections and a tanker terminal.

Campeggio, Lorenzo (b. 1474—d. June 19, 1539, Rome), Italian cardinal, humanist, and lawyer who, upon entering the service of the church in 1510, became one of the most valued representatives of the papacy.

Between 1511 and 1539 five popes employed Campeggio almost continuously as nuncio or legate; his political and religious embassies gave him a particular knowledge of Germany, where he was nuncio to the emperor Maximilian in 1511 and 1513 and legate at the diets of Regensburg (1524) and Augsburg (1530). In Rome his knowledge of curial procedure made him a realistic advocate of reform, though always loyal to the papacy. He first visited England on an unsuccessful mission for Leo X (1518–19), was given the See of Salisbury in 1524, and in 1528 went to England to inquire into the King's marriage with Catherine of Aragon as co-legate with Cardinal Wolsey; the case was withdrawn to Rome before a decision had been given. He served on preparatory commissions for the Council of Trent before his death.

Campen, Jacob van (b. Feb. 2, 1595, Haarlem, Holland [The Netherlands]—d. Sept. 13, 1657, Huis Randenbroek, near Amersfoort), Dutch architect, one of the leaders of a group of architects who created a restrained architectural style that was suited to the social and political climate of the Netherlands.

Van Campen began his career as a painter. He studied the work of Andrea Palladio and others in Italy and introduced a Dutch Classical style to the Netherlands. His domestic style was quiet and unpretentious, and it had considerable influence, especially in England. His masterpiece is considered to be the Mauritshuis (1633–44; now the Royal Picture Gallery) in The Hague, where, with Pieter Post, he also designed the royal palace, Huis ten Bosch (1645). His other important works include the Town Hall (now Royal Museum), Amsterdam (1648–55), and the Baroque Nieuwe Kerk (New Church, or St. Anne's Church), Haarlem (1645–49).

Campephagidae, songbird family, order Passeriformes, including cuckoo-shrikes and minivets. The 70 species, found from Africa to the Pacific Islands, are 13 to 35 centimetres (5 to 14 inches) long and have slightly hooked bills, rather long tails, and fluffy plumage with loose, stiff feathers on the back and rump. Many are gray and barred; this, together with a fondness for eating caterpillars, suggests a cuckoo. Most also eat fruit. Campephagids inhabit forests and gardens, often in noisy

flocks; they whistle or trill agreeably and flit from tree to tree in follow-the-leader fashion. The cup nest, usually placed high in a tree, contains from two to five eggs. Nestlings may wear white down, and juveniles resemble adult females, whose coloration may differ greatly from that of males. *See* cuckoo-shrike; minivet.

camphor, an organic compound of penetrating, somewhat musty aroma, used for many centuries as a component of incense and as a medicinal. Modern uses of camphor have been as a plasticizer for cellulose nitrate and as an insect repellent, particularly for moths. The molecular formula is $C_{10}H_{16}O$.

Camphor occurs in the camphor laurel, *Cinnamomum camphora,* common in China, Taiwan, and Japan. It is isolated by passing steam through the pulverized wood and condensing the vapours; camphor crystallizes from the oily portion of the distillate and is purified by pressing and sublimation. Since the early 1930s camphor has been made by several processes from the compound α-pinene.

Camphor belongs to a group of organic compounds defined as terpenoid ketones. The structure and the reactions peculiar to it were important problems of 19th-century organic chemistry. The pure compound is a white, waxy solid that melts at about 178°–179° C (352°–354° F).

Campi, Giulio (b. 1502, Cremona, Duchy of Milan—d. 1572, Cremona), Italian painter and architect who led the formation of the Cremonese school. His work, and that of his followers, was elegant and eclectic. Campi was a prolific painter, working in both oil and fresco; at its best his work was distinguished by the richness of its colour.

He first studied under his father, Galeazzo (1475–1563). Among the earliest of his school were his brothers, Vincenzo (1536–91) and Antonio (1536–*c.* 1591); the latter was also a sculptor and historian of Cremona. Bernardino Campi (1522–*c.* 1592) was a pupil of Giulio and the son of the goldsmith Pietro Campi. Bernardino early followed his father's profession and did extensive work as a painter of portraits and sacred subjects.

Campidano, narrow, low-lying plain, about 20 mi (32 km) wide, in southwestern Sardinia, Italy, extending inland about 70 mi (110 km) from the Golfo di (Gulf of) Oristano. It separates Sardinia's small southwestern highland, Iglesiente, from the greater Eastern Highlands, which cover the entire eastern half of the island. Cereal grains, olives, almonds, vegetables, fruit, and grapes for wine are the primary agricultural products. Until 1946 the region was a malarial swamp, but drainage efforts and changed patterns of land use along the course of the Flumini (river) Mannu have made it a populous and fertile region, the chief cities of which include Oristano, a provincial capital, and Terralba.

Campin, Robert (b. *c.* 1378, Tournai, Fr.—d. April 26, 1444, Tournai), one of the earliest and greatest masters of Flemish painting. He has been identified with the Master of Flémalle on stylistic and other grounds. Characterized by a naturalistic conception of form and a poetic representation of the objects of daily life, Campin's work marks the break with the prevailing International Gothic style and prefigures the achievements of Jan van Eyck and the painters of the Northern Renaissance.

Documents show that Campin was established as a master painter in Tournai in 1406. Two pupils are mentioned as entering his studio in 1427—Rogelet de la Pasture (generally identified with the great Rogier van der Weyden) and Jacques Daret. The only documented work by Jacques Daret, an altarpiece executed for the Abbey of St. Vaast near Arras, shows close stylistic analogies with works by Rogier van der Weyden on one hand and works earlier in style by the Master of Flémalle on the other. Both seem to proceed from common models, for they obviously are not copies of one another. As the Tournai records give the name of Campin as master of both Daret and Rogier, it has been generally assumed that the Master of Flémalle may be reasonably identified with Campin. Some scholars, however, have stylistically considered the works ascribed to the Master of Flémalle as early works by Rogier himself.

Campin's art is indebted to that of manuscript illumination, but his work displays greater powers of observation and ability to render plastic forms than is found in contemporary manuscript illumination. One of his masterpieces is the "Mérode Altarpiece" (*c.* 1428), a triptych of the Annunciation with the donors and St. Joseph on the wings (The Cloisters, New York City). The Virgin is portrayed in a setting of bourgeois realism in which interior furnishings are rendered with the frank and loving attention to detail that was to become a characteristic tradition of Flemish art. Another important work, at the Städelsches Kunstinstitut in Frankfurt am Main, consists of two wings of an altarpiece dating *c.* 1440 that are said to have come from the Abbey of Flémalle. They depict the Virgin and Child and St. Veronica (with Trinity on the reverse). Among other works generally ascribed to Campin are the "Virgin and Child Before a Firescreen" and a double portrait at the National Gallery, London, a "Nativity" at Dijon (dated *c.* 1430), and the "Werl Altarpiece" (1438) in the Prado, Madrid.

Campina Grande, city, eastern Paraíba state, northeastern Brazil, in the Serra do Bacamarte, at 1,804 ft (550 m) above sea level. Located on the site of an Ariú Indian village, it was originally called Porta do Sertão (Gateway to the Desert). Made a village in 1766, it was elevated to city status in 1864 and renamed Campina Grande (Great Plain). It is an important commercial and industrial centre in the northeastern interior. The city is a distribution centre for cotton, sisal, *feijão* (beans), cassava, and leather products. Factories manufacture textiles, metallurgical products, plastics, and pharmaceuticals. The city is the seat of a regional university and has mineral and agricultural research stations and an art museum. Goods are transported by road, rail, river, and air to João Pessoa (the state capital) to the east, Recife, and other communities in Paraíba and neighbouring Pernambuco and Rio Grande do Norte states. Pop. (1980 prelim.) 222,229.

Campinas, city, eastern São Paulo state, Brazil, in the highlands near the Rio Atibaia at 2,274 ft (693 m) above sea level. Formerly known as Nossa Senhora da Conceição de Campinas de Mato Grosso and as São Carlos, it was given town status and was made the seat of a municipality in 1797. In the 19th century Campinas was the state's leading commercial centre. Although later surpassed by São Paulo and Santos, it is still significant as a clearing point for coffee, citrus, cocoa, and sugarcane from the hinterland.

The state agronomical institute and large experimental plantations and other agricultural research institutions are located there. Industries in Campinas include foundries, textile mills, lock and key factories, and packing and processing plants; agricultural equipment and motorcycles are also manufactured. The Pontifícia Universidade Católica de Campinas was founded in 1941 and the Universidade Estadual de Campinas in 1962. Antônio Carlos Gomez, composer of operas, was born in Campinas. Several museums, theatres, and art galleries are located there, and the city has a symphony orchestra. Railroads and highways converge upon the city, which lies on the main São Paulo–Brasília highway, 55 mi (90 km) northwest of São Paulo city. Campinas also has an international airport. The picturesque Salto (falls) d'Itá are 5 mi north. Pop. (1980 prelim.) 566,517.

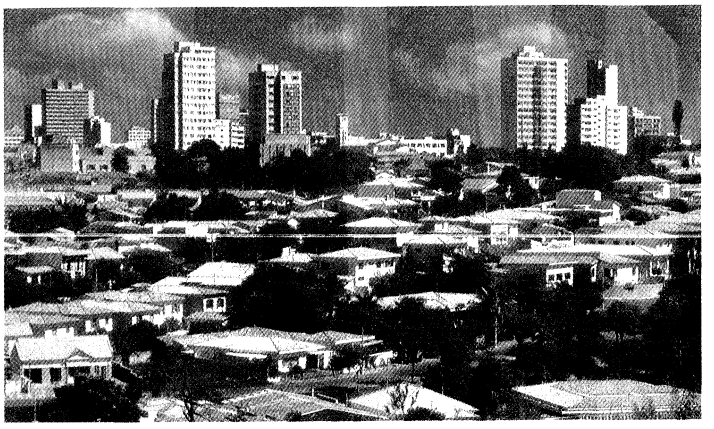
Campine, la (region, Belgium): *see* Kempenland.

camping, recreational activity in which participants take up temporary residence in the outdoors, usually using tents or specially designed or adapted vehicles for shelter. Camping was at one time only a rough, back-to-nature pastime for hardy open-air lovers, but it later became the standard holiday for vast numbers of ordinary families.

History. The founder of modern recreational camping was Thomas Hiram Holding, who wrote the first *Campers Handbook* (1908). His urge to camp derived from his experiences as a boy when he crossed the prairies of the United States in 1853 in a wagon train covering 1,200 miles with a company of 300. In 1877 with a canoe, the earliest vehicle of the recreational camper, he camped on a cruise in the Highlands of Scotland, and made a similar cruise the next year. He wrote two books on the cruises. Later he used a bicycle as his camping vehicle and wrote *Cycle and Camp* (1898).

Holding founded the first camping club in the world, the Association of Cycle Campers, in 1901. By 1907 it had merged with a number of other clubs to form the Camping Club of Great Britain and Ireland, of which it is still a flourishing part. Capt. Robert Falcon Scott, the famous Antarctic explorer, became the first president of the Camping Club, in 1909.

After World War I, Sir Robert Baden-Powell, founder of the Boy Scout movement, became



Campinas, Braz.
Reflejo—EB Inc.

president, and the Camping Club of Great Britain and Ireland fostered the establishment of camping organizations in a number of west European countries. In 1932, again on British initiative, steps were taken to establish the Fédération Internationale de Camping et de Caravanning (FICC), and the first international camp and congress was held in 1933. Apart from World War II, this International Rally, as it is now called, has been held every year since, usually in different countries of western Europe, although it was held in Israel in 1964 and in Hungary in 1966.

In North America individuals camped in the wilderness for recreation from the early 1870s, traveling on foot, on horseback, or by canoe; but there was no organized camping. Many organizations, such as the Adirondack Mountain Club (founded 1922), the Appalachian Mountain Club (founded 1876), and the Sierra Club (founded 1892), have catered, in part, to campers for a long time, but the organization of campers on a large scale developed after World War II.

The majority of organized campers belong to local clubs, but there are two large-scale national organizations, the National Campers and Hikers Association (NCHA; founded 1954) and the North American Family Campers Association. The NCHA has groups or chapters all over North America, and its biggest activity is its annual "campvention," a meeting of campers from all over North America, which has attracted as many as 30,000 people. The NCHA affiliated with the FICC in 1960. The North American Family Campers Association (founded 1957) has over 50 chapters throughout the United States. The Camping Club of Canada, a national organization that affiliated with the FICC in 1953, took on a new title, the Canadian Federation of Camping and Caravanning, in 1965.

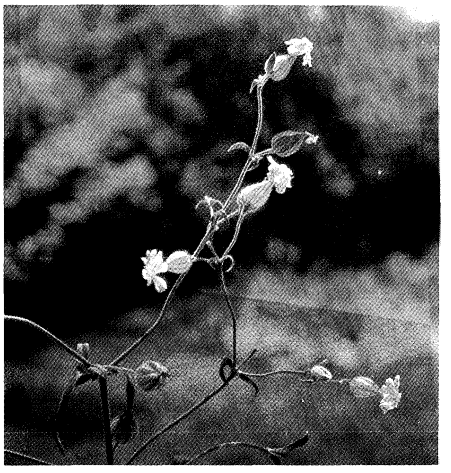
Individual camping is widely practiced in Australia and New Zealand, but organized facilities are relatively few. In South Africa there are several hundred campsites and a number of camping clubs. The most recently formed clubs are in Sri Lanka (formerly Ceylon) and the West Indies, further indications of the wide spread of recreational camping.

Youth camping. Organized camping of another kind started in the United States in 1861 with a boys' camp run by Frederick William Gunn and his wife at Milford-on-the-Sound for students of the Gunnery School for Boys in Washington, D.C. Its success was immediate; it was repeated for 18 successive years and other similar camps began to develop. A private camp was established in 1876 by Joseph Trimble Rothrock, and a church camp was started at Gardners Island, R.I., in 1880 by the Rev. George W. Hinckley. Camp Dudley, a YMCA camp still in existence, was founded in 1885 by Summer F. Dudley. The first girls' camp was established by Luther Halsey Gulick and his wife on the Thames River in Connecticut in 1888.

When the Boy Scouts of America was formed in 1910 by Ernest Thompson Seton, it incorporated camping as a major part of the program, as emphasized by Gen. (later Sir) Robert Baden-Powell. Similar emphasis on camping was to be found in the Girl Guides (founded in Great Britain in 1910), the Campfire Girls (U.S., 1910), and the Girl Scouts (U.S., 1912; patterned after the Girl Guides). Most other organizations concerned with young people, such as the Young Men's Christian Association (YMCA), the Young Women's Christian Association (YWCA), the Young Men's Hebrew Association (YMHA), the Boys Clubs of America, the Girls Clubs of America, and Four-H Clubs, also undertook camp development as an important part of their activity.

(A.R.)

campion, also called CATCHFLY, common name for ornamental rock-garden or border plants constituting the genus *Silene*, of the pink family (Caryophyllaceae), consisting of about 500 species of herbaceous plants distributed throughout the world. Campion and catchfly also are names for members of the genus *Lychnis* of the same family.



Bladder campion (*Silene vulgaris*)
Jewel Craig—The National Audubon Society Collection/Photo Researchers

Some species of *Silene* stand erect; others are spreading plants. The stems often are covered with a sticky material. The smooth-edged leaves are arranged opposite each other on the stem. Some species have solitary flowers; others have branched clusters of red, white, or pink flowers. Each of the five petals has a narrow, stalklike base, sometimes with scales at the junction of the base and the broad upper part. The fruit is a capsule. Bladder campion (*S. vulgaris*) has large, white, drooping flowers. Many subspecies are found in different habitats throughout Europe.

Campion, Saint Edmund (b. Jan. 25, 1540, London—d. Dec. 1, 1581, London; canonized Oct. 25, 1970; feast day October 25), English Jesuit martyred by the government of Queen Elizabeth I.

The son of a London bookseller, Campion was teaching at Oxford University at the time of his ordination (1568) as a deacon in the Anglican church. But in a crisis of conscience he discovered that his sympathies lay with Roman Catholicism. He was received into the Catholic Church at Douai in northern France and in 1573 went to Rome to become a member of the Society of Jesus.

Edmund Campion, detail of an engraving
By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

In 1580 Campion joined the first mission that was sent by the Jesuits to minister to the Catholics of England, who were strictly forbidden to practice their religion. Unlike Robert Parsons, he carefully avoided any political involvement on behalf of his religion. After preaching at secret Catholic meetings in Berkshire, Oxfordshire, Northamptonshire, and Lancashire, Campion created a sensation by having 400 copies of his *Decem rationes* ("Ten Reasons"), a pamphlet denouncing Anglicanism, distributed before a service in St. Mary's, Oxford (June 27, 1581).

He was arrested by a spy at Lyford, Berkshire, on July 17, 1581, and taken to the Tower of London. When he refused under severe torture to recant his religious convictions, his captors invented charges that he had conspired to overthrow the Queen. He was convicted of treason and hanged. Throughout his ordeal Campion exhibited religious zeal and great courage. Campion Hall at Oxford was named for him. He was canonized in 1970 by Pope Paul VI as one of the Forty Martyrs of England and Wales.

Campion, Thomas, Campion also spelled CAMPIAN (b. Feb. 12, 1567, London—d. March 1, 1620), English poet, composer, musical and literary theorist, physician, and one of the outstanding songwriters of the brilliant English lutenist school of the late 16th and early 17th centuries. His lyric poetry reflects his musical abilities in its subtle mastery of rhythmic and melodic structure.

After attending the University of Cambridge (1581–84) Campion studied law in London, but he was never called to the bar. Little is known of him until 1606, by which time he had become a doctor. Possibly he studied medicine in France or Holland. He practiced medicine from 1606 until his death.

Campion's first publication was five sets of verses appearing anonymously in the pirated 1591 edition of Sidney's *Astrophel and Stella.* In 1595 his *Poemata* (Latin epigrams) appeared, followed in 1601 by *A Booke of Ayres* (written with Philip Rosseter), of which much of the musical accompaniment and verses were Campion's. He wrote a masque in 1607 and three more in 1613, in which year his *Two Bookes of Ayres* probably appeared. *The Third and Fourth Booke of Ayres* came out in 1617, probably followed by a treatise (undated) on counterpoint.

Campion's lyric poetry and songs for lute accompaniment are undoubtedly his works of most lasting interest. His music (always for "ayres," not madrigals) is delicate, singable, and expressive. Though his theories on music are slight, he thought naturally in the modern key system, with major and minor modes, rather than in the old modal system. Campion stated his theories on rhyme in *Observations in the Art of English Poesie* (1602). In this work he attacked the use of rhymed, accentual metres, insisting instead that timing and sound duration are the fundamental element in verse structure. Campion asserted that in English verse the larger units of line and stanza provide the temporal stability within which feet and syllables may be varied.

With the exception of his classic lyric *Rosecheekt Lawra, Come,* Campion usually did not put his advocacy of quantitative, unrhymed verse into practice. His originality as a lyric poet lies rather in his treatment of the conventional Elizabethan subject matter. Rather than using visual imagery to describe static pictures, he expresses the delights of the natural world in terms of sound, music, movement, or change. This approach and Campion's flowing but irregular verbal rhythms give freshness to hackneyed subjects and seem also to suggest an immediate personal experience of even the commonest feelings. *The Selected Songs,* edited by W.H. Auden, was published in 1972.

Campo, Matthias Gallas, Graf von (count of): *see* Gallas, Matthias.

Campo Formio, Treaty of (Oct. 17, 1797), a peace settlement between France and Austria, signed at Campo Formio (now Campoformido, Italy), a village in Venezia Giulia

southwest of Udine, following the defeat of Austria in Napoleon Bonaparte's first Italian campaign.

The treaty preserved most of the French conquests and marked the completion of Napoleon's victory over the First Coalition. The Cisalpine and Ligurian republics in northern Italy were established under French influence, and France gained Venice's Ionian Islands in the Adriatic Sea. In compensation for loss of possessions in Lombardy, Napoleon gave Austria the Venetian territory east of the Adige River, including Istria, Dalmatia, and the city of Venice. This act marked the end of 1,100 years of Venetian independence. Austria gave up its Belgian provinces to France and also agreed, pending ratification at a congress of the estates of the empire, that France could annex the territory it occupied on the left bank of the Rhine River from Basel to Andernach, including Mainz. In return, France promised to use its influence to help Austria to obtain Salzburg and part of Bavaria. It was secretly agreed that Prussia, a former ally of Austria, was to receive no territorial compensation.

Of the original anti-French coalition, only Britain remained hostile to France after the conclusion of this treaty; Prussia had made peace in March 1795 after the effectuation of the Third Partition of Poland in January 1795.

Campo Grande, city, capital of Mato Grosso do Sul state, southwestern Brazil, lying near the headwaters of the Rio Anhanduí, in the Serra de Maracaju, at 1,770 ft (540 m) above sea level. Campo Grande is the largest city and the most active commercial centre of Mato Grosso do Sul. In 1975 the Brazilian government fertilized large tracts of scrubland near Campo Grande for agricultural production (corn [maize], coffee, rice, *feijão* [beans]). Its industries include the shipping of cattle, meat-packing, and processing of beef, hides, skins, maté (tea), and agricultural products. The Universidade Estadual do Mato Grosso do Sul was founded in 1970. Campo Grande is situated on the São Paulo–Corumba Railroad and is the head of a railroad spur running southwest through Mato Grosso do Sul to the Paraguayan border. The city lies at the junction of roads connecting the pastoral and agricultural interior with São Paulo. It also has an airfield. Pop. (1980 prelim.) 282,844.

Campoamor y Campoosorio, Ramón de (b. Sept. 24, 1817, Navia, Spain—d. Feb. 12, 1901, Madrid), Spanish poet whose value lies in his expression of contemporary social attitudes. After studying Latin and philosophy, he went to Madrid, in 1838, to pursue a degree in medicine but turned to literature instead.

Campoamor y Campoosorio, engraving
Archivo Mas, Barcelona

Although his two early books, *Ternezos y floras* (1842; "Endearments and Flowers") and *Ayes de alma* (1842; "Laments of the Soul"), show the influence of the Spanish Romantic poet Zorilla, he broke away from Romanticism with his book *Doloras* (1842), simple verses of worldly wisdom much like proverbs, which were thought to herald a breakthrough into new poetic forms. Continuing his experimentation throughout his life, he published *Pequeños poemas* (1871; "Little Poems") and *Humoradas* (1886; "Pleasant Jokes"). Most of his verse contains little more than sentimental philosophy cloaked in a rhymed prose of affected simplicity.

Campobasso, city, capital of Campobasso province and of Molise region, south central Italy, northeast of Naples. The old town on a hill was abandoned in 1732 by its inhabitants, who built a new town on a lower fertile plain. The Castello Monforte (1459) with six towers of the medieval walls remains in the old town, which also has the Romanesque churches of S. Bartolomeo and S. Giorgio. The neoclassical cathedral and an archaeological museum with relics of the Samnites, Frentani, and Campani (ancient Italic peoples) are in the new town. Agricultural products include the celebrated pears, which ripen in winter, and scamorze (semi-hard) cheeses. The making of cutlery, long a specialty, has dwindled, but paving tiles and soap are manufactured. Pop. (1981 prelim.) mun., 48,291.

Campobello Island, second largest island (9 mi [14 km] long by 3 mi wide) after Grand Manan of a small island group at the entrance to Passamaquoddy Bay (an inlet of the Bay of Fundy), southwestern New Brunswick, Canada. Although politically Canadian and administered as part of Charlotte County, the island is closely associated with the United States as the site of Pres. Franklin D. Roosevelt's summer home. It was originally granted in 1767 to Capt. William Owen of the Royal Navy, who in 1770 contrived its name from that of Lord William Campbell, then provincial governor, as *campobello* (Spanish-Italian: "fair field") as descriptive of the island's appearance. James Roosevelt, father of FDR, bought a house on the west coast at Welshpool (Welchpool) in 1883, and in 1906 FDR was given by his mother the adjoining 34-room "cottage," which became well known as the presidential retreat in the 1930s. There Roosevelt was stricken with polio in 1921. The dwelling was subsequently deeded as a memorial museum to the governments of Canada and the United States and is now maintained within the 2,600-ac (1,050-ha) Roosevelt Campobello International Park (opened in 1964).

The island, linked to Lubec, Maine, by the Roosevelt International Bridge (1962), is inhabited by fishermen. It is indented with sandy coves, inlets (havens for fishing boats), and has rugged headlands with picturesque lighthouses. Campobello Provincial Park (25 ac) overlooks the scenic Herring Cove on the west coast. Pop. (1981) 1,424.

Campos, city, northeastern Rio de Janeiro state, eastern Brazil, 35 mi (56 km) up the Rio Paraíba do Sul from its mouth on the Atlantic coast of eastern Brazil, at 43 ft (13 m) above sea level. One of the most important commercial cities of the state, it produces cacao, sugarcane, coffee, rice, corn (maize), and *feijão* (beans) and processes rum and livestock products. Offshore drilling for oil began in the Campos basin in 1980. The city has railroad connections with Rio de Janeiro, Vitória in the state of Espírito Santo, and cities in the Paraíba Valley and is also accessible by river and air. Pop. (1980 prelim.) 174,218.

Campos, Arsenio Martínez (Spanish general and politician): *see* Martínez Campos, Arsenio.

Campos, Haroldo de and Augusto de (respectively b. Aug. 19, 1929, São Paulo, Braz.; b. 1931, São Paulo), poets and literary critics, best known as the prime movers in the creation of Brazilian concretist poetry in the 1950s. Together with the poets Décio Pignatari and Ferreira Gullar, the brothers Campos launched the first exposition of concrete poetry in 1956 and published the avant-garde art and poetry magazines *Noigandres* and *Invencão.* Concrete poetry attempts to move away from a purely verbal concept of verse toward what its proponents call "verbivocovisual expression," incorporating geometric and graphic elements into the poetic act or process. Their experiments have included the use of ideograms as a substitute for verbal forms, the concept of a poem as a "layout" of black on white (or vice versa), and the attempt to create poems as objects to be seen and handled as well as heard or read. The Campos brothers and Décio Pignatari published *Teoria da Poesia Concreta* ("Theory of Concrete Poetry") in 1965. Haroldo and Augusto also translated into Portuguese works of Ezra Pound (1960), e.e. cummings (1960), James Joyce (1962), Stéphane Mallarmé (1970), and Vladimir Mayakovsky (1967). Haroldo de Campos also published some of his essays in *Metalinguagem* (1967; "Metalanguage") and *A Arte no Horizonte do Provável* (1969; "Art on the Horizon of the Probable").

Campos do Jordão, city, southeastern São Paulo state, Brazil, in the Serra da Mantiqueira, at an altitude of 5,500 ft (1,700 m). Founded as early as 1700, the city has developed as a health resort and tourist centre. Fruit growing (papayas, mangoes, guavas, passion fruit, and oranges) is also of economic importance. The vicinity, with a profusion of springs and waterfalls, is noted for its scenic beauty. Nearby are the Pedro do Baú (6,000 ft) and Itapeva (6,100 ft) mountains. Paved

Gardens of Campos do Jordão, Brazil
Plessner International

roads and a railroad link the city with São Paulo and Rio de Janeiro. Pop. (1980 prelim.) 23,330.

Campra, André (b. Dec. 4, 1660, Aix-en-Provence, Fr.—d. June 29, 1744, Versailles), most important French composer of operas between Jean-Baptiste Lully and Jean-Philippe Rameau.

Educated at Aix, he apparently became, at age 19, music master at Toulon cathedral. He held similar posts at Arles in 1681 and Toulouse in 1683. In 1694 he became director of music at Notre-Dame in Paris, where he was the first to use strings in addition to the organ accompaniment to the services. Already well known for his motets, he turned to secular works, and his first *opéra-ballet, L'Europe galante,* was performed in 1697 under the name of his brother, Joseph Campra. In 1700 he gave up his church appointment and for 40 years enjoyed a wide reputation for his stage works.

The *opéra-ballet,* a genre that he initiated, became in his hands a charming vehicle for chain upon chain of danced and sung *divertissements* uncomplicated by any great dra-

matic unity. His religious music, which includes psalm settings, motets, and a mass, is admired for its power and beauty.

Camptosaurus, extinct genus of large herbivorous dinosaurs found as fossils in Late Jurassic to Early Cretaceous rocks (the Jurassic Period ended 136,000,000 years ago and preceded the Cretaceous Period). *Camptosaurus,* an ornithopod (a group of relatively primitive bipeds), varied in length from 2 to 6 metres (6 to 20 feet). It had very strong hind limbs and smaller forelimbs that were strong enough to support the animal if it chose to progress on all fours, as it might while feeding.

The rather heavy tail may have been employed to support the animal when it stood erect. The skull was low, long, and massive, with large temporal and nasal openings. The lower jaw was shorter than the upper, but a distinctive jaw suspension ensured that the cheek teeth were brought into apposition in chewing. The teeth were broad and leaf-shaped; they were present only at the sides of the jaws; a beaklike structure, probably covered by horny pads in life, was effective in getting plant material into the mouth, where it was cut by the cheek teeth.

Campus Martius, English FIELD OF MARS, in ancient Rome, a floodplain of the Tiber River, the site of the altar of Mars and the temple of Apollo in the 5th century BC. Originally used primarily as a military exercise ground, it was later drained and, by the 1st century BC, became covered with large public buildings—baths, amphitheatre, theatres, gymnasium, crematorium, and many more temples.

The Pantheon (*q.v.*) is the most notable structure extant. The historian Livy (1st century BC) called the area *campus ignifer* because of the volcanic smoke often seen there.

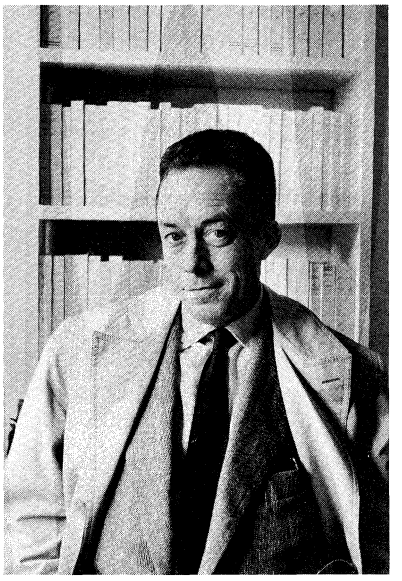
Camrose, city, central Alberta, Canada, on Camrose Creek near Bittern Lake, 58 mi (93 km) southeast of Edmonton. Founded in 1905 as the village of Sparling, after the Methodist clergyman Joseph W. Sparling (1843–1912), it was incorporated (1907) as a town and renamed for Camrose, Wales. An agricultural, dairying, and railroad centre, it is surrounded by hundreds of oil wells. The city produces steel and processes grain, flour, and meat products. Camrose is the site of Camrose Lutheran College (1911). Inc. city, 1955. Pop. (1981) 12,570.

camshaft, in internal combustion engines, rotating shaft with attached disks of irregular shape (the cams), which actuate the intake and exhaust valves of the cylinders. The cams and the camshaft are usually formed as a unit, with the cams set at such angles that open and close the valves in a prescribed sequence as the cams rotate. A separate camshaft for each row of cylinders is driven by gears or chains from the crankshaft.

Camú River, river in north central and northeastern Dominican Republic. Its headstreams rise in the Cordillera Central near Santiago de los Caballeros and La Vega. The Camú, about 50 mi (80 km) long, flows generally eastward across the fertile La Vega Real region, joining the Yuna River just southeast of Pimentel. A network of canals branching out from the Camú River and its tributaries is used principally for irrigating rice.

Camus, Albert (b. Nov. 7, 1913, Mondovi, Alg.—d. Jan. 4, 1960, near Sens, Fr.), French novelist, essayist, and playwright, best known for such novels as *L'Étranger* (1942; *The Stranger,* 1946), *La Peste* (1947; *The Plague,* 1948), and *La Chute* (1956; *The Fall,* 1957) and for his work in leftist causes. He received the 1957 Nobel Prize for Literature.

Early years. Less than a year after Camus was born, his father, an impoverished worker of Alsatian origin, was killed in World War I during the first battle of the Marne. His mother, of Spanish descent, worked as a charwoman to support her family. Camus and his elder brother Lucien moved with their mother to a working-class district of Algiers where all three lived, together with the maternal grandmother and a paralyzed uncle, in a two-room apartment. Camus's first published collection of essays, *L'Envers et l'endroit* (1937), describes the physical setting of these early years and includes portraits of his mother, grandmother, and uncle. A second collection of essays, *Noces* (1938), contains intensely lyrical meditations on the Algerian countryside and presents natural beauty as a form of wealth that even the very poor can enjoy. Both collections contrast the fragile mortality of human beings with the enduring nature of the physical world.



Camus, photograph by Henri Cartier-Bresson
Henri Cartier-Bresson—Magnum

In 1918 Camus entered primary school and was fortunate enough to be taught by an outstanding teacher, Louis Germain, who helped him to win a scholarship to the Algiers *lycée* (high school) in 1923 (it was typical of Camus's sense of loyalty that 34 years later his speech accepting the Nobel Prize for Literature was dedicated to Germain). A period of intellectual awakening followed, accompanied by great enthusiasm for sport, especially football, swimming, and boxing. In 1930, however, the first of several severe attacks of tuberculosis put an end to his sporting career and interrupted his studies. Camus had to leave the unhealthy apartment that had been his home for 15 years, and after a short period spent with an uncle—a butcher by trade and a Voltairean by conviction—Camus decided to live on his own, supporting himself by a variety of jobs while registered as a philosophy student at the University of Algiers.

At the university, Camus was particularly influenced by one of his teachers, Jean Grenier, who helped him to develop his literary and philosophical ideas and shared his enthusiasm for football. He obtained a *diplôme d'études supérieures* in 1936 for a thesis on the relationship between Greek and Christian thought in the philosophical writings of Plotinus and St. Augustine. His candidature for the *agrégation* (a qualification that would have enabled him to take up a university career) was cut short by another attack of tuberculosis. To regain his health he went to a resort in the French Alps—his first visit to Europe—and eventually returned to Algiers via Florence, Pisa, and Genoa.

Camus's literary career. Throughout the 1930s, Camus broadened his interests. He read the French classics as well as the writers of the day—among them Gide, Montherlant, Malraux—and was a prominent figure among the young left-wing intellectuals of Algiers. For a short period in 1934–35 he was also a member of the Algerian Communist Party. In addition, he wrote, produced, adapted, and acted for the Théâtre du Travail (Workers' Theatre), later named the Théâtre de l'Équipe, which aimed to bring outstanding plays to working-class audiences. He maintained a deep love of the theatre until his death. Ironically, his plays are the least admired part of his literary output, although *Le Malentendu* (*Cross Purpose*) and *Caligula,* first produced in 1944 and 1945, respectively, remain landmarks in the Theatre of the Absurd. Two of his most enduring contributions to the theatre may well turn out to be his stage adaptations of Faulkner's *Requiem for a Nun* (*Requiem pour une nonne;* 1956) and Dostoyevsky's *Possessed* (*Les Possédés;* 1959).

In the two years before the outbreak of World War II, Camus served his apprenticeship as a journalist with *Alger-Républicain.* He fulfilled a variety of functions, including those of leader- (editorial-) writer, subeditor, political reporter, and book reviewer. He reviewed some of Sartre's early literary work and wrote an important series of articles analyzing social conditions among the Muslims of the Kabylie region. These articles, reprinted in abridged form in *Actuelles III* (1958), drew attention (15 years in advance) to many of the injustices that led to the outbreak of the Algerian War in 1954. Camus took his stand on humanitarian rather than politico-ideological grounds and continued to see a future role for France in Algeria while not ignoring colonialist injustices.

He enjoyed most influence as a journalist during the final years of the occupation of France and the immediate post-Liberation period. As editor of the Parisian daily *Combat,* the successor of a Resistance news sheet run largely by Camus, he maintained an independent left-wing position based on the ideals of justice and truth and the belief that all political action must have a solid moral basis. Later, the old-style expediency of both Left and Right brought increasing disillusion, and in 1947 he severed his connection with *Combat.*

By now Camus had become a leading literary figure. *L'Étranger* (U.S. title, *The Stranger;* British title, *The Outsider*), a brilliant first novel begun before the war and published in 1942, is a study of 20th-century alienation with a portrait of an "outsider" condemned to death less for shooting an Arab than for the fact that he never says more than he genuinely feels and refuses to conform to society's demands. The same year saw the publication of an influential philosophical essay, *Le Mythe de Sisyphe* (*The Myth of Sisyphus*), in which Camus, with considerable sympathy, analyzed contemporary nihilism and a sense of the "absurd." He was already seeking a way of overcoming nihilism, and his second novel, *La Peste* (1947), is a richly symbolical account of the fight against an epidemic in Oran by characters whose importance lies less in the (doubtful) success with which they oppose the epidemic than in their determined assertion of human dignity and fraternity. Camus had now moved from his first main concept of the absurd to his other major idea of moral and metaphysical "rebellion." He contrasted this latter ideal with politico-historical revolution in a second long essay, *L'Homme révolté* (1951; *The Rebel*), which provoked bitter antagonism among Marxist critics and such near-Marxist theoreticians as Jean-Paul Sartre. His other major literary works are the

technically brilliant novel *La Chute* (1956) and a collection of short stories, *L'Exil et le royaume* (1957; *Exile and the Kingdom*). *La Chute* reveals a preoccupation with Christian symbolism and contains an ironical and witty exposure of the more complacent forms of secular humanist morality.

In 1957, at the early age of 44, Camus received the Nobel Prize for Literature. With characteristic modesty he declared that had he been a member of the awarding committee his vote would certainly have gone to André Malraux. Less than three years later he was killed in an automobile accident.

Assessment. As novelist and playwright, moralist and political theorist, Albert Camus after World War II became the spokesman of his own generation and the mentor of the next, not only in France but also in Europe and eventually the world. His writings, which addressed themselves mainly to the isolation of man in an alien universe, the estrangement of the individual from himself, the problem of evil, and the pressing finality of death, accurately reflected the alienation and disillusionment of the postwar intellectual. Though he understood the nihilism of many of his contemporaries, Camus also argued the necessity of defending such values as truth, moderation, and justice. In his last works he sketched the outlines of a liberal humanism that rejected the dogmatic aspects of both Christianity and Marxism. (J.Cr.)

MAJOR WORKS. *Novels and short stories. L'Étranger* (1942; English title, *The Outsider,* 1946; U.S. title, *The Stranger,* 1946); *La Peste* (1947; *The Plague,* 1948); *La Chute* (1956; *The Fall,* trans. by Justin O'Brien, 1957). Short stories collected in *L'Exil et le royaume* (1957; *Exile and the Kingdom,* trans. by J. O'Brien, 1958); *La mort heureuse* (1970; *A Happy Death,* 1972).

Plays. Le Malentendu (performed 1944; pub. with *Caligula,* performed 1945, in *Le Malentendu, suivi de Caligula,* 1944; *Caligula and Cross Purpose,* 1947); *L'État de siège* (performed and pub. in 1948; *State of Siege,* trans. in *Caligula and Three Other Plays,* 1958); *Les Justes* (performed 1949, pub. 1950; *The Just Assassins,* trans. in *Caligula and Three Other Plays,* 1958). Adaptations: *La Dévotion à la Croix* (1953, from Calderón); *Un Cas intéressant* (1955, from Dino Buzatti); *Requiem pour une nonne* (1956, from William Faulkner); *Les Possédés* (1959, from Dostoyevsky).

Essays, journalism, and notebooks. Collections: *L'Envers et l'endroit* (1937), recollections of childhood and travel sketches; *Noces* (1938), four Algerian essays; *Actuelles,* 3 vol. (1950, 1953, 1958), editorials and articles written for *Combat,* 1944–45; *L'Été* (1954). Other essays: *Le Mythe de Sisyphe, essai sur l'absurde* (1942, enlarged and rev. ed. reprinted 1945; *The Myth of Sisyphus,* trans. by J. O'Brien, 1955), a long philosophical essay; *Lettres à un ami allemand* (1945; trans. by J. O'Brien in *Resistance, Rebellion, and Death,* 1960), four linked essays, with preface, in the form of letters written during the Occupation, the first and second previously published in the "underground" reviews, *Le Revue Libre* (1943) and *Cahiers de la Libération* (1944); *Le Minotaure ou la halte d'Oran* (written 1939, pub. 1950), poetic and satirical description of Oran, the background for *La Peste; L'Homme révolté* (1951; *The Rebel,* 1953), a long metaphysical, historical, and political essay. Notebooks published posthumously: *Carnets: Mai 1935–Février 1942* (1962; *Notebooks, 1935–42,* trans. by Philip Thody, 1963); *Carnets: Janvier 1942–Mars 1951* (1964; *Notebooks, 1942–51,* trans. by P. Thody, 1965); *Carnets: Avril 1951–Décembre 1959* (1966; *Notebooks, 1951–59,* trans. by P. Thody, 1969).

BIBLIOGRAPHY. The major bibliographies of works by and about Camus are: R.F. Roeming (ed. and comp.), *Camus: A Bibliography* (1968); and B.T. Fitch and P.C. Hoy, *Essai de bibliographie des études en langue française consacrées à Albert Camus (1937–1967)* (1969). His main works are published with much excellent editorial material by Roger Quilliot in two "Bibliothèque de la Pléiade" volumes: *Théâtre, récits, nouvelles* (1962), and *Essais* (1965). Collections of the author's writings in English translation are *The Collected Fiction of Albert Camus* (1961); *Resistance, Rebellion and Death* (1961); and *Lyrical and Critical* (1967). Camus's main English translators are Stuart Gilbert, Justin O'Brien, and Philip Thody.

Good general studies in French include: Roger Quilliot, *La Mer et les prisons,* rev. ed. (1970; *Sea and Prisons: A Commentary on the Life and Thought of Albert Camus,* 1970); J.C. Brisville, *Camus* (1959); and Morvan Lebesque, *Albert Camus par lui-même* (1963). Camus has been fortunate in his English and American critics. Major studies of his personality and writings are Germaine Brée, *Camus* (1959); John Cruickshank, *Albert Camus and the Literature of Revolt* (1959); and Philip Thody, *Albert Camus, 1913–1960* (1961). Later studies offering clear expository summaries of his ideas are Adele King, *Camus* (1964); and P.H. Rhein, *Albert Camus* (1969). Emmett Parker, *Albert Camus: The Artist in the Arena* (1965), is an excellent analysis of Camus's political writings and ideas on artistic commitment. Lev Braun, *Witness of Decline, Albert Camus: Moralist of the Absurd* (1974), is an evaluation in terms of revolt. Richard H. Akeroyd, *The Spiritual Quest of Albert Camus* (1977), extends the controversy as to whether Camus would have adopted Christianity.

Consult the INDEX *first*

Camus, Marcel (b. April 21, 1912, Chappes, Ardennes, Fr.—d. Jan. 13, 1982, Paris), French motion-picture director who won international acclaim for his second film, *Orfeu Negro* (*Black Orpheus*) in 1958. The film was praised for its use of exotic settings and brilliant spectacle and won first prize at both the Cannes and Venice film festivals as well as an Oscar from the Academy of Motion Picture Arts and Sciences.

Camus, educated as an art teacher, spent most of World War II as a prisoner of war, after which he entered the film industry as an assistant and technical adviser to directors Jacques Feyder and Luis Buñuel and others.

Morte en fraude (1956; *Fugitive in Saigon,* 1957), Camus's first feature film, was a protest against the war in Indochina and received little attention. Later films—such as *L'Oiseau de paradis* (1961; *Dragon Sky,* 1964), *Le Chant du monde* (1965; "The Song of the World"), and *Otalia de Bahia* (1976)—also failed to attract the interest of critics and the public in the way that *Orfeu Negro* had.

Can-Am Cup (automobile racing): *see* Canadian-American Challenge Cup.

Can Tho, municipality and provincial seat of Hau Giang *tinh* (province), Mekong delta region, southeastern Vietnam. Situated on the left bank of the Song (river) Hau Giang, 90 mi (145 km) southwest of Ho Chi Minh City (formerly Saigon), it is an industrial centre and the largest city of the flat delta region, which includes the Ca Mau Peninsula and the principal rice-growing areas of the country. A large inland port, it is protected by dikes from the annual flooding of the Mekong and has a canal link to Vi Thanh in the southwestern part of the province. It has a teacher-training and agricultural college founded in 1976. In the 1960s an industrial park for agriculturally related industries was established 6 mi north of the city. Older industries include coconut-oil extraction and rice milling; new industries include the manufacture of fertilizer, ice, implements, plastic goods, bricks, and fish sauce. The city is served by two airports, the major one, Binh Thuy, northwest of the city, and has a hospital. A former Khmer (Cambodian) district, it was occupied in the 18th century by the Vietnamese to become part of southern Vietnam. It is the centre of a significant concentration of Hoa Hao, a militant Buddhist sect. Pop. (1979) 182,856.

Canaan, area variously defined in historical and biblical literature, but always centred on Palestine. Its original pre-Israelite inhabitants were called Canaanites. The names Canaan and Canaanite occur in cuneiform, Egyptian, and Phoenician writings from about the 15th century BC as well as in the Bible. "Canaan" refers sometimes to an area encompassing all of Palestine and Syria, sometimes to the entire land west of the Jordan River, and sometimes to a strip of coastal land from Acre ('Akko) northward. The Israelites occupied and conquered Palestine, or Canaan, beginning in the late 2nd millennium BC, or perhaps earlier; and the Bible justifies such occupation by identifying Canaan with the Promised Land, the land promised to the Israelites by God.

The origin of the term is disputed, but it may derive from an old Semitic word denoting "reddish purple," referring to the rich purple or crimson dye produced in the area or to the wool made with the dye. Biblically, Canaanites are identified in Genesis as descendants of Canaan, a son of Ham and grandson of Noah. *See also* Phoenicia.

The civilization of coastal Canaan can be traced to Paleolithic and Mesolithic times; settlement in fixed towns and villages, however, appears not to have occurred until the Neolithic Period (*c.* 7000–*c.* 4000 BC). The following Chalcolithic Age (*c.* 4000–*c.* 3000 BC) is characterized by the use of pottery and copper and by houses of uncut stones, with walls of mud brick.

The introduction of metal in the Early Bronze Age (*c.* 3000–2000 BC) brought about a cultural revolution, marked by the development of sculpture and metallurgy and by a decline in painted pottery. The Semites first appear during this period. With the Middle Bronze Age (*c.* 2000–*c.* 1550 BC) recorded history began. The Semitic Amorites, who penetrated Canaan from the northeast, became the dominant element of the population. Other invaders included the Egyptians and the Hyksos, a group of Asian peoples who seem to have migrated from north of Palestine. The Hurrians (the Horites of the Old Testament) also came to Canaan from the north.

The Late Bronze Age (*c.* 1550–*c.* 1200 BC) was mainly one of Egyptian control, although their power was contested by the Hittites of Anatolia. The period was also marked by incursions of marauders called Hapiru or Apiru, a multi-ethnic group identified by many scholars with the original Hebrews, of whom the later Israelites were only one branch or confederation. By the end of the 13th century BC, however, Egypt's domination over southern Canaan had waned, and the Hittites collapsed under the assault of enemies from the north.

During the transition from the Late Bronze to the Early Iron Age—probably *c.* 1250 BC—the Israelites entered Canaan, settling at first in the hill country and in the south. In the following century, Canaan suffered further invasion at the hands of the Philistines, who appear to have come from Crete. They eventually established a coalition of five city-states on the southern coast of Canaan. Under the leadership of King David (10th century BC), the Israelites were finally able to break the Philistine power and at the same time vanquish the native Canaanites. Thereafter Canaan became, for all practical purposes, the Land of Israel.

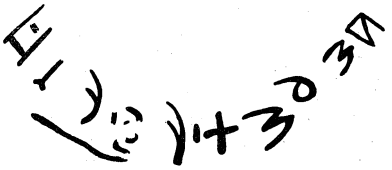
Canaan was situated at the crossroads of several cultures, and throughout its recorded history its art and literature illustrate a mixture of many elements: Egyptian, Mycenaean, Cretan, Hurrian, and Mesopotamian.

Most of what is known about Canaanite religion is derived from a series of tablets discovered at Ras Shamra, site of ancient Ugarit, on the north coast of Syria. The principal god was El, but the jurisdiction over rainfall

and fertility was delegated to Baal, or Hadad. Other important deities included Resheph, lord of plague and the nether world; Kothar, the divine craftsman; Asherah, consort of El; and Astarte, goddess of fertility.

The language of the Canaanites may perhaps be best-described as an archaic form of Hebrew. The Canaanites were the first people, as far as is known, to have used an alphabet. In Late Bronze Age strata, archaeologists have found a form of script recognized by most scholars as the parent of Phoenician and thence of the Greek and Latin alphabets. They also found that a curious cuneiform alphabet was in use at Ras Shamra. Side by side with these innovations, however, the traditional syllabic cuneiform of Mesopotamia was regularly employed.

Canaanite inscriptions, a group of 11 inscriptions recovered from bowls and other utensils found in several archaeological sites in Palestine dating from approximately the 16th–13th centuries BC. Since they have not as yet been satisfactorily deciphered, it is unclear whether the writing system used in these inscriptions is related to the North Semitic alphabet (*q.v.*), which has been positively dated only to the 11th century BC but may be several centuries older. It is also unclear whether there is any connection between the Canaanite inscriptions and the Sinaitic inscriptions,



Early Canaanite inscription from Lachish, 13th century BC

From D. Diringer, *Writing*

but the theory that the Canaanite group forms a link between them and the North Semitic alphabet appears unlikely.

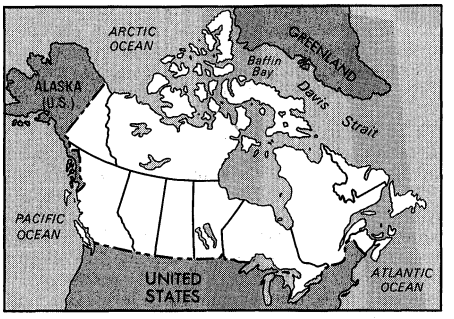
Canaanite languages, group of Northern Central or Northwestern Semitic languages including Hebrew, Moabite, Phoenician, and Punic; they were spoken in ancient times in Palestine, on the coast of Syria, and in scattered colonies elsewhere around the Mediterranean. An early form of Canaanite is attested in the Tell el-Amarna letters (*c.* 1400 BC). Moabite, which is very close to Hebrew, is known chiefly from one inscription dating from the 8th century BC. The only living Canaanite language is Hebrew, which was revived as a spoken language in the 19th and 20th centuries. *See also* Hebrew language; Phoenician language.

To make the best use of the Britannica, consult the INDEX *first*

Canaanite religion, beliefs and practices prevalent in ancient Palestine and Syria during the 2nd and 1st millennia BC, centring primarily on the deities El, Baal, and Anath (*qq.v.*). From time to time it subverted the essential monotheism of the Israelites after they occupied Canaan, the Promised Land of the Old Testament.

Canada, the world's second largest country in area after the Soviet Union, occupying the northern two-fifths of North America and covering 3,849,675 square miles (9,970,610 square km). The capital is Ottawa. Canada stretches about 2,860 miles (4,600 km) from north to south (83°–42° N) and nearly 3,340 miles (5,380 km) from east to west (52°–140° W). Canada is bounded on the north by the Arctic Ocean, on the south by the United States, on the west by the Pacific Ocean and the U.S. state of Alaska, and on the east by the Atlantic Ocean. The population in 1987 was estimated to be 25,857,000.

A brief treatment of Canada follows. For full treatment, *see* MACROPAEDIA: Canada. For information about its major cities, *see* Montreal; Toronto.



Canada

For current history and for statistics on society and economy, *see* BRITANNICA WORLD DATA ANNUAL.

The land. Canada may be divided into two groups of physiographic regions. The first, a large interior lowland area centred on the Hudson Bay and covering nearly four-fifths of the country, includes the Canadian (Laurentian) Shield, the interior plains, and the Great Lakes–St. Lawrence lowlands. The second, comprising a rim of highlands, includes the Innuitian Mountains in the northern islands, the highlands extending from Baffin Island through northern Labrador in the northeast, the Appalachians in the southeast, and the Canadian Cordillera in the west.

The Canadian Shield is by far the largest region, covering nearly half of Canada's total territory. With few exceptions, it has a monotonous landscape with low relief, rarely exceeding 2,000 feet (600 m) in elevation. Its western edge is marked by the chain of large lakes extending from the Northwest Territories southeastward to Lake Superior. The Laurentide Scarp, rising 1,500 feet (460 m) above Lake Superior's northern shore, defines the shield's southern rim as it continues eastward almost imperceptibly through Ontario, rising 2,000 feet above sea level along the St. Lawrence River.

Canada's interior plains, an extension of the Great Plains northward from the U.S. states of Montana and North Dakota, occupy the fifth of the country lying west of the shield region. The Great Lakes–St. Lawrence lowlands, the most densely populated part of Canada, occupy an area east from Lake Huron and along the northern shores of Lake Ontario, Lake Erie, and the St. Lawrence River and south of the Laurentide Scarp. It is a level area, lying at less than 2,000 feet above sea level.

The most important and largest of the highland rim regions is the western section of the Canadian Cordillera, extending into Canada's Yukon Territory from Alaska in the northwest and into the northwestern United States from British Columbia. With several peaks of more than 15,000 feet (4,500 m), the 500-mile-(800-kilometre-) wide mountain belt rises in its northern reaches to 19,524 feet (5,951 m) at Mount Logan.

Five of Canada's rivers are among the world's 40 largest. The St. Lawrence River accounts for about two-fifths of the country's Atlantic runoff. The Mackenzie River provides about half of the Arctic runoff, while the Yukon and the Fraser rivers together contribute almost 40 percent of the country's discharge to the Pacific. The Nelson River is one of several rivers supplying a sizable freshwater flow to the Hudson Bay. In addition to Lake Superior (with an area of 31,700 square miles [82,100 square km]) and Lake Huron (23,000 square miles [59,600 square km]), both of which are shared with the United States, Canada's Great Bear (12,028 square miles [31,153 square km]) and Great Slave (11,031 square miles [28,570 square km]) lakes are among the world's 11 largest lakes.

Canada's climate is dominated by its extremely cold and generally long winters. With the exception of the maritime climate on the country's Pacific coast near Vancouver Island, where January temperatures average 37° F (3° C), the average January and February temperatures range from less than −32° F (−36° C) in Eureka, Northwest Territories, to about 32° F (0° C) on Sable Island, Nova Scotia. Average summer temperatures decrease and the average annual precipitation increases coastward (east and west) from south-central Canada; the July temperature in Winnipeg, Manitoba, averages 68° F (20° C), and Winnipeg's annual precipitation is about 20 inches (510 mm). The country's maximum precipitation (262 inches [6,655 mm]) falls on Vancouver Island. Minimum precipitation occurs in the northern islands (an Arctic desert), where summer temperatures frequently remain below freezing.

While less than 5 percent of Canada's total land area is considered arable, this still amounts to nearly 178,000 square miles (461,000 square km). The unequal distribution of Canada's rainfall, with respect to arable land, results in only about 1 percent of its cropland being irrigated; dry farming predominates in the southern interior plains. More than one-third of the country is forested, consisting of a large variety of deciduous and coniferous species. Its northern coniferous, or boreal, forest stretches from Newfoundland to Alaska and is one of the largest in the world. The northern reaches of the country are characterized by tundra. Canada's wildlife is extremely varied. Some distinctively Canadian animals are the moose, the beaver, and the Canada lynx.

Canada has substantial reserves of several metals and contributes significantly to world production of nickel (about one-fifth), zinc, molybdenum, cadmium, cobalt, and copper. It produces large amounts of iron and lead. It also has substantial reserves of coal, petroleum, and natural gas.

The people. Canada's population represents two principal and several smaller national and cultural groups. People of British and French descent compose the majority, while those of German, Ukrainian, and Italian origin make up significant minorities. The principal religion of the country is Roman Catholicism, with the United Church of Canada and the Anglican Church of Canada also claiming large memberships. English and French are the principal languages spoken, with more than twice as many English-speakers as French-speakers. Canada's population has a relatively low annual rate of growth by world standards, and the birth and death rates are also comparatively low. The infant mortality rate is about average for a Western industrialized country. Three-fourths of the population lives in urban areas. Emigration, at times considerable, has tended toward the United States.

The economy. Canada has a developed market economy that is export-directed and closely linked with that of the United States. The nation's economy grew slowly in the 1980s as the country sought measures to cope with the international economic slump. Low world prices for oil, gas, and wheat, some of Canada's major exports, contributed to its economic problems. A high but declining rate of inflation and persistently high unemployment continued to vex the country's policymakers. Canada continues, however, to be ranked with Switzerland, Sweden, and the United States as one of the most affluent countries in the world. The gross national

product (GNP) reached $253,350,000,000 in 1980; GNP per capita was more than $10,000.

Agriculture accounts for approximately 5 percent of the GNP and employs a comparable percentage of the work force. Canada is one of the world's major grain producers, with approximately four-fifths of its farmland located in the prairie provinces between the Great Lakes and the Rocky Mountains. Wheat is the chief export crop; others include feed grains, oilseeds, apples, potatoes, and maple syrup.

The timber industry in Canada is extremely well developed, and forest resources are vast. Canada is the leading exporter of wood and wood products, with exports amounting to nearly $10,500,000,000 in 1980.

Fishing is also an important export industry and fish are caught both in the country's rivers and lakes and in the ocean. A general trend toward larger catches from marine fisheries can be attributed in part to the official extension of Canadian fishing jurisdiction to 200 nautical miles off the east and west coasts. Furs are another significant export product.

Canada's mineral industry, however, is the single largest contributor to exports. In addition to crude petroleum and natural gas, principal export items are copper, nickel, lead, zinc, and their products, as well as iron ore, primary iron, and steel.

Manufacturing and construction together account for one-third of the GNP and employ approximately one-quarter of the work force. Petroleum refining and the production of motor vehicles are dominant industries. Other important industries include pulp and paper production, meat packing, and iron and steel production

The most striking aspect of Canadian mining and manufacturing is the extent of foreign ownership or influence. Although exploitation of the country's mineral resources has been a major factor in Canada's economic development, it has also been a major cause of the massive capital inflow that has resulted in the domination of Canadian industry by foreign corporations, primarily U.S. companies. Almost all private, nonagricultural activities are dominated by U.S. influences through either corporate ownership of Canadian assets or the growing dependence of Canadian producers on U.S. market trends and financial markets.

The services sector accounts for more than one-half of the GNP and employs two-thirds of the work force. Production of electricity reached 366,677,000,000 kW-hr in 1980 and was largely generated by water power.

An important characteristic of Canadian trade unionism is its international orientation. Two-thirds of all trade unions belong to unions with international (mainly U.S.) affiliations.

The federal government is involved in the development of natural resources throughout Canada; but agricultural operations and a majority of industrial operations are privately owned. National economic policy has been somewhat conditioned by the dependence of private-sector growth on foreign influence. The Canadian government has attempted to check dependence by channelling public savings into specific industries and by creating programs aimed at regaining control of the Canadian oil and gas industry.

Canadian economic development has been affected by foreign trade far more than that of most developed nations. Exports and imports combined represent almost one-half of the GNP, having grown at a rate of more than 35 percent during 1970–80. Much of the growth in Canadian foreign trade can be attributed to the integration of the Canadian market into the U.S. market. Canadian exports to the United States account for approximately two-thirds of total exports, and imports from the United States account for more than two-thirds of total imports. Canada has strong economic ties with the United Kingdom and other European communities, but the growing Japanese market has replaced the United Kingdom as Canada's second largest export market. Exports to China and Australia have also increased dramatically.

Administration and social conditions. Canada is a federal state with a parliamentary political system. Governmental structure and authority are based on both the British North America Act of 1867 and unwritten legal custom; Britain's nominal influence in Canada's constitutional matters ended with the Constitution Act of 1982, which was approved by the Canadian and British parliaments. Supreme political authority rests with Canada's bicameral Parliament, which consists of a Senate and a House of Commons. The leader of the majority party in the House automatically becomes the prime minister. His cabinet, which is appointed by the governor general on the prime minister's advice, remains in power as long as it maintains majority support in the House. The British monarch, who serves as Canada's symbolic executive, appoints a representative, the governor general, on the advice of the Canadian prime minister.

The House has 282 members elected to five-year terms by universal adult suffrage, while the Senate is composed of 104 members appointed by the governor general on the advice of the prime minister. All bills must pass both houses to become laws; only the House of Commons may introduce bills for the expenditure of public funds or the imposition of any tax. There are two major political organizations in Canada: the Liberal Party and the Progressive Conservative Party. The dominant political party in Quebec, the Parti Québécois, is committed to winning political sovereignty for the province. The country participates in both North Atlantic Treaty Organization defense and United Nations peace-keeping activities.

Canada is divided into 10 provinces and 2 national territories, the Yukon Territory and the Northwest Territories. The provinces have control over such matters as education, property laws, and natural resources, while responsibility for social welfare and health care is divided between the federal and the provincial governments. Federal programs provide unemployment insurance, war veterans' and old age pensions, and family allowances; all other types of welfare are covered by provincial programs. The vast majority of the population belongs to the federal medical care insurance program, which provides coverage for medically required services rendered by a physician or surgeon. Provincial hospital insurance programs, funded in part by the federal government, cover almost all of the population. Health conditions in Canada are generally excellent; the country has a high number of physicians and hospital beds per capita, good perinatal care, and high life expectancy rates of 70 years for men and 77 years for women.

Each province and territory has the authority and responsibility for organizing its own educational system. Most Canadian children enter an eight-grade elementary school at age 6; at about 14 years of age almost all enroll in a regular four- or five-year secondary school. Graduation from secondary school may lead to matriculation at one of the nation's more than 60 institutions of higher education. Laval University in Quebec, the oldest in Canada, was founded in 1852 during the French regime.

The first truly Canadian literary works were written in French by explorers, missionaries, and settlers and many of them provided the inspiration for subsequent writings. Particularly noteworthy is Marc Lescarbot's *Histoire de la Nouvelle France* (1609). Other classics of Canadian literature include William Kirby's *Golden Dog* (1877) and Robert W. Service's *Trail of '98* (1910). The 1940s saw the emergence of Canadian writers of the first rank. Hugh MacLennan established himself as a writer of international importance with *Barometer Rising* (1941) and *Two Solitudes* (1945). Gabrielle Roy's novel *Bonheur d'Occasion* (1945) was an immediate success, and *Le Survenant* (1945) by Germaine Guèvremont placed its author among the finest of French-language novelists. Since 1960 other important writers, including Margaret Laurence, Robertson Davies, Margaret Atwood, and Alice Munro, have emerged (*see also* Canadian literature). In music there have been several internationally renowned Canadian performers, among them pianist Glenn Gould and Metropolitan Opera performers George London and Jon Vickers.

Daily newspapers in Canada are privately owned and free from government censorship. The broadcast media, though also free from censorship, are subject to supervision by the Canadian Radio-television and Telecommunications Commission, a governmental body. The publically owned Canadian Broadcasting Corporation operates two national television networks, one in French and one in English.

Prime ministers of Canada

	party	term
Sir John Alexander Macdonald (*1st time*)	Liberal Conservative	1867–73
Alexander Mackenzie	Liberal	1873–78
Sir John Alexander Macdonald (*2nd time*)	Liberal Conservative	1878–91
John Abbott (from 1892, Sir John Abbott)	Liberal Conservative	1891–92
Sir John Thompson	Liberal Conservative	1892–94
Mackenzie Bowell (from 1895, Sir Mackenzie Bowell)	Liberal Conservative	1894–96
Sir Charles Tupper, 1st Baronet	Liberal Conservative	1896
Wilfred Laurier (from 1897, Sir Wilfred Laurier)	Liberal	1896–1911
Robert Laird Borden (from 1914, Sir Robert Laird Borden)	Conservative	1911–20
Arthur Meighen (*1st time*)	Conservative	1920–21
W.L. Mackenzie King (*1st time*)	Liberal	1921–26
Arthur Meighen (*2nd time*)	Conservative	1926
W.L. Mackenzie King (*2nd time*)	Liberal	1926–30
Richard Bedford Bennett (from 1941, Viscount Bennett)	Conservative	1930–35
W.L. Mackenzie King (*3rd time*)	Liberal	1935–48
Louis St. Laurent	Liberal	1948–57
John G. Diefenbaker	Progressive Conservative	1957–63
Lester B. Pearson	Liberal	1963–68
Pierre Elliott Trudeau (*1st time*)	Liberal	1968–79
Joseph Clark	Progressive Conservative	1979–80
Pierre Elliott Trudeau (*2nd time*)	Liberal	1980–84
John M. Turner	Liberal	1984
Brian Mulroney	Progressive Conservative	1984–

History. Native Indian, including Eskimo (Inuit), peoples inhabited Canada in antiquity. Archaeological evidence has confirmed the existence of a Norse site in Newfoundland, thus placing the European penetration of the "New World" as far back as *c.* AD 1000.

Fishing expeditions in the waters off Newfoundland began as early as 1500 and involved not only the English and French but the Spanish and Portuguese as well. The French claim to Canada was made in 1534, when Jacques Cartier entered the Gulf of St. Lawrence. A small settlement was made in Nova Scotia (called Acadia by the French) in 1605, and by 1608 Champlain had reached Quebec. Serious efforts at colonization did not take place until the mid-1600s, however, when the Company of New France was established. Fur trading was the impetus behind the early colonizing efforts.

In response to French activity the English in 1670 formed the Hudson's Bay Company, based on the claim laid by Henry Hudson's voyage into Hudson Bay 60 years earlier. The British intended to exert control over the fur trade in all of the region drained by the Bay. The resulting British–French rivalry for the interior of upper North America persisted for almost a century. The first French loss occurred in 1713 at the conclusion of Queen Anne's War (the War of the Spanish Succession) when Nova Scotia and Newfoundland were ceded to the British. The French decision to develop and extend their holdings into the Ohio and Mississippi valleys led directly to the French and Indian War, which in turn resulted in France's expulsion (1763) from continental North America. When the British reorganized Canada, New France became the colony of Quebec.

After the American Revolution, the population of Canada was augmented by loyalists fleeing the United States. Many settled in Nova Scotia, and settlers crossing the Bay of Fundy established New Brunswick in 1784. The increasingly large number of loyalists arriving in Quebec led the British to divide the colony into Upper and Lower Canada in 1791 and to extend to both new provinces British institutions and constitutional rights.

The French majority in Lower Canada did not always prosper under the British. Severe economic problems, coupled with political dissatisfaction, led them to open rebellion in 1837. The British united the two provinces in 1841, and by 1848 had established self-government for the Canadian colonies.

The expansionist desire of the Canadians and the British desire to terminate its defense of inland Canada resulted in the confederation movement in the mid-1800s. In 1867 the Dominion of Canada, comprising Nova Scotia, New Brunswick, Quebec, and Ontario, came into existence under the British North America Act. One aspect of the act important to Canada's growth was the provision of the sale of Hudson's Bay Company landholdings to the Dominion government.

After confederation, Canada embarked on a westward expansion and internal development not unlike that of its southern neighbour. The prosperity that accompanied Canada into the 20th century, however, was marred by continuing conflict between the English and French communities. The rebellions led by Louis Riel in western Canada, though unsuccessful, gave the French a martyr and hero. The disappearance of French and denominational schools in Manitoba in 1890 further alienated the French. Serious questions concerning Canadian participation in British foreign military adventures affected the French community throughout the early 20th century.

After World War I Canada pursued a foreign policy increasingly independent of British control. In 1931 Britain recognized the position of its dominions and created equality of status among them in the Statute of Westminster.

French separatism was a major concern in the 1970s. In 1976 the Parti Québécois, under the leadership of René Lévesque, won provincial elections in Quebec and pressed for separation. In 1980 voters in Quebec, however, rejected the Lévesque sovereignty-association status referendum.

With the Canada Act, approved in 1982, the British patriated the British North America Act to Canada, thus giving Canada total control over its constitution and severing the legal ties between the two countries.

Canada, Air: *see* Air Canada.

Canada, Anglican Church of, self-governing Anglican church that dates from the Church of England congregations established in Canada during the 18th century. In 1750 Canada's first Anglican church was built in Halifax, Nova Scotia. Additional congregations were formed as settlers came from England and as many American colonists who remained loyal to England resettled in Canada during and after the American Revolution.

Charles Inglis (1734–1816), rector of Trinity Church in New York and a Loyalist who returned to England in 1783, was consecrated bishop of Nova Scotia in 1787, the first bishop consecrated for work outside of the British Isles. Under his leadership more than 20 churches were built, and an academy and college were founded.

The Anglican Church gradually spread throughout Canada, and until 1832 it was the established church of Canada. As congregations increased, they were grouped into dioceses and provinces. A unifying organization, the General Synod, was established in 1893 in Toronto for the two provinces and 15 dioceses then in existence.

A revised *Book of Common Prayer* (1959) is used by the church for its liturgy. Its doctrinal statements are the Apostles' and Nicene creeds and the Thirty-nine Articles.

In the late 20th century the Anglican Church in Canada was made up of 28 dioceses, each headed by a bishop. The dioceses were combined into four provinces, each headed by an archbishop. The dioceses and provinces hold synods to conduct the business of the church in their areas. The work of the entire church is governed by the General Synod, headed by the primate. Headquarters are in Toronto.

Canada, Bank of, Canadian financial institution established under the Bank of Canada Act (1934). It was founded during the Great Depression to regulate credit and currency. The Bank commenced operations on March 11, 1935. It not only acts as the fiscal agent for the Canadian government, but it has the sole right to issue paper money. The Canadian Ministry of Finance has ultimate direction of the bank, and all profits made go to the Receiver General of Canada.

Canada Act, also called CONSTITUTION ACT 1982, Canada's constitution approved by the British Parliament on March 25, 1982, and proclaimed by Queen Elizabeth II on April 17, 1982, making Canada wholly independent. The document contains the original statute that established the Canadian Confederation in 1867 (the British North America Act; *q.v.*), the amendments made to it by the British Parliament over the years, and new material resulting from negotiations between the federal and provincial governments between 1980 and 1982.

The new constitution represented a compromise between Canadian Prime Minister Pierre Elliott Trudeau's vision of "one Canada with two official languages" and the particular concerns of the provinces. A novel part of the document was the Charter of Rights and Freedoms. This set down 34 rights to be observed across Canada, ranging from freedom of religion to linguistic and educational rights based on the test of numbers. Many of the rights could be overridden by a "notwithstanding clause," which allowed both the federal Parliament and the provincial legislatures to set aside guarantees in the Charter. Designed to preserve parliamentary supremacy, a basic political principle in Canada, "notwithstanding clauses" would have to be renewed every five years to remain in force. Thus the Charter of Rights was not fully entrenched in the Canadian constitution as the Bill of Rights was in that of the United States.

The Canada Act also contained a formula for its amendment in Canada, a subject that had defeated attempts to gain agreement on a new constitution as far back as 1927. Under the formula, resolutions of the Canadian Parliament, accompanied by the concurrence of two-thirds of the provinces (7) representing at least 50 percent of the country's population, would be sufficient to approve a constitutional amendment. Other sections of the act recognized the aboriginal and treaty rights of native peoples, strengthened the provinces' jurisdiction over their natural resources, and committed the central government to provide public services of reasonable quality across Canada by ensuring revenue (equalization) payments to the provinces.

The constitutional changes having been extensively discussed in Canada since their presentation in 1980, and their mode of procedure having secured judicial endorsement in 1981, there was little opposition when they came before the British Parliament early in 1982. All major British parties supported them, although some members of Parliament felt that native rights were inadequately protected. The Queen gave royal assent to the Canada Act on March 29, 115 years to the day after Queen Victoria, her great-great-grandmother, had approved the federation act of 1867. Thus the last legal tie with Great Britain was severed, and Canada became a fully sovereign state.

Although the people of Quebec were deeply divided over the merits of the new constitution, the Quebec government—strongly separatist—went ahead with its opposition to the changes. The Quebec government took its case to the courts, but the Quebec Court of Appeal, on April 7, 1982, held that Quebec did not possess a veto over constitutional change, even if it affected provincial jurisdiction. Again, on September 8, the Superior Court of Quebec held that sections of Quebec's controversial language law, Bill 101, were unconstitutional because they conflicted with the new Charter of Rights. Bill 101 required English-speaking Canadian parents educated outside Quebec to send their children to French schools if they moved to Quebec. The Charter, on the other hand, guarantees minority language education in all provinces for children of Canadian citizens where numbers warrant the establishment of schools. Quebec's claim to a constitutional veto was decisively rejected by the Supreme Court of Canada, 9–0, on Dec. 6, 1982.

canada balsam, also called CANADA TURPENTINE, or BALSAM OF FIR, oleoresin consisting of a viscous yellowish to greenish liquid exuded by the balsam fir of North America, *Abies balsamea.* It is actually a turpentine, belonging to the class of oleoresins (natural products consisting of a resin dissolved in an essential oil), and not a balsam.

Canada balsam solidifies to a transparent mass and is an important cement, particularly in microscopy for mounting specimens and for glass in optical work.

Canada Bill (1791): *see* Constitutional Act.

Canada Company, organization instrumental in colonizing much of the western part of Upper Canada (now Ontario). Many residents of Upper Canada had incurred losses during

the War of 1812 and subsequently claimed an indemnity from the British government. The latter agreed to pay a portion of the claims if the government of Upper Canada provided the remainder. At the suggestion of John Galt, an agent of the claimants, the authorities in Upper Canada decided to raise their share of the indemnity by selling the crown lands in the western part of the province to a company that would settle them.

The Canada Company was formed in 1824 and chartered on Aug. 19, 1826. It obtained about 2,500,000 acres (1,000,000 hectares) of land in Upper Canada, for which it made annual payments to the provincial government until 1843.

Galt was named secretary and, in 1827, superintendent of the company. He founded the towns of Galt and Goderich, built a road to Goderich, and brought settlers in to develop the area. His work was considered to be too costly, however, and in 1829 he was replaced by Thomas Mercer Jones. The company, often criticized as a monopoly in its active days, continued in existence until the 1950s.

Canada Cup (golf): *see* World Cup.

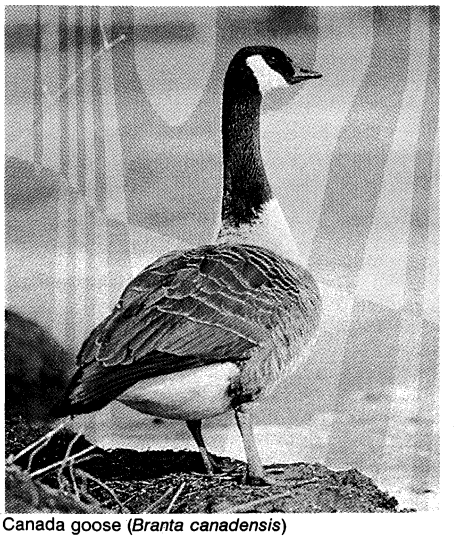
Canada Day, formerly (until 1982) DOMINION DAY, the national holiday of Canada, observed on July 1. It commemorates the formation of the Dominion of Canada on July 1, 1867. Following the 1982 patriation of the Canadian constitution—which until that time had been embodied in the British North America Act (1867), an act of the British Parliament—the name of the holiday was officially changed to Canada Day. It is celebrated with parades, fireworks, display of the flag, and the singing of the national anthem.

The possibility of union among the various provinces in British North America had been discussed for many years. In 1864 a meeting was held in Charlottetown, Prince Edward Island, by representatives of Quebec, Ontario, Nova Scotia, and New Brunswick, and after three years of negotiations federation was achieved. Subsequent to the passage of the British North America Act, other provinces joined the union.

Canada East, also called LOWER CANADA, in Canadian history, the region in Canada now known as Quebec. From 1791 to 1841 the region was known as Lower Canada and from 1841 to 1867 as Canada East, though the two names continued to be used interchangeably.

Settled primarily by French Canadians who wanted to preserve their distinctive identity and cultural traditions, Canada East was reluctant to join the proposed confederation with Canada West (*q.v.*). Because banking, transportation, and manufacturing throughout Canada centred largely on Montreal in the East, the people of Canada West were more eager to join together and have outlets for their agriculture. The champion of confederation in Canada East was George E. Cartier, who was instrumental in bringing about confederation in 1867.

Canada goose (*Branta canadensis*), a brown-backed, light-breasted goose with black head and neck and white cheeks that flash when the bird shakes its head before taking wing. It belongs to the family Anatidae (order Anseriformes). The subspecies vary greatly in size, from 1⅓ kilograms (3 pounds) in the cackling goose (*B. c. minima*), to about 8 kilograms (20 pounds) in mature males of the giant Canada goose (*B. c. maxima*). The latter race has a wingspread of up to 2 metres (6½ feet), second in size only to that of the trumpeter swan among common waterfowl. Canada geese breed across Canada and Alaska and winter mainly in the southern U.S. and Mexico. They are an important game bird. Attention is drawn to their V-formations during migrations by almost incessant "honking" during flight.



Canada goose (*Branta canadensis*)
Leonard Lee Rue III

Canada geese were introduced into England for sport and as ornamental waterfowl in the 17th century and, subsequently, into other countries.

canada turpentine: *see* canada balsam.

Canada West, also called UPPER CANADA, in Canadian history, the region in Canada now known as Ontario. From 1791 to 1841 the region was known as Upper Canada and from 1841 to 1867 as Canada West, though the two names continued to be used interchangeably.

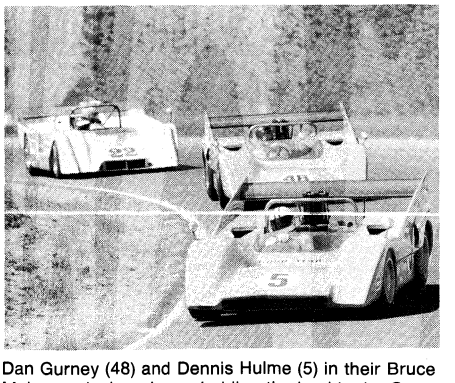
A largely agricultural area far from markets, Canada West sought confederation with Canada East (*q.v.*) in order to gain access to eastern transportation and also to secure the combined strength necessary to build transportation westward.

The government of Canada West had long been unstable when the "Great Coalition" of John A. Macdonald, George E. Cartier, and George Brown was formed and soon led to confederation. The unified Dominion of Canada was made official by the British North America Act (*q.v.*) of 1867.

Canada yew: *see* American yew.

Canadaway Stage, division of Upper Devonian rocks and Late Devonian time in the northeastern U.S. (the Devonian Period began about 395,000,000 years ago and lasted about 50,000,000 years); the Canadaway precedes the Conneaut Stage and follows the Chemungian Stage. It was named for exposures studied along Canadaway Creek in western New York. The sandstones and shales of the Canadaway have been studied extensively in southwestern New York and northwestern Pennsylvania.

Canadian–American Challenge Cup, byname CAN-AM CUP, trophy of a series of automobile races that take place annually (from 1966), sponsored jointly by the Sports Car Club of America (SCCA) and the Canadian Automobile Sports Committee (CASC). Entries are two-seater sports and racing cars classified in Group 7 by rules of the Fédération Internationale de l'Automobile, world governing body of auto racing. Races in the series are short, usually about 200 miles (320 kilometres) in length, and are held at various road circuits in the U.S. and Canada. A driver's championship is awarded at the end of each year.



Dan Gurney (48) and Dennis Hulme (5) in their Bruce McLaren-designed cars holding the lead in the Can-Am Cup race at Mosport, Ont., June 1970
Alice Bixler—Miller Services

Canadian Football League (CFL), major Canadian professional football organization, formed in 1956 when the Western Interprovincial Football Union (WIFU) and the Interprovincial Rugby Football Union (IRFU), both dating from the early 1900s, joined in the Canadian Football Council, which adopted its present name a year later. The WIFU and IRFU became the Western and Eastern conferences, respectively, of the new league, which soon took over operation of playoffs for the Grey Cup, emblematic of supremacy in Canadian football.

Teams in the CFL Western Conference are the British Columbia Lions, Calgary Stampeders, Edmonton Eskimoes, Saskatchewan Roughriders, and Winnipeg Blue Bombers. In the east are the Hamilton Tiger-Cats, Toronto Argonauts, Ottawa Rough Riders, and Montreal Alouettes. For results of the Grey Cup, *See* Sporting Record: *Football*: *Canadian Football.*

Canadian high, also called ALASKAN HIGH, large atmospheric high-pressure centre produced by the extremely low winter temperatures over northwestern Canada. Its cold, dense air does not extend above three kilometres (two miles). The high's location east of the Canadian Rockies shelters it from the relatively warm Pacific Ocean and helps it maintain its identity. Its average January sea level pressure is 1,020 millibars (30.12 inches of mercury). The Canadian high gradually shifts southeastward until it eventually reaches the Atlantic Ocean, where it merges with the Azores high.

Canadian Imperial Bank of Commerce, major commercial banking company operating in Canada and other countries. Headquarters are in Toronto.

The bank was established in 1858 as the Bank of Canada, and reorganized in 1867 as the Canadian Bank of Commerce. The present name was assumed upon the merger in 1961 of the Canadian Bank of Commerce and the Imperial Bank of Canada (established in 1875). Over the years the bank has absorbed a number of smaller banks.

The bank and its affiliates provide general banking services, energy financing, and advising and trust services. It also participates in a number of investment companies in foreign countries.

Canadian Labour Congress (CLC), nationwide association of trade unions in Canada, including wholly Canadian "national" unions and "international" unions that are Canadian branches of U.S. unions. The CLC was formed in 1956 in the merger of the Trades and Labor Congress of Canada (TLC) and the Canadian Congress of Labour (CCL).

The Trades and Labor Congress of Canada was founded in 1886; and, although, from the beginning, it accepted both craft unions and industry-wide unions, its membership consisted largely of craft unions, many of them affiliated with the American Federation of Labor (AF of L) in the United States. In 1940, when the AF of L expelled the Congress of In-

dustrial Organization (CIO) and its industrial unions, the TLC followed suit and expelled its CIO affiliates. In that same year, these ousted affiliates joined with the All-Canadian Congress of Labour (established in 1927) to form a new body of industrial unions, the Canadian Congress of Labour. In 1956 (one year after the AF of L and the CIO merged), the CCL and the TLC united as the Canadian Labour Congress, with headquarters in Ottawa and with the first elected president, Claude Jodoin, coming from the TLC.

The CLC supports the New Democratic Party. About 55 percent of the CLC's "international" unions are affiliated with the American Federation of Labor-Congress of Industrial Organizations (AFL-CIO) of the United States.

Canadian literature, the body of written works produced in French or English by Canadians. A brief treatment of Canadian literature follows. For full treatment, *see* MACROPAEDIA: Canadian Literature.

The earliest writings in English-speaking Canada were the records in plain and unadorned language of the impressions that British travellers received as they journeyed through the vast, largely unexplored expanses of the Canadian region. These early travel narratives were eventually supplanted by the writings of native Canadians, particularly those who lived in the Maritime provinces. Such writers as Thomas McCulloch and Thomas Chandler Haliburton wrote about the customs and dialect of their fellow Nova Scotians in a lively and humorous fashion. Early Canadian poets such as Oliver Goldsmith confined themselves mainly either to patriotic songs and hymns or to topographical narratives of discovery and exploration, as well as celebrations of pioneer life.

The confederation of the Canadian provinces into the Dominion of Canada in 1867 stimulated a flurry of literary activity while enhancing national pride. The so-called Confederation group of poets—notably Sir Charles G.D. Roberts, Bliss Carman, Archibald Lampman, and Duncan Campbell Scott—expressed the new national consciousness in their transcendental and romantic praise of the Canadian landscape, as well as in poems treating the theme of love and in meditative philosophical speculations. Their poetry dominated Canadian production in the medium until the beginning of the 20th century. The most popular form of novel in the second half of the 19th century was the historical romance, with a variety of practitioners whose approaches ranged from romanticized views of settlers' early conflicts with Indians to quasi-documentary tales of realistic adventure.

The early 20th century saw a reaction against the sentimental and patriotic Victorian verse of the preceding era. The poet E.J. Pratt, whose works range from lyric poems of Newfoundland life to such epic narratives as *The Titanic* (1935), was a central figure in Canadian poetry before World War II. The beginnings of Canadian modernist poetry can be found in the free verse and open language of A.J.M. Smith, A.M. Klein, and others active around mid-century. Novels of local colour began to replace the long-popular historical romance in the early 20th century. Especially notable were Lucy M. Montgomery's children's novel *Anne of Green Gables* (1908), *Sunshine Sketches of a Little Town* (1912) by the master satirist Stephen Leacock, and the 16 novels by the internationally popular novelist Mazo de la Roche that chronicled the tumultuous lives and loves of the Whiteoaks family, beginning with *Jalna* (1927).

The Canadian novel shifted in the 1940s and '50s from local colour to a tentative strain of lyricism, with many works centring on such previously atypical protagonists as children or artists. In the 1960s and '70s, contemporary urban life and relations between the sexes were dissected with brilliant irony by the novelist Margaret Atwood, while Mordecai Richler and Robertson Davies also achieved international renown. Parody, feminism, and surrealistic black humour remained characteristic of the Canadian novel in the 1970s and '80s. Poetry also blossomed in the postwar decades in the works of Atwood, the satirist and social commentator Earle Birney, Leonard Cohen, and the experimental poet-playwright Michael Ondaajte.

Throughout its history Canada has had two distinct and vital cultures: one English, the other French. French Canada, which is concentrated in the present province of Quebec, was slower to build a literary tradition than was English-speaking Canada. It was not until the 1830s, long after the imposition of British rule, that the first French-Canadian collection of verse and the first novel were published. The principal publications of the mid-19th century, including François-Xavier Garneau's *Histoire du Canada* (1845–48; *History of Canada*) and the patriotic poetry of Octave Crémazie, reflected the people's growing sense of national identity. French Canada's first literary grouping, the Quebec Movement, founded in 1860, was devoted to ensuring the survival of French-Canadian culture in a predominantly English-speaking land. The basically conservative, Roman Catholic orientation of the movement's members dictated the conventional treatment of nostalgic themes that is typical of their novels and verse. The members of the next major literary school, the Montreal School, founded in 1895 and centred in the city of that name, published mostly verse influenced by Symbolist and Parnassian poets in Europe. The Montreal School divided early in the 20th century into aesthetes and regionalists. It was the latter who dominated French-Canadian literature for the next 30 years, but the regionalists were producing works with rural and agricultural themes even while Quebec was becoming increasingly urban and industrial. After World War II, French-Canadian fiction became resolutely urban, as typified in Gabrielle Roy's portrait of Montreal working-class life, *Bonheur d'occasion* (1945; *The Tin Flute*) and Roger Lemelin's *Les Plouffe* (1948; *The Plouffe Family*). The introspective unrhymed verse of Hector de Saint-Denys Garneau greatly influenced subsequent poets of the 1940s and '50s, particularly those associated with the important Quebec publishing house L'Hexagone.

The gradual modernization of Quebec and the social and political upheaval represented by the separatist movement of the late 1960s and '70s greatly stimulated cultural self-awareness and its resulting literary activity. Poetry in the 1960s became politically engaged and preoccupied with freedom of expression and the search for an authentic sense of identity, as typified in Gaston Miron's *L'Homme rapaillé* (1970; *The Agonized Life*). Novelists such as Jacques Godbout, Hubert Aquin, Marie-Claire Blais, and Gérard Bessette borrowed freely from the unconventional structure of the French *nouveau roman* ("new novel") while dealing with radical themes, social criticism, and the disenchantment of the younger generation in the nuclear age.

Canadian National Railway Company, corporation created by the Canadian government in 1922 to operate a number of nationalized railroads (including the old Grand Trunk lines, the Intercolonial Railway, the National Transcontinental Railway, and the Prince Edward Island Railway) as one of Canada's two transcontinental railroad systems.

In its early years Canadian National engaged in a fierce competitive struggle with the privately owned Canadian Pacific Ltd. This ended with the Canadian National–Canadian Pacific Act in 1933, that directed the two railways to cooperate in seeking economies and eliminating duplication of services. In 1978 Canadian National's passenger services were taken over by VIA Rail Canada, a crown corporation set up to operate all Canadian passenger services except commuter services.

Canadian National's transcontinental line runs across Canada from Halifax, Nova Scotia, to Vancouver and Prince Rupert, B.C. It also controls the Central Vermont Railway, with a terminus at New London, Conn.; the Duluth, Winnipeg, and Pacific Railway; and the Grand Trunk Western Railroad Company serving Detroit and other points in Michigan. The company also owns a chain of hotels, the CN Tower in Toronto, restaurants, trucking companies, ferry lines, and telecommunications services.

Canadian Pacific Ltd., formerly (1881–1971) CANADIAN PACIFIC RAILWAY COMPANY, privately owned company that operates one of Canada's two transcontinental railroad systems. The company was established to complete a transcontinental railroad that the government had begun under the agreement by which British Columbia entered the confederation in 1871. The main line from Montreal to Vancouver was completed in 1885. Later the company absorbed other railroads, including several in the United States.

For much of the company's history, most of its owners lived outside Canada, but this began to change after World War II as more Canadians began to invest in the company. By the late 20th century, about two-thirds of the voting rights were held in Canada.

Canadian Pacific initially received a land grant of 25,000,000 acres. Over the years it acquired assets in mining and smelting, and in timber. In 1956 it set out to develop these assets, establishing subsidiaries in oil and gas, minerals, fertilizers, food products, forest products, iron and steel, real estate, hotels, insurance, finance, trucking, telecommunications, shipping lines, and airlines. These assets were centralized in a holding company, Canadian Pacific Investments Ltd., in 1962 and the parent company was renamed Canadian Pacific Ltd. in 1971. In 1980 Canadian Pacific Investments Ltd. became Canadian Pacific Enterprises Ltd.

By the late 20th century railroad activities accounted for only a small part of the company's net earnings. Rail freight tonnage was largely in minerals, manufactured products, and grain. Canadian Pacific's passenger services were taken over in 1978 by the crown corporation VIA Rail Canada.

Canadian Pacific Railway, Canada's first transcontinental railway, begun soon after the confederation of Canada East and West in 1867. Donald A. Smith, the principal organizer of the Canadian Pacific, drove the last spike of the railway on Nov. 7, 1885. The first train left Montreal for Vancouver on June 28, 1886.

At the time that it was completed, the Canadian Pacific was one of the longest railways in the world. Its completion was a triumph over both financial and geographic obstacles, particularly the barrier of the Rocky Mountains; construction of the Kicking Horse Pass was a monumental engineering task. The railroad was financed and built by a syndicate of industrialists and financiers who in turn received strong support from the Canadian government in the form of subsidies and land grants.

Canadian River, river rising in the Sangre de Cristo Mountains, northeastern New Mexico, U.S., and flowing southward across the Las Vegas Plains, cutting a gorge nearly 1,500 ft (450 m) deep in the Canadian escarpment before turning eastward. It continues through

the Texas Panhandle in a deep, narrow valley cut into reddish sandstones, the walls of which are known locally as the "breaks," and flows eastward through the Antelope Hills in Oklahoma, past Oklahoma City, to join the Arkansas River 27 mi (47 km) southeast of Muskogee, at the western edge of the Boston Mountains. Through most of its 906-mi course, the Canadian is a braided stream with an interlacing system of channels; it drains an area of 29,700 sq mi (76,900 sq km).

Flood-control and irrigation units along its course are Conchas Dam and reservoir (1939), near Tucumcari, N.M.; Ute Reservoir, impounded at Logan, N.M.; and Lake Meredith, impounded by Sanford Dam, near Borger, Texas. The main tributary is the North Canadian, which joins the Canadian from the west, near Eufaula, Okla., there dammed to form Eufaula Reservoir before the combined streams enter the Arkansas. Other tributaries include the Mora River and Ute Creek in New Mexico and Mustang Creek in Texas.

The rugged terrain along the river in the Llano Estacado (Staked Plain) in southeastern New Mexico and western Texas was a favourite hiding place for bandits and rustlers. The river was probably named by early French traders and hunters from Canada who followed it west into Spanish territory. The Fort Smith and Santa Fe pioneer trails went through the Canadian River Valley.

Canadian Rockies, segment of the Rocky Mountains, extending southeastward in a band 25 to 50 mi (40 to 80 km) wide for about 1,000 mi from north central British Columbia, Canada, and forming to the south nearly half of the 900-mi border between the provinces of British Columbia and Alberta. To the west, the Rocky Mountain Trench (a geological depression) separates the front ranges of the Canadian Rockies from the Columbia Mountains, which include the scenic Selkirk Mountains and are often considered part of the Rocky Mountain system.

About 50 peaks surpass 11,000 ft (3,350 m). Mt. Robson (12,972 ft) in British Columbia is the highest. Others include Mt. Joffre (the first glacier-hung peak north of the U.S. border), Mt. Assiniboine (the "Matterhorn of the Rockies"), Mt. Columbia (12,300 ft; Alberta's highest point), and Mt. Forbes. Spectacular alpine scenery is found in Banff, Jasper, and Waterton lakes national parks on the eastern slopes in Alberta and in the Kootenay and Yoho national parks on the western slopes in British Columbia. The Canadian Rockies are the source of many headstreams, notably of the Kootenay, Columbia, Fraser, Peace, Liard, Athabaska, and Saskatchewan rivers.

Important rail and highway passes include Yellowhead, Crowsnest, and Kicking Horse (*qq.v.*), the latter crossed by the Trans-Canada Highway.

Canadian Series, lowermost rocks of the Ordovician System in North America; it is defined on the basis of exposures seen in southeastern Canada. (The Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years.) The original type section for the Canadian Series is incomplete and is not completely satisfactory; only the lower part of the series is represented, and outcrops are discontinuous. More complete sections are known from the eastern side of Lake Champlain, in Vermont, as well as from exposures seen in the Nittany Arch of central Pennsylvania, where a continuous 1,200-metre (4,000-foot) section of Lower Ordovician strata is exposed. An excellent section also can be seen on the flanks of the Ozark dome. Strata of the Canadian Series, across the craton (stable interior) and into the geosynclinal trough, are calcareous with a large amount of dolostone (a sedimentary rock composed of fragmental, concretionary, or precipitated dolomite). The alteration of limestone to dolomite or dolostone has produced destruction of many fossils in the Canadian rocks. Thus, correlation across regional boundaries, especially where deformation has played a major role, is very difficult.

In contrast to this calcareous facies, east of Logan's Line from New York to Newfoundland, a black shale facies occurs that is rich in a graptolitic fauna (class of extinct colonial marine animals).

Canadian whisky, blend of distilled liquors, produced exclusively from cereal grains, which is usually bottled at 86 proof. *See* whiskey.

Çanak, Treaty of, Çanak also spelled CHANAK, also called TREATY OF THE DARDANELLES (Jan. 5, 1809), pact signed between the Ottoman Empire and Great Britain at Çanak (now Çanakkale, Tur.) that affirmed the principle that no warships of any power should enter the Straits of the Dardanelles and the Bosporus. The treaty anticipated the London Straits Convention of 1841, by which the other major powers committed themselves to this same principle.

Implicitly directed against Russia, which had signed the Tilsit (1807) and Erfurt (1808) agreements with Napoleonic France, the Treaty of Çanak offered security to the British against the entry of the Russian fleet from the Black Sea into the Mediterranean. It also reaffirmed in full Great Britain's capitulary rights (trading and consular privileges) in the Ottoman Empire, while its secret provisions provided that the British assist the Ottomans in the event of a French declaration of war against them.

Çanakkale, city, capital of Çanakkale *il* (province), northwestern Turkey, at the mouth of Koca Çay (the ancient Rhodius River), on the Asian side of the Dardanelles. Originally a 15th-century Ottoman fortress called Kale-i Sultaniye, in the 18th century it developed a reputation for its pottery, whence its name (Turkish *çanak,* "pot," and *kale,* "fortress"). The pottery industry reached its peak in the 18th and 19th centuries and has now declined;

Quayside scene, Çanakkale, Tur.
Farrell Grehan—Photo Researchers

but the city has become one of the chief centres of the Turkish fish-canning industry. It is connected by steamer service with Istanbul. Because of its location controlling the Dardanelles (Turkish Çanakkale Boğazı), less than 1 mi (1.6 km) wide at that point, Çanakkale has always been strategically important. It was damaged by British bombardment during World War I.

Çanakkale *il,* 3,995 sq mi (10,347 sq km) in area and lying in both European and Asiatic Turkey, includes the Gallipoli Peninsula and İmroz Adası (island). It is noted for its many ancient sites, chief among which is the excavated city of Troy on the Aegean Sea, about 20 mi southwest of Çanakkale city. Economic activities include food-processing industries, wine making, and agriculture. Pop. (1980) city, 39,979; (1983 est.) *il,* 404,200.

Çanakkale Boğazı (strait, Turkey): *see* Dardanelles.

Cāṇakya (Hindu statesman): *see* Kauṭilya.

canal, artificial waterway built primarily for navigation but also used for crop irrigation, water supplies, and drainage. Canals are usually connected with natural bodies of water or other canals to form systems of inland waterways.

A brief treatment of the history and construction of canals follows. For full treatment, *see* MACROPAEDIA: Public Works.

The early civilizations of the Middle East probably built canals to satisfy their need for drinking and irrigation water; navigation was of lesser importance. In the 7th century BC the Assyrian king Sennacherib had a stone canal 50 miles (80 kilometres) long built to bring fresh water to the city of Nineveh. Around 510 BC Darius I, the king of ancient Persia, undertook the construction of a canal linking the Nile River and the Red Sea, a forerunner of the modern Suez Canal. Phoenicia, Sumeria, and Babylonia, were all sites of canal systems, the most ambitious project being a navigation canal that extended 200 miles between Sāmarrā' and al-Kūt, both now in modern Iraq.

In the 3rd century BC the Chinese began building a series of canals to tie together the inland regions around their major rivers. The greatest of these projects was the Grand Canal; with a total length of more than 1,000 mi it is the longest artificial waterway in the world. The first section was opened in AD 610, and later dynasties added to it until it ran from the Yangtze River to Peking.

Romans built extensive canal systems throughout northern Europe and Britain that were used primarily for military transport. Some, such as those constructed in southeastern Britain, were designed for drainage.

The decline of Rome led to a lapse in European waterway development for a time. By the 12th century, however, commercial expansion started a revival of their use, and eventually about 85 percent of medieval Europe's transport went by inland waterway. Canals from this period still dominate the transportation system of Venice, which was built on marshy islands in a lagoon of the Adriatic. Around 1373 the Dutch developed the pound lock, an innovation that remains the most significant in canal construction. The tightly closed chamber, or pound, of a lock is flooded with or drained of water, so that a vessel within it is raised or lowered with the water level. The vessel is thus able to pass between bodies of water at different elevations.

With the perfection of the pound lock canals could be built through terrain where the changes in elevation, or gradient, had previously made their construction difficult or impossible. Beginning in the 16th century an extensive system of canals was constructed in Europe. Canal building did not begin in earnest in England until the start of the Industrial Revolution in the late 18th century, but the network of waterways that were then rapidly built greatly facilitated the early industrial preeminence of the country.

The era of the canal was the period be-

Major canals of the world

	length		year(s) constructed (reconstructed)[a]	principal use[b]
	mi	km		
Africa				
Egypt				
Suez Canal	105	168	1856–69	N
Morocco				
Beni Moussa Canals	76	122	1938–	M
Beni Amir Canals	40	64	1938–	M
Sudan				
Gezira Canals	3,125	5,030	1925–	I
Mangril Canals	. . .	. . .	1957–62	I
Jonglei Canals	250	402	late 1970s–	M
Asia				
Afghanistan				
Nangarhār Canal	44	70	1961–	I
Helmand Valley Canals	. . .	. . .	. . .	I
Bangladesh				
Ganges–Kobadak Canals	1,898	3,054	. . .	M
Teesta Barrage Canals	1,405	2,262	. . .	M
Burma				
Shwebo and Ye-U Canals	660	1,062	1906	I
North Nawin Irrigation Canals	323	519	1967–	I
Zawgyi Canal System	252	400	1925	I
Mandalay Canal System	200	322	1902	I
Panlaung Canal System	215	346	. . .	I
China				
People's Victory Canal	99	160	1953	I
Grand Canal	1,107	1,782	*c.* 4th century BC (6th century BC) (1958–64)	M
Ta-yü-chang Canal	145	233	post 1949	I
A-k'o-su Victory Canal	127	204	post 1949	I
Ching-hui Canal	50	80	post 1949	I
Northern Kiangsu Main Canal	104	168	post 1949	I
India				
Rājasthān Canal	403	649	1955–	M
Western Yamuna Canal	1,739	2,799	1821 (1973–76, 1875–79, 1940–43)	I
Cauvery Delta System	3,478	5,597	*c.* 100 (1899–1902)	I
Upper Ganga Canal System	2,958	4,760	1854	I
Godāvari Delta System	2,500	4,019	1846–90	I
Betwa Canal	168	270	1881–93	I
Sārda Canal	1,164	1,873	1915–26	I
Pravara Canal	81	130	. . .	I
Godāvari Canals	117	188	. . .	I
Bhakra Canals	2,790	4,490	. . .	M
Hirākūd Canal System	552	888	1963–64	M
Tungabhadra Canals	339	545	1956	M
Dāmodar Valley Corporation Canals	1,550	2,494	1958	M
Durgāpur Barrage	140	225	1952–55	M
Nāgārjuna Sāgar Canals	243	391	1955–	I
Kosi Canals	103	176	1955–	I
Iraq				
Wādī Tharthār Channel	40	65	1958	M
Japan				
Aichi Canal	70	112	. . .	M
Gumma Channels	25	40	1968	I
Malaysia				
Tanjong Karang Canals	25	40	. . .	I
Krian Canals	41	66	early 1960s	I
Muda River Canal	60	97	. . .	I
Pakistan				
Lower Jhelum Canal	1,200	1,922	1898–1901	I
Upper Jhelum Canal	. . .	. . .	1912–15	I
Upper Chenāb Canal	. . .	. . .	1912–15	I
Lower Bān Doāb Canal	. . .	. . .	1912–15	I
Upper Swāt Canal	. . .	. . .	1917–18	I
Upper Sind Innundation Canal	. . .	. . .	1921	I
Thal Canal System	1,956	3,148	1946	I
Inter-River Link Canals	412	663	. . .	I
Syria				
Homs–Hamah Canal	55	88	1934–51	I
Ghāb–Acharneh Canals	590	950	. . .	I
Thailand				
Raphiphat Canal	20	32	1916–24	M
Taiwan				
Chia-nan Canal	640	1,024	1920–30	I
Europe				
Belgium				
Alpert Canal	80	129	1939	N
Bruges–Zeebrugge Canal	. . .	. . .	. . .	N
Willebroek Canal (Brussels–Rupel)	20	32	1561 (1922)	N
Charleroi–Brussels Canal	44	77	1968	N
Bulgaria				
Southern Main Canal	182	293	late 1960s–	I
Finland				
Saimaa Canal	27	43	1845–56 (1968)	N
France				
Rhine–Rhône Canal	199	320	1784–1833	N
Marne–Rhine Canal	196	316	1838–53	N
Canal du Midi	149	240	1661–81	N
Canal Latéral a la Garoune	124	200	. . .	N
Canal du Nord	59	95	early 1900s (1961–65)	N
St. Quentin Canal	57	92	1738–1810	N
Grand Canal d'Alsace	30	50	1932–completed after WWII	N
Marseille–Rhône Canal	50	81	. . .	N
Canal du Centre	. . .	. . .	. . .	N
Germany, East				
Oder–Spree Canal	52	84	. . .	. . .
Oder–Havel Canal	51.5	83	1914	N
Ems–Jade Canal	45	72	1887	N
Küsten Canal	43	70	1935	N
Elbe–Havel Canal	35	56	1936	N
Weser–Elbe Canal	. . .	. . .	. . .	N
Germany, West				
Mittelland Canal	202[c]	325	1905–38	N
Dortmund–Ems Canal	168	270	1890–99 (1950)	N
Ludwigs Canal	107	172	1836–45	N
Nord–Sud Canal	75	120	1968–	N
Main–Danube Canal	106	171	1968–	N
Kiel Canal	61	98	1887–95 (1907–14)	N
Elbe–Lübeck Canal	40	64	1895–1900	N
Greece				
Corinth Canal	4	6.3	1881–93 (1948)	N
Ireland				
Grand Canal	80	130	. . .	N
Hungary				
Tiszalök Canals	101	163	1941–67	I
Italy				
Grand Canal (Venice)	2	3	. . .	N
Cremona–Milan Canal	46.5	75	late 1960s	N
The Netherlands				
North Holland Canal	48	78	1825	N
Amsterdam–Rhine Canal	45	72	(1952)	N
Juliana Canal	21	34	1935	N
North Sea Canal	17	27	1865–76	N
Ghent–Ternenzen Canal	11	18	1832	N
Scheldt–Rhine Canal	. . .	. . .	late 1960s	N
Poland				
Wieprz-Kyzna Channel	87	140	. . .	I
Augustów Canal	62	100	1824–39	N
Bydgoszcz Canal	16	25	1722	N
Gliwice Canal	25	41	1933–39	N
Portugal				
Sorraia Valley Canals	237	381	1953–58	M
Alentejo Canals	5,592	9,000	1959–	M
Romania				
Terasa Brăilei Canals	870[d]	1,400	1969–	I
Calafat–Băileşti Canals	27	44	1969–	I
Spain				
Monegros Canal	53	85	late 1960s	I
Bárdenas Canal	45	72	late 1960s	I

Major canals of the world (continued)

	length mi	length km	year(s) constructed (reconstructed)[a]	principal use[b]
Sweden				
Gota Canal	261	420	1810–30	N
U.S.S.R.				
Karakumsky Kanal	664	1,069	c. 1950–80	M
Vyshiivolok Water System[e]	873	1,406	1703–09	N
Irilysh-Karaganda Canal	280	451	1971	M
North Crimea Canal	250	403	1961–71	N
Volga-Baltic Waterway	229	368	1964	M
Bol'shoi Fergana Canal	214	345	1939–40	M
Baltic-White Sea Canal	141	227	1931–33	N
Dneiper-Bug Canal	122	196	1837–48 (1945–46)	N
Samur-Aspheron Canal	113	182	1939–40 (1951–55)	M
Terek-Kuma Canal	93	150	1952–60	I
Moscow Canal	80	128	1932–37	N
Volga-Don Canal	63	101	1950–52	N
Nevinnomyssk Canal	30.6	49.2	1936–48	M
United Kingdom				
Leeds- Liverpool Canal	143	230	1770–1816	N
Caledonian Canal	55	88	early 1800s	N
Manchester Ship Canal	36	58	1894	N
Grand Trunk Canal	...	...	...	N
Grand Union Canal	...	...	...	N
Kennet-Avon Canal	...	...	...	N
North America				
Canada				
St. Lawrence Seaway	182[f]	293	1954–59	N
St. Lambert Lock[g]	3	4.8	1954–59	N
Cote Ste. Catherine Lock[g]	7.5	12	1954–59	N
Beauharnois Canal[g]	12	19	1929–32	N
Wiley-Dondero Canal[gh]	10	16	1954–59	N
Iroquois Canal[g]	...	...	1954–59	N
Welland Canal[i]	27.6	44	1913–32	N
Sault Ste. Marie Canal	1.4	2.2	1895	N
St. Mary's Falls Canal[h]	1.6	2.6	1855	N
Trent Canal	275	443	1833–1918	N
Rideau Canal	125	200	1826–32	N
Richelieu Canals	43	69	1833–44	N
Lachine Canal	8.7	14	1821–25	N
Ste. Anne Canal	2	3.2	1840–43 (1879–86)	...
Jamaica				
St. Dorothy Canal	19	30.6	1961	I
Mexico				
Main Canal	208	335	post 1950	I
Guillermo Rode Canal	124	200	post 1950	I
Requena Canal	122	197	post 1950	I
Humaya Canal	112	180	post 1950	I
Alto Canal	77	124	...	I
Ing. Antonio Coria Canal	73	118	post 1950	I
Anzalduas Canal	57	92	post 1950	I
Canal Sacramento	47	75	post 1950	I
Culiucan Canal	43	69	post 1950	I
Santa Rosa-Tlahualilo Canal	43	70	post 1950	I
El Carrizo Canal	36	58	post 1950	I
Panama				
Panama Canal	51	82	1880–1914 (1935, 1955, 1970, 1974)	N
Puerto Rico				
Lajas Valley Canals	124	200	1948–61	I
United States				
Atlantic Intracoastal Waterway[j]	1,900	3,057	...	N
Cape Cod Canal[k]	8	13	1914	N
Chesapeake-Delaware Canal[k]	14	22	1829 (1919)	N
Albemarle-Chesapeake Canal[k]	...	...	...	N
Gulf Intracoastal[l] Waterway	1,100	1,770	...	N
Illinois Waterway[m]	327	526	1933	N
Chicago Sanitary and Ship Canal[n]	30	48	1900	N
Calumet Sag Channel[n]	16	26	...	N
N.Y. State Barge Canal (Erie Canal)[o]	520	837	1903–18	N
Tennessee-Tombigbee Waterway	234	377	1979–	N
Lake Washington Ship Canal	8	13	1916	N
Sacramento Deep-water Ship Canal[p]	...	...	1963	N
California Aqueduct	450	724	...	I
Coachella Canal	123	198	...	I
San Luis Canal	103	168	...	I
West Side Canal (Rio Grande)	...	...	...	I
All-American Canal	80	129	...	I
South America				
Ecuador				
Pisque Canal	39	62	...	I
Riobamba Canal	40	63	...	I
Peru				
San Lorenzo Canals	97	157	1953–61	I
Joya Canals	...	...	1955–	I
Margen Izquierda Canals	...	...	1964–	I

. . . Not available. [a]Includes years for canal modernization. [b]N=navigation, I=irrigation, M=multipurpose. [c]Includes 41 mi of canal in East Germany. [d]Includes main irrigation canals and tributary irrigation channels. [e]A system of artificial canals, channels, and reservoirs linking several rivers. [f]Length given is the distance from Montreal to Lake Ontario, or the distance of the St. Lawrence Seaway project, while the distance from the Atlantic to Duluth, Minnesota is more than 2,300 mi (3,700 km). [g]Canal along the Montreal to Lake Ontario portion of the St. Lawrence Seaway. [h]Situated on the U.S. side of the St. Lawrence Seaway. [i]Canal along the St. Lawrence Seaway linking Lake Ontario to Lake Erie. [j]A series of artificial and natural channels linking the ports along the Atlantic coast from Boston to Key West. [k]Part of the Atlantic Intracoastal Waterway. [l]A series of artificial and natural channels linking the Gulf coast ports from Texas to Florida. [m]A series of artificial and natural channels linking Lake Michigan to the Mississippi River via the Illinois River. [n]Part of the Illinois Waterway. [o]Includes 363 mi of the old Erie Canal that was constructed 1813–25. [p]Links Sacramento to San Francisco Bay.

tween the start of the Industrial Revolution and the rise to predominance of the railroad in the mid-19th century. During this time canal-building activity was most dramatic in the United States, where territorial expansion had opened up a vast interior that was hard to reach. At the beginning of the 19th century the United States had only about 100 mi of canals, but by the end of the century more than 4,000 mi had been constructed. Among the most important waterways were the several linking the Great Lakes and one, the Illinois and Michigan Canal, that connected the Great Lakes to the Mississippi River.

Railroads and, later, motor vehicles brought an end to the canal boom, but inland-waterway transportation has remained important. With their network of transnational rivers and canals, Europeans have continued to rely heavily on waterway commerce. The Soviet Union has been a significant beneficiary. Not only have inland waterways opened vast areas of its interior to development, but Moscow—linked to the White, Baltic, Black, Caspian, and Azov seas by canals and rivers—has become a major inland port.

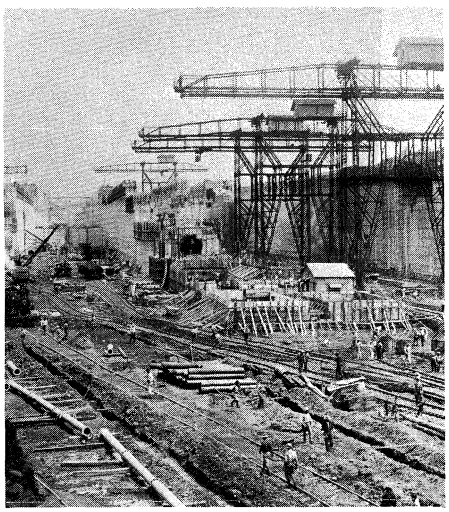
Transoceanic shipping boomed with the construction of several inland waterway projects in the 19th and 20th centuries. The Kiel Canal, dug through a spit of land in northern West Germany, cut travel distance between the North and the Baltic seas by several hundred miles. The efforts begun by Darius I in the Suez some 2,300 years earlier were finally realized in 1869 with the opening of the Suez Canal. In the Western Hemisphere the 51-mile Panama Canal, cut through the Isthmus of Panama and completed in 1914, allowed ships to move between the Atlantic and Pacific oceans without having to go around South America. In addition, the St. Lawrence Seaway, which utilizes several canals and sets of locks, was opened in 1957; its completion provided the link between the North Atlantic and the Great Lakes and turned such cities as Toronto and Chicago into ocean ports.

The pound lock solved the most fundamental problem of the canal builder: maintaining a gradient that was level enough to hold water over varied terrain. Two major innovations, the miter gate and the side pound (or side pond), have further improved its working capabilities. A mitre gate consists of two leaves that close to form an angle upstream. It can withstand much higher water pressures than can be withstood by a gate that closes flat, thus making possible deeper and longer locks that can accommodate larger ships.

In areas where water is in abundance, locks can be constructed with little concern for the availability of water to run them. In many instances, however, water must be conserved in order to maintain an adequate level in the

canal. By using side pounds water can be reused; it is pumped out and stored in the pounds when the water level in the lock is lowered and then pumped back in when the level is raised.

Modern waterway engineering is directed toward providing channels suitable for larger vessels to travel faster by reducing delays at locks or from darkness and other natural hazards. One way of making these improvements is by selecting a canal site in an area that presents few natural obstacles. The Kiel Canal crosses fairly level terrain, which minimized the excavation work; it has locks only at either end. By utilizing existing lakes and marshes, engineers were able to build the Suez Canal without using locks.



Panama Canal under construction, 1912
By courtesy of the Panama Canal Company

Where physical features make locks a necessity, efforts are made to improve their efficiency or keep their use to a minimum. On the Welland Canal of the St. Lawrence system, for example, the locks are arranged in pairs, and ships can move both up and down the river simultaneously. Engineers on the Panama Canal reduced the need for locks by cutting a deep channel through the continental divide and by damming a river to create a long, navigable lake.

Even with the help of locks canal builders occasionally encounter gradients that are too steep and abrupt to be approached in gradual steps. One solution is to haul vessels up inclined planes. One such structure built in Brussels in 1968 can lift a 1,350-ton barge up an incline that rises 229 feet (91 metres) in one mile. Another device is the vertical lift, which is necessary when the change of level occurs within an extremely short distance. Operated by high-pressure hydraulic lifts, submersible floats, or geared counterweights, lifts can also replace several locks. One lift completed at Henrichenburg, West Germany, in 1962 can lift a 1,000-ton vessel 60 feet.

Canal, Giovanni Antonio (painter): *see* Canaletto.

Canal Zone, also called PANAMA CANAL ZONE, historic administrative entity in Panama over which the United States exercised jurisdictional rights from 1903 to 1979. It was a strip of land 10 mi (16 km) wide along the Panama Canal, extending from the Atlantic to the Pacific Ocean and bisecting the Isthmus of Panama. It covered 553 sq mi (1,432 sq km), of which about one-third was water (principally Gatun Lake). The Canal Zone had two administrative subdivisions, the Balboa (Pacific) and Cristobal (Atlantic) districts. Balboa Heights was the administrative headquarters for both the Canal Zone government and the Panama Canal Company.

The Canal Zone came into being on May 4, 1904 ("Acquisition Day"), under the terms of the Hay–Bunau-Varilla Treaty of 1903 by which Panama granted to the United States, in return for annual payments, the sole right to operate and control the canal and about 5 mi of land on each side. The canal was constructed between 1904 and 1914. As reorganized in 1951, the administration of the canal and adjoining land was entrusted to two closely related U.S. agencies, the Panama Canal Company (responsible for operating the canal itself) and the Canal Zone government (responsible for civil rule in the zone). The governor of the Canal Zone, appointed by the president of the United States and supervised by the secretary of the army, was ex officio president and director of the Panama Canal Company.

The zone was abolished on Oct. 1, 1979, with the return to Panama of direct civil control under a treaty signed in 1977. By the same treaty a commission under joint United States–Panamanian ownership was established to operate the canal until the year 2000, when Panama was to assume full control. The northern part (271 sq mi) of the former Canal Zone is now part of Colón province; the southern part (282 sq mi) is in Panamá province.

Canale Grande (Venice): *see* Grand Canal.

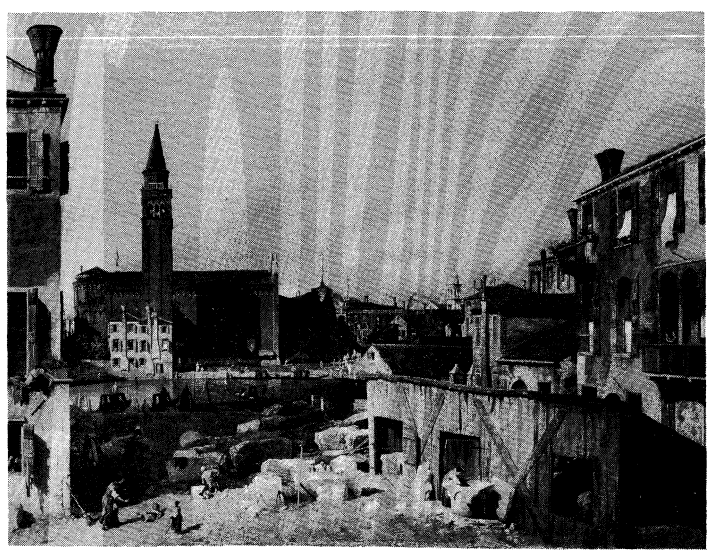
Canalejas (y Méndez), José (b. July 31, 1854, El Ferrol, Spain—d. Nov. 12, 1912, Madrid), Spanish statesman and leader of the democratic party who, as prime minister, forbade, by his anticlerical "Padlock Law," the establishment of new religious orders and introduced obligatory military service.

His election to the Cortes of 1881 for the district of Soria was the beginning of his political career. In the following years, Canalejas represented the districts of Agreda, Algeciras, and Alcoy and Madrid. He was undersecretary to the presidency (1883), minister of public works and of justice (1888), minister of finance (1894–95), and co-minister of agriculture, industry, and commerce (1902). He became prime minister after the fall of the government of Segismundo Moret (February 1910). Although he presided over liberal governments under the monarchy, Canalejas always showed democratic tendencies, leaning toward radicalism in some issues. In 1906 he began an anticlerical campaign when he discovered that secret negotiations had been conducted with the Vatican. The campaign culminated with his anticlerical legislation when he became chief of the government. In Morocco, after the French entry into Fès (1910), he ordered (1911) the occupation of Larache, Alcázar, and Arcila by Spanish troops, but in 1912 had to make an agreement that further reduced the Spanish Zone of Morocco. He presented a proposal for a law calling for a joint legislature for the four Catalan provinces with a small degree of autonomy, but he died before the law was passed. His strong measures against labour unrest and the displeasure he caused among the republicans were some of the factors that led to his assassination by the anarchist Manuel Pardiñas.

Canaletto, byname of GIOVANNI ANTONIO CANAL (b. Oct. 18, 1697, Venice—d. April 20, 1768, Venice), Italian topographical painter whose masterful expression of atmosphere in his detailed views (*vedute*) of Venice and London and English country homes influenced succeeding generations of landscape artists.

Canaletto was born into a noble family whose coat of arms he occasionally used as a signature. How he came to be known as Canaletto is uncertain, however; perhaps the name was first used to distinguish him from his father, Bernardo Canal, a theatrical scene painter in whose studio Canaletto assisted. Canaletto is recorded as working with his father and brother in Venice from 1716 to 1719 and in Rome in 1719–20, painting scenes for Alessandro Scarlatti operas. It was in Rome that Canaletto left theatrical painting for the topographical career that was to bring him international fame so quickly, although a close connection to his theatrical work remained in his choice of subject matter, his use of line and wash drawings, and his theatrical perspective.

When he returned to Venice, he began his contact with the foreign patrons who would continue as his chief support throughout his career. Four large paintings were completed for the Prince of Liechtenstein, in or before 1723, and in 1725–26 he finished a series of pictures for Stefano Conti, a merchant from Lucca. Dated memorandums accompanying the Conti pictures suggest how busy and yet how exacting the artist was at this time. Canaletto indicates that delays in the delivery of the pictures had been due to the pressure of other commissions and his own insistence on obtaining reliable pigments and on working from nature. In his pictures of the late 1720s, such as "The Stonemason's Yard" (National Gallery, London), he combined a freedom and subtlety of manner that he was rarely to



"The Stonemason's Yard," oil on canvas by Canaletto, *c.* 1730; in the National Gallery, London
By courtesy of the trustees of the National Gallery, London

achieve again with an unrivalled imaginative and dramatic interpretation of Venetian architecture. His understanding of sunlight and shadow, cloud effects, and the play of light on buildings support the contention in his memorandums that he was working out-of-doors, which was a most unusual procedure for painters of that time.

Throughout the 1730s Canaletto was deeply absorbed in meeting foreign demands for souvenir views of Venice. Such was the pressure upon him that he ultimately was forced to work largely from drawings and even from other artists' engravings, rather than from nature. He also developed the use of the *camera ottica,* a device by which a lens threw onto a ground-glass screen the image of a view, which could be used as a basis for a drawing or painting. Finally, he developed a mechanical technique, in which ruler and compasses played a part, and architecture and figures were put into the picture according to a dexterous and effective formula. Such a vast number of views of Venice were produced during his lifetime that it is often thought that Canaletto was head of a large studio, but there is no evidence of this.

Canaletto had no serious rivals. The painter Luca Carlevaris, who may have been his initial inspiration in choosing to produce topographical pictures for a largely foreign audience, had been driven from the field; Bernardo Bellotto, Canaletto's nephew, was not yet a mature painter; and Michele Marieschi was a follower rather than a competitor. Because of this lack of rivals, Canaletto became increasingly difficult to deal with. Owen Mac Swinney, an English operatic figure and patron of Canaletto, wrote as early as 1727,

> The fellow is whimsical and varys his prices, every day: and he that has a mind to have any of his work, must not seem to be too fond of it, for he'l be y^e^ worse treated for it, both in the price and the painting too.

The outbreak of the War of the Austrian Succession in 1740, which cut down sharply the number of visitors to Venice, seriously affected Canaletto's commissions. At this point, an early acquaintance, Joseph Smith—publisher, merchant, and later British consul in Venice—stepped into the breach. As standardized views of Venice dropped from demand, Smith seems to have encouraged Canaletto to expand his range of subjects to include Roman monuments and the area of Padua and the River Brenta. Pictures composed of more or less recognizable elements rearranged (*capriccio*) and pictures composed of almost completely imaginary architectural and scenic elements (*veduta ideata*) now began to play an increasingly important part in Canaletto's work. In 1741–44 Canaletto also made a series of 30 etchings, exceptionally skillful and sensitive, showing a command of perspective and luminosity.

Canaletto's international reputation served him well as the tourists became more scarce. In 1746 he went to England, where he was welcomed, and remained until 1755, despite an invitation to Dresden (now in East Germany) from the Elector of Saxony. He worked mainly in London, on English views. It is notable, when considering the works executed during this period, that Canaletto—an artist 50 years of age who had evolved various conventions based on Venetian experience—was dealing with an entirely different set of atmospheric conditions and different subject matter. Occasionally, by putting English material into a Venetian framework, he achieved a masterpiece, but for the most part he fell below his own standards, and his work was lifeless and mechanical.

On his return to Venice, however, his reputation had not diminished; and at last he received official recognition—election to the Venetian Academy in 1763 and, in the same year, appointment as prior of the Collegio dei Pittori. (W.G.C.)

MAJOR WORKS. Since Canaletto executed so many paintings of views of Venice and other real and imaginary scenes, the list given here is of representative works that may be seen in public collections.

Views of Venice. Piazza San Marco Looking East from South of the Central Line" (Fogg Art Museum, Harvard University); "Venice: Piazza S. Marco and the Colonnade of the Procurate Nuove" (National Gallery, London); "The Piazzetta Looking North West: The Fonteghetto della Farina" (*c.* 1735–40; Museum of Fine Arts, Boston); "Scene in Venice; The Piazzetta Entrance to the Grand Canal" (*c.* 1726–28; Metropolitan Museum of Art, New York City); "View in Venice" (National Gallery of Art, Washington, D.C.).

Views of England. "Greenwich Hospital from the North Bank of the Thames" (National Maritime Museum, Greenwich, London); "Old Somerset House from the River Thames" (Minneapolis Institute of Arts, Minneapolis, Minn.); "Old Walton Bridge" (1754; Dulwich College Picture Gallery, London).

Capricci and imaginary compositions. "Capriccio, a Tomb by the Lagoon" (Uffizi, Florence); "Capriccio, a Domed Circular Church" (Worcester Art Museum, Massachusetts).

BIBLIOGRAPHY. The most complete collections of Canaletto's paintings and drawings are held in the Royal Collections at Windsor and Buckingham Palace; see Michael Levy, *Canaletto Paintings in the Collection of Her Majesty the Queen* (1964); and K.T. Parker, *The Drawings of Antonio Canaletto in the Collection of His Majesty the King at Windsor Castle* (1948). Other works recommended include: W.G. Constable, *Canaletto,* 2 vol. (1962), the most comprehensive biography, with catalogue raisonné and full bibliography; F.J.B. Watson, *Canaletto,* 2nd ed. (1950), an authoritative brief account, with bibliography; Vittorio Moschini, *Canaletto* (1954; *Drawings by Canaletto,* 1963 and 1969), the best collection with many plates; and *Canaletto: Giovanni Antonio Canal, 1697–1768* (1964), an exhibition catalog from the Art Gallery of Toronto (with text by W.G. Constable)—the best introductory work for the general reader.

Canaletto THE YOUNGER, (1720–80) also called CANALETTO BELOTTO: *see* Bellotto, Bernardo.

Canali, Isabella: *see* Andreini, Isabella.

canapé, an hors d'oeuvre consisting of a small piece of bread, crouton, or cracker (British biscuit) with a savoury spread or topping and garnish. Canapés are commonly served with cocktails or as an appetizer. *See* hors d'oeuvre.

Cañar, province, central highland Ecuador, with an area of 1,213 sq mi (3,141 sq km). It is transversed by a segment of the higher Andean cordillera (mountains) and encompasses part of the Cuenca Basin to the east and of the Río Naranjal Valley to the northwest.

An important centre of the northern Inca Empire in precolonial times, Cañar has many ruins of Inca structures, the largest of which is the fortress-like Ingapirca. The higher mountain slopes are used for the pasture of sheep; subsistence crops including corn (maize), wheat, barley, potatoes, and fruit are grown around the provincial capital, Azogues (*q.v.*). In the deeply cut valley of the Río Naranjal are sugarcane and coffee plantations. The nation's largest known coal deposit is at Biblián, just north of Azogues, but exploitation has been limited. The southern spur of the Guayaquil–Quito railway and the Pan-American Highway cross the province from north to south.

National economic development programs (run by the National Irrigation Agency, Ten Year Development Plan Commission, the Andean Mission, and the Centre for Economic Reconversion) have been implemented in Cañar in an effort to better the living standard of the inhabitants. Pop. (1982 prelim.) 175,933.

Canarias, Islas (Atlantic Ocean): *see* Canary Islands.

Canaries Current (Atlantic Ocean): *see* Canary Current.

Canario (people): *see* Guanche and Canario.

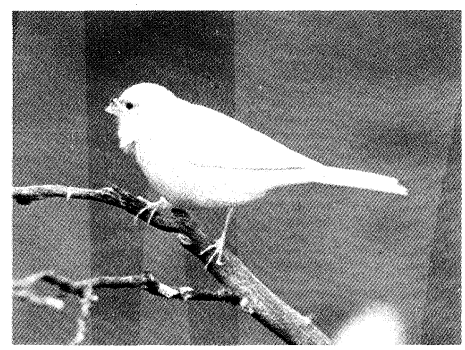
Canaris, Wilhelm (Franz) (b. Jan. 1, 1887, Aplerbeck, Westphalia—d. April 9, 1945, Flossenbürg concentration camp, Bavaria, Ger.), German admiral, head of military intelligence (Abwehr) under the Nazi regime and a key participant in the resistance of military officers to Hitler.

Having served in the navy during World War I, he was a member of the military tribunal that sentenced the murderers of the German Communist theoretician Rosa Luxemburg, and then he allegedly helped one of the condemned officers to escape.

Appointed head of the Abwehr (January 1935), he organized German aid to Gen. Francisco Franco during the Spanish Civil War. Believing that the Nazi regime would ultimately destroy traditional conservative values and that its foreign ambitions were dangerous to Germany, he enlisted some of the anti-Hitler conspirators into the Abwehr and shielded their activities. He was transferred to the economic staff of the armed forces (February 1944) after an investigation of the Abwehr by the Schutzstaffel (SS); he remained there until after the abortive assassination attempt against Hitler (July 20, 1944), when he was arrested and executed.

canary (*Serinus canaria*), popular cage bird of the family Carduelidae (order Passeriformes). It owes its coloration and sustained vocal powers to 400 years of selective breeding by man. Varieties called rollers trill almost continuously, the notes running together; choppers have a loud trill of distinct notes. Well-known breeds include Hartz Mountain, Norwich, and Yorkshire. The average life span of a caged canary is 10–15 years; some have survived for more than 20 years.

The canary is native to the Canary, Azores, and Madeira islands. The wild form is streak-backed and mostly greenish brown. Among other members of the genus are the serin (*q.v.*) of Europe and the brimstone canary, or bully seedeater (*S. sulphuratus*) of Africa, which is also kept as a pet. For information on the black-throated canary *see* seedeater. A classic account of canary breeding is contained in Gustav Eckstein's *Canary: the History of a Family* (1936). For wild canary in the U.S. *see* goldfinch; woodwarbler. For wild canary in Australia *see* warbler.



Canary (*Serinus canaria*)
Eric Hosking

canary creeper, also called CANARYBIRD FLOWER, CANARYBIRD VINE, OR CANARY NASTURTIUM (*Tropaeolum peregrinum*), annual climbing herb, of the family Tropaeolaceae, native to northwestern South America and introduced to other regions as a cultivated gar-

den plant. It grows to a height of 1.8–3 m (6–10 feet). The leaves are round and deeply five-lobed. The flowers, about 2.5 cm (1 inch)

Canary creeper (*Tropaeolum peregrinum*)
G.E. Hyde from The Natural History Photographic Agency—EB Inc.

across, are pale yellow and have a long, green spur.

Canary Current, also called CANARIES CURRENT, part of a clockwise-setting ocean-current system in the North Atlantic Ocean. It branches south from the North Atlantic Current and flows southwestward along the northwest coast of Africa as far south as Senegal before turning westward to eventually join the Atlantic North Equatorial Current. The cool temperature of the water is produced by upwelling caused by offshore winds from the continent. As the current flows around the Canary Islands, it helps to lessen the heating effect of the Sahara to the east. The thermal mixing creates excellent fishing grounds in the region.

Canary Islands, Spanish ISLAS CANARIAS, *comunidad autónoma* ("autonomous community") of Spain, comprising the Spanish provinces of Las Palmas and Santa Cruz de Tenerife and encompassing the insular councils of Gran Canaria, Fuerteventura, Lanzarote, Tenerife, La Palma, Gomera, and Hierro. The community was established by the statute of autonomy of Aug. 10, 1982.

A brief treatment of the Canary Islands follows. For full treatment, *see* MACROPAEDIA: Spain.

The original inhabitants of the Canaries were the Guanches (*see* Guanche and Canario), now extinct, a Berber people who were conquered by the Spanish in the 15th century. The Romans learned of the Canaries through Juba II, king of Mauritania, whose account of an expedition (*c.* 40 BC) to the islands was preserved by the writers Plutarch and Pliny the Elder. The latter mentions "Canaria, so called from the multitude of dogs (*canes*) of great size." In 999 the Arabs landed and traded on Gran Canaria. During the 13th and 14th centuries Genoese, Majorcan, Portuguese, and French navigators visited the islands. Juan de Béthencourt, who became king of the islands by order of Henry III of Castile in 1404, completed the conquest of Lanzarote, Fuerteventura, and Ferro, and in December 1406 he returned to Europe, leaving his nephew Maciot in charge. Between 1420 and 1479 a Portuguese force subdued Gomera. In 1479 the Treaty of Alcáçovas recognized Spanish sovereignty over the Canaries, and the conquest of the remaining islands was completed in 1496.

The Canary Islands formed a single Spanish metropolitan province until 1927, when rivalry between the two ports, Las Palmas de Gran Canaria and Santa Cruz de Tenerife (*qq.v.*), caused a division into two provinces. To Las Palmas province were allocated Gran Canaria, Fuerteventura, and Lanzarote, together with three inhabited islets (Alegranza, Graciosa, Lobos) and several uninhabited rocky islets. Santa Cruz de Tenerife province comprises the islands of Tenerife, La Palma, Gomera, and Ferro (Hierro). Each of the seven main islands of the archipelago has its own council (*cabildo insular*).

The Canary Islands lie 4° north of the Tropic of Cancer and have a subtropical climate. Temperatures are high and show little seasonal variation; annual precipitation, which is concentrated in November and December, is low, rarely exceeding 10 inches (250 mm), except on the windward northeastern sides of the islands, where it may reach 30 inches (750 mm).

The population of the group has more than quadrupled since 1900. Natural increase has accounted for most of the growth, with the result that the median age is well below the Spanish national average. The populations of Tenerife and Gran Canaria have grown rapidly relative to those of the other islands, which have shown little growth since 1960. Immigration from Spain is low and primarily involves merchants, bureaucrats, and military personnel. Only about one-third of the population is economically active, reflecting the large number of children in the population and the low participation of women in the work force. The rural population is dispersed in small villages. Villages in the hinterland antedate the Spanish conquest (1402–96), while those along the coast date from the colonial period. The prevalence of *minifundios,* or small landholdings, has hindered the mechanization of agriculture, though the formation of agricultural cooperatives in Tenerife and La Palma was expected to increase the use of tractors.

Bananas, the leading crop, are protected in the Spanish market against foreign competition. Tomatoes are grown between November and April for export. The cultivation of flowers and plants is a new industry. Cereals must be imported. Dry farming predominates in Fuerteventura and Lanzarote, while irrigation is widespread in Gran Canaria and Tenerife. *Heredades,* or associations of farmers, were instituted in 1503 to regulate irrigation. Camels were introduced by the Spaniards and continue to be used as draft animals.

Industries are small-scale outside Santa Cruz de Tenerife, whose oil refinery processes large quantities of crude petroleum. The Instituto Nacional de Indústria has encouraged investment in food-processing industries.

The service sector has benefited from the expansion of tourism, the peak season falling between December and March. Tourism centres on Tenerife and La Palma.

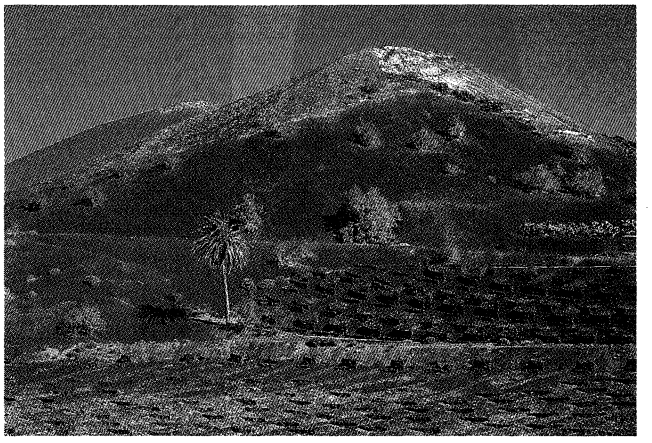
Castilian is spoken with a slight Andalusian accent, and certain archaic words peculiar to the archipelago show Portuguese influences. The malaguena (*malagueña*) is a popular dance of Andalusian origin. Las Palmas hosts a folkloric festival in late April. The traditional costume worn by men and women features a cloak of white wool. The cuisine centres on fish, which is served with potatoes and a piquant sauce known as *mojo picón. Gofio* is a flour made from wheat and corn (maize) or barley and accounts for more than half of the cereals consumed in the region. Pop. (1986 est.) 1,442,523.

Canasta, card game of the Rummy family and itself the progenitor of a large group of games including Samba, Bolivia, and others. The name *canasta,* from the Spanish word for "basket," probably derives from the tray placed in the centre of the table to hold undealt cards and discards.

Canasta originated in Uruguay in the late 1940s. By 1948 it was the most popular game in the fashionable clubs of Argentina, and in 1949 it was introduced in the United States and by the 1950s had become extremely popular. The "official" laws of the game were made first (1950) by the Regency Club of New York City and later (1951) revised by a committee of American and Argentine authorities. In Great Britain and on the European continent, Canasta had only moderate success. Throughout Latin America, Canasta remained the principal social card game long after its North American vogue had ended.

The most popular form of the game is played by four players in two partnerships, with partners facing each other across the table. A 108-card pack is used, two standard 52-card packs plus 4 jokers. All jokers and deuces are wild. Eleven cards are dealt to each player, the undealt portion of the pack is placed on the table as the stock, and the top card of the stock is turned up to start the discard pile. Each player in turn must draw, may meld, and must discard one card face up on the discard pile. The melds of partners are combined. A hand ends when a player goes out (melds his last card). The object of the game is to score points by making as many melds as possible.

Canastra Mountains, Portuguese SERRA DA CANASTRA, mountain range on the Planalto Central (Brazilian Highlands) in western Minas Gerais state. Extending 150 miles (240 km) from the Goías state border in the north to the upper Grande River in the south, the Canastra Mountains rise to an average elevation of 6,000 feet (1,800 m) and form the eastern border of the Triângulo Mineiro, a grassland region between the Paranaíba River and the Grande River. The mountains are the source of the São Francisco River and contain significant deposits of calcium, lead, iron, tho-



Field of volcanic ash prepared for planting wine grapes on the lower slopes of the nearby volcano, Lanzarote, Canary Islands
A.G.E. FotoStock

The National Library of Australia, Canberra, with a statue by Henry Moore in the foreground
Robin Smith Photography, New South Wales

rium, zinc, and diamonds. A federal highway extends from Brasília along the eastern slopes of the Canastra Mountains to Belo Horizonte, and a second, newer highway traverses the mountains east–west, connecting Uberaba in the west with Montes Claros.

Canaveral, Cape, seaward extension of a barrier island and city in Brevard County, east central Florida, U.S., separated from the mainland by the Indian and Banana rivers (lagoons). It is the site of operations for the U.S. space program under the National Aeronautics and Space Administration (NASA). Following the death of President John F. Kennedy in 1963, it was renamed Cape Kennedy, but it officially reverted to its original Spanish name, meaning "place of reeds, or cane," in 1973.

Until after World War II the cape was a stretch of barren, sandy scrubland. After 1950, when a German V-2 rocket was fired from the cape, complete facilities for the assembling and launching of ballistic and space vehicles were installed. The first U.S. manned flight into outer space occurred on May 5, 1961, when Alan B. Shepard, Jr., was launched from the installation in his Project Mercury capsule, and the first lunar-landing flight, manned by Neil Armstrong, Edwin Aldrin, and Michael Collins, was launched from the cape on July 16, 1969. Facilities for the complex operations have spilled over to man-made islands in the Banana River and to the John F. Kennedy Space Center on Merritt Island (connected by NASA Causeway). Nearby is Patrick Air Force Base.

Wildlife continue to inhabit the area, which is a national wildlife refuge. Canaveral National Seashore lies to the north. Cape Canaveral city (Port Canaveral) was incorporated in 1962. Pop. (1982 est.) city, 6,248.

Canberra, federal capital of the Commonwealth of Australia, in the northeastern section of the Australian Capital Territory, astride the Molonglo River, a tributary of the Murrumbidgee. A small squatters' settlement of stockmen called Canberry, or Canbury (a derivation of an Aboriginal term meaning "meeting place"), was made there as early as 1824. By 1836 the name had evolved to Canberra. Following the inauguration of the commonwealth in 1901, the site was chosen for the new capital in 1909, and the delineation of the Australian Capital Territory followed. A worldwide competition was launched in 1911 to find a design for a new federal capital, and the winning plan was submitted by the U.S. architect Walter Burley Griffin. Construction began in 1913 but was interrupted by World War I. On May 9, 1927, ceremonies marked the official transfer of the federal Parliament from Melbourne to the new capital.

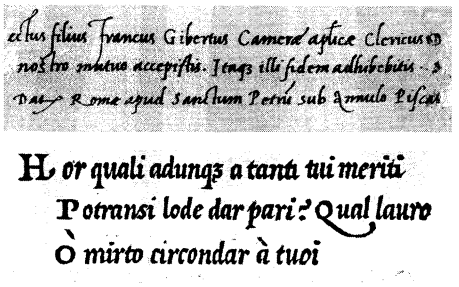
Canberra lies on a plain at the foot of 6,200-foot (1,900-metre) spurs of the Australian Alps, enjoying warm summers and cool winters and receiving considerably less rainfall than the surrounding highlands. The city is expanding. Only the centre and inner suburbs conform to the original plans, which included Lake Burley Griffin, an ornamental water axis formed in 1963 by a dam across the Molonglo River. Residential development lies mainly in satellite towns, including Weston Creek (1962), Belconnen (1966), and Tuggeranong (1975). Planning for this growth is controlled by the National Capital Development Commission and is administered by the Department of Territories.

There are light industries and a growing tourist trade. Notable features are the Australian National University (1936), Mount Stromlo Observatory (1924), the National Library of Australia (1968), the High Court of Australia (1981), the Australian National Gallery (1982), the Church of St. John the Baptist (1845), the Australian National War Memorial (1941), and a few colleges of technical and further education. Canberra is also the headquarters of the Commonwealth Scientific and Industrial Research Organization and the Australian Defence Force Academy. Pop. (1983 est.) 255,900.

cancan, lively and risqué dance of French or Algerian origin, usually performed by four women. Known for its high kicks in unison that exposed both the petticoat and the leg, the cancan was popular in Parisian dance halls in the 1830s and appeared in variety shows and revues in the 1840s. The cancan is in a lively $\frac{2}{4}$ time and was at first danced to quadrille or galop music. Specific cancans were composed by Jacques Offenbach and other composers after about 1840. Later, the dance appeared in such works as Franz Lehar's operetta *Die lustige Witwe* (1905; *The Merry Widow*) and Cole Porter's *Can-can* (1953).

Cancan, "Le Chahut," oil painting by Georges Seurat, 1889–90; in the Rijksmuseum Kröller-Müller, Otterlo, Neth.
By courtesy of the Rijksmuseum Kroller-Muller, Otterlo, Neth.

cancellaresca corsiva, also called CANCELLARESCA, LITTERA DA BREVI, OR CHANCERY CURSIVE, in calligraphy, script that in the 16th century became the vehicle of the New Learning throughout Christendom. It developed during the preceding century out of the *antica corsiva,* which had been perfected by the scribes of the papal chancery. As written by the calligrapher and printer Lodovico degli Arrighi of Vicenza in the early decades of the 16th century, the cancellaresca corsiva can range from eye-arresting contrasts of Gothic-like thick and thin strokes to a delicate, supple monotone tracery. Arrighi's ascending letters, rather than terminating in serifs as in earlier versions, wave plumelike to the right, offset by the leftward swing of the descenders. Lively yet disciplined, responsive to various cuts of nib and speeds of movement, the cancellaresca corsiva has been revived under the popular name italic in the 20th century for personal use.



Cancellaresca corsiva scripts:
(Top) Cancellaresca corsiva script from a letter from Cardinal Bembo, attributed to Ludovico degli Arrighi, 1516 (Chicago, Newberry Library, Wing MS. ZW); (bottom) variety of cancellaresca script by Giovanni Battista Palatino, from *Libro nuovo d'imparare a scrivere,* 1540
Courtesy of the Newberry Library, Chicago

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cancer, any of a group of more than 100 related diseases characterized by the uncontrolled multiplication of abnormal cells in the body. If this multiplication of cells occurs within a vital organ or tissue, normal function will be impaired or halted, with possible fatal results.

A brief discussion of cancer follows. For full discussion, *see* MACROPAEDIA: Cancer.

Cancer occurs in many different plants and animals but is most commonly studied in association with human beings. Cells and tissues are said to be cancerous when, for reasons not clearly understood, they grow more rapidly than normal, assume abnormal shapes and sizes, and cease functioning in a normal manner. The ultimate involvement of a vital organ by cancer, either primary or metastatic, may lead to the death of the patient. Cancer, in contrast to benign neoplasms (tumours), tends to spread, and the extent of its spread is usu-

ally related to an individual's chances of surviving the disease. Cancers are generally said to be in one of three stages of growth: early, or localized, when a tumour is still confined to the tissue of origin, or primary site (frequently curable); direct extension, where cancer cells from the tumour have invaded adjacent tissue or have spread only to regional lymph nodes (sometimes curable); or metastasis, in which cancer cells have migrated to distant parts of the body from the primary site, via the blood or lymph systems, and have established secondary sites of infection (often incurable). Cancer is said to be malignant because of its tendency to cause death if not treated. Benign tumours usually do not cause death, although they may if they interfere with a normal body function by virtue of their location or size.

In general, cancer cells divide at a higher rate than do normal cells, but the distinction between the growth of cancerous and normal tissues is not so much the rapidity of cell division in the former as it is the partial or complete loss of growth restraint in cancer cells and their failure to differentiate into a useful, limited tissue of the type that characterizes the functional equilibrium of growth of normal tissue.

Cancer may not be as autonomous as once believed. The lesions probably are influenced by the host's susceptibility and immunity. Certain cancers of the breast and prostate, for example, are considered dependent on specific hormones for their existence; other cancers are dependent on the presence of specific viruses.

Classification. There are two major types of cancer according to the simplest method of classification: carcinoma and sarcoma. Carcinomas occur in epithelial tissues, which cover the body (the skin) and line the inner cavitary structures of organs (such as the breast, the respiratory and gastrointestinal tracts, the endocrine glands, and the genitourinary system). Sarcomas develop in connective tissues, including fibrous tissues, adipose (fat) tissues, muscle, blood vessels, bone, and cartilage. Rarely, a cancer develops in both epithelial and connective tissue and is called a carcinosarcoma. Cancers of the blood-forming tissues (such as leukemias and lymphomas), tumours of nerve tissues (including the brain), and melanoma (a cancer of the pigmented skin cells) are classified separately.

Prefixes are generally added to the basic designations of carcinoma and sarcoma to indicate the tissue of origin. Thus a sarcoma originating in bone and tending to reproduce osseous tissue is called osteogenic sarcoma; other examples of the use of prefixes include liposarcoma (primary in fat), fibrosarcoma (primary in fibrous tissue), and synovial sarcoma (primary in the synovial linings of bursa and joint). The word primary indicates that the cancer originated in the tissue rather than was established as a secondary site through metastasis from another lesion. The prefix adeno- connotes the persistence of ductal or glandular elements in the epithelial tumour, as in thyroid adenocarcinoma, gastric adenocarcinoma, and uterine adenocarcinoma. Cancers of the pavement-cell epithelium of the skin and of certain mucous membranes, such as cancers of the tongue, lip, larynx, urinary bladder, uterine cervix, or penis, may be termed epidermoid or squamous-cell carcinomas.

Causation. It is known that cancer can be caused by a variety of factors acting singly or in concert, but the mechanism or groups of mechanisms remain unknown. It is well established that exposure to such chemicals as asbestos, polycyclic hydrocarbons, and several of the compounds contained in cigarette smoke can cause cancer. Ionizing radiation from such sources as X-rays, radioactive fallout, and ultraviolet light are also known to be carcinogenic. It is difficult to determine, however, what proportion of cancer is due to exposure to these agents, because the length of time between exposure and the appearance of cancer is usually prolonged. Some cancers are believed to be of viral origin. Burkitt's lymphoma, for example, develops after exposure to the rare Epstein–Barr virus; and women who develop infections of genital herpes, which is caused by a virus, seem to be more prone to cervical cancer. Research has demonstrated the presence of genes, called oncogenes, that are equivalent to those in viruses known to cause cancer. It seems that in normal cells these genes are "silent," or not expressed, but when they are expressed the cells become malignant.

Treatment. Current cancer treatment depends on drugs and hormones (chemotherapy), surgery, radiation therapy, or a combination of these. The earlier cancer is diagnosed and the sooner treatment can be implemented, the greater the chances of a successful cure. The poor success rates in treating lung, breast, and colorectal tumours are due mainly to lateness of diagnosis of many of these tumours.

All forms of treatment have disadvantages. Most chemotherapeutic drugs are designed to attack the genetic material—the DNA—of the tumour cells in an effort to stop them from multiplying and spreading the tumour. But these drugs are not specific and can also kill normal healthy cells. In radiation therapy, radiation directed at the cancer may destroy normal tissue in adjacent areas. Improvements in equipment and radiation sources, however, have been able to reduce this risk.

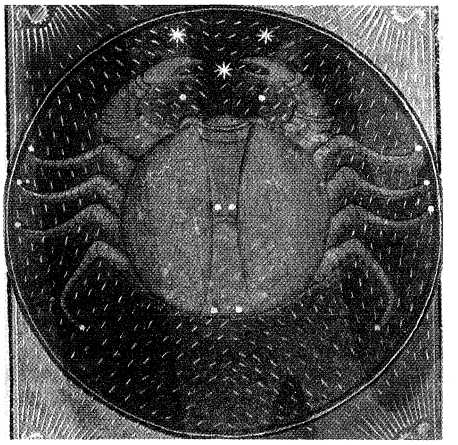
If the tumour is confined to a distinct area, such as a portion of the colon or lung, it may be possible to remove it surgically, but the malignant cells must be completely removed in order to reduce significantly the risk of developing metastases (secondary tumours) through the migration of cancer cells. Cancer of the breast, for example, tends to metastasize to the bones, while melanoma tends to spread to the lung. Once a tumour has metastasized to diffuse areas of the body, it is much more difficult to remove the secondary tumours surgically; they may be numerous and inaccessible, and chemotherapy may be the only option.

Some of the greatest successes in treating cancer have occurred with the rarer tumours. Platinum-based drugs are proving effective against cancers of the ovaries and testes, for instance. Drugs and radiotherapy have done much to prolong survival in those with cancer of the lymphoid tissue, where the body's defense cells are found. And transplantation of bone marrow cells is reducing the death toll from childhood leukemias. The success of this technique depends on matching the donor marrow cells to those of the recipient to prevent rejection and in knocking out the parts of the donor marrow that will attack their new host.

An estimated one in three persons in developed countries will get cancer at some point in his life. Until more effective treatment of the common tumours can be developed, success in overcoming cancer will depend on early diagnosis of the disease (by screening those at high risk) and avoidance of known environmental carcinogens such as cigarette smoke, some industrial chemicals, and possibly the rich, fatty, low-fibre foods of modern diets.

Cancer (Latin: Crab), in astronomy, zodiacal constellation lying between Leo and Gemini at about 8 hours 25 minutes right ascension (the coordinate of the celestial sphere analogous to longitude on the Earth) and 20° north declination (angular distance north of the celestial equator). It contains the well-known star cluster called Praesepe or the Beehive.

In astrology, Cancer is the fourth sign of the zodiac, considered as governing the period *c.* June 22–*c.* July 22. Its representation as a crab (or lobster or crayfish) is related to the



Cancer, illumination from a Book of Hours, Italian, *c.* 1475; in the Pierpont Morgan Library, New York City (MS. G.14)

By courtesy of the Pierpont Morgan Library, New York, the Glazier Collection

crab in Greek mythology that pinched Heracles while he was fighting the Lernaean hydra. Crushed by Heracles, the crab was rewarded by Heracles' enemy, Hera, by being placed in the heavens.

Cancer and Capricorn, Tropics of, latitudes approximately 23°27′ N and 23°27′ S of the terrestrial Equator, respectively. These latitudes correspond to the northernmost and southernmost declinations of the Sun's ecliptic (*q.v.*) to the celestial equator. At the summer solstice (in the Northern Hemisphere), around June 21, the Sun attains its greatest declination north and is directly over the Tropic of Cancer. At that time the Sun appears in the constellation Gemini, but in 2 BC, when the constellations were named, it lay in the constellation Cancer, thereby resulting in the designation Tropic of Cancer. Similarly, at the winter solstice (Northern Hemisphere), around December 21, the Sun is directly over the Tropic of Capricorn and lies within the boundaries of the constellation Sagittarius, having reached its southernmost declination in the ecliptic. About two millenia ago, however, it appeared in the constellation Capricorn at the winter solstice, and so the name Tropic of Capricorn. Because of the gradual change in the direction of the Earth's axis of rotation, the Sun will reappear in the constellations of Cancer and Capricorn in approximately 24,000 years.

Canchungo, formerly TEIXEIRA PINTO, town, Cacheu region, northwestern Guinea-Bissau, West Africa. The town lies between the Rio Chacheu and the Rio Mansôa in an area of coastal lowlands and is a major producer of oil-palm vegetable oil for export. It is also a market centre for rice and coconuts grown nearby. The town is connected by road to Bissau, the national capital. Pop. (1979) mun., 36,766.

cancioneiro (Portuguese: "songbook"), collection of Portuguese lyrics (*cantigas*) dating from the 12th century. The earliest examples of Portuguese-Galician poetry, composed from the 12th to the 14th century, were collected during the 14th and 15th centuries into three manuscript songbooks: the *Cancioneiro da Ajuda,* the *Cancioneiro da Vaticana,* and the *Cancioneiro de Colocci-Brancuti* (or *da Biblioteca Nacional de Lisboa*). The 2,000 poems in these books can be classified by content into three major categories: (1) the *cantigas de amigo,* laments of women for their lovers, dealing with sad partings, grief, and patient waiting and containing descriptions of

nature that are permeated with *saudade,* the melancholy tone characteristic of Portuguese poetry; (2) the *cantigas de amor,* in which the pining lover is a man; and (3) the *cantigas de escárnio e maldizer,* ribald satires on contemporary themes. There are also occasional religious songs extolling the miracles of the Virgin. The lyrics are attributed to some 200 poets, including the Portuguese king Dinis (died 1325) and his illegitimate son Alfonso Sanches.

The later *Cancioneiro Geral* (1516), compiled by Garcia de Resende, contains nearly 1,000 *cantigas* in Portuguese and Castilian. Dealing with love and satiric themes, the verses are more intricate and sophisticated than those in the earlier collections and show evidence of Spanish and Italian influence.

Although the early Portuguese *cantigas* now seem unoriginal in idea and conventional in metrical form and expression, the poems contain examples of the rare musical qualities characteristic of later Portuguese lyrics.

The Portuguese *cantigas* stimulated the development of Spanish lyrical poetry, collected into *cancioneros* (Spanish: "songbooks"). Outstanding among them are the *Cancionero de Baena* (1445), a collection of 583 poems made by Juan Alfonso Baena that shows the influence of the Portuguese lyric but is more intellectual, using symbol, allegory, and classical allusion in the treatment of themes of high moral, philosophical, or political intent; and the *Cancionero general* (1511), a collection of late medieval lyrics made by Hernando del Castillo.

cancrinite, rare feldspathoid mineral, a sodium and calcium carbonate–aluminosilicate that occurs as an alteration product of nepheline and feldspar in nepheline–syenite and related rocks. It also is found in metamorphic rocks and in contact zones between

Cancrinite with rhodochrosite (light areas) from Ontario

By courtesy of the Joseph and Helen Guetterman collection; photograph, John H. Gerard—EB Inc.

limestone and igneous intrusives. Famous localities are Alnö, Sweden; Fen district, Norway; Iivaara, Finland; and Iron Hill, Colo., United States. For chemical formula and detailed physical properties, *see* feldspathoid (table).

Cancún, resort city, Quintana Roo state, southeastern Mexico. Located just off the northeastern coast of the Yucatán Peninsula on an L-shaped island (12 mi [21 km] long by ¼ mi [400 m] across), the resort area of Cancún is linked by a causeway to Cancún city, essentially a service town, on the mainland. Cancún island and the coastal area occupied by Cancún city have abundant white sand beaches, palm groves, and coral reefs, with virtually no rainy season, as the jungles in southern Quintana Roo state draw off almost all the yearly rainfall. Originally settled by Maya Indians, the area was first described and named *Cancúne* (Mayan: Vessel at the End of the Rainbow) in 1843 by U.S. explorer John Lloyd Stephens and British explorer Frederick Catherwood in their classic work *Incidents of Travel in Yucatan* (1843). Cancún remained a small fishing-and-gathering settlement of about 100 Mayas until 1970. Then the area was selected, with the aid of a computer after a three-year study of conditions by the Mexican government in association with private interests, as a suitable site for an international holiday centre. Within a decade a steady flow of tourists from all parts of the world had established Cancún as a successful experiment in planning an entirely new city and resort area. Severe housing problems persisted, however, even within the service town, where about 30,000 workers live in rudimentary shacks. Cancún city is linked by highway with nearby Puerto Juarez to the north and with Puerto Morelos to the south. An international airport is located 12 mi south of the city on the mainland. Pop. (1982 est.) 50,000.

caṇḍāla, class of people in India generally considered to be outcastes and untouchables. According to the ancient law code, the *Manusmṛti,* the class originated from the union of a Brahmin (the highest class within the *varṇa,* or four-class system) woman and a Śūdra (the lowest class) man. The term is also used in modern times for a specific caste of agriculturalists, fishermen, and boatmen in Bengal, more usually referred to as Namaśūdra. Some scholars consider the origin of the Namaśūdra to be an aboriginal tribe from the Rājmahāl Hills in Bihār.

Candar DYNASTY, also called İSFENDİYAR, Turkmen dynasty (*c.* 1290–1461) that ruled in the Kastamonu-Sinop region of northern Anatolia.

The dynasty took its name from Şemseddin Yaman Candar, who served in the army of the Seljuq sultan Masʿūd II (ruled 1283–98) and was awarded the Eflani region, west of Kastamonu, in return for his services. Candar's son Süleyman captured Kastamonu and Sinop and in 1314 accepted the suzerainty of the Il-Khans (western branch of the Mongols), until the breakdown of Il-Khanid power at the death of its ruler, Abū Saʿīd, in 1335.

In *c.* 1380, as a result of dynastic struggles, the principality was divided into two branches: Kastamonu and Sinop. The Kastamonu branch, which had accepted Ottoman suzerainty, was annexed by Sultan Bayezid I in 1391, while the Sinop branch remained under Candar rule. In 1402 the entire territory was restored to Candar by Timur (Tamerlane), the Central Asian conqueror of the Ottomans. Dynastic rivalries again caused a division of the principality in 1417, with one branch falling once more under Ottoman influence. In 1461 the entire principality was annexed by the Ottoman sultan Mehmed II. Later members of the Candar dynasty served as governors of Ottoman provinces in Asia and in the Balkans.

Renowned for their patronage of men of letters, the Candar dynasty contributed to the development of Turkish as a literary language.

candela, SI unit of measurement, defined as the luminous intensity in the perpendicular direction of a surface of 1/600,000 of a square metre of a blackbody (a theoretically perfect absorber and emitter of radiation) at the temperature at which platinum solidifies (approximately 1,773° C; 3,223° F) under standard atmospheric pressure (101,325 newtons per square metre). The candela, abbreviated as cd, has replaced the standard candle or lamp as a unit of luminous intensity in calculations involving artificial lighting and is sometimes called the "new candle."

Candela (Outeriño), Felix (b. Jan. 27, 1910, Madrid), Spanish-born Mexican architect, designer of reinforced-concrete (ferroconcrete) structures distinguished by thin, curved shells that are extremely strong and unusually economical.

Candela emigrated to Mexico in 1939 and began to design and help construct buildings in that country. He attracted international attention in 1950 by designing (in collaboration with Jorge Gonzáles Reyna) the Cosmic Ray

Candela

Rollie McKenna

Pavilion, Ciudad Universitaria (the campus of the National Autonomous University of Mexico, Villa Obregón, near Mexico City). The thickness of the reinforced concrete roof of this pavilion varies from only ⅝ inch (1.6 centimetres) to 2 in. (5 cm). Subsequently, Candela built in Mexico City the churches of La Virgen Milagrosa (1954; the Virgin of the Miraculous Medal), with a warped roof of reinforced concrete 1½ in. (3.8 cm) thick, and San Vicente de Paul (1960). In addition to Rio's Warehouse, Mexico City (1955), and other warped-shell industrial buildings, he designed various thin-shell catenary, or barrel-vaulted, factories and warehouses. On several of his projects he acted as construction foreman.

His design was chosen for the Sports Palace used in the 1968 Olympic Games in Mexico City. Candela taught in the United States at Harvard University (1961–62) and at the University of Illinois, Chicago (1971–77).

candelabra tree: *see* Paraná pine.

candelabrum, plural CANDELABRA, in architecture, a decorative motif derived from the pedestal or shaft used to support a lamp or candle. The Romans, developing Hellenistic precedents, made candelabra of great decorative richness. Two Roman types are found. The simpler consists of a slender shaft, often fluted, supported on a spreading base of animals' feet and acanthus scrolls, and carrying a flat shelf with vaselike moldings. The multitude of such candelabra found in Pompeii proves them to have been a common form of household decoration. The more monumental type, made of marble or bronze and used in public buildings, had for the base a pedestal resembling a little altar, which carried a heavy shaft frequently decorated with row on row of acanthus leaves. The lavishness of such examples was imitated in works by Renaissance artists.

candelilla wax, hard, yellowish-tan to brown wax found as a coating on candelilla shrubs, *Euphorbia antisyphilitica* or *Euphorbia cerifera,* which grow wild in northern Mexico and Texas. Candelilla wax resembles carnauba wax but is less hard. Because it blends with other waxes and is less costly, candelilla wax is used chiefly as an extender in formulas containing carnauba, paraffin, and other waxes. It has been used in polishes, paints, inks, waterproofing, and carbon paper.

Candella (Indian history): *see* Chandelā.

Caṇḍī, also called CAṆḌIKĀ, demon-destroying form of the Hindu goddess Śakti, particularly popular in eastern India. She is known by various names, such as Mahāmāyā or Abhayā (Sanskrit: She Who is Without Fear), and appears to be a composite of folk beliefs with the higher traditions. Her representation is similar to that of Durgā, another form of Śakti. She is shown with either 8 or 10 arms, seated on a lion vehicle. Hundreds of folktales and songs tell of her exploits. She is the central figure of an extensive Middle Bengali literature known as *Caṇḍī-maṅgal*, the most famous of which is that of Mukundarāma Cakravartī (*c.* 16th century).

Candia (city, Crete): *see* Iráklion.

Candia, Sea of (Europe): *see* Crete, Sea of.

Caṇḍīdās (fl. late 14th to early 15th century, Bengal, India), poet whose love songs addressed to the washerwoman Rāmī were popular in the medieval period and were a source of inspiration to Vaiṣṇava and Sahajiyā religious movements that explored parallels between human and divine love.

The popularity of Caṇḍīdās' songs inspired much imitation, making it difficult to establish firmly the identity of the poet. Furthermore, the details of his life have been overlaid with legend. The poems themselves relate that the author was a Brahman and a village priest (in either the village Chhātna in Bānkura district or Nannur in Bīrbhūm district) who broke with tradition by openly declaring his love for the low-caste Rāmī. The lovers viewed their relationship as sacred, the closest possible analogy to the spiritual union of the divine lovers Rādhā and Krishna. Caṇḍīdās refused to relinquish either his temple duties or his love for Rāmī, much to the chagrin of his family. A feast to placate the village Brahmins was prepared but was thrown into confusion by the unexpected appearance of Rāmī.

What happened afterward is obscured by legend. One version relates that Caṇḍīdās assumed the form of Vishnu; another claims that he was dismissed as priest and fasted to death as a protest but came to life again on the funeral pyre. A third version (based on poems supposedly written by Rāmī) states that he was whipped to death while tied to the back of an elephant, on the orders of the Nawab of Gaur, for having attracted the attention of the Begum.

The poetry of Caṇḍīdās had a strong influence on later Bengali art, literature, and religious thought. In the *sahajiyā* (Sanskrit: "natural") movement of the 16th-century Sahajīya cult, religious experience was pursued through the senses, and the love of a man for the wife of another or for a woman of unsuitably low caste was praised above others for its intensity in the face of social disapproval.

candidiasis, also called MONILIASIS, infectious disease produced by the yeastlike fungus *Candida albicans* and closely related species. A common inhabitant of the mouth, vagina, and intestinal tract, *Candida* ordinarily causes no ill effects, except among infants and in persons debilitated by illness such as diabetes. There is evidence that prolonged treatment with broad-spectrum antibiotics, such as chloramphenicol and the tetracyclines, may predispose to the development of candidiasis, perhaps by killing off normal microbial antagonists to the fungus.

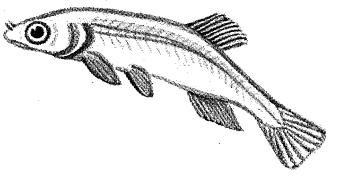
Candidiasis of the mucous membranes of the mouth or vagina is known as thrush and is a common fungus infection; it is usually localized and mild but may spread into a generalized cutaneous eruption. Oral thrush most often occurs in bottle-fed babies and in persons with terminal illness; vaginal infection is most common in diabetic or pregnant women.

Candidiasis of the skin is most likely to occur in the folds, especially in moist areas such as the armpits, between the buttocks, and in the navel. The folds between the fingers and around the nails are often affected in persons whose hands are frequently wet. *Perlèche* is a *Candida* infection occurring at the corners of the mouth.

Occasionally the fungus invades the respiratory system, producing a bronchopulmonary infection that simulates miliary tuberculosis. The infection rarely becomes systemic, but when it does so it may damage the lining of the heart or the meninges.

Candidiasis is extremely difficult to treat; iodide and gentian violet have endured as therapeutic agents, while nystatin, an antifungal antibiotic, has shown some efficacy.

candiru (*Vandellia cirrhosa*), scaleless, parasitic catfish of the family Trichomycteridae found in the Amazon River region. A translucent, eel-like fish about 2.5 centimetres (1 inch) long, the candiru feeds on blood and is commonly found in the gill cavities of other fishes. It is sometimes also parasitic to humans and has been known to enter the urethras of bathers and swimming animals. Once in the passage, it erects the short spines on its gill covers and may thereby cause inflammation, hemorrhage, and even death to the victim.



Candiru (*Vandellia cirrhosa*)
Painting by Karen Allan

Candish, Thomas (English navigator): *see* Cavendish, Thomas.

candle, light source now mostly used for decorative and ceremonial purposes, consisting of wax, tallow, or similar slow-burning material, commonly in cylindrical form but made in many fanciful designs, enclosing and saturating a fibrous wick.

Candles were among the earliest inventions of the ancient world, as shown by candlesticks from Egypt and Crete dating to at least 3000 BC. By the European Middle Ages tallow candles were in wide use: in a Paris tax list of 1292, 71 chandlers, or candlemakers, are named.

In the 19th century a French chemist, Michel-Eugène Chevreul, separated the fatty acid from the glycerin of fat to produce stearic acid, from which superior candles could be made. New processes for producing candle stock appeared in rapid succession. In addition to stearin, two other important sources were found: spermaceti, from the head cavity of the sperm whale, and paraffin wax, from petroleum. A composite of paraffin and stearic acid became the basic candle stock.

In use, heat from the flame liquefies the wax near the base of the wick. The liquid flows upward by capillary action, then is vaporized by the heat. The flame is the combustion of the wax vapour.

Candle-molding machinery, also developed in the 19th century, consists of rows of molds in a metal tank that is alternately heated and cooled. After the molds are cooled, the candles are ejected by pistons. Spools of wicking from the bottom of the machine are threaded through the pistons to pass through the candle mold. As the cooled candles are ejected, the wicks are cut.

The Standard or International Candle is a measurement of light source intensity. It was originally defined as a one-sixth-pound candle of sperm wax, burning at the rate of 120 grains per hour. This intensity of light was standardized in 1921 in terms of incandescent lamps, and candles are no longer used for reference.

Modern candles are produced in a wide variety of colours, shapes, and sizes. Beeswax and bayberry wax are occasionally employed as additives, and some candles are scented. Candlemaking has become a popular hobby.

candlefish, also called EULACHON, species of smelt (*q.v.*).

Candlemas, also called PRESENTATION OF THE LORD, or PRESENTATION OF CHRIST IN THE TEMPLE, or HYPAPANTE, in the Christian Church, festival on February 2, commemorating the occasion when the Virgin Mary, in obedience to Jewish law, went to the Temple in Jerusalem both to be purified 40 days after the birth of her son and to present Jesus to God as her firstborn (Luke 2:22–38). The festival was formerly known in the Roman Catholic Church as the Purification of the Blessed Virgin Mary and is now known as the Presentation of the Lord. In the Anglican Church it is called the Presentation of Christ in the Temple. In the Greek Church it is called Hypapante (Meeting), in reference to Jesus' meeting in the Temple with the aged Simeon.

The earliest reference to the festival is from Jerusalem, where in the late 4th century the Western pilgrim Etheria attended its celebration on February 14, 40 days after Epiphany (then celebrated as Christ's birthday), and wrote of it in the *Peregrinatio Etheriae.* It soon spread to other Eastern cities, and in 542 Justinian I decreed that its date should be moved back to February 2 (40 days after Christmas). By the middle of the 5th century the custom of observing the festival with lighted candles had been introduced, and the name Candlemas developed from this custom. In the Western Church, Pope Sergius I (687–701) instituted the festival in Rome. In the East it is primarily a festival of Christ; in the West it was primarily a celebration of the Virgin Mary until the calendar reform of 1969.

candlepins, bowling game played on a standard tenpin lane with slender, cylindrical pins about 15 inches (38 centimetres) tall and tapered at both ends. The ball is 4.5 inches in diameter and 2 pounds 7 ounces (1.1 kilograms) in weight. Three balls are bowled in a frame (box), as in duckpins, but pins knocked down (deadwood) are not removed until the frame is completed. Scoring is roughly the same as in duckpins (*q.v.*).

Candler, Asa Griggs (b. Dec. 30, 1851, near Villa Rica, Ga., U.S.—d. March 12, 1929, Atlanta), U.S. soft-drink manufacturer who developed Coca-Cola.

Born on a farm, Candler studied medicine, became a pharmacist, and developed a prosperous wholesale drug business. In 1887 he

Candler
By courtesy of Emory University, Atlanta

purchased the formula for Coca-Cola, then not particularly well-known, from a business associate. He improved the manufacturing process and built Coca-Cola into one of the most prosperous of U.S. businesses. Under Candler the firm was most successful in the South. He sold the business in 1919 for $25,000,000. Candler also devoted his energy to philanthropy. With his financial aid, Emory College, located near Atlanta, moved into the city and expanded to become Emory University. His gift of nearly $2,000,000 made possible the construction of a teaching hospital adjacent to the university's medical school.

candlestand, stand to hold a candlestick, often composed of a column rising from tripod legs and supporting a circular or polygonal tray. Stands of this type evolved from medieval metal standards. Seventeenth-century English candlestands were of oak or walnut, 3 to 5 feet (90 to 150 centimetres) tall, with twist and baluster turnings and scroll feet.

In the 18th century carved candlestands with cabriole legs were common, some of the finest being gilded. In the closing years of the century Rococo and chinoiserie designs gave way to the more severe Neoclassical style.

candling, egg-grading process in which the egg is inspected before a penetrating light in a darkened room for signs of fertility, defects, or freshness. First used to check embryo development in eggs being incubated, candling is used in modern commercial egg production primarily to rate quality.

Because the air cell at the wide end of the egg shrinks with age, its size is a good indicator of freshness. The shadow cast on the shell by the yolk also shows the age; since an older egg has thinner albumin, its yolk rests closer to the shell, casting a sharper shadow. The trained candler can also tell the size, shape and color of the yolk and detect the presence of blood clots.

Candolle, Alphonse(-Louis-Pierre) Pyrame de (b. Oct. 27/28, 1806, Paris—d. April 4, 1893, Geneva), Swiss botanist who introduced new methods of investigation and analysis to phytogeography, a branch of biology that deals with the geographic distribution of plants.

Candolle succeeded his father, the eminent botanist Augustin Pyrame de Candolle, to the chair of botany and as the director of the botanical gardens at the University of Geneva (1842–93). Candolle edited the last 10 volumes of the *Prodromus Systematis Naturalis Regni Vegetablis* (17 vol., 1824–73), his father's massive attempt to classify and describe all known species of seed plants. He brought his father's laws of nomenclature to completion with *Lois de la nomenclature botanique* (1867). In 1867 Candolle called the first International Botanical Congress in Paris, which made a systematic attempt to standardize and decide nomenclatural practices in botany. Although Candolle's laws were adopted by the congress, they were not applied seriously by the botanists.

Candolle and his son, Anne-Casimir de Candolle (1836–1918), edited a series of monographs dealing with seed plants, *Monographiae Phanerogamarum*, 7 vol. (1879–91). Best known for his contributions to the study of the geographical distribution of plants, Alphonse wrote *Géographie botanique raisonée*, 2 vol. (1855), still a key work of phytogeography. In *Origine des plantes cultivées* (1883) Candolle sought to establish centres of plant origins by using historical, linguistic, and archaeological, as well as botanical, data.

Candolle, Augustin Pyrame de (b. Feb. 4, 1778, Geneva—d. Sept. 9, 1841, Geneva), Swiss botanist who established scientific structural criteria for determining natural relations among plant genera. After Charles Darwin's introduction of the principles of organic evolution, Candolle's criteria provided the empirical foundation for a modern evolutionary history of plants. His system of plant classification found nearly universal application for half a century, during which time it served as a model for other systems.

Candolle, engraving by Ambroise Tardieu
By courtesy of the Museum National d'Histoire Naturelle, Paris

After his arrival in Paris (1796), Candolle struck up a friendship with the French naturalists Georges Cuvier and Jean-Baptiste de Lamarck, became an assistant to Cuvier at the Collège de France (1802), and prepared revisions of Lamarck's *Flore française* (1805, 1815). When he was appointed professor of botany at the University of Montpellier (1808), Candolle had already begun a government-commissioned botanical and agricultural survey of France (1806–12), the results of which he published in 1813.

Also in 1813 Candolle published his most important work, *Théorie élémentaire de la botanique,* in which he contended that plant anatomy, not physiology, must be the sole basis of classification, for which he coined the term taxonomy. After introducing the concept of homologous parts (of common ancestry, although different in structure) for plants as Cuvier had done for animals—particularly convincing evidence in favour of organic evolution—Candolle, like Cuvier, nonetheless retained a firm belief in the constancy of species.

Accepting the natural history chair at the Université de Genève (1817–41), where he was the first director of the botanical gardens, Candolle undertook the detailed development of ideas presented in the *Théorie,* first outlining systematic laws of botanical nomenclature in his *Regni Vegetabilis Systema Naturale* (2 vol., 1818–21; "Natural Classification for the Plant Kingdom"). He next undertook the most ambitious task of preparing a descriptive classification of all known seed plants, *Prodromus Systematis Naturalis Regni Vegetabilis* (17 vol., 1824–73), for which he prepared the first seven volumes.

Although his taxonomy suffered from a failure to observe his own criteria in formulating broad taxa, resulting in his inclusion of gymnosperms with dicotyledons, ferns with monocotyledons, and all else as acotyledons, Candolle achieved extensive subdivision of flowering plants, describing 161 families of dicotyledons, and demonstrated decisively the inadequacy of Linnaean classification, which his system supplanted. He also pioneered the study of phytogeography, the biogeography of plants, by carrying out investigations in Brazil (1827), East India (1829), and North China (1834).

candomblé, local name in Bahia for the Brazilian macumba (*q.v.*) cult.

Candra Gupta, also spelled CANDRAGUPTA, CHANDRA GUPTA, or CHANDRAGUPTA, name of Indian rulers of Magadha, grouped below chronologically and indicated by the symbol •.

• **Candra Gupta,** also called MAURYA (reigned *c.* 321–*c.* 297 BC), founder of the Maurya dynasty and the first emperor to unify most of India under one administration. Credited with saving the country from maladministration and freeing it from foreign domination, he fasted to death in sorrow for his famine-stricken people.

Candra Gupta was born into a family left destitute by the death of his father, chief of the migrant Mauryas, in a border fray. His maternal uncles left him with a cowherd who brought him up as his own son. Later, he was sold to a hunter to tend cattle. Purchased by a Brahman politician, Cāṇakya (also called Kauṭilya), he was taken to Taxila (now in Pakistan), where he received an education in military tactics and the aesthetic arts. Tradition states that while he slept, following a meeting with Alexander the Great, a lion began licking his body, gently waking him and prompting in him hopes of royal dignity. With Cāṇakya advising, he collected mercenary soldiers, secured public support, and ended the autocracy of the Nanda dynasty in a bloody battle against forces led by their commander in chief, Bhaddasala.

Ascending the throne of the Magadha kingdom, in modern Bihār, in about 325 BC, Candra Gupta destroyed the sources of Nanda power and eliminated opponents through well-planned administrative schemes that included an effective secret service. When Alexander died in 323, his last two representatives in India returned home, leaving Candra Gupta to win the Punjab *c.* 322. The following year, as emperor of Magadha and ruler of the Punjab, he began the Maurya dynasty. Expanding his empire to the borders of Persia, he *c.* 305 defeated an invasion by Seleucus I Nicator, a Greek contender for control of Alexander's Asian empire. Candra Gupta then extended his empire beyond the barriers of the Vindhya Range to the south, subduing the whole of India with an army of 600,000 men.

Ranging from the Himalaya Mountains and the Kābul valley (in modern Afghanistan) to the southern tip of India, Candra Gupta's Indian Empire was one of history's most extensive. Its continuation for at least two generations is attributable in part to his establishment of an excellent administration patterned after that of the Persian Achaemenid dynasty (559–330 BC) and after Cāṇakya's text on politics, *Arthaśāstra.*

Traditionally, Candra Gupta was influenced to accept Jainism by the sage Bhadrabāhu, who predicted the onset of a 12-year famine. When the famine came, Candra Gupta made efforts to counter it, but, dejected by the tragic conditions prevailing, left to spend his last days in the service of Bhadrabāhu at Śravaṇa Belgoḷa, a famous religious site in southwest India, where Candra Gupta fasted to death.

• **Candra Gupta I** (reigned 320–c. 330), Indian king, founder of the imperial dynasty of the Guptas.

The grandson of Sri Gupta, the first known ruler of the Gupta line, Candra Gupta I, whose early life is unknown, became a local chief in the kingdom of Magadha (parts of modern Bihār). He increased his power and territory by marrying, about 308, Princess Kumāradevī of the Licchavi tribe, then controlling north Bihār and perhaps Nepal. Toward the close of the 3rd century AD, India consisted of a number of independent states, both monarchical and nonmonarchical; it is highly probable that the Guptas and Licchavis ruled over adjoining principalities. Their union by marriage enhanced the power and prestige of the new kingdom. Special gold coins depicted the King and Queen on one side and the Licchavis on the other. The chronology of the Gupta

era, dating from AD 320 and used in India for several centuries, is believed to be based on the date either of his coronation or of his marriage. By the conclusion of his reign, his kingdom probably extended west to the present city of Allahābād and included Ayodhyā and south Bihār. These regions were assigned to him by the *Purāṇa*s (ancient chronicles of early Sanskrit literature). His dominions must have been sufficiently large to justify his assumption of the imperial title *mahārājādhirāja*—"king of kings"—and to enable his son Samudra Gupta to begin the conquest that led to the founding of the Gupta Empire.

The suggestion that Candra Gupta I conquered the Scythians is probably without foundation. Nor is it likely that he overcame the Licchavis by killing their king or that he was murdered by his heir. The tradition generally accepted is that the King held an assembly of councillors and royal family members at which Prince Samudra Gupta was formally nominated to succeed his abdicating father.

Consult the INDEX *first*

Candra Gupta II, also called VIKRAMĀDITYA (reigned *c.* 380–*c.* 415), powerful emperor of northern India, son of Samudra Gupta and grandson of Candra Gupta I. During his reign, art, architecture, and sculpture flourished, and the cultural development of ancient India reached its climax.

According to tradition, Candra Gupta II achieved power by assassinating a weak elder brother. Inheriting a large empire, he continued the policy of his father Samudra Gupta by extending control over neighbouring territories, whether by military or peaceful means. From 388 to 409 he subjugated Gujarāt, the region north of Bombay, Saurāṣṭra (now Saurāshtra), in western India, and Mālwa, with its capital at Ujjain. These territories were ruled by Śaka chiefs, whose ancestors were Scythian tribes from the regions around Lake Balkhash (in Kazakh Soviet Socialist Republic). To strengthen his southern flank he arranged a marriage between his daughter Prabhāvatī and Rudrasena II, king of the Vākāṭakas. When Rudrasena died, Prabhāvatī acted as regent for her sons, thereby increasing Gupta influence in the south. The Emperor may also have made a matrimonial alliance with a dynasty in Mysore. He is almost certainly the King Candra eulogized in the Sanskrit inscription on the iron pillar in the Qūwat-ul-Islām mosque in Delhi.

A strong and vigorous ruler, Candra Gupta II was well qualified to govern an extensive empire. Some of his silver coins bear the title Vikramāditya (Sun of Valour), which suggests that he was the prototype of the king Vikramāditya of later Hindu tradition. Although the Emperor generally resided at Ayodhyā, which he made his capital, the city of Pāṭaliputra (now Patna in Bihār) also achieved prosperity and grandeur. A benevolent king under whom India enjoyed peace and relative prosperity, he also patronized learning; among the scholars at his court were the astronomer Varāhamihira and the Sanskrit poet and dramatist Kālidāsa. The Chinese Buddhist pilgrim Fahsien, who spent six years (405–411) in India during his reign, spoke highly of the system of government, the means for dispensing charity and medicine (the Emperor maintained free rest houses and hospitals), and the goodwill of the people. But he never visited the Emperor or his court. Candra Gupta II was a devout Hindu, but he also tolerated the Buddhist and Jain religions.

Candradeva (Jaina author): *see* Hemacandra.

Candrakīrti (fl. *c.* AD 600–650), principal representative of the Prāsaṅgika school of Buddhist logic. Candrakīrti wrote the famous commentary the *Prasannapadā* ("The Clear Worded") on the thought of the Buddhist sage Nāgārjuna. Although there were several earlier commentaries explaining Nāgārjuna, Candrakīrti's became the most authoritative; it is the only one that has been preserved in its original Sanskrit (other commentaries are available only in Tibetan translation).

candy, also called CONFECTION, sweet food product. In the United States, the word candy refers to both sugar- and cocoa-based confections and is differentiated from sweetened baked goods; elsewhere the terms sugar confectionery, chocolate confectionery, and flour confectionery (meaning goods such as cakes and pastries) are used.

A brief article on confectionery and candy products follows. For full treatment, *see* MACROPAEDIA: Food Processing.

Written and pictorial records of candy were left by the Egyptians, and from these it is learned that early candymakers used honey as a sweetener, sugar being unknown, and added figs, dates, nuts, and spices. There is little reference to the manufacturing of candy until about the middle of the 14th century, when sugar shipped into Venice was used for making confections. It was not until the cultivation of sugarcane spread throughout the world and the refining of sugar was developed that the confectionery industry began to grow. Prior to this time, a confection was an item sold or dispensed only by pharmacists and spice stores. By the 16th century, confectioners were making many kinds of sweetmeats and candy by molding sugar, nuts, and fruits of various kinds into fanciful forms. Only hand methods were employed, and the few utensils and appliances used were primitive and crude. They were used principally in cooking or boiling the sugar and molding or shaping the candies. In the late 18th century the first candy-manufacturing machinery was developed; by the late 20th century annual worldwide production totaled millions of pounds.

More than 70 agricultural products are used in making candy; they include sugar, corn (maize) products, chocolate, eggs, fruits, nuts, butter, milk, and cream. The main ingredients used for manufacturing candy are cane and beet sugars combined with other carbohydrate foods such as corn syrup, cornstarch, honey, molasses, and maple sugar. To the sweet base are added chocolate, fruits, nuts and peanuts, eggs, milk products, flavours, and colours. In food value, candy is a concentrated source of food energy; milk, fruits, and nuts, when used, supply additional nutritive value.

The more than 2,000 types of candy are generally divided into the categories of high-boiled, or hard, candy; caramels and toffee; nougats; fondants; jellies; marshmallows; pastes, such as marzipan; gums and pastilles; coated, or "panned," sweets, also called dragées; truffles; flavoured popcorn; cotton candy; licorice; and chewing gum.

candytuft, any of 30 species of Eurasian plants of the genus *Iberis*, of the mustard family (Brassicaceae). Most species are native to the Mediterranean region. Globe candytuft (*I. umbellata*), widely grown garden annual native to southern Europe, bears flat clusters of pink, violet, white, purple, or red flowers in late summer. The plants are 40 centimetres (16 inches) tall and have long, narrow leaves and roundish seedpods. Rocket candytuft (*I. amara*) has thick, deeply lobed leaves and large, white, often pink-tinged, fragrant flowers on 22-cm stalks. It grows on chalky hills and in fields. Two matting, evergreen perennials with white flowers are *I. saxatilis* and the larger edging candytuft (*I. sempervirens*),

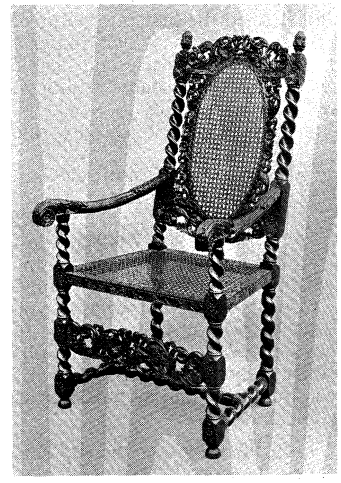
Candytuft (*Iberis umbellata*)
G.E. Hyde—EB Inc.

both from open areas in southern Europe and widely planted in gardens.

Cane (ancient Arabia): *see* Ḥiṣn al-Ghurāb.

cane fencing (French *canne*), the art of defending oneself with a walking stick, developed in France by the 16th century but little practiced after the beginning of the 20th. In cane fencing, unlike singlestick, the thrust was as important as the cut and thus cane fencing approached sabre fencing. The cuts were usually given after one or more rapid preliminary flourishes, or *moulinets* (French: "twirls"), which served to confuse an assailant. The thrusts were similar to those in foil fencing but often carried out with both hands grasping the stick, giving greater force and enabling the cane to be used at very close quarters. French canes were made of tough wood, about three feet (one metre) long, without a handguard, and tapered toward the point. In practice matches, masks, gloves, padded vests, and shin guards were worn.

cane furniture, furniture in which a mesh of split canes is stretched over parts of the framework, principally on the backs and seats of chairs. It was made in India as early as the 2nd century AD and was also known in China. Cane was imported into Europe by the East India Company, and cane furniture became fashionable in England and the Netherlands toward the end of the 17th century. It is particularly associated with the high-backed chairs with ornately carved front stretchers made at the time of the English Restoration. In France canework was popular for less opulent furni-



Restoration period carved armchair with cane back and seat, English, *c.* 1680; in the Metropolitan Museum of Art, New York City
By courtesy of the Metropolitan Museum of Art, New York City, Fletcher Fund, 1923

ture during the Régence and was still used in the Louis XV period. It gradually returned to favour in early 19th-century England with the use of furniture in the Chinese taste.

Thomas Sheraton suggested in *The Cabinet Dictionary* (1803) that cane should be used for bed ends and "any thing where lightness, elasticity, cleanness, and durability, ought to be combined." Cane furniture based on English styles was introduced into Germany, Spain, and the American colonies; the council chamber in Williamsburg, Va., for example, was furnished with cane chairs early in the 18th century. Canework has never entirely gone out of fashion and is still used.

cane rat (*Thryonomys*), any of six species of large African rodents of the family Thryonomyidae (order Rodentia). Cane rats are heavyset and short tailed, with small ears and coarse, bristly, speckled brown fur. They are 35 to 60 centimetres (14 to 24 inches) long, excluding the tail. Cane rats are edible and are valued as food. They are found over much of sub-Saharan Africa, generally near water, and are such good swimmers that they often head for water when pursued. They shelter in dense vegetation or in burrows and feed on roots, grass, and other plants. They also damage sug-

Cane rat (*Thryonomys swinderianus*)
Painting by H. Douglas Pratt

arcane. Cane rats tend to be solitary. Females bear litters of two to four young that are well haired and open-eyed at birth.

Canea (city, Crete): *see* Khaniá.

Canelo, South American Indian people that traditionally lived along the upper Pastaza, Napo, and Bobonaza rivers on the eastern slopes of the Ecuadorian Andes. The original language and culture of the Canelo are poorly documented, because the Canelo were among the first Amazonian Indians to embrace Christianity. When they were first settled in a Dominican mission in 1581, the Canelo gave up their native language for Quechua, the Indian language familiar to the missionaries, and dropped many of their old ways in favour of the customs of the Spanish.

Traditionally, the Canelo were slash-and-burn farmers who grew sweet cassava, corn (maize), and beans; in post-Columbian times, they began growing bananas and plantains for their own consumption and cultivated bitter cassava, which they processed into farinha and traded with the Spanish. The Canelo fished with spears, harpoons, and fishnets made of cotton and palm fibre; and they hunted birds, monkeys, and small mammals with blowguns, spears, nets, traps, and poison.

In the 20th century, a few Canelo continue to live in and near Christian missions and in scattered villages, but the majority of the Canelo have disappeared into the mestizo farming population of the Andes.

Canelones, department, southern Uruguay, bounded in the south by the Río de la Plata. Its truck gardens, dairy and poultry farms, vineyards, and cattle butchers supply products to the nearby Montevideo market and provide a flourishing economy for the territory of 1,751 sq mi (4,536 sq km). The Rubino Institute is a veterinary research centre in Canelones department. Beach resorts at Atlántida and La Floresta, part of Canelones' 40-mi (64-km) coastline, and the racetrack at Las Piedras attract visitors from Montevideo. Proximity to the capital also has raised land values and encouraged land subdivision, with loss of soil fertility an indirect result. Coastal wildlife includes flamingos, cranes, and white herons. The departmental capital is Canelones (*q.v.*). Pop. (1975) 325,594.

Canelones, formerly GUADELUPE, capital, Canelones department, southern Uruguay. The settlement was founded at a nearby site in 1774 and moved to its present location in 1783. In addition to its administrative functions, Canelones is a commercial and manufacturing centre for the agricultural and pastoral hinterlands, which yield grains, grapes, sugar beets, cattle, and sheep. Flour and paper mills are among the city's industries. There is a wine-processing school in Canelones. A highway and railroad lead to Montevideo. Pop. (1975 prelim.) 15,938.

Canendiyú, department, eastern Paraguay, bounded on the north by Brazil and the Amambay and Mbaracayú mountains, on the east by Brazil and the Paraná River, and by the departments of Caaguazu on the south, San Pedro on the west, and Amambay on the northwest. The department has an area of 5,663 sq mi (14,667 sq km) and physiographically consists of two regions. The eastern part is relatively higher in elevation and covered by grasses or impenetrable hardwood forests. The grasslands become prairies in the western part of the department and are used for grazing cattle. The economy relies on the extraction of Yerba maté (Paraguayan tea) and the export of hardwoods used in cabinetmaking and building construction. The major agricultural products are soybeans, mint, cotton, coffee, tobacco, rice, and wheat. Salto del Guairá, on the Paraná River near the Guairá Falls, is the departmental capital and largest town. At Curuguaty is the former residence of Uruguayan national hero, José Gervasio Artigas, who in 1820 escaped political enemies by fleeing to Paraguay after freeing his homeland from the rule of Argentina and Brazil. Pop. (1982 prelim.) 66,670.

Canepanova, Pietro: *see* John XIV *under* John (papacy and antipapacy).

Canetti, Elias (b. July 25, 1905, Rustschuk, Bulg.), novelist and playwright whose works explore the emotions of crowds and the position of the individual at odds with the society around him. He was awarded the Nobel Prize for Literature in 1981.

Canetti was descended from Spanish Sephardic Jews. He wrote in German, his third language, his first two being Spanish and English. He learned the latter when his parents settled in England. After his father's death in 1913, he moved with his mother to Vienna. He was educated in Zürich, Frankfurt, and Vienna, receiving a doctorate in chemistry at the University of Vienna in 1929.

Canetti's interest in crowds crystallized from the witnessing of street rioting over inflation that he saw in Frankfurt in the 1920s, which culminated in 1927 with the burning of the Vienna Palace of Justice by an angry mob. A planned eight-novel saga of the madness he saw around him was reduced to *Die Blendung* (1935; *Auto-da-Fé*, 1946, U.S. title, *Tower of Babel*, 1947, republished as *Auto-da-Fé* in the U.S., 1964). It tells the horrifying story of the destruction of a scholar's life in the grotesque underworld of a city. Shortly before World War II, Canetti emigrated to England and put aside literature to devote his time to research on the psychopathology of power. *Masse und Macht* (1960; *Crowds and Power*, 1962) is an outgrowth of that compelling interest, which is also evident in Canetti's three plays, *Hochzeit* (1932; "The Wedding"), *Komödie der Eitelkeit* (1950; "Comedy of Vanity"), and *Die Befristeten* (1964; "The Numbered"). The first two were first performed in Braunschweig, W.Ger., in 1965 and the third in Oxford in 1956. They were published as *Dramen* in 1964. He has also published from his notebooks *Aufzeichnungen 1942–1972* (1978); *Der Ohrenzeuge—Fünfzig Charaktere* (1974; *Ear Witness: Fifty Characters,* 1979), a book of character sketches; and two volumes of his autobiography, *Die gerettete Zunge* (1977; *The Tongue Set Free,* 1979) and *Die Fackel im Ohr* (1980; "The Torch in the Ear").

Caney Fork River, river formed by the confluence of the Collins and Rocky rivers in central Tennessee, U.S. It flows for 144 mi (232 km) in a northwesterly direction to the Cumberland River, near Carthage, in Smith County. On the river are two dams: Center Hill Dam (completed in 1951), impounding Center Hill Reservoir; and the Great Falls Dam (1925), creating Great Falls Reservoir, part of the Tennessee Valley Authority.

Caṅgadeva (Jaina author): *see* Hemacandra.

Cangas de Narcea, also called CANGAS DE TINEO, city, Oviedo province (autonomous community [region] of Asturias), northwestern Spain; it lies southwest of Oviedo city at the confluence of the Narcea and Luiña rivers. The name combines *cangas* (meaning "town") with the Narcea, which is spanned by a Roman bridge. Notable buildings in the city include the monastery of San Juan de Corias, called the Escorial of the Asturias (dating from the 13th century and rebuilt in the 18th), and the Collegiate Church of Santa María Magdalena (1639), containing the tomb of its founder, Archbishop Valdés Llano. Mining of coal and lead, which are trucked to the port of San Esteban and the rail station of Pravia, is the dominant economic activity, but meat-packing and tourism (based on fishing and game hunting) are also significant. Pop. (1981) 19,738.

Cange, Charles du Fresne, seigneur du (lord of), byname THE FRENCH VARRO, French LE VARRON FRANÇAIS (b. Dec. 18, 1610, Amiens, Fr.—d. Oct. 23, 1688, Paris), one of the great French universal scholars of the 17th century, who wrote dictionaries of medieval Latin and Greek using a historical approach to language that pointed toward modern linguistic criticism.

He was educated at the Jesuit college of Amiens and studied law at the University of Orléans before beginning, in 1631, a brief practice as an advocate at the parliamentary bar in Paris. Not long afterward he returned to Amiens, where he succeeded his father-in-law to a sinecure as the town's titular treasurer (1645–68). Relatively late in life he wrote his first historical works, collected in *Histoire de l'empire de Constantinople sous les empereurs français,* 2 vol. (1657; "The History of the Empire of Constantinople Under the French Emperors"). Forced to leave Amiens in 1688 because of a severe epidemic, he spent his last months in Paris.

A charming and modest man who was friend to many other great scholars of his age, du Cange amassed great amounts of information in many fields; he was well versed in languages, history, law, archaeology, numismatics, and geography. All these interests were combined in his masterworks, the *Glossarium ad Scriptores Mediae et Infimae Latinitatis* (1678; "A Glossary for Writers of Middle and Low Latin") and the *Glossarium ad Scriptores Mediae et Infimae Graecitatis* (1688; "A Glossary for Middle and Low Greek"). These works were of major significance because in them du Cange attempted to develop a historical perspective on the two languages; *i.e.,* he tried

to distinguish the medieval Latin and Greek vocabularies from their classical counterparts. Moreover, because he illustrated from documents and primary sources not only the words but also the matters described by the words, the two books are more like encyclopaedias than dictionaries. The works were of epic scale and virtually unprecedented in their fields; the recent reprints attest to the continuing value of his scholarship as a forerunner of modern historical linguistics.

Cangzhou (China): *see* Ts'ang-chou.

Caniapiscau River, French RIVIÈRE CANIAPISCAU, river in Nouveau-Québec (New Quebec) region, northern Quebec province, Canada. Rising from Lake Caniapiscau in central Quebec, it flows generally northward for 460 miles (740 km) to its junction with the Larch River, discharging into Ungava Bay via the 85-mile- (137-kilometre-) long Koksoak River. Its name is an Indian word meaning "rocky point." Flowing for some 200 miles (320 km) through a cataract-ridden gorge, the Caniapiscau has tremendous hydroelectric power potential within easy reach of the Labrador-Ungava iron-ore mining region.

Canice, SAINT, Canice also spelled CANICUS: *see* Kenneth, Saint.

Caniff, Milton (Arthur) (b. Feb. 28, 1907, Hillsboro, Ohio, U.S.—d. April 3, 1988, New York City), American comic-strip artist, originator of "Terry and the Pirates" and "Steve Canyon," which were outstanding for their fine draftsmanship as well as their suspense and humour.

After graduating from Ohio State University, Columbus, in 1930, Caniff worked on a fantasy–adventure strip for the Associated Press in New York City. In 1934 he began drawing "Terry," and for 12 years he continued to produce the highly popular strip, which was notable for the authentic details of its Oriental settings. During World War II he also produced "Male Call" for armed-services newspapers. At the end of the war Caniff left the syndicate that owned the copyright for "Terry" and in 1947 introduced "Steve Canyon," about an adventurous pilot engaged in international intrigues who later became a U.S. air force officer in Korea and Vietnam.

canine, also called CANID, any member of the family Canidae, terrestrial mammals (order Carnivora), including about 14 living (and about 70 extinct) genera of dogs and doglike animals. Found throughout the world except in Antarctica and on most ocean islands, canines are adapted for running and tend to be slender, long-legged animals with long muzzles, bushy tails, and erect, pointed ears. They have four- or five-toed forefeet; four-toed hind feet; blunt, nonretractile claws; and well-developed canine and cheek teeth.

Canines depend mainly on hearing and smell. They run on their toes and can endure long chases. Largely carnivorous, they prey on all types of animals and some also eat carrion and vegetable matter, or both. Their litters usually contain about four to six young born after a gestation period of 60–65 days. Canines probably were the first animals to be domesticated (as indicated by remains in Neolithic campsites). Although they are helpful in controlling rodent and rabbit populations, they have been hunted for their pelts and slaughtered to prevent their reputed (sometimes real) destruction of livestock and large game.

The genus *Canis* includes nine living species of canines. It contains the coyote, dingo, and dog (*qq.v.*), and various wolf and jackal (*qq.v.*) species.

canine distemper, an acute, highly contagious, viral disease affecting dogs, foxes, wolves, mink, raccoons, and ferrets; other common animals are not susceptible. A few days after exposure to the virus, the animal develops a fever, becomes apathetic, and refuses food and water. Further symptoms include coughing and discharges from the eyes and nose; vomiting and diarrhea; and muscular twitching, posterior paralysis, or convulsions.

Canine distemper is best treated by prompt injections of serum globulin; secondary infections are warded off by use of antibiotics. Most untreated cases are fatal. Immunity can, however, be conferred by vaccination.

canine tooth, also called CUSPID, EYE TOOTH, or DOG TOOTH, in mammals, any of the single-cusped (pointed), usually single-rooted teeth adapted for tearing food, and occurring behind or beside the incisors (front teeth). Often the largest teeth in the mouth, the canines project beyond the level of the other teeth and may interlock when the mouth is closed, restricting the animal to an up-and-down chewing action. Among sheep, oxen, and deer, only the upper canines are large; the lower ones resemble incisors. Rodents lack canines. The tusks of wild boar and walrus are enlarged canines. In some animals (*e.g.*, pig, deer, baboon, gorilla), the male has much larger canines than does the female; these perform a threatening and protective function besides that of tearing. Humans have small canines that do not project beyond the level of the other teeth—thus, in humans alone among the primates, rotary chewing action is possible. In humans there are four canines, one in each half of each jaw. The human canine tooth has an oversized root, a remnant of the large canine of the nonhuman primates. *See also* incisor; molar; premolar.

canine viral hepatitis, acute viral infection common in young dogs, affecting the liver and inner lining of blood vessels. It is usually characterized by fever, lack of appetite, vomiting, intense thirst, abdominal tenderness, and hemorrhages. It also infects foxes, timber wolves, coyotes, and bears.

Puppies, which seem most susceptible, have the highest mortality rate. The severity of the illness, which may occur at any time during the year, varies from an unnoticeable disease to a fatal infection. A susceptible dog usually becomes ill six to nine days after exposure to a dog discharging the virus, the first sign being an elevation of temperature. If the fever persists more than two days, other symptoms become apparent. These include general signs of distress and an attitude of apathy, followed by a partial or complete loss of appetite, combined with intense thirst. Fiery redness of the mouth lining is an important sign. Swellings, causing disfigurement, are sometimes found. Skin hemorrhages resulting from a bodily injury bleed profusely, control being difficult because of prolonged blood-clotting time. Approximately 25 percent of the dogs that recover from infectious hepatitis develop temporary bluish-white discolorations of one or both corneas of the eyes.

Treatment of symptoms by a veterinarian is desirable to prevent the complications that may occur as a result of secondary bacterial infection. Once the symptoms are evident, however, therapeutic substances do not affect the disease course resulting from direct virus action. The canine infectious hepatitis virus persists for months in the urine of most dogs that recover from the infection, serving as a constant source of infection to susceptible dogs. Prevention by vaccination is thus the best way to protect dogs from this highly contagious disease.

Because of similarities in symptoms, canine infectious hepatitis has long been confused with another important disease of dogs, canine distemper. Furthermore, these diseases may occur simultaneously. After recovery, a dog is immune to both diseases. Immunity against both diseases can also be produced by the administration of distemper virus modified by culture in hens' eggs in combination with canine hepatitis virus derived from infected dogs.

Canisius, Saint Peter, Dutch SINT PETRUS CANISIUS, or KANIS (b. May 8, 1521, Nijmegen, Neth.—d. Dec. 21, 1597, Fribourg, Switz.; canonized 1925; feast day December 21), doctor of the church, Jesuit scholar, and strong opponent of Protestantism who has been called the Second Apostle of Germany.

Educated at the University of Cologne, he became a Jesuit (1543) and taught successively at the universities of Cologne, Ingolstadt, and Vienna. He founded colleges at Munich (1559), Innsbruck (1562), Dillingen (1563), Würzburg (1567), Augsburg, and Vienna.

Perhaps more than any of his contemporaries, Canisius delayed the advance of Protestantism by his participation in the religious discussions at Worms (1557), at the Council of Trent and the Diet of Augsburg (1559). He sought to renew the Roman Catholic Church in Germany by means of his friendship with the Holy Roman emperor and numerous magnates, by his zealous preaching in various German towns, by the extension of the Jesuit order, and especially by his desire to provide worthy and scholarly priests. His German missions won him fast friendships with persons in all walks of life, including the emperor. He did important work in southern Germany and Austria, Bohemia, and Switzerland, where in 1580 he settled in Fribourg and founded a Jesuit college (now the University of Fribourg).

His most influential work was the Triple Catechism (1555–58), which contained a lucid exposition of Catholic dogma; it became the most famous catechism of the Counter-Reformation, running through 400 editions in 150 years. J. Brodrick's *St. Peter Canisius* appeared in 1935.

canistel, also called EGGFRUIT (*Lucuma nervosa*), small tree, of the sapodilla family (Sapotaceae), native to northern South America and cultivated in other tropical regions. It grows 3–7.5 m (10–25 feet) tall and has spreading branches, alternate leathery leaves, and small white flowers. The canistel fruit is oval in shape, 5–10 cm (2–4 inches) long, and orange-yellow in colour. Its edible orange flesh is sweet.

Canitz, Friedrich Rudolf, Freiherr von (baron of) (b. Nov. 27, 1654, Berlin—d. Aug. 11, 1699, Berlin), one of a group of German court poets who prepared the way for the new ideas of the Enlightenment. His satires (*Nebenstunden unterschiedener Gedichte;* 1700) are dry and stilted imitations of French and Latin models but helped to introduce classical standards of taste and style into German literature. He was made a privy councillor by the elector Frederick III in 1697; the emperor Leopold I created him a baron of the empire.

caṅkam literature, caṅkam also spelled ŚAṄGAM, earliest writings in Tamil, thought to have been produced in three *caṅkams*, or literary academies, in Madurai, India, from the 1st to the 4th century AD. The *Tolkāppiyam,* a book of grammar and rhetoric, and eight anthologies (*Eṭṭuttokai*) of secular poetry were compiled: *Kuruntokai, Narriṇai, Akanāṉūru, Aiṅkuruṉūru, Kalittakai, Puranāṉūru, Patirruppattu,* and *Paripāṭal.* Possibly unique in early Indian literature, which is almost entirely religious, these poems are concerned with two main topics, love and the praise of kings and their deeds. Many, especially on the latter subject, display great freshness and vigour and are singularly free from the literary conceits of much of the other early and medieval literatures of India. Since they are almost entirely secular, these poems are also free from the complex mythical allusions that are such an outstanding feature of most In-

dian art forms. There are, nonetheless, some instances of religious works in *caṅkam* poetry. *Pattupāṭṭu* ("The Ten Long Poems") contains the earliest Indian poem of personal devotion to a god, and *Paripāṭal* contains poems about Vishnu, Śiva, and Murugaṉ.

Cankar, Ivan (b. May 10, 1876, Vrhnika, Carniola, Austria-Hungary [now in Yugoslavia]—d. Dec. 11, 1918, Ljubljana, Slovenia [now in Yugoslavia]), Slovene writer and patriot.

After a childhood spent in poverty, he went to Vienna and soon began to earn his living by his writings, which defended the oppressed and made satirical attacks upon those who exploited them. He returned to Slovenia in 1907. Cankar was a prolific writer of short stories, novels, articles, drama, and verse; he was also a political speaker and was imprisoned for his criticism of the Austrian regime. In spite of its tendentious nature, his work reveals an original style—simple yet eloquent, subtle, and melodious. Cankar's collected works were edited by Izidor Cankar in 20 volumes (1925–36).

canker, disease of plants that is caused by numerous species of fungi and bacteria. Symptoms include round-to-irregular, sunken, swollen, flattened, or cracked, discoloured, and dead areas on the stem (cane), twig, limb, or trunk. Cankers may enlarge and girdle a twig or branch, killing the foliage beyond it. They are most common on plants weakened by mechanical, winter, or insect injury; drought; nutritional imbalances; nematodes; and root rot.

Control includes removing diseased parts in dry weather; growing adapted or resistant varieties in warm, well-drained, fertile soil; avoiding overcrowding, overwatering, and mechanical wounds; treating bark and wood injuries promptly; controlling insect and rodent disease carriers; wrapping young trees to prevent sunscald; and keeping plants vigorous by the use of fertilizers.

canker sore, also called APHTHOUS STOMATITIS, a small, painful ulcer of the oral cavity. Canker sores are round, shallow, white ulcers on the inner surface of the cheek or lip. They are surrounded by an inflamed area and may reach 2.5 cm (1 inch) in size. Canker sores can occur in three forms: as one to five small lesions that heal within two weeks; as relatively large ulcers exceeding 6 mm (1/4 inch) in diameter and persisting up to three months, leaving a scar; and as many small, superficial ulcers that appear simultaneously. The most severe cases may interfere with eating and speech.

As much as half the population may develop canker sores at some time. The cause of the sores remains unknown. No permanent cure is known either, and canker sores usually heal by themselves. Local anesthetic agents and anti-inflammatory drugs may provide partial relief from discomfort.

cankerworm: *see* measuring worm.

Çankırı, formerly KANGRI, historically GANGRA, city, north-central Turkey. It lies at the confluence of the Tatlı and the Acı rivers. Gangra, capital of the ancient Paphlagonian kings, was incorporated into the Roman province of Galatia (*c.* 6 BC) and renamed Germanicopolis. It was captured by the Seljuq Turks after their victory over Byzantine forces at Malazgirt (AD 1071) and then changed hands several times among the various Turkmen dynasties until its final incorporation into the Ottoman Empire in the 15th century. A once-strong Byzantine fortress there is now in ruins. The city's great mosque was designed (*c.* 1550) by Sinan, court architect to the Ottoman sultan Süleyman I the Magnificent. The large nearby salt mines, known in Byzantine times, are still worked. Çankırı lies on the Ankara–Zonguldak rail line. The agricultural products of the surrounding area include grain and fruits, and Angora (Ankara) goats are raised for the silky wool that produces mohair. Pop. (1980) city, 34,933.

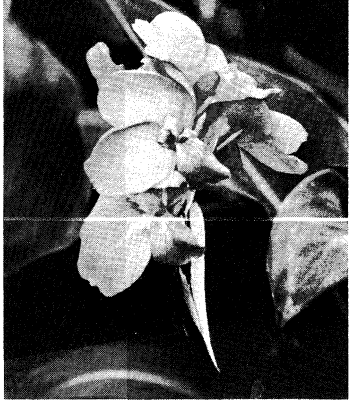
Canlaon, chartered city, central Negros island, Philippines. The former municipality, made a city in 1961, is named for Mount Canlaon (8,071 feet [2,460 m]), the volcano beneath whose eastern slopes it lies. A national park was established there in 1934, with an area of 95 square miles (245 square km); the volcano's deposits created the fertile soil of the surrounding sugarcane country. Canlaon is connected by road with the east-coastal and the west-coastal highways of Negros island. Inc. city, 1961. Pop. (1980) 28,785.

Canlaon, Mount, also called CANLAON VOLCANO, active volcano, north-central portion of the island of Negros, Philippines. It lies about 20 miles (32 km) southeast of Bacolod. Part of the volcanic Cordillera Central, it is, at 8,086 feet (2,465 m), the highest point in the Visayan Islands. Mount Canlaon National Park (1934) encompasses 95 square miles (245 square km) of rugged, forested terrain that includes craters, hot springs, and a variety of wildlife (monkeys, deer, and boars).

Cannabaceae, the hemp family of the nettle order (Urticales), containing two genera and three species of aromatic herbs distributed throughout temperate parts of the Northern Hemisphere. Older authorities included the two genera, *Cannabis* and *Humulus,* in the mulberry family (Moraceae). Members of the family Cannabaceae are erect or climbing plants with petalless flowers and dry, one-seeded fruits. Hemp (*q.v.*) and hop (*q.v.*) are the only economically important species.

Cannabis, plant genus belonging to the family Cannabaceae of the nettle order (Urticales). The genus comprises one species, hemp (*q.v.*; *C. sativa*), a stout, aromatic, erect annual herb that originated in Central Asia and is now cultivated widely in the North Temperate Zone. A tall, canelike variety is raised for the production of hemp fibre, while the female plant of a short, branchier variety is prized as the more abundant source of marijuana (*q.v.*).

Cannaceae, the canna family of the ginger order (Zingiberales), a single genus with about 55 species, distributed from southeastern North America through South America. These tropical herbs possess rhizomes (underground stems) with erect stems growing to 3 m (10 feet) high. The tall or dwarf foliage displays spirally arranged leaves that may be green or bronze. The flowers are asymmetrical, with one half-functional stamen and a labellum, a petallike structure rolled outward.



Indian shot (*Canna indica*)
Joan E. Rahn—EB Inc.

The two to five "petals" are actually sterile stamens (staminodes); there are also three regular petals. Some species have two floral parts called wings on either side of the labellum. Sometimes spotted variations of the scarlet, red-orange, or yellow flowers occur.

The genus *Canna* is widely grown for ornamental use. One species, *C. edulis,* from Peru has edible, starchy rhizomes.

Cannae, Battle of (216 BC), major battle near the ancient village of Cannae, in Apulia (Puglia), southeastern Italy, between the forces of Rome and Carthage during the Second Punic War. The Romans were crushed by the troops of Hannibal, with the help of his allies—the Africans, Gauls, and Spaniards. The Roman consuls of 216 BC, Lucius Aemilius Paulus and Gaius Terentius Varro, prepared to meet Hannibal in a pitched battle and so advanced to Cannae with about 80,000 men. The Carthaginians had about 40,000 infantry and 10,000 cavalry. The Romans faced southwest, with their right wing resting on the Aufidus River and with the sea about three miles to their rear. They placed their cavalry (about 6,000) on their wings and massed their infantry in an exceptionally deep (and therefore narrow) formation in the centre in the hope of breaking the enemy centre by weight and push. To counter this, Hannibal relied on the elasticity of his formation. He stationed his Gallic and Spanish infantry in the centre, two groups of his African troops on their flanks, and the cavalry on the wings. But before engaging the enemy, his line adopted a crescent shape, the centre advancing with the African troops on their flanks *en échelon.* As he anticipated, his cavalry won the struggle on the wings, and some then swept around behind the enemy.

Meanwhile, the Roman infantry gradually forced back Hannibal's centre, and victory or defeat turned upon whether the latter held. It did: although it fell back, it did not break, and the Roman centre was gradually drawn forward into a trap. Hannibal's crescent had now become a circle: the African troops, past whom the Romans were now thrusting, turned inward against them, and the Carthaginian cavalry was in the rear. Pressed tightly together and hence unable to properly use their arms, the Romans were surrounded and cut to pieces. Only 14,000 Roman soldiers escaped, and 10,000 more were captured; the rest were killed. The Carthaginians lost about 6,000 men. Cannae is regarded by military historians as a classic example of a victorious double envelopment.

Cannanore, town, northern Kerala state, southern India. A port on the Arabian Sea, Cannanore carried on important trade with Persia and Arabia in the 12th and 13th centuries AD. Until the 18th century it was the capital of the raja of Kolattiri. Vasco da Gama visited Calicut in 1498, and a Portuguese fort was built in 1505. A fort was built there by the Dutch in 1656. The British captured Cannanore in 1783, after which the ruler became tributary to the British East India Company. Cannanore was the British military headquarters on India's west coast from 1709 to 1887.

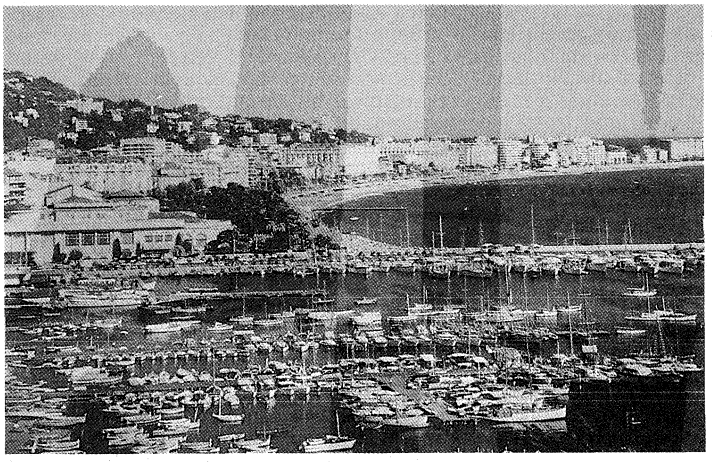
The town has large spinning, weaving, and hosiery mills and exports some copra, coir, and pepper. It is the site of several forts, a Portuguese church, and several mosques. The economy of the hinterland is based on the growing of cashews, peppers, and coconuts. Fishing is also important. Pop. (1981) town, 60,904; metropolitan area, 157,797.

Cannaregio, Andrea di, Cannaregio also spelled CANNAREGGIO, or CANAREGGIO (composer): *see* Gabrieli, Andrea.

Cannauj (India): *see* Kannauj.

cannel coal, type of hydrogen-rich, sapropelic coal characterized by a dull black, sometimes waxy lustre. It was formerly called candle coal because it lights easily and burns with a bright, smoky flame. Cannel coal consists of micrinites, macerals of the exinite group, and certain inorganic materials (*see* maceral). Cannel coal usually occurs at the top or bottom of other coals, though it sometimes can be found as individual seams up to 2 feet (61 centimetres) thick. Cannel coal was probably formed in lakes and pools where floating spores, transported by wind and water, accumulated in mud mixed with plant debris. During the 19th century cannel coal was used in the manufacture of illuminating gas and as fireplace coal.

Cannes, resort city of the French Riviera, Alpes-Maritimes *département,* Provence-Alpes-Côtes-d'Azur region, southern France, southwest of Nice. Named for the canes of its once-reedy shore, it was probably settled by Ligurian tribesmen and occupied successively by Phocaeans, Celts (or Gauls), and Romans. In the 4th century it came under the protection of the monks of Lérins, whose abbots were lords of Cannes and who in the 10th century built fortifications under Pointe du Chevalier to guard against Muslim sea raiders. Napoleon, on the first night of his return from Elba, encamped his small army in the dunes outside the village. The international resort reputation of Cannes originated with Lord Brougham, who, prevented by quarantine measures from entering Nice in 1834, stopped at the fishing village of Cannes; he later built a villa and returned every winter for 34 years.



The harbour and the Promenade de la Croisette, Cannes, Fr.
Editions "La Cigogne"—Hachette

In the crescent of the Golfe de La Napoule, Cannes backs against a line of sheltering wooded hills. Its palm-planted Promenade de la Croisette follows the curve of the sand beach and is fringed with luxury hotels. The harbour is a port of call for yachts and transatlantic liners. There are two casinos, and the Palais des Festivals is the site of the International Film Festival. Tourism is the main source of revenue; of this about a fifth is winter tourism; foreign visitors make up two-fifths of the traffic. There is an international market for flowers, especially mimosa, which has flourished in the region since its introduction from Santo Domingo in 1835.

The monks continue to inhabit Saint-Honorat, one of the offshore Îles de Lérins (*see* Lérins, Abbey of), where they make a Chartreuse-like liqueur called Lerina. The Man in the Iron Mask was imprisoned on the nearby island of Sainte-Marguerite. Pop. (1982) 71,888.

cannibalism, also called ANTHROPOPHAGY, eating of human flesh by humans. The term is derived from a Spanish form of the language of the Carib, a West Indies tribe who were well known for their practice of cannibalism. A widespread custom going back into early human history, it has been found among peoples on most continents.

Though many early accounts of cannibalism probably were exaggerated or in error, the practice prevailed until modern times in parts of West and Central Africa, Melanesia (especially Fiji), New Guinea, Australia, among the Maoris of New Zealand, in some of the islands of Polynesia, among tribes of Sumatra, and in various tribes of North and South America.

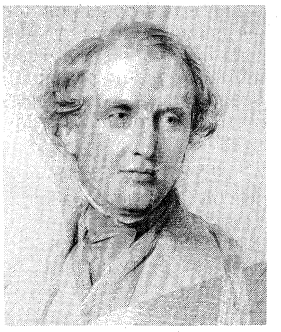
In some regions human flesh was looked upon as a form of food, sometimes equated with animal food, as is indicated in the Melanesian pidgin term "long pig." Victorious Maoris often cut up the bodies of the dead after a battle and feasted on the flesh, and the Batak of Sumatra were reported to have sold human flesh in the markets before they came under full control by the Dutch.

In other cases the consumption of particular portions or organs was a ritual means by which certain qualities of the person eaten might be obtained or by which powers of witchcraft or sorcery might be employed. Ritual murder and cannibalism in Africa were often related to sorcery. Headhunters and others often consumed bits of the bodies or heads of deceased enemies as a means of absorbing their vitality or other qualities and reducing their powers of revenge (*see also* headhunting).

In some cases, the body of a dead person was ritually eaten by his relatives, a form called endocannibalism. Some Aboriginal Australians performed such practices as acts of respect. In other cases, ritual cannibalism occurred as a part of the drama of secret societies. In the traditional cannibal society of the Kwakiutl Indians of the Northwest Coast of the United States and southwestern Canada, for example, the novice who was possessed by the cannibal spirit ate the flesh of a corpse or bit a piece out of the arm of a living person before being subdued and returned to a normal psychological state. Such dramas, however, were carefully staged for their effect on the audience; both the Kwakiutl and their neighbours held the eating of human flesh in abhorrence.

cannibalism, in zoology, the eating of any animal by another member of the same species. Cannibalism frequently acts to control population or to ensure the genetic contribution of an individual. In certain ants, injured immatures are regularly consumed. When food is lacking, the colony turns to the remaining healthy immatures. This practice allows the adults to survive the food shortage and live to breed again. In lions, males taking over a pride may kill and eat the existing young; the mothers who lose their cubs will then more rapidly become impregnated by the new dominant males. Aquarium guppies will regulate their population size by eating most of their young. When confined to cages, many animals, among them the popular golden hamster, may devour their young if disturbed.

Canning, Charles John Canning, Earl, also called (1837–59) VISCOUNT CANNING OF KILBRAHAN (b. Dec. 14, 1812, London—d. June 17, 1862, London), statesman, governor general of India during the Indian Mutiny of 1857, who became the first viceroy of India in 1858 and played an important part in the work of reconstruction and conciliation.



Lord Canning, chalk portrait by G. Richmond, 1851; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

The youngest son of George Canning, he was a member of Parliament from 1836 and inherited a viscounty from his mother in 1837. He joined the Cabinet of Sir Robert Peel in 1841 as undersecretary of state for foreign affairs and from 1846 as commissioner of woods and forests. Postmaster general under Lord Aberdeen (1853–55), he was appointed governor general of India by Palmerston's government in 1856. Canning immediately dispatched a military expedition to the Persian Gulf against the Shah of Persia, who had seized the British protectorate of Herāt in Afghanistan. The expedition drove the Shah's forces out of Herāt and won the friendship of Dōst Moḥammad Khān, ruler of Afghanistan, consolidated by a treaty in 1857.

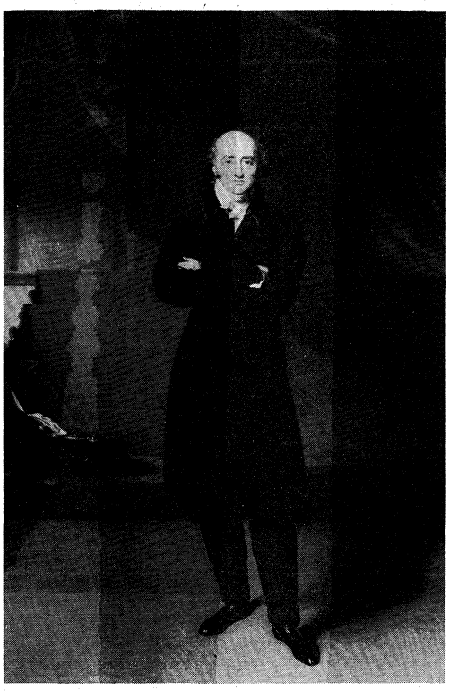
The same year saw the outbreak of the Indian Mutiny—an uprising of Bengali soldiers that developed into a widespread revolt against British rule in northern India. Canning promptly gathered reinforcements, including British troops on their way to China, and reoccupied the rebel strongholds. After quashing the mutiny, Canning insisted upon "deliberate justice and calm, patient reason" in dealing with the rebels. He convinced the Indians that his purpose was conciliation, not vengeance, despite widespread English distrust of all Indians and demands for wholesale punishment.

Canning presided over the reorganization of the Indian government after its transfer from the British East India Company to the crown. He was given an earldom in 1859. By the Indian Councils Act of 1861, he reorganized his executive council, instituting departmental distribution of responsibilities. He enlarged the council to make room for Indian nonofficial members and remodelled the Indian Army, infusing its ranks with Europeans. He encouraged railway development, took measures for famine relief, and helped found the universities of Calcutta, Bombay, and Madras.

Although he endeavoured to protect tenants against eviction or undue rent increases and intervened to prevent their exploitation by European indigo planters, Canning introduced a land-revenue settlement in Oudh that was unduly favourable to landlord interests. He resigned his post in 1862 after the death

(November 1861) of his wife. He left no issue, and his title lapsed.

Canning, George (b. April 11, 1770, London—d. Aug. 8, 1827, Chiswick, near London), British statesman known for his liberal policies as foreign secretary (1807–09, 1822–27) and as prime minister for four months during 1827.



George Canning, painting by Sir Thomas Lawrence and R. Evans; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Early life and career. Canning's father, the eldest son of an Irish landowner, was disinherited for his marriage to a beautiful but penniless girl and died in 1771, leaving his wife and year-old son entirely destitute. The widow became an actress and the mistress of an actor, by whom she had five children. In 1783 she married another actor, by whom she had five more children, but this new connection did nothing to rescue her from discredit and misfortune. From this unsatisfactory environment, George Canning was taken away by a wealthy uncle, Stratford Canning, who raised him with his own children, one of whom was the future diplomat Viscount Stratford de Redcliffe.

Canning was educated at Eton College and at Christ Church, Oxford. After graduating (1791), he soon decided on a political career and, in July 1792, came under the influence of the prime minister, William Pitt, who undertook to find him a seat in Parliament. He was elected for the privately controlled borough of Newtown, Isle of Wight, in July 1793 and quickly became recognized as one of the rising men on the government side of the house. Pitt further procured for him the undersecretaryship of state for foreign affairs in 1796. Though the work was "pretty hard and constant" he found time to contribute to *The Anti-Jacobin* (1797–98), a weekly paper founded to ridicule both English and French men of republican sentiment.

In 1799 he left the foreign office and was appointed a commissioner of the Board of Control for the government of India. In May 1800 he was promoted to the office of joint paymaster of the forces and was made a privy councillor. A few weeks later he married an heiress, Joan Scott. By her he had four children, including Charles John, later Earl Canning and a governor general of India.

When Pitt resigned in 1801, Canning, too, left office. Disapproving of Pitt's support of the new prime minister, Henry Addington (later 1st Viscount Sidmouth), he made himself independent in 1802 by giving up the seat of Wendover, which he had represented since 1796, and purchasing election as member of Parliament for the Irish borough of Tralee. In 1803 Pitt began to turn against Addington, and Canning could then go into open opposition without forfeiting Pitt's friendship.

On the formation of Pitt's last ministry in May 1804, Canning became treasurer of the navy, but his unpopularity (his biting wit made him many enemies) kept him out of the Cabinet. Much to his disgust, his colleagues resigned after Pitt's death (January 1806) because of the insecurity of their parliamentary position. When, however, in March 1807 the King called upon "the friends of Mr. Pitt" again to form a government, Canning became foreign secretary.

Rise to leadership. Actions in the Napoleonic Wars that occurred during Canning's first tenure of the foreign secretaryship included the seizure of the Danish fleet (his own brilliant planning) and the unfortunate expedition to Walcheren Island off the Scheldt River, in The Netherlands. The Peninsular War, involving British, Spanish, and French resistance to Napoleon on the Iberian Peninsula, was also begun. Holding Viscount Castlereagh, the war secretary, responsible for the disasters that overtook British arms at Corunna in Spain, and at Flushing (Vlissingen) in Holland, Canning, in 1809, insisted on his dismissal. They quarrelled and fought a duel on September 21, in which Canning was wounded in the thigh. Both had already resigned, Canning because of the nonfulfillment by the duke of Portland, William Bentinck, the dying prime minister, of his promise that Castlereagh should be removed from the War Department. Canning offered to form a government, but the King called upon his rival, Spencer Perceval, and Canning remained out of office until 1816.

Lord Liverpool, who succeeded to the premiership in 1812 on Perceval's assassination, tried hard to induce Canning to take office, but Canning refused to allow his old rival Castlereagh (who generously offered to surrender the foreign secretaryship to him and to take the inferior office of chancellor of the Exchequer) to retain the leadership of the House of Commons. So Canning lost the chance of being the peacemaker of Europe in 1815, and he had further damaged his reputation in 1814 by accepting what was believed to be a rich sinecure, the post of ambassador to Portugal.

Two years later, he entered the Cabinet as president of the Board of Control. Canning, disapproving of the government's efforts to deprive George IV's queen, Caroline, of her title and position, resigned in December 1820. In the hope of improving his financial position and believing that advancement at home was blocked by the King's hostility to him, he accepted the governor generalship of Bengal in March 1822, with the additional prospect of a peerage on his return, but, before his ship was ready to sail, Castlereagh committed suicide (August 12), and George IV reluctantly acquiesced in Canning's succession to the "whole inheritance"—the foreign secretaryship and the leadership of the House of Commons.

He was now the most important member of the government. Afraid of becoming too deeply involved in continental politics and disliking the great despotic sovereigns who were anxious to suppress liberal movements everywhere, he cut England adrift in 1823 from the so-called Holy Alliance engineered by the emperor Alexander I of Russia to preserve the European status quo; prevented European intervention in South America on behalf of Ferdinand VII of Spain; recognized the independence of the rebellious Spanish-American colonies; sent an army to Portugal to meet the threat of attack by Spain; gave diplomatic support to the Greeks in their struggle with the Turks for freedom; and ensured the eventual creation of an independent Greek state.

Lord Liverpool's premiership came to an end in February 1827. He had long since marked out Canning as his successor, but it was far from obvious that Canning would be the King's choice. Although since 1822 he had gained a remarkable ascendancy at Windsor Castle by the success of his foreign policy and by a judicious attention to the royal intimates there, Canning was the leading advocate of Roman Catholic emancipation, and George IV had been persuaded that the cause of the monarchy was linked with that of the Established Church and resistance to the Catholic claims. Robert Peel and the Duke of Wellington, the leading opponents of Catholic relief, knew that no government could be formed without Canning, and Canning refused to serve under another anti-Catholic premier.

Finally, on April 10, he was authorized to reconstruct the ministry on the understanding that a Catholic relief bill was not to be forced on the King. Moved partly by personal animosity, partly by dislike of Canning's advocacy of Catholic emancipation, half the Cabinet refused to serve under him, and, in all, more than 40 ministers and political appointees resigned. The Whigs, however, came to his assistance, and most of the independent members of Parliament supported him with their votes. But his ministry lasted only four months; his health broke down under the strain, and he died in August 1827 at Chiswick, in the house of the Duke of Devonshire.

Assessment. To some, and especially to his intellectual inferiors, Canning seemed arrogant and contemptuous. His wit and sarcasm were remembered by all who heard or read his speeches. He was the most indefatigable of men, often working from breakfast until late at night without food, and this long-continued irregularity, his friends believed, rendered an irritable temperament still more uncontrollable. The world tended to misjudge his character from his defects and overlooked his energy, patriotism, and outstanding abilities. It was the fashion to say of him that he was no gentleman.

The hatred and malignity with which he was assailed by the Tory aristocracy in 1827 showed what mountains of prejudice still existed against a prime minister born outside the governing class. In choosing Canning as prime minister, George IV found that he had to fight over again his father's battles against the pretensions of the great families to deprive the crown of its ancient right to nominate its servants.

Contemporaries said that Canning's ministry was the most popular with the middle classes that had ever been known. As member for Liverpool (1812–22), he came to recognize fully the needs of the rising commercial and industrial interests. He put his country before personal or party interests. None of the party leaders of the time had more generous notions of the obligations that he owed to his supporters. He never thought he could do too much for his friends, but he never used his influence to secure undeserved promotion for them. They, for their part, were drawn to him by bonds of intense personal devotion, and, through his disciples, such as William Huskisson and Lord Palmerston, he wielded an authority that endured beyond the grave.

(A.As.)

BIBLIOGRAPHY. The most useful biography for the general reader is Sir Charles Petrie, *George Canning*, 2nd ed. (1946). Though not based on much original research, it makes good use of secondary sources. Dorothy Marshall, *The Rise of George Canning* (1938), covers Canning's career

to the death of Pitt. It is based on Canning's private papers formerly at Harewood House, Leeds, but now in the Leeds Public Library. However, the quotations contain many inaccuracies. H.W.V. Temperley, *The Foreign Policy of Canning, 1822–1827* (1925), is a lengthy and valuable study based on official and private archives but perhaps too detailed for the general reader. The specialist will still find useful Canning's *Speeches,* 6 vol. (1828), some corrected by himself.

Canning, Stratford (British diplomat): *see* Stratford de Redcliffe, Stratford Canning, 1st Viscount.

Canning Basin, also called DESERT ARTESIAN BASIN, arid sedimentary basin in northwestern Western Australia. Occupying a largely unexplored area of about 150,000 sq mi (400,000 sq km), it extends south from the Fitzroy River to the De Grey River and from the coast southeast almost to 128° E longitude. The basin underlies the western section of the Great Sandy Desert (*q.v.*). Most of its interior is covered by parallel sand dunes, between the crests of which there may appear clay pans and spinifex vegetation. The region has artesian water formations and, because of crustal sag under the Canning Basin, is a centre of seismic activity. The Blina oilfield is in the area.

Cannizzaro, Stanislao (b. July 13, 1826, Palermo—d. May 10, 1910, Rome), Italian chemist, teacher, and legislator who recognized the distinction between atomic and molecular weights and also discovered the Cannizzaro reaction.

At Pisa (1845–46) he assisted Rafaelle Piria, who first prepared salicylic acid. Condemned to death for his part in the Sicilian revolution (1848), Cannizzaro escaped to Marseille and arrived in Paris (1849). In the laboratory of Michel-Eugène Chevreul, he helped to prepare cyanamide in 1851, the year he became professor of chemistry and physics at Alessandria, Piedmont (now in Italy). There he discovered (1853) that treatment of benzaldehyde with a concentrated alcoholic hydroxide (Cannizzaro reaction) produced equal amounts of benzyl alcohol and the salt of benzoic acid.

Professor of chemistry at Genoa (1855), in 1858 he showed that the atomic weights of the elements in the molecules of a volatile compound can be calculated by applying Avogadro's principle concerning gases (gram-molecular weights of different gases occupy equal volumes at the same temperature and pressure); in the case of a nonvolatile compound for which a vapour density is unknown, the atomic weights can be calculated by a measurement of specific heat. In 1891 his finding brought him the Copley medal from the Royal Society of London.

While professor of inorganic and organic chemistry at Palermo (1861–71) he studied aromatic compounds and amines. He was appointed to the chemistry chair at the University of Rome in 1871 and entered the Italian Senate that same year. He became vice president of the assembly and a member of the public instruction council.

Cannock Chase, district, county of Staffordshire, England. It has an area of 30 sq mi (79 sq km). The southern portion of the Staffordshire coalfield, including the Lea Hall Colliery, is in the district; coal mining and metalworking traditionally have dominated the economy, but they have been augmented by a variety of alternative industries. Cannock was originally a royal preserve and hunting forest, and Brindley Heath includes large areas of forestry and open space. Pop. (1982 est.) 85,800.

cannon, big gun, howitzer, or mortar, as distinguished from a musket, rifle, or other small arm. Modern cannon are complex mechanisms cast from high-grade steel and machined to exacting tolerances. They characteristically have rifled bores, though some contemporary tank-mounted and field artillery guns are smooth-bored.

Huge artillery pieces appeared in Europe in the 15th century, but until *c.* 1670 the word cannon was applied only to special types of guns. These were usually divided into the cannon royal or double cannon, which weighed about 8,000 pounds (3,630 kilograms) and fired a ball weighing 60–63 lbs; the whole cannon, which weighed about 7,000 lbs and fired a 38–40-lb ball; and the demicannon of about 6,000 lbs, which shot a 28–30-lb ball. Other large guns were not called cannon but bore different names (*e.g.,* culverin, *q.v.*) that indicated their size and function.

During the third quarter of the 17th century, large guns came to be designated by the weight of their projectiles and secondarily by their other characteristics; *i.e.,* whether field or siege types, and whether they were called light or heavy, short or long. The name cannon gradually came to be applied to every gun that was fired from a carriage or fixed mount and had a bore larger than one inch.

In the 20th century, rapid-firing guns of 20 millimetres (0.8 inch) and larger mounted in aircraft and firing explosive shells were called automatic cannon. In 1953 the U.S. Army introduced a 280-mm gun, the first built to fire atomic-explosive shells; it was called an atomic cannon. Similar weapons were displayed by the U.S.S.R. in 1957. In later years, atomic explosives were fitted into shells small enough to be fired in standard artillery.

Cannon, Annie Jump (b. Dec. 11, 1863, Dover, Del., U.S.—d. April 13, 1941, Cambridge, Mass.), U.S. astronomer who specialized in the classification of stellar spectra. She did much of the classification for the monumental *Henry Draper Catalogue* of stellar spectra, published from 1918 to 1924; she also worked on later supplements to the catalog.

Cannon was an assistant at the Harvard College Observatory, Cambridge, Mass., 1897–1911. After 1911 she was curator of astronomical photographs. In 1938 she was named William Cranch Bond astronomer at Harvard. Cannon discovered many variable stars and five novae.

Cannon, Charles A. (b. Nov. 29, 1892, Concord, N.C., U.S.—d. April 2, 1971, Kannapolis, N.C.), industrialist who built Cannon Mills into one of the largest textile companies in the United States. A major power in North Carolina, he boasted of having twice saved the state's credit during the Great Depression.

Cannon quit college in 1911 to work in mills founded and owned by his father. In 1916 he became vice president of Cannon Manufacturing Company and became president in 1921 upon his father's death. During his tenure the company grew from 4 plants with 6,700 workers to 17 plants with 24,000 workers and an annual income of $305,000,000. Cannon popularized the firm's familiar "Cannon" trademark and pioneered several advances in the textile industry, among them national consumer advertising.

A man of patriarchal manner, Cannon opposed unions, and none ever succeeded in organizing his mills. He and his company dominated Kannapolis, a quintessential company town built on property originally owned by Cannon's father and never legally incorporated as a municipality. Cannon Mills remains one of North Carolina's largest employers.

Cannon, James (b. Nov. 13, 1864, Salisbury, Md., U.S.—d. Sept. 6, 1944, Chicago), U.S. clergyman, a zealous prohibitionist, and a foe of Democratic presidential candidate Alfred E. Smith.

Educated at Princeton Theological Seminary, Princeton, N.J., he entered the ministry of the Methodist Episcopal Church, South, in 1888; was elected bishop in 1918; and retired in 1938. Bishop Cannon was a foremost Anti-Saloon leaguer and head of the World League Against Alcoholism. During the 1928 presidential campaign, he delivered violent tirades against Alfred E. Smith, an outspoken "wet," who advocated repeal of the Prohibition Amendment.

In 1930 Bishop Cannon, before a body of high-church Methodists, answered charges of stock speculation in "bucket shops." By admitting his "error" and begging for forgiveness, he was not tried. Shortly afterward, when called to appear before a senate lobby committee to explain what he did with $48,300 given him for use in Virginia during the 1928 campaign, the bishop defied the committee and refused to answer questions. He was later acquitted in federal court of violating the Corrupt Practices Act. With the repeal of prohibition his influence waned, although he continued his temperance crusade.

Cannon, Joseph Gurney, byname JOE CANNON (b. May 7, 1836, Guilford County, N.C., U.S.—d. Nov. 12, 1926, Danville, Ill.), U.S. politician, a longtime member of the U.S. House of Representatives.

Admitted to the Indiana bar in 1858, Cannon moved to Illinois the following year, where he continued the practice of law and entered politics. In 1872 he was elected to the U.S. House of Representatives, where he served for 46 years (1873–91, 1893–1913, 1915–23). Cannon was a staunch conservative and loyal Republican who, because of seniority, held important committee chairmanships and was speaker of the House for eight years (1903–11). As speaker, he exercised the power of that office in a blatantly partisan manner until March 1910, when a coalition of Democrats and insurgent Republicans passed a resolution making the speaker ineligible for membership on the committee on rules, thus divesting him of much of his power. Cannon was, however, personally liked by his colleagues, and was popularly known as "Uncle Joe" Cannon.

Cannon, Walter Bradford (b. Oct. 19, 1871, Prairie du Chien, Wis., U.S.—d. Oct. 1, 1945, Franklin, N.H.), U.S. neurologist and physiologist, the first to use X-rays in physiological studies. These led to the publication of *The*

Walter Bradford Cannon, detail of a portrait by Marie Danforth Page, 1931; in the Harvard Medical School, Boston

Harvard University Portrait Collection at Harvard Medical School, Boston, through the Warren Anatomical Museum

Mechanical Factors of Digestion (1911). His investigations on hemorrhagic and traumatic shock during World War I were summarized in *Traumatic Shock* (1923). He worked on methods of blood storage and in 1931 discovered sympathin, an adrenaline-like substance that is liberated at the tips of certain nerve cells.

Cannon's work on the emergency functions of the sympathetic nervous system and on homeostasis are reported in *Bodily Changes in Pain, Hunger, Fear and Rage* (1915) and in *The Wisdom of the Body* (1932). His con-

tributions to the knowledge of the chemical mediation of nerve impulses were published (with A. Rosenblueth) in *Autonomic Neuroeffector Systems* (1937) and *The Supersensitivity of Denervated Structures* (1949). He was graduated in medicine from Harvard (1900) and taught there from 1899 to 1942.

Cannon King, The: *see* Krupp, Alfred.

cannonball tree (*Couroupita guianensis*), tall, soft-wooded tree, of the family Lecythidaceae, native to northeastern South America and notable for its large, spherical woody fruit, which resembles a rusty cannonball. The tree is also cultivated in the southern regions of North America.

Cannonball tree (*Couroupita guianensis*)
W.H. Hodge

The leaves are oval, oblong, or broadly lance shaped; the leaf margins are smooth or finely toothed. The showy flowers, borne in clusters 60–90 centimetres (2–3 feet) long issuing from the trunk, have concave petals about 5 cm long. They are yellow or red on the outside and crimson or lilac on the inside. The fruit, which grows to 20 cm in diameter, is pulpy on the inside and contains many seeds. The hard shell is used locally to make utensils.

Cano, Alonso (b. March 19, 1601, Granada, Spain—d. Sept. 3, 1667, Granada), painter, sculptor, and architect, often called the Spanish Michelangelo for his diversity of talents. Although he led a remarkably tempestuous life, he produced religious works of elegance and ease.

"Immaculate Conception," statuette by Alonso Cano, 1655–56; in the sacristy of the Granada cathedral, Spain
Archivo Mas, Barcelona

Moving to Seville in 1614, he studied sculpture under Juan Martínez Montañés and painting under Francisco Pacheco. Forced to leave Seville in 1637 because of a duel with the painter Llano y Valdés, he fled to Madrid and obtained the favour of the court. His activities as court painter ended in 1644, when, suspected of the murder of his wife, he had to escape to Valencia. He then returned to King Philip IV and successfully solicited a position as canon in the cathedral in Granada in 1652, but he was expelled for misbehaviour in 1656. Returning to Madrid, he took holy orders and was appointed chief architect of the Granada cathedral, a position he held until his death.

Cano painted extensively in Seville, Madrid, and Granada. The Seville paintings, among them "Via Crucis" (Worcester, Mass.) and "St. Francis Borgia" (Seville), are influenced by Zurbarán, monumental and bold, with strong *tenebroso* (emphasis on darkness). The Madrid paintings, including "St. Isidore's Miracle of the Well" (1645–46; Prado), are more impressionistic, foreshadowing the work of Velázquez. Finally, the last paintings, from his stay in Granada, especially the "Mysteries of the Virgin in the Cathedral," are harmonious, with a classic balance and symmetry.

No sculpture from his Seville period has survived, but many of his polychromed wood statues exist from his time in Granada. His finest work of sculpture, "San Diego de Alcalá" (1653–57; Palace of Charles V, Granada), is characteristic in its simplicity of design and its expressive eloquence.

Cano is most famous for his paintings and sculpture, but his facade for the cathedral at Granada is considered one of the most original works of Spanish architecture, bearing Cano's unique personal stamp and executed with remarkable expressive unity.

Cano, Melchor, Melchor also spelled MELCHIOR (b. *c.* 1509, Tarancon, Spain—d. Sept. 30, 1560, Toledo), Dominican theologian and bishop who upheld the rights of the Spanish crown against the claims of the papacy.

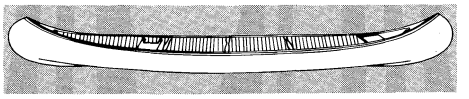
A professor of theology in Salamanca, and later at Valladolid (1546–52), he was sent by Emperor Charles V to the Council of Trent (1551–52), where he participated actively in discussions on the Eucharist and on penance. Cano strongly opposed the influence of his fellow Dominican Bartolome de Carranza, whom he accused of Lutheranism. Cano's close association with the anti-papal policies of King Philip II of Spain incurred the enmity of Pope Paul IV. The Holy See did not confirm his election as Provincial of the Dominicans (1557) and delayed confirmation of his reelection (1559). His reputation as a theologian rests on his *De locis theologicis* (posthumously published in 1563), an analysis of the scientific value of theological statements, which led him to evaluate the sources of theology. He also wrote commentaries on the Pauline epistles.

Canoas, city, eastern Rio Grande do Sul state, southern Brazil. Situated 9 mi (22 km) north of Porto Alegre, the state capital, in the grassy lowlands south of the Serra Geral, Canoas enjoys a subtropical climate (60° to 78° F [16° to 26° C]) with abundant rainfall. The city was created by decree from several municipalities of Porto Alegre region in 1839, and although the majority of its labour force is employed in Porto Alegre, Canoas has become an important industrial centre in its own right, manufacturing glass, chemicals, and pharmaceutical products. It has several meat-packing plants and a petroleum refinery connected by pipeline to a large petrochemical complex completed in the early 1980s in nearby Trifuno. Canoas is also the location of Brazil's fifth zone Air Force base; an all-weather highway links Canoas and Porto Alegre. Pop. (1980 prelim.) 214,115.

Canobus (ancient Egyptian city): *see* Canopus.

canoe, lightweight boat pointed at both ends and propelled by one or more paddles (not oars). Paddlers face the bow.

There are two main forms of the canoe: that open from end to end (the modern recreational or sport Canadian canoe), propelled with a paddle having a single blade; and the kayak (*q.v.*), covered with a deck, that has a well or cockpit into which the paddler, using a



Modern open Canadian canoe

double-bladed paddle, snugly fits. Other boats sometimes called canoes include the dugout (a shaped and hollowed-out log), or pirogue.

Columbus recorded the word *canoa* as that used by West Indians to describe their pirogue-like boats. The earliest canoes had light frames of wood or, for the Eskimo kayak, whalebone covered by tightly stretched bark of trees (usually birch, occasionally elm) or animal skins (the kayak). Others were made from pieces of bark sewed together with roots and caulked with resin; sheathing and ribs were pressed into the sheet of bark, which was hung from a gunwale temporarily supported by stakes. The birchbark canoe was first used by the Algonkian Indians in what is now the northeastern part of the United States and adjacent Canada, and its use passed westward. Such canoes were used for carrying goods, hunters, fishermen, and warriors. The craft varied in length from about 15 feet (4½ metres)—20 feet (6 metres) being most common—to about 100 feet (30 metres) in length for some war canoes; sometimes as many as 20 paddlers were employed. The dugout was used by Indians in what is now the southeastern United States and along the Pacific coast as far north as modern Canada, as well as by peoples in Africa, New Zealand, and elsewhere in the Pacific. For use in the open sea, canoes were fitted with outriggers, or pairs of canoes were linked by spars (*see* catamaran). The early French missionaries and explorers in northern North America used birchbark canoes, as did the voyageurs and others later engaged in the fur trade, which required relatively large canoes.

Modern sport and recreation canoes are of varying size but are usually about 17 feet in length and about 34 inches (85 centimetres) in breadth. Depth is about 12 to 14 inches, the ends rising slightly higher. Canoes are made of wood, canvas over wood frames, aluminum, and molded plastic or fibre glass. Some canoes are designed or adapted to be propelled by a sail, and some aluminum canoes are made with square sterns to accommodate outboard motors. The introduction of the faltboat (German *Faltboot*, "folding boat") early in the 20th centry extended greatly the use of the kayak for canoeists who did not live near water but who could easily transport the folded craft to water.

canoe cedar, common name usually applied to giant arborvitae (*q.v.*) but also used for a species of false cypress (*q.v.*).

canoeing, the use for sport, recreation, or competition of a canoe, kayak, or foldboat, all small, narrow, lightweight boats propelled by paddles and pointed at both ends. There are many canoe clubs in Europe and North America, and most canoes are used in touring or cruising, travel in wilderness areas, or wild-water sport, the thrilling and dangerous sport of canoeing in rapids or surf.

History. A Scottish sportsman, traveller, and philanthropist, John MacGregor (*q.v.*), in the 1860s founded almost singlehandedly the recreation and sport of canoeing. He designed canoes, which were decked and provided with a mast and sail as well as paddles, travelled in them throughout Europe and in the Middle East, and promoted their use in lectures and books. Robert Baden-Powell, founder of the Boy Scouts, designed a series of canoes with sails in the 1870s, and thereafter his and MacGregor's canoes followed a separate course of development from the paddled canoe. A type of decked sailing canoe was recognized by the International Canoe Federation (ICF) after World War II, and in 1970 the sail canoe became a one-design class (a racing division in which all boats are built to the same measurements) in yachting.

In 1866 MacGregor founded the Canoe Club (from 1873 the Royal Canoe Club) with other prestigious sportsmen and travellers. Other British canoeing groups, some devoted to cruising, came and went until in 1936, when the British Canoe Union became the governing body for all aspects of the sport in the United Kingdom. Organization began in North America with the New York Canoe Club (founded 1871), and in 1880 the American Canoe Association became the governing body in the United States. The Canadian Canoe Association was organized in 1900. The Internationale Repräsentationsschaft des Kanusport was founded in 1924 and won canoeing a place in the Olympic Games in 1936, which after World War II was reconstituted as the International Canoe Federation in 1946.

Recreation and sport. Canoeing began as a noncompetitive recreation and for a majority of canoeists remained such, involving paddling on local streams and lakes, extended tours, sometimes in North America repaddling the waters of earlier missionaries, explorers, and voyageurs. Canoeing was also combined for many enthusiasts with fishing, hunting, and camping trips. Wild-water, or white-water, canoeing on rivers with rapids and surf canoeing in the ocean also became popular. The development of recreational canoeing was furthered after World War II in North America by the proliferation of small aircraft that permitted canoeists to reach remote wilderness waters not used since the Indians and voyageurs travelled them.

Canoeing as a sport probably began as impromptu races between individuals returning from hunting and fishing raids and war expeditions. As an organized sport canoeing began in the second half of the 19th century in local and national competitions in Great Britain and North America, many of which persist. The sport became progressively more popular in Europe in the 20th century, so that, with the advent of canoeing events for men in the Olympic Games from 1936 and for women from 1948, most Olympic winners were European, with the Soviet Union and eastern European nations increasingly predominating. In the mid-20th century, however, the outstanding single performer was the Swedish canoeist Gert Fredriksson, who in Olympic Games from 1948 through 1956 won 6 gold medals for individual and team performances, as well as more than 40 more gold medals in international competition.

Olympic events for men include kayak pairs (K-2) (K = kayak and C = Canadian canoe; the number refers to the number of paddlers) at 1,000 metres (from 1936) and at 500 metres (from 1976); kayak singles (K-1) at 1,000 metres (from 1936) and at 500 metres (from 1976); kayak fours (K-4) at 1,000 metres (from 1964); Canadian singles (C-1) at 1,000 metres (from 1936) and at 500 metres (from 1976); and Canadian pairs (C-2) at 500 metres (from 1936) and at 1,000 metres (from 1976). Olympic events for women include kayak singles at 500 metres (from 1948) and pairs at 500 metres (from 1960). Other events sponsored by the ICF in international events include white-water, or wild-water, racing (at least 3 kilometres [1.9 miles]) for both Canadian canoes and kayaks; and slalom racing, derived from slalom in skiing, for kayaks, in which racing is through gates. Current speed for such races must be at least 2 metres (6.5 feet) per second. Slalom racing was also held as an Olympic event for both Canadian canoes and kayaks in the 1972 Olympic Games. Races are held on still water (except for wild-water and slalom) in depths of at least 3 metres. Races of up to 1,000 metres take place entirely in lanes, while longer races only end in lanes. Long-distance racing is not governed by the ICF. Notable long-distance races include the Sella Descent, a 16.5-km (10-mi) race contested annually from 1931 in northern Spain; and the Liffey Descent, a 28.2-km (17.5-mi) race contested annually from 1959 in Ireland. Sports related to canoeing are canoe polo and canoe surfing.

Sport canoes. ICF specifications for craft vary from 4 m in length for K-1 and C-1 craft to 11 m for K-4. Weight ranges from 12 kilograms (26 pounds) for K-1 to 50 kg for C-7. Weight is unrestricted for slalom and wild-water craft. Canadian canoes are built of wood of veneer-like thinness. Sprint canoes, C-1 and C-2, are built very low and sleek; the paddlers kneel on one knee. For wild-water and slalom a canvas spray deck with openings for the paddles may be used. The sprint racing kayaks, K-1 and K-2, are made of veneer-like wood with a small rudder under the stern. Kayaks for slalom and wild-water racing are quite short and made of fibre glass. Kayaks for distance racing have deep bows. *See* Sporting Record: *Canoeing.*

canon, musical form and compositional technique, based on the principle of strict imitation, in which an initial melody is imitated at a specified time interval by one or more parts, either at the unison (*i.e.,* the same pitch) or at some other pitch. Such imitation may occur in the same note values, in augmentation (longer note values), or in diminution (shorter note values). Melodically, the original direction may be reversed, so that in imitation the tune is read backward (retrograde), or the intervals, while unchanged, are made to move in the opposite direction (mirror), or both (retrograde mirror).

The oldest known canon is the 13th-century English round *Sumer is icumen in* (also called the *Reading Rota;* "rota" was a medieval term for round). This unique six-part composition is based on a four-voice canon that can be derived from a single notated part according to verbal instructions, or *canones* ("rules"). Two canonic supporting voices forming a ground bass (repeated bass pattern) complete the six parts.

During the 15th century, canon became an important unifying device in settings of the mass. The Flemish composer Jean d'Okeghem composed his *Missa prolationum* (*Prolation Mass*) as a canon cycle in which a double canon is combined with a mensuration canon: two two-part canons proceed simultaneously at different rates of speed (*i.e.,* mensurations).

In the 18th century, Johann Sebastian Bach created two monumental canon cycles in his *Art of the Fugue* and *Goldberg Variations.* Arnold Schoenberg, Anton von Webern, and Paul Hindemith employed the technique extensively in the 20th century.

Canons also occur in folk music—*e.g.,* in the Balkans and in Africa. In western Europe, rounds (canons in strict imitation at the unison) such as "Frère Jacques" are a part of many community singing traditions, as were the English catches (wherein one part tries to "catch" the next) of the 17th and 18th centuries. Canons have also long been vehicles for inside jokes among musicians.

Canon City, seat (1861) of Fremont County, south central Colorado, U.S., at the eastern end of the Royal Gorge of the Arkansas River between the Front Range and Wet Mountains, just north of a segment of San Isabel National Forest. The site (altitude 5,343 ft [1,629 m]), formerly a camping ground of the Ute Indians, was settled by gold seekers in 1859. In the late 1860s oil was discovered nearby, and Canon City (from Spanish *cañon,* "canyon") developed as a supply point for the nearby mines and oil field; it was incorporated in 1872. A territorial prison, now the Colorado State Penitentiary, was established there in 1871, and a women's correctional institution was added in 1968. After the arrival of the Denver and Rio Grande Railway in 1874, the community became a shipping point for agricultural products, livestock, minerals, quarried marble, and (later) manufactured items (firebrick, concrete, hand tools, conveyors, and ore concentrates).

The city is the seat of College of the Cañons, an extension of the University of Southern Colorado at Pueblo. The Alantasauru archaeological finds (including fossils of prehistoric dinosaurs) were discovered at Oil Creek (northeast) in 1878. The poet Joaquin Miller (1837–1913) once served as judge, mayor, and minister in Canon City. The Royal Gorge, spanned by a suspension bridge 1,053 ft above the Arkansas River, has an incline aerial tramway (built 1931). Buckskin Joe is a reconstructed mining town at the entrance to the gorge. Canon City is a base for model rocket manufacturing. Pop. (1980) 13,037.

canon law, Latin JUS CANONICUM, the body of laws made within certain Christian churches (Roman Catholic, Eastern Orthodox, independent churches of Eastern Christianity, and the Anglican Communion) by lawful ecclesiastical authority for the government of the whole church or of some part thereof. In a wider sense the term includes precepts of divine law, natural or positive, incorporated in the canonical collections and codes.

A brief treatment of canon law follows. For full treatment, *see* MACROPAEDIA: Christianity.

The word canon derives from the Greek *kanōn,* which means "rule," or "norm." The canon law concerns the constitution of the church, the relations between it and other bodies, and matters of internal discipline. It is not per se a formulation of dogma, although statements of the divine positive and natural law contained in the canons may be doctrinal in nature. Canon law has developed to the greatest extent in ecclesiastical bodies of the hierarchical type, and especially in the Roman Catholic Church. The development of canon law in the eastern churches was more haphazard than that in the West, largely because of the strongly autonomous character of the great eastern patriarchates. After the final break with Rome in 1054, the eastern churches were cut off from the centralizing movement in the canon law of the West and came predominantly under the influence of Constantinople.

The Roman Catholic Church. At no time during the first centuries of Christianity was there any attempt to enact uniform legislation for the whole church. Each community was ruled by its own customs and traditions, with, however, a certain uniformity indicating a common origin. Such compilations of canon law as exist contain occasional decisions given by councils or by certain great bishops.

These compilations began in the East, the first appearing in the province of Pontus. This contained 20 canons of Nicaea (325), together with others from the Councils of Ancyra (314) and Neocaesarea (early 4th century). The col-

lection later grew to more than 150 canons, so well known that they were referred to by number at the Council of Chalcedon (451). It was further augmented by canons from that council and from the Council of Constantinople and by placing the so-called Apostolic Canons at the head of the collection. This was the Greek collection as first translated and introduced into the West. During the 6th century other documents were added, and from the Latin collection of Dionysius Exiguus were borrowed canons of the Councils of Sardica (342 or 343) and Carthage (419), the latter including most of the canons of the African councils. The Council *in Trullo* (692) enacted 102 canons and officially accepted the Greek collection above mentioned. The collection thus formed, together with 22 canons of the Council of Nicaea (787), became the official canon law of the Greek and subsequently of the Russian church.

In the West, even local collections are not mentioned until the 5th century, and not until the 8th and 9th centuries are there found traces of unification as a result of exchange of these collections among various regions. The most ancient and homogeneous of these is the African collection deriving from the almost annual plenary meetings of the African episcopate. This survives only in the collection called the *Hispana* and in that of Dionysius Exiguus. The latter reproduces more or less fully almost all the synods of the African collection; this is the *Concilium Africanum*, so often quoted in the Middle Ages and also recognized by the Greeks.

It was against this diversified background that John Gratian, a Camaldolese monk, published, sometime between 1139 and about 1150, his monumental treatise, called at first *Concordantia discordantium canonum* but soon known simply as the *Decretum Gratiani*, or *Decretum*. He drew his materials from the existing collections and included the canons of recent councils and recently published decretals, up to and including the Lateran council (1139). When necessary, he had recourse to the Roman law and made extensive use of the Fathers and ecclesiastical writers.

The *Decretum* served as the definitive collection of canon law for several centuries. To it were added new compilations of papal laws and decisions, and in 1500 the enlarged collection, known as the *Corpus Juris Canonici* ("Corpus of Canon Law"), was published in Paris.

After the Council of Trent (1545–63) there was a marked move toward centralization in the Roman Catholic Church and an increased tendency toward uniformity of legislation emanating from the Holy See.

At the same time, however, the dispersed condition of the canonical documents was not remedied; on the contrary, the large number of pontifical constitutions and of decrees from the Roman congregations even aggravated the situation. No uniform treatment was undertaken until Catholic bishops from all quarters of the world petitioned for a codification of the canon law at the time of the Vatican Council (1869–70).

The Vatican council was forced to dissolve without dealing with the question of canonical reform, but on March 19, 1904, Pope Pius X issued a *motu proprio* decreeing the revision and codification of the canon law of the Latin church. A commission of cardinals was appointed for this purpose, under the direction of Pietro (later Cardinal) Gasparri, together with a body of consultants. After years of concerted labour, the new *Codex Juris Canonici* (Code of Canon Law) was officially promulgated on May 27, 1917, and, with the exception of a few provisions effective immediately, went into force throughout the Latin church on May 19, 1918.

Revision of the *Codex Juris Canonici* was undertaken, at the direction of Pope John XXIII, to reflect the decrees and decisions of the second Vatican Council (1962–65). The second *Codex Juris Canonici* was signed by Pope John Paul II on Jan. 25, 1983.

Anglican canon law. The British Parliament recognizes the British monarch as supreme head of the Church of England. The development of church law in the Anglican Communion is held by some to be not canon law but, instead, the ecclesiastical law of the state. Proposals relating to any matter concerning the Church of England—other than dogma—are made by a Church Assembly (established in 1919) and are presented for approval to the ecclesiastical committee of Parliament. Upon the approval of both houses of Parliament, followed by royal approval, the proposal becomes law.

Canon Law, Code of: *see* Codex Juris Canonici.

Canon Law, Corpus of: *see* Corpus Juris Canonici.

canonical ensemble, in physics, a functional relationship for a system of particles that is useful for calculating the overall statistical and thermodynamic behaviour of the system without explicit reference to the detailed behaviour of particles. The canonical ensemble was introduced by J. Willard Gibbs, a U.S. physicist, to avoid the problems arising from incompleteness of the available observational data concerning the detailed behaviour of a system of interacting particles—for example, molecules in a gas.

One way to describe a system of particles is to state explicitly the position and momentum (*i.e.,* mass times velocity) of each particle (*see* microscopic state). If there are N particles and each particle has s modes in which it can move (*see* freedom, degree of), $2sN$ values are required to specify its state. This system can then be described as a point in a $2sN$-dimensional space (called gamma [Γ] space). As time passes, changes in the details of the system would correspond to movement of the point in the Γ space. An ensemble is a large number of similar systems, as described by a collection of points in Γ space.

A canonical ensemble (or, more explicitly, macrocanonical ensemble) is an ensemble for which the density of points in Γ space varies exponentially with the total energy E of the system: $\rho = Ae^{-E/\theta}$, in which A and theta (θ) are constants of the system. If the system is in equilibrium at absolute temperature T, its gross (macroscopic) behaviour will be described by taking the average behaviour of a system in a canonical ensemble in which $\theta = kT$. The constant k is called Boltzmann's constant.

A microcanonical ensemble consists of systems all of which have the same energy and is often found useful in describing isolated systems in which the total energy is a constant. Such macrocanonical and microcanonical ensembles are examples of petit ensembles, in that the total number of particles in the system is specified.

A grand ensemble is any ensemble for which the restriction of a constant number of particles is abandoned. Such a description is more general and is particularly applicable to systems in which the number of particles varies, *e.g.,* chemically reacting systems.

canonical hours (liturgy): *see* divine office.

canonical hours, in music, settings of the public prayer service (divine office) of the Roman Catholic Church, divided into Matins, Lauds, Prime, Terce, Sext, None, Vespers, and Compline. The early monastic communities composed a complete series of hours for morning, noon, and evening; cathedral and parish churches had incorporated all the hours by the 8th century, and by the 9th century the structure was fixed.

The musical items found in the hours include antiphons (texts usually sung before and after psalms), and psalm tones (formulas for intonation of psalms), responsories (texts usually sung after lessons, or scriptural readings), hymns, and lesson tones. The first musical settings of the hours were sung in plainsong (one voice part, in unmeasured rhythm). As in the case of the mass, the music of the hours absorbed tropes, or musical and textual additions, especially in the responsories of Matins (*see* trope; Gregorian chant).

Settings of the hours preserve some of the oldest examples of polyphony, the art of simultaneous combination of melodies. Thus the *Winchester Troper,* a 10th- or 11th-century manuscript copied for services for Winchester Cathedral, contains one of the largest body of early two-part settings of the responsories for Matins. The Spanish *Codex Calixtinus* (about the 12th century) also includes two-part polyphony for the Matins responsories.

The polyphony common at the monastery of Saint-Martial at Limoges in France was expanded by Léonin, a composer at Notre-Dame Cathedral, Paris, *c.* 1160–80, in his two-part responsories for Matins. His successor, Pérotin, expanded the work of Léonin, composing not only in two parts but also in three and four parts. Both men worked on the Magnus Liber Organi ("Greek Book of Organum"), a collection of two-part organums for the entire church year.

In the 15th century polyphonic settings for Vespers were most common, but there are some settings of responsories for Matins and hymns for Lauds. The Burgundian Guillaume Dufay especially, as well as another Burgundian Gilles Binchois, and the Englishman John Dunstable provided a standard repertoire that survives in manuscripts all over Europe. This repertoire includes Vesper hymns, psalms, antiphons, and Magnificats (settings of the canticle of the Virgin Mary) in three-part treble-dominated style (elaborate top part over two often instrumental, slower moving lower parts). They also used three-part *fauxbourdon* style, in which the middle voice moves in parallel to the upper part at the interval of a fourth below it, while the lowest part moves in parallel sixths (as in *E–C*) with the upper part. Psalm settings became more frequent only after 1450. The plainchant psalm-tone formula sometimes alternates with a polyphonic three-part setting, often in *fauxbourdon* style. By 1475 melodic imitation was increasingly used in all the musical settings, and four-part texture became standard.

In the 16th century renewed interest arose in the polyphonic settings of the hours. The Lutheran publisher Georg Rhau brought out several Vesper publications between 1538 and 1545. Consequent to the Roman Catholic liturgical reforms promoted by the Council of Trent (1545–63), cycles of hymns and Vesper services as well as settings of Matins, Lauds, and Compline for the major feasts appeared. These were performed in many local churches and newly formed seminaries. The psalms were now set in *falsobordone* style: a four-part chordal texture having the plainchant psalm tone in the upper part.

Very important in the 16th century were the settings of Matins and Lauds for Thursday, Friday, and Saturday of Holy Week during the service of Tenebrae ("darkness"), in which 15 candles were individually extinguished until the church was in total darkness. In Matins, there are nine lessons, each concluding with a responsory. The first three lessons are taken from the Book of Lamentations in the Bible. Numerous polyphonic settings were made of Tenebrae texts. Among the most famous are the Spaniard Tomás Luis de Victoria's Lamentations and Responsories (1585). With Clau-

dio Monteverdi's *Vespers* (1610), a new style emerges. Orchestrally inspired church services revolutionized the polyphonic tradition of ecclesiastical music.

In the 18th century Mozart wrote two Vesper services for soloists, chorus, and orchestra. In the 19th century attempts were made to revive the singing of Vespers by republishing 16th-century settings. Composition in this style was also encouraged by the Cecilian movement (founded 1868), which promoted reform in Roman Catholic church music.

In the 17th and 18th centuries the Lamentations were set to music for solo voices and musical instruments. In the 20th century settings of the Lamentations and responsories have been composed by Igor Stravinsky (1958), Ernst Krenek (1957), and Francis Poulenc (1962).

canonization, official act of a Christian church declaring one of its deceased members worthy of public cult and entering his or her name in the canon, or authorized list, of recognized saints. In the early church there was no formal canonization, but the cult of local martyrs was widespread and was regulated by the bishop of the diocese. The translation of the martyr's remains from the place of burial to a church was equivalent to canonization. Gradually, ecclesiastical authorities intervened more directly in the process of canonization. By the 10th century appeals were made to the pope. The first saint canonized by a pope was Ulrich, bishop of Augsburg, who died in 973 and was canonized by Pope John XV at the Lateran Council of 993. Pope Alexander III (1159–81) began to reserve the cases of canonization to the Holy See, and this became general law under Gregory IX (1227–41).

Pope Sixtus V (1585–90) assigned to the Congregation of Rites, one of the offices of the Roman Curia, the duty of conducting the processes of beatification (*i.e.,* a step toward canonization, whereby limited public veneration is permitted) and canonization. In the following century Pope Urban VIII forbade the public cult of any person not as yet beatified or canonized by the church. Exception was made only for those who were in possession of public cult from time immemorial or for at least 100 years.

The legislation of Pope Urban VIII, together with later legislation by Pope Benedict XIV, formed the basis of the procedures for beatification and canonization found in the Code of Canon Law (promulgated 1917) of the Roman Catholic Church. Two types of beatification and canonization are distinguished by the Code: formal, or ordinary, and extraordinary, or equivalent.

Formal beatification has entailed four general steps: an informative process, introduction of the cause, the apostolic process, and four definite judgments. The first of these steps was under the jurisdiction of the bishop in whose diocese it took place, the other three were directly under the jurisdiction of the Congregation of Rites and the pope. In the late 1960s Pope Paul VI announced that the process of beatification and canonization would be shortened and decentralized, and he established a new congregation (administrative division) to handle such processes. Diocesan, provincial, or regional courts would conduct the entire investigation in consultation with the Vatican. Thus, duplication would be avoided and less time needed to complete the process.

The investigation of the candidate involves the gathering together of all material pertaining to the candidate's reputation for sanctity or heroic virtue, the writings of the candidate, and information about miracles performed by the candidate either during his life or after death. The bishop appoints a person, called postulator of the cause, to promote the cause and also a promoter of the faith, commonly known as the "devil's advocate," to see that the entire truth is made known about the candidate. After the process is completed, if the pope orders the beatification, it is in the form of a solemn proclamation with a solemn mass. Veneration then may be carried on in specified localities.

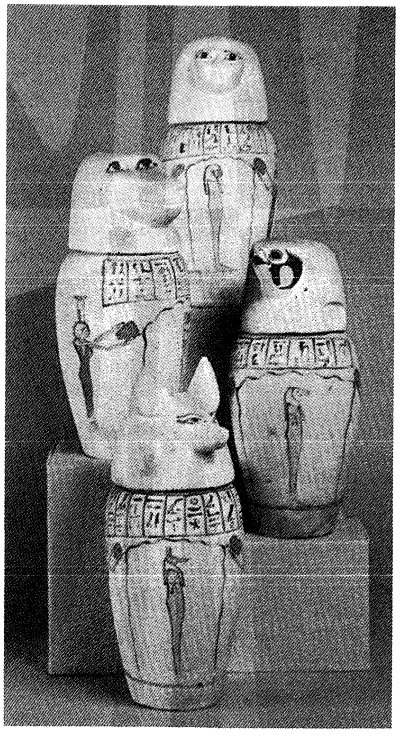
The canonization process is essentially the same, but at least two authentic miracles obtained through invocation after beatification must occur before the cause for canonization may be introduced.

Extraordinary or equivalent canonization is simply a papal confirmation that a person is a saint. It is applied only in the case of persons whose worship was immemorial at the time of Pope Urban VIII (1634).

Canonization in the Eastern Orthodox Church is a solemn proclamation rather than a process. Spontaneous devotion toward an individual by the faithful establishes the usual basis for sainthood. The bishop accepts the petition, examines it, and delivers it to a commission that will render a final decision.

In the Anglican Church, a commission was appointed in 1950, which discussed in subsequent years (especially at the 1958 Lambeth Conference) the question of canonization for members of its own communion.

Canopic jar, in ancient Egyptian funerary ritual, covered vessel of wood, stone, pottery,



Set of Canopic jars with heads of (top) a human, (left) a baboon, (right) a falcon, (bottom) a jackal; in The Walters Art Gallery, Baltimore

By courtesy of The Walters Art Gallery, Baltimore

or faience in which was buried the embalmed viscera removed from a body during the process of mummification. The earliest jars, which came into use during the Old Kingdom (*c.* 2686–*c.* 2160 BC), had plain lids; but during the Middle Kingdom (*c.* 2040–1786 BC) the jars were decorated with sculpted human heads, probably representations of the deceased; from the 19th dynasty to the end of the New Kingdom (1320–1085 BC) the heads represented the four sons of the god Horus (jackal-headed Duamutef, falcon-headed Qebehsenuf, human-headed Imset, and baboon-headed Hapy). In the 20th dynasty (*c.* 1200–*c.* 1085 BC) the practice began of returning the embalmed viscera to the body, and the art of making Canopic jars declined.

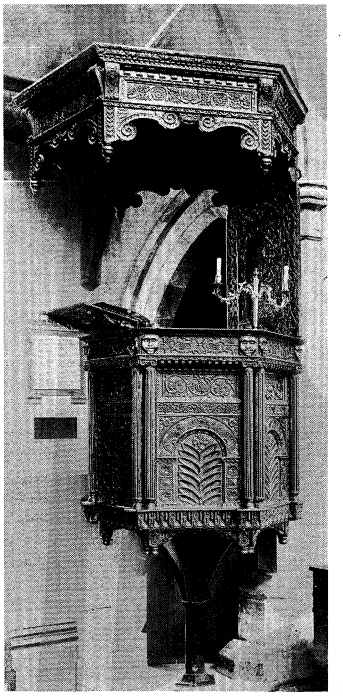
Canopus, also spelled CANOBUS, ancient Egyptian city on the western coast of the Nile Delta, in al-Iskandarīyah *muḥāfaẓah* (governorate). Known to the Greeks as Kanopos, its Egyptian name was PeGewat. The Canopic branch of the Nile is entirely silted up, but on the shore about 2 miles (3.22 kilometres) from Abū Qīr there are extensive remains, including the temple of the Greco-Egyptian god Sarapis. Canopus was a centre of the ointment industry and a pleasure resort for the people of Alexandria.

Osiris was worshipped at Canopus under the curious form of a human-headed vessel. The name Canopic jars was therefore mistakenly applied by archaeologists to the jars with human and animal heads in which the viscera were placed by the ancient Egyptians after mummification.

Canopus, also called ALPHA CARINAE, second brightest star (after Sirius) in the night sky, with an apparent visual magnitude of −0.73. Lying in the southern constellation Carina, about 100 light-years from the Earth, Canopus is sometimes used as a guide in the attitude control of spacecraft because of its angular distance from the Sun and the contrast of its brightness among nearby celestial objects. The Syrian Stoic philosopher Poseidonius (*c.* 135–50 BC) used sightings of Canopus near the horizon in his estimation of the size of the Earth.

Canopus, Decree of, also called TABLE OF TANIS, ancient bilingual, trigraphic Egyptian decree that provided a key for deciphering hieroglyphic and the simpler demotic scripts. The decree, written in Greek, demotic, and hieroglyphs, was promulgated March 7, 238 BC, by an assemblage of priests in honour of Ptolemy Euergetes and his consort Berenice. The two copies of the decree discovered at Tanis (modern Ṣān al-Ḥajar al-Qiblīyah) in 1866 are considered by many scholars to be second only to the Rosetta Stone in their value for deciphering ancient Egyptian.

canopy, in architecture, a projecting hood or cover suspended over an altar, statue, or



Canopy, or sounding board, over pulpit, Burgh Church, Lincolnshire, England, 1623

By courtesy of Maurice H. Ridgeway and the Courtauld Institute of Art, London

niche. It originally symbolized a divine and royal presence and was probably derived from the cosmic audience tent of the Achaemenian kings of Persia. In the Middle Ages it became a symbol of the divine presence in churches. During the 14th and 15th centuries, tombs, statues, and niches were overhung with richly decorated tabernacle work in stone, and these were reflected in delicate spiral wooden canopies over fonts.

With the Renaissance, the canopy placed over the altar developed into the baldachin (*q.v.*), a fixed structure supported on pillars that reached its most highly evolved form in the 17th century with Gian Lorenzo Bernini's great Baroque baldachin over the high altar of St. Peter's in Rome. Between the mid-16th and 18th centuries canopies were in use for various purposes throughout Europe. Over pulpits in the Protestant countries of western Europe a flat wooden canopy called a sounding board was placed, and great canopies of classical inspiration were erected over important sepulchral monuments. The traditional Jewish wedding ceremony takes place beneath a type of canopy known as a *ḥuppa*.

In domestic architecture, canopies over doors and fireplaces have been in use from the earliest times.

Canosa di Puglia, Latin CANUSIUM, town, Bari province, Puglia (Apulia) region, southeastern Italy, on the right bank of the Ofanto (ancient Aufidus) River, overlooking the Tavoliere (tableland) di Puglia, just southwest of Barletta. Ancient Canusium was originally a Greek town, said to have been founded by the legendary hero Diomedes, companion of Odysseus. It voluntarily accepted Roman sovereignty and remained loyal throughout the Punic Wars, but revolted in the Social War (90–89 BC), in which it appears to have suffered. An important trade centre on the Via Traiana (a Roman road) for agricultural products, Apulian wool, and ceramics, it became a municipium (city) under the early Roman Empire. In the 6th century it was still one of the most important cities in Apulia. Destroyed by the Saracens in the 9th century and rebuilt by the Normans in the 11th, it was thereafter part of the Kingdom of Naples. A large number of Greek relics have been found, including fine polychrome vases made there in the 3rd century BC, and there are several Roman remains. The town is dominated by a ruined medieval castle and by the 11th-century former cathedral dedicated to S. Sabino (bishop of Canosa 514–566; the bishopric passed to Andria in 1818) containing interesting Byzantine relics. Adjacent to the cathedral is the detached mausoleum of Bohemond I, son of the Norman Robert Guiscard, who captured Antioch during the First Crusade (1096).

Canosa's population was depleted in the early 20th century by large-scale emigration, principally to the Americas. Activities remain chiefly rural and include stock breeding and dairy farming, and the cultivation of cereals, herbs, olives, and almonds. Olive oil, wine, and pottery are manufactured. Pop. (1981 prelim.) mun., 30,363.

Canossa, ruined 10th-century castle southwest of Reggio nell'Emilia in Italy, famous as the meeting place (1077) of Pope Gregory VII and Emperor Henry IV. The stronghold was built *c.* 940 by Atto Adalbert, the founder of the House of Attoni and first count of Canossa.

At the invitation of Matilda, countess of Canossa (Matilda of Tuscany), a strong supporter of the papacy in the Investiture Controversy, Gregory VII stayed at the fortress in 1077 while on his way to Germany to take action against his opponent, Henry IV. To forestall his deposition, Henry journeyed to Canossa as a simple penitent and, on January 28, after waiting for three days, received absolution.

Though this did not mark any lasting victory for the papacy, the name Canossa became associated with the submission of the secular power to the church; hence Bismarck's dictum, during Prussia's *Kulturkampf* against Roman Catholic influences in Germany: "Nach Canossa gehen wir nicht" ("We are not going to Canossa").

The castle was destroyed in 1255 by the people of Reggio.

Canova, Antonio, MARCHESE (marquess) D'ISCHIA (b. Nov. 1, 1757, Possagno, Republic of Venice—d. Oct. 13, 1822, Venice), Italian sculptor, one of the greatest exponents of Neoclassicism. Among his works are the tombs of popes Clement XIV (1783–87; SS. Apostoli, Rome) and Clement XIII (1787–92; St. Peter's, Rome) and statues of Napoleon (Brera, Milan, and Wellington Museum, London) and of his sister Princess Borghese, reclining as "Venus Victrix." He was created a marquess for his part in retrieving works of art from Paris after Napoleon's defeat.

Canova, the son of a stonemason who died in 1761, was reared by his grandfather, also a stonemason. Under the protection of a Venetian senator, Canova, at the age of 11, went to work with the sculptor Giuseppe Bernardi (called Torretti), who lived at Pagnano (Asolo). In the same year (1768) Bernardi moved his studio from provincial Pagnano to Venice, and Canova went with him. The boy helped his master, executed a few humble commissions on his own, and, as was customary at the time, studied classical art and drew from the nude.

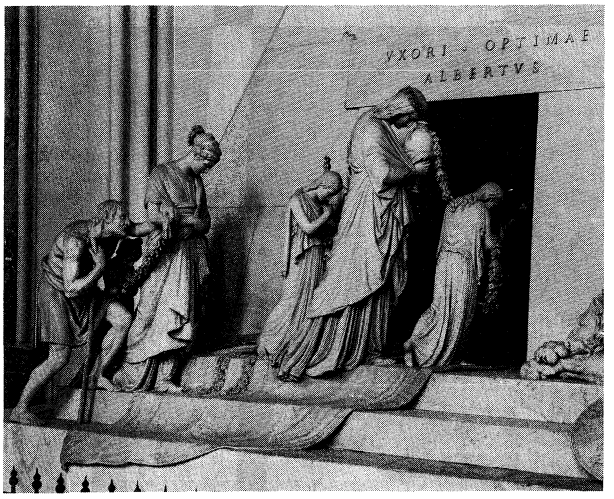
In 1775 Canova set up his own studio in Venice. In 1779 he sculpted "Daedalus and Icarus," which had been commissioned by Pisani, procurator of the Venetian republic; it was Canova's first important work. Somewhat Rococo in style, the figures were considered so realistic that the sculptor was accused of making plaster casts from life models.

Canova was in Rome in 1779 and 1780, where he met the leading artists of the period, including the Scottish painter-dealer Gavin Hamilton, who directed Canova's studies toward a more profound understanding of the antique. Canova visited Naples and the ancient archaeological sites of Herculaneum, Pompeii, and Paestum. He returned briefly to Venice, but in 1781 he was again in Rome, where he was to spend most of the rest of his life. There he became an active and influential figure in the artistic life of the city and was always willing to help young artists and find them patrons.

In 1783 Canova received an important commission for the tomb of Pope Clement XIV in the Roman church of SS. Apostoli. When displayed in 1787 crowds flocked to see it. That same year he was commissioned to execute a tomb in St. Peter's to Pope Clement XIII. Completed in 1792, its general treatment shows a more developed understanding of the classical aesthetic of antiquity than his monument to Clement XIV. Subsequent tombs were increasingly Neoclassical and combined restraint with sentiment, in a manner akin to the work of Canova's English contemporary, John Flaxman.

The French invasion of Rome in 1798 sent Canova northward. In Vienna he worked on a funerary monument to Maria Christina (1798–1805) in the Augustinerkirche. In 1802, at the Pope's instigation, he accepted Napoleon's invitation to go to Paris, where he became court sculptor and considerably influenced French art. He spent part of 1802 in Paris working on a bust of Napoleon, and in 1806 Joseph Bonaparte commissioned an equestrian statue of Napoleon.

About 1807 he finished one of his most famous works in which he shows Napoleon's sister, Pauline Borghese, reclining almost naked on a couch as "Venus Victrix"—a fusion of classical goddess and contemporary portrait. In 1811 he completed two colossal statues of Napoleon (Brera, Milan, and Wellington Museum, London), in which the Emperor is shown as a heroic classical nude. In the Napoleonic period he had also begun carving some of his most expressive and ambitious pieces, "Perseus with Medusa's Head" (1801) and the "Pugilists" (1802), both in the Vatican.



Detail from the marble tomb of Maria Christina, by Antonio Canova, 1798–1805; in the Augustinerkirche, Vienna

By courtesy of the Bundesdenkmalamt, Vienna; photograph, Eva Frodl-Kraft

Canova in 1805 was appointed inspector general of fine arts and antiquities of the papal state. In 1810 he was made president of the Accademia di S. Luca in Rome (a position he was to hold for life). After having visited Paris to arrange for the return of Italian art treasures plundered by the French, he went to London (1815) to give his opinion on the Elgin Marbles. The success of his mission in Paris led to the reward of the title of marquis of Ischia by the Pope. While in London, the Prince Regent, later George IV, commissioned a life-size group of "Venus and Mars." Other late commissions included the Stuart monument in St. Peter's (1819), the alteration and completion of the equestrian Napoleon into Charles III of Naples (1819), and a monument of George Washington (1820; destroyed by fire in 1830), idealized in Roman costume, erected at Raleigh, N.C., in 1821.

Canova was also a painter, but his paintings (mostly in the Gipsoteca Canoviana at Possagno) constitute a minor part of his works and generally are poor in quality. They include a few portraits and re-creations of antique paintings discovered at Herculaneum. Canova was buried at Possagno in a temple designed by himself in imitation of the Pantheon in Rome.

Canova was as important in the development of the Neoclassical style as Jacques-Louis David in painting. Canova's domination of European sculpture at the turn of the 18th century and the beginning of the 19th is reflected in countless adulations in memoirs, poems, and newspapers. "Sublime," "superb," and "marvelous" are adjectives frequently found describing Canova's work in his lifetime, although his reputation as a sculptor declined considerably during the following century. (D.I.)

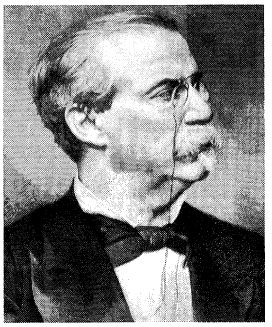
MAJOR WORKS. *Sculpture.* "Eurydice" (1773; Museo Civico Correr, Venice); "Orpheus" (1776; Museo Civico Correr); "Daedalus and Icarus" (1779; Museo Civico Correr); "Apollo" (1779; Accademia, Venice); "Theseus and the Minotaur" (1781–82; Victoria and Albert Museum, London); tomb of Clement XIV (1783–87; SS. Apostoli, Rome); tomb of Clement XIII (1787–92; St. Peter's, Rome); "Cupid and Psyche" (1792; Louvre, Paris); "Monument to Angelo Emo" (1792–95; Museo Storico Navale, Venice); "Hercules and Lichas" (model 1796, marble 1815; Galleria Nazionale d'Arte Moderna, Rome); "Perseus with Medusa's Head" (1801; Vatican, Belvedere, Rome); "Pugilists" (1802; Vatican, Belvedere); "Napoleon As First Consul" (1802; Gipsoteca Canoviana, Possagno, Italy); "Monument to Vittorio Alfieri" (1805–10; Sta. Croce, Florence); "Pauline Borghese as Venus Victrix" (1805–07; Borghese Gallery, Rome); "Dancing Girl with Her Hands on Her Hips" (1806–10; Hermitage, Leningrad); "Dancing Girl with Her Finger on Her Chin" (1806–10; Galleria Nazionale d'Arte Antica, Rome); "Venus Italica" (1812; Pitti Palace, Florence); "The Three Graces" (1813–16; Hermitage); "Venus and Mars" (1816–22; Buckingham Palace, London); "Theseus and the Centaur" (1819; Kunsthistorisches Museum, Vienna); "Endymion" (1819–21; Chatsworth House, Derbyshire, England).

BIBLIOGRAPHY. An excellent survey of Canova's art and life is David Finn and Fred Licht, *Canova* (1983). Three older Italian studies are Elena Bassi, *Canova* (1943) and *La Gipsoteca di Possagno: Sculture e dipinti di Antonio Canova* (1957); and Antonio Munoz, *Antonio Canova: Le opere* (1957). Isabella Albrizzi, *The Works of Antonio Canova: In Sculpture and Modelling,* 3 vol. (1824–28; originally published in Italian, 4 vol. in 2, 1821–24), is still useful.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Cánovas del Castillo, Antonio (b. Feb. 8, 1828, Málaga, Spain—d. Aug. 8, 1897, Santa Agueda, Guipúzcoa), Spanish statesman and prime minister, whose political activity brought about the restoration of Spain's Bourbon dynasty. He was author of the Constitution of 1876.

Upon the death of his father, Cánovas came to Madrid to live under the protection of his relative, the writer Serafín Estébanez Calderón, and of the banker José Salamanca. In 1852 he was introduced to General Leopoldo O'Donnell, whose political mentor he later became. His first political act was his involvement in the conspiracy of O'Donnell (1859), the program for which (Manifesto of Manzanares) was the work of Cánovas. In the 1854 elections Cánovas was elected to the Cortes (parliament) for the district of Málaga, but his unwillingness to support the Espartero–O'Donnell government led him to resign and accept (1855) the lucrative position the government offered him in the Vatican.



Cánovas, detail of an engraving by Aruselio Carretero
By courtesy of the Biblioteca Nacional, Madrid

After his return from Italy (1857), Cánovas held several governmental posts until he became minister of the interior in the administration of Alejandro Mon (1864) and of colonies under O'Donnell (1865). He participated in the Cortes convoked by General Prim (1868) after the dethronement of Isabella II (Sept. 29, 1868) but refused to support the monarchy of Amadeus (1870–73). Instead, Cánovas became the leader of the Alfonsines and prepared the return of Alfonso XII. After the proclamation of the king by General Martínez Campos at Sagunto (Dec. 29, 1874), Cánovas became prime minister, a post in which he alternated with Práxedes Mateo Sagasta, leader of the liberal party. When King Alfonso XII died (Nov. 25, 1885), Cánovas secured the peaceful transmission of power to Queen María Cristina and the future accession to the throne of Alfonso XIII by the so-called Pact of Pardo with Mateo Sagasta and General Martínez Campos and by his own resignation as prime minister.

His domestic policy brought to Spain public order and a degree of national unity, but he did not satisfy the working class. In the question of Cuba, Cánovas committed himself to a war policy. He failed to give Cuba any liberal reforms. Furthermore, Cánovas aggravated the situation by sending to the island, after the resignation of Martínez Campos, General Valeriano Weyler y Nicolau, whose measures of repression did not promote the cause of Spain before the eyes of the U.S. government. He was still trying to solve the Cuban problem when he was assassinated by the Italian anarchist Angiolillo.

Cánovas del Castillo was a learned man, a member of the academies of language and history. He published meritorious historical works, of which his *Estudios del reinado de Felipe IV* ("Studies of the Reign of Philip IV"), *Historia de la decadencia de España* ("History of the Decadence of Spain"), and *Bosquejo de la casa de Austria en España* are useful.

Canrobert (town, Algeria): *see* Oum el-Bouaghi.

Canrobert, (François-) Certain (b. June 27, 1809, Saint-Céré, Fr.—d. Jan. 28, 1895, Paris), soldier and political figure who as a marshal of France (from 1856) was a supporter of Napoleon III.

A descendant of a long line of military officers, he attended the military academy at Saint-Cyr. After assignment on the Spanish frontier he requested transfer to Algeria, where he served with distinction (1835–51). He rose quickly in rank and won fame for his victory with the Zouaves at Zaatcha (1847) and for the taking of Constantine. He received the Legion of Honour in 1849.

Back in Paris in February 1851, Canrobert played a key role in the Bonapartist coup of Dec. 2, 1851, and Napoleon III rewarded him by making him a division general and his personal aide-de-camp. He became commander in chief of French forces in the Crimean War (September 1854). Though always courageous, he revealed an instinctive reluctance to assume responsibility. After some disagreements with the English commander, Lord Raglan, he was, by his own request, recalled to France.

Canrobert continued to be a leading military figure in the Second Empire. He distinguished himself in the Italian campaigns (1859–60), especially at the battles of Solferino and Magenta. In the Franco-German War (1870–71) he fought bravely at Saint-Privat but was taken prisoner at Metz. He returned to France in March 1871. After service on the Superior Council of War, he was elected in 1876 to the Senate, where he served for several years and was a leading advocate of the imperial restoration.

Canso, Strait of, also called CANSO GUT, a channel separating Cape Breton Island from the Nova Scotia, Canada, mainland, leading from Chedabucto Bay (an inlet of the Atlantic Ocean) to St. Georges Bay and the Northumberland Strait. It is about 17 miles (27 km) long and averages 2 miles (3 km) in width, with depths of more than 200 feet (60 m). Since 1955 the 7,000-foot (2,100-metre) Canso Causeway, carrying rail and Trans-Canada Highway traffic, has linked Cape Breton Island with the mainland; a navigation lock is capable of handling most oceangoing vessels. Chief towns on the strait are Port Hawkesbury and Mulgrave. Canso is derived from the Micmac Indian *kamsok,* translated as "beyond the cliffs," referring to the bluffs along the south shores of Chedabucto Bay that run eastward to Cape Canso.

Cantabri, ancient Iberian tribe with a strong Celtic element; its people were subdued by the Romans after protracted campaigns beginning before 200 BC. Their homelands lay among the Cantabrian Mountains along the northern coast of Spain. Regarded as the fiercest people of the peninsula, they were finally subjugated by Rome in 19 BC. The Cantabri were originally divided into nine distinct clans; reorganization under the Romans reduced the number of tribal units to seven.

Cantabria, *comunidad autónoma* ("autonomous community") and historic region of Spain, coextensive with the northern Spanish *provincia* of Cantabria, formerly called Santander. The community was established by the statute of autonomy of Dec. 30, 1981. The Cantabri, an Iberian tribe with a strong Celtic element, dominated the region until 19 BC. The region has been associated with Old Castile (*q.v.*).

Cantabria borders the Bay of Biscay to the north. The rolling coastal hills rise gradually into the Cantabrian Mountains. Almost one-half of the land lies above 2,000 feet (600 m), and only a fourth lies under 650 feet (200 m). Cantabria is bounded by the Asturian province of Oviedo to the west. The valleys of Besaya and Pas connect Cantabria with the provinces of Palencia to the southwest and Burgos to the southeast. Karstic tablelands mark the southeastern border of Cantabria, which is linked to the Meseta Central and is drained by the Ebro. Vizcaya lies to the east. An oceanic climate prevails. Annual precipitation is high, exceeding 40 inches (1,000 mm), and fairly regular; precipitation tapers off toward the Ebro basin.

The population is heavily concentrated along the coastal areas. More than one-third of the population lives in the city of Santander, which has grown at the expense of the older centres of Castro-Urdiales, Laredo, Trasmiera, and San Vicente de la Barquera. The rural population tends to be widely scattered, living in isolated farmsteads or small hamlets.

Employment is fairly evenly distributed

among the agricultural, industrial, and service sectors, but agriculture accounts for only a small percentage of Cantabria's gross domestic product. Cattle and sheep husbandry is the dominant agricultural activity.

Mining is a major industry and centres on the deposits of lead, zinc, and pyrites around Reocín. Cantabria produces a large portion of Spain's zinc and is also a chief producer of pyrites. Iron and graphite are also mined. Torrelavega has become Cantabria's leading industrial centre, producing chemicals and synthetic fibres. Reinosa and Santander are major metallurgical centres.

Santander is the financial and commercial centre of all but the easternmost zones of the provinces, which are oriented toward Bilbao. Reinosa is the commercial centre of southern Cantabria as well as of adjoining settlements in the province of Palencia. Laredo and Castro-Urdiales have become important centres of tourism.

The traditional costume worn by men includes the *boina,* or beret, typical of the Basques. The traditional farmstead resembles the Basque *caserío* and is built of stone, but roofs have four sides and balconies are more open. Nomenclature of places is primarily Romance, indicating that Arab influence in the region was slight. Nomenclature incorporates various Celtic words, however, among them *aban,* or river, which appears as Abanillas, La Abadilla, and Abaño. The name Cantabria is derived from the Celtic, denoting people of the mountain. Pop. (1986 est.) 527,410.

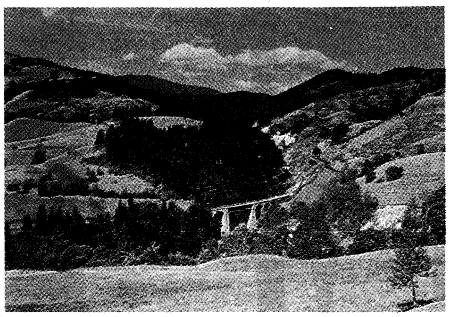
Cantabria, formerly SANTANDER, *provincia,* in Cantabria *comunidad autónoma* ("autonomous community"), northern Spain, bordering the Bay of Biscay. Popularly known as La Montaña ("The Mountain"), for its highlands that increase in height toward the south, it has an area of 2,042 square miles (5,289 square km). Principal towns in Cantabria include Santander, the provincial capital; Torrelavega, an industrial and mining (iron, zinc, lead) centre; Reynosa, a steel-manufacturing centre; and the fishing ports of Santoña, Laredo, and Castro Urdiales. Pop. (1986 est.) 527,410.

Cantabrian Mountains, Spanish CORDILLERA CANTÁBRICA, mountain chain generally extending along the northern coast of Spain for approximately 180 miles (300 km). Scenic and well-forested (with beeches and maritime pines), the mountains are geologically of similar origin to the Pyrenees, though classified as a separate formation. They comprise a series of high ridges rising inland from Torrelavega, in Santander province, and crossing (east–west) Asturias toward Galicia. Fractures have sharply demarcated the range from the Castilian plateau (part of the Meseta Central) in the south and the Cantabrian coastlands in the north, but the eastern and western limits are indistinct. The eastern foothills south of Santander rise abruptly into the gigantic limestone mountains of the Europa Peaks (8,688 feet [2,648 m]) and the Labra Peak (6,581 feet [2,006 m]). The main ridge continues westward, usually less than 60 miles (100 km) wide but with elevations of 5,000–7,000 feet (1,500–2,000 m). Most of the higher peaks, including Vieja, Prieta, and Espigüete, exceed 8,000 feet (2,500 m) and are along the main ridge. West of the Narcea valley, the ranges change their east–west trend and the Sierra de Rañadoiro runs almost north–south. The main ridge divides into the Sierra de Ancares and the Sierra del Caurel to the northwest, and the Sierra de Gistreo and León Mountains, to enclose the basin of El Bierzo, which is drained by the upper Sil River.

These chains are a more impressive barrier than the Pyrenees. The Oviedo–León railway crosses the Pajares Pass at 4,524 feet (1,379 m) and is one of the most difficult railway passes in Europe. The region is economically important because of its iron and coal deposits and as a source of hydroelectric power for the coastal region.

Cantal, *département,* Auvergne region, south-central France, in the higher, southern portion of the ancient province of Auvergne. It has an area of 2,211 square miles (5,726 square km). A region of high plateaus extending eastward into the Massif Central, Cantal has at its centre a symmetrical volcanic mass, the Massif Cantal, which culminates in the precipice known as the Plomb du Cantal, 6,096 feet (1,858 m). Tablelike tongues of solidified lava extend from the central core southeast and north. Streams arise and radiate to the Allier, Dordogne, and Truyère rivers, cutting through the volcanic rock and forming passes at the valley heads. The rivers are a source of hydropower.

Winters are wet and severe; the snow falls early and lasts late into spring. In the high country an alpine pastoral economy prevails. The cattle graze on upland pastures (*aigades*) from May to September. The herdsmen summer in low stone *burons* (seasonal shelters) where the Cantal cheeses are also made, the milk of 30 cows going into one 50-kilogram (110-pound) wheel of cheese. Fodder and potatoes are grown in the lowlands. Uranium is mined in the northwest corner of Cantal near Bort-les-Orgues. Some of the many thermal springs, notably those of Chaudes-Aigues, are developed as spas; some of the spas have begun to add facilities for winter sports.



The Lioran Pass leading from the Cère valley to the Alagnon valley in Cantal *département*, France
Editions Modernes "Theojac"

There are three *arrondissements:* Aurillac, the capital; Mauriac; and Saint-Flour. Cantal is in the educational division of Clermont-Ferrand, and its court of appeals is in Riom, both in the adjacent Puy-de-Dôme *département.* A tradition of temporary migration, both short-term during the lowland harvests and longer-term, takes Auvergnats to Paris, where many are in the catering trades. Permanent migration greatly reduced the population after the coming of the railroads in the 1860s. Pop. (1986 est.) 160,400.

cantala (*Agave cantala*), plant of the family agave (Agavaceae) and its fibre, belonging to the leaf-fibre group, obtained from plant leaves. The plant has been cultivated in the Philippines since 1783 and was growing in Indonesia and India by the early 1800s. It is known as maguey in the Philippines, and in commercial trade the Philippine fibre is known as Manila, or Cebu, maguey, distinguishing it from other fibres known as maguey, such as that of the Mexican *Agave lurida* and various South American fibre-producing plants.

Cantala is a tropical plant having lance-shaped, thorn-edged leaves growing directly from the stalk to form a dense rosette. The fibre is freed from the leaves by mechanical decortication, a scraping or peeling operation, or by a retting process common in the Philippines, employing saltwater and producing fairly weak and stained fibre.

The fibre strands, white in colour, are 30 to 60 inches (75 to 150 cm) long, of fine diameter, and moisture-absorbent. Cantala is made into coarse twines serving the same purposes as twines of the related sisal and henequen plants but is softer and more pliant. It is used locally for woven fabrics and is mainly cultivated on the Indian subcontinent, in Indonesia, and in the Philippines.

Cantar de Mio Cid (English: "Song of My Cid"), also called POEMA DE MIO CID, Spanish epic poem of the mid-12th century, the earliest surviving monument of Spanish literature and generally considered one of the great medieval epics and one of the masterpieces of Spanish literature.

The poem tells of the fall from royal favour and the eventual vindication of the Castilian 11th-century noble and military leader Rodrigo Díaz de Vivar (1043–99), popularly known as the Cid, who became Spain's national hero. The original manuscript of the poem, believed to have been composed *c.* 1140, has been lost; the earliest existing copy, called *Poema del Cid,* dates from 1307.

Distinguished for its realistic tone and treatment of the historical setting and the topographical detail as well as for its imaginative poetic artistry, the poem caught the popular imagination and lived on in epic, chronicle, ballad, and drama. The theme, with many additions and variations, inspired numerous writers in Spain and elsewhere and helped to fix the popular conception of the Spanish character. Its best-known non-Spanish treatment is Pierre Corneille's play *Le Cid* (1637), a landmark of French Neoclassical drama. English translations of the Spanish original include those by J.G. Markley and L.B. Simpson in prose (1961, 1962) and that by W.S. Merwin in verse (1959).

cantata (from Italian *cantare,* "to sing"), originally, a musical composition intended to be sung, as opposed to a sonata, a composition played instrumentally; now, loosely, any work for voices and instruments. The word first appeared in the Italian composer Alessandro Grandi's *Cantade et arie a voce sola* (*Cantatas and Arias for Solo Voice;* published 1620–29). There were precursors of the cantata in earlier strophic arias (in which the melody for each strophe, or stanza, was varied over a constant bass) and such earlier vocal works of chamber proportion as the late madrigals of Claudio Monteverdi. The early cantatas after Grandi were written by Italian composers, most in secular style (*cantata da camera,* "chamber cantata"), but some in sacred manner (*cantata da chiesa,* "church cantata") and all in the vernacular language, Italian. The precise nature of the two styles varied, both finally taking on characteristics of the recitative–aria combination of contemporary opera. Luigi Rossi, Pietro Antonio Cesti, and especially Giacomo Carissimi were prominent 17th-century cantata composers. A second generation of cantata writers standardized the form into a chain of recitatives and da capo arias (ABA, the A section usually varied on its repetition) for one or occasionally two voices. Such composers as Alessandro Stradella, Mario Savioni, Giovanni Legrenzi, and their students made the cantata a regular feature of aristocratic musical life in the courts of Rome and elsewhere in Europe. Alessandro Scarlatti was the major figure of the last main group of Italian cantata composers. Johann Hasse, a German pupil of Scarlatti, took the chamber cantata to Dresden; and George Frideric Handel, among others, wrote cantatas in the Italian manner. The early 18th century saw a similar trend in French music, notably in the works of Louis Clérambault, Jean-Baptiste Morin, and Jean-Philippe Rameau. The French cantatas were usually to French texts, and in Germany, where the cantata lost its aristocratic connotations, they were in German.

Lutheran ministers, notably Erdmann Neumeister, encouraged the absorption of secular music into the church service. They provided German Protestant composers with cycles of texts for sacred cantatas based on the operatic aria form. Previously, Lutheran church music had been based largely on 12th-century music with biblical texts. With the influx of Neumeister's more secularized form, the church music was transformed by Italian operatic style. Georg Philipp Telemann, with his 12 cycles of cantatas for each Sunday and holiday, represents this trend.

The word cantata is best known to many through the works of J.S. Bach, although he called them by such older terms as motetto, concerto, or ode (the name cantata was applied by 19th-century editors) and rejected the superficial style that often characterized the form. From 1714 Bach integrated da capo arias into his church works. During his early Leipzig years (1723–25) he developed the so-called chorale cantata, which begins with an elaborate choral fantasy on the first stanza of a hymn and closes with a simple harmonization of the last stanza in which the congregation presumably joined. The intermediate stanzas are paraphrased in the texts of recitatives and arias for one or more vocal soloists, and the various movements were interwoven with the liturgical service.

Secular cantatas were also common in Bach's day (*e.g.,* his *Coffee* and *Peasant* cantatas) and afterward. The great Viennese composers wrote cantatas, usually for a particular event—*e.g.,* Mozart's *Die Maurerfreude* (*Masonic Joy*)—but the form gradually declined.

From about 1800 the style of the cantata became increasingly free, and the term was often applied to any fairly large work for solo voice or voices, chorus, and orchestra, from Beethoven's *Der glorreiche Augenblick* (*The Glorious Moment*) onward. Mendelssohn even combined the cantata with the symphony in the so-called symphony-cantata *Lobgesang* (1840; *Hymn of Praise*), whereas the 20th-century English composer Benjamin Britten gave the title *Spring Symphony* (1949) to a work that is actually a cantata.

Cultivation of the cantata in the 20th century has been fostered by composers such as Britten who are interested in older forms of music. Generally, however, the chamber cantata as originally defined now appears as an occasional by-product of the inclination of many modern composers toward song cycles and the setting of poetry in general.

cante jondo (Andalusian Spanish: "deep song," or "grand song"), the most serious and deeply moving variety of flamenco, or Spanish Gypsy song. The *cante jondo* developed a distinctive melodic style, the foremost characteristics of which are a narrow range, a predilection for the reiteration of one note in the manner of a recitative (intoned speech), a dramatic use of ornate melodic embellishment, an Oriental preoccupation with microtones (intervals smaller than a semitone), and a subtle, intricate rhythm that defies notation. For the place of the *cante jondo* within the music and dance of the flamenco tradition, *see* flamenco.

Canteloube (de Malaret), (Marie-)Joseph (b. Oct. 21, 1879, Annonay, Fr.—d. Nov. 4, 1957, Paris), French composer, pianist, and folk-song collector best known for his compositions that evoke the landscape of his native region.

Cantaloube studied with Vincent d'Indy from 1901; under this influence he traveled through France collecting folk songs, making arrangements of many of them for voice and instrumental accompaniment, and publishing them. Of these arrangements the most widely admired are the *Chants d'Auvergne* (1923–30), scored for voice with orchestra.

Although his folk-song settings have won a degree of popularity, Canteloube's original works, which include the operas *Le Mas* and *Vercingétorix* (performed at the Paris Opéra in 1929 and 1933, respectively), have been neglected. He also edited the *Anthologie des chants populaires français* (1939–44).

Cantelupe, Saint Thomas de, also called THOMAS OF CANTELUPE, OF THOMAS OF HEREFORD, Cantelupe also spelled CANTILUPE (b. *c.* 1218, Hambleden, Buckinghamshire, Eng.—d. Aug. 25, 1282, Montefiascone, near Orvieto,

St. Thomas de Cantelupe, cast of his seal; in the collection of the Dean and Chapter of Hereford Cathedral, England

By courtesy of the Dean and Chapter of Hereford Cathedral, England; photograph, F.C. Morgan

Papal States; canonized 1320, feast day October 3), reformist, educator, English church prelate, bishop, and defender of episcopal jurisdiction who played an important role in the Barons' War.

Thomas was of noble birth; after being ordained at Lyon, *c.* 1245, he continued his studies in France at Orléans and Paris. He then taught canon law at Paris and at Oxford, where in 1262 he became chancellor. When Simon de Montfort, Earl of Leicester, won the Barons' War (1264), he appointed Thomas chancellor of England in 1265. After Montfort's death on the following August 4 and after the baronial party's subsequent disintegration, Thomas was dismissed and returned to Paris (1265–72). He was then at Oxford for a second term as chancellor (1273–74). Known for his ascetic life, strict discipline, and martial spirit, he was made (1275) bishop of Hereford, which he found in a state of deterioration. He restored his see, began a reform, and became adviser to King Edward I of England.

After John Peckham became archbishop of Canterbury in 1279, Thomas became involved in jurisdictional disputes with him that led to his excommunication in 1282. He went to Italy to plead his cause to Pope Martin IV but died before his case was judged. After Thomas was buried in the cathedral of Hereford, several miracles were reported, and Edward requested the process for his veneration. He was canonized by Pope John XXII.

Cantemir, Antioch Dmitrievich (Russian poet and statesman): *see* Kantemir, Antiokh Dmitriyevich.

Cantemir, Dimitrie: *see* Kantemir, Dmitry (Konstantinovich).

canter, a three-beat collected gait of a horse during which one or the other of the forelegs and both hind legs lead practically together, followed by the other foreleg and then a complete suspension when all four legs are off the ground.

Essentially a slow, collected gallop that averages from five to nine miles an hour, the canter, which is popular for horse shows and park rides, is said to be derived from the Canterbury gallop, a pace set by horseback-riding monks on their way to Canterbury.

The long form, or extended canter, permits the neck of the horse to stretch forward with the horse's weight placed on its forequarter. The moment of suspension in this gait, which varies from a slow lope to a fast gallop, is restricted. In the short form, or collected canter, a gait seen in dressage or three-gaited classes, a much higher head and neck is featured, as is a more visible point of suspension.

In cantering disunited, the right or left legs of the horse move together.

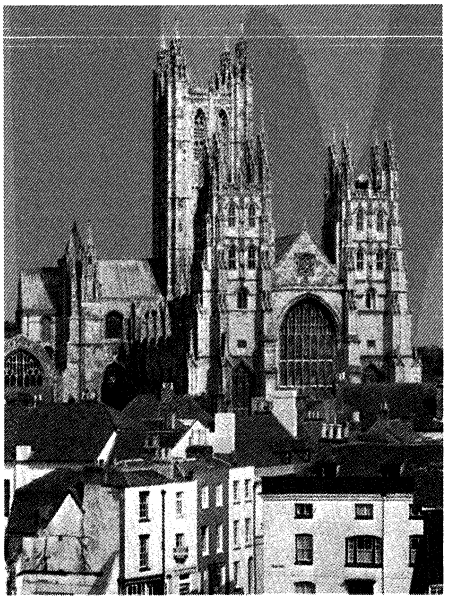
Canterbury, district (city), county of Kent, England. It has an area of 120 square miles (311 square km).

The site of Canterbury, which has been occupied since pre-Roman times, was formerly the mouth of the Stour, which flowed into the Wantsum Channel, the strait that separated the Isle of Thanet from the mainland. The Roman town of Durovernum Cantiacorum was established after the invasion of Claudius in AD 43. It was connected to London (55 miles [89 km] northwest) and to Dover (16 miles southeast) by Casingc Street (later Watling Street). Parts of the Roman city wall, built about AD 200 and heightened in the Middle Ages, still stand.

In the late 6th century, Canterbury was the capital of Aethelberht I, king of Kent, whose marriage to a Christian—Bertha, daughter of the Frankish king Charibert—probably influenced him in favour of the mission of St. Augustine of Canterbury, who arrived on the Isle of Thanet in 597 and founded a monastery. After his consecration at Arles as bishop of the English, Augustine returned to Canterbury and established the cathedral that has remained the primary ecclesiastical administrative centre of England.

The city grew in importance, though it suffered badly from Danish raids, especially in 1011. After the murder (1170) of Archbishop Thomas Becket in the cathedral and Henry II's penance there in 1174, Becket's shrine attracted many pilgrims. Catering to their needs became the principal activity of many inns of the town, and a picture of the travelers is given in *The Canterbury Tales* of Chaucer.

Municipal government dates at least to the 14th century, and the city was promoted to county status, with a sheriff, in 1461. During the 16th-century Reformation, the numerous monastic houses were dissolved, the cult of



The cathedral in Canterbury, Kent

Tom Nebbia—Aspect Picture Library, London

Thomas Becket was suppressed, and the town languished. An influx of Protestant refugees (mostly weavers) from the Continent subsequently revived the town.

Modern Canterbury is a market town and district service centre. It has some light industries and attracts many tourists; its many educational institutions include the University of Kent (1965). The city suffered severely from bombardment in World War II—though the cathedral was little damaged—and the shopping area has since been extensively reconstructed.

The cathedral has been repeatedly rebuilt—first in 1070–89, then in the 14th century, and later when the present nave and tower were built. The large crypt was granted to the Huguenot refugees as their church at the end of the 16th century, and weekly services are still held in French. Christchurch Gate gives entrance to the remains of the monastic buildings. A Norman staircase leads to the hall of the King's School, founded in the early Middle Ages and reestablished in 1541 by Henry VIII. Other medieval ecclesiastical buildings grace the city, including survivors of the original 22 parish churches and remains of the Norman abbey church (St. Augustine's) outside the walls. The great abbey gate (*c.* 1300) now gives access to a theological college. Pop. (1981 prelim.) city, 34,404; (1982 est.) district, 123,200.

Canterbury, archbishop of, in the Church of England, the primate of all England and archbishop of the ecclesiastical province of Canterbury, which roughly covers England south of the former counties of Cheshire and Yorkshire. In addition to a palace in Canterbury, the archbishop has a seat at Lambeth Palace in London. The first archbishop of Canterbury was St. Augustine of Canterbury (d. 604/605), a Benedictine monk sent from Rome by Pope Gregory I to convert the Anglo-Saxons in England. He arrived in 597 and was well received by Aethelberht I, king of Kent, who gave him a place to live in Canterbury and allowed him to preach.

The Reformation caused no break in the continuity of the office. Thomas Cranmer (archbishop 1533–56) accepted the Act of Supremacy (1534) that made the English sovereign, rather than the pope, the head of the Church of England.

Although no one is recognized as head of all the churches that make up the Anglican Communion, the archbishop of Canterbury is considered the senior bishop. He presides, as host and chairman, over the Lambeth Conference at Lambeth Palace, a decennial meeting of the bishops of the Anglican Communion.

Archbishops of Canterbury

Augustine (Austin)	597–604	Simon Islip	1349–66
Laurentius (Lawrence)	604–619	Simon Langham	1366–68
Mellitus	619–624	William Whittlesey	1368–74
Justus	624–627	Simon Sudbury	1375–81
Honorius	627–653	William Courtenay	1381–96
Deusdedit	655–664	Thomas Arundel	1396–97
Theodore (Theodorus)	668–690	Roger Walden	1397–99
Berhtwald (Beorhtweald)	693–731	Thomas Arundel *(restored)*	1399–1414
Tatwine	731–734	Henry Chichele	1414–43
Nothelm	735–739	John Stafford	1443–52
Cuthbert (Cuthbeorht)	740–760	John Kempe	1452–54
Bregowine (Breguwine)	761–764	Thomas Bourgchier	1454–86
Jaenberht (Jaenbeorht)	765–792	John Morton	1486–1500
Aethelheard	793–805	Henry Deane	1501–03
Wulfred	805–832	William Warham	1504–32
Feologild	832	Thomas Cranmer	1532–55
Ceolnoth	833–870	Reginald Pole	1555–58
Aethelred	870–889	Matthew Parker	1559–75
Plegmund	890–914	Edmund Grindal	1575–83
Aethelhelm	914–923	John Whitgift	1583–1604
Wulfhelm	923–942	Richard Bancroft	1604–10
Oda	942–958	George Abbot	1611–33
Aelfsige	959	William Laud	1633–45
Beorhthelm	959	William Juxon	1660–63
Dunstan	960–988	Gilbert Sheldon	1663–77
Aethelgar	988–990	William Sancroft	1677–90
Sigeric Serio	990–994	John Tillotson	1691–94
Aelfric	995–1005	Thomas Tenison	1694–1715
Aelfheah	1005–12	William Wake	1715–37
Lyfing	1013–20	John Potter	1737–47
Aethelnoth	1020–38	Thomas Herring	1747–57
Eadsige	1038–50	Matthew Hutton	1757–58
Robert of Jumièges	1051–52	Thomas Secker	1758–68
Stigand	1052–70	Frederick Cornwallis	1768–83
Lanfranc	1070–89	John Moore	1783–1805
Anselm	1093–1109	Charles Manners Sutton	1805–28
Ralph d'Escures	1114–22	William Howley	1828–48
William of Corbeil	1123–36	John Bird Sumner	1848–62
Theobald	1138–61	Charles Thomas Longley	1862–68
Thomas Becket	1162–70	Archibald Campbell Tait	1868–82
Richard of Dover	1174–84	Edward White Benson	1883–96
Baldwin	1184–90	Frederick Temple	1896–1902
Hubert Walter	1193–1205	Randall Thomas Davidson	1903–28
Stephen Langton	1206–28	Cosmo Gordon Lang (from 1942, Baron Lang of Lambeth)	1928–42
Richard le Grant	1229–31	William Temple	1942–44
Edmund Rich	1233–40	Geoffrey Francis Fisher (from 1961, Baron Fisher of Lambeth)	1945–61
Boniface of Savoy	1241–70	Arthur Michael Ramsey	1961–74
Robert Kilwardby	1272–78	Frederick Donald Coggan	1974–80
John Pecham	1279–92	Robert Alexander Kennedy Runcie	1980–
Robert Winchelsey	1293–1313		
Walter Reynolds	1313–27		
Simon Mepham	1327–33		
John Stratford	1333–48		
Thomas Bradwardine	1348–49		

Canterbury and York, Convocations of, in the Church of England, ecclesiastical assemblies of the provinces of Canterbury and of York that meet two or three times a year and, since the mid-19th century, have been concerned particularly with the reform of the canons of ecclesiastical law.

Their origin can be traced to the time of Archbishop Theodore (668–690). Later they became, in effect, a parliament in which, in addition to transacting ecclesiastical business, the clergy taxed themselves for the benefit of the royal exchequer. At the Reformation, the Act of Submission of the Clergy (1533) provided that convocation was not to meet without the permission of the king. For the next 140 years the convocations were busy with the Reformation settlement, working with the monarch and Parliament. After the Restoration of Charles II in 1660, the clergy evidently tacitly agreed to abandon their claim to tax themselves. In 1663 they voted subsidies for the king, but since then they have been taxed, like the rest of the nation, by Parliament. After the Glorious Revolution (1688) convocation began to exhibit an independence of thought that was embarrassing to the government. In 1717 King George I suspended convocation, which then met only for innocuous formal sessions until the mid-19th century.

Since the 15th century both convocations have been divided into two houses: the upper consists of the archbishop and diocesan bishops of the province; the lower consists of representatives of the inferior clergy. Convocation is summoned by the archbishop, who, in obedience to a writ from the sovereign, issues a mandate. The sovereign may issue letters of business to the convocations when he desires their opinion on any matter. They sometimes pass resolutions known as acts of convocation, which, though influential, have no effect in law.

With the Synodical Government Measure of 1969, most of the powers of the convocations, including the power to legislate by canon, passed into the hands of a general synod composed of members of the houses of bishops, members of the houses of clergy, and a house of laity. Though the convocations continue to meet, their transactions are principally formal.

Canterbury Plains, lowland area of east central South Island, New Zealand, and heart of Canterbury administrative region. The plains cover an area of 150 mi (240 km) by 45 mi bordering on the Pacific. The Rangitata, Rakaia, and Waimakariri are the principal rivers, flowing east from the Southern Alps to cross the plains, which have hot summers and generally low humidity and a mean annual rainfall of less than 30 in. (750 mm). Organized settlement of the area began in the 1850s with the introduction of merino sheep and the beginning of intensive farming for produce to ship to the goldfields of Victoria, Australia. The plains, the largest low-lying farm district of New Zealand, are well suited to mechanized agriculture for grains, pasture seed, and fodder crops, as well as fat-lamb raising. In the vicinity of Christchurch, the urban centre and chief outlet of the region, there is dairy, poultry, and fruit and vegetable farming and, around Ashburton, some use of irrigation for agriculture.

Canterbury Tales, The, collection of tales, most in verse and most written soon after 1387, by the English poet Geoffrey Chaucer. Chaucer's work differs from other collections of tales (*e.g.*, Boccaccio's *Decameron* [*q.v.*]) in the variety of the tellers of the tales, in the vividness with which the tellers are described, and in the developing relationships between tales and tellers.

Chaucer at first planned a huge scheme of about 30 pilgrims (including the poet himself) described on a pilgrimage from the Tabard Inn in Southwark, then a suburb of London, to the famous shrine of St. Thomas Becket in Canterbury Cathedral and back again. Each pilgrim was to tell two stories going and two returning. Only 24 stories are included (some unfinished).

Canth, Minna, in full ULRIKA VILHELMINA CANTH, *née* JOHNSSON (b. March 19, 1844, Tampere, Russian Finland—d. May 12, 1897, Kuopio), novelist and dramatist, a late 19th-century leader of the revival of the Finnish vernacular and Realist movement.

Minna Canth
Otava Publishing Co., Helsinki

In 1863 she entered the seminary at Jyväskylä, where she married her teacher, J.F. Canth, in 1865. Widowed in 1879, with seven children, she went into business at Kuopio but still found time to produce literary works that had a powerful impact on her contemporaries. In her early short stories, *Novelleja ja Kertomuksia* (1878), she was somewhat influenced by the Norwegian writer B.M. Bjørnson's idealistic descriptions of country life, but in later novels and plays she turned to the realistic treatment of urban social problems, as in *Työmiehen vaimo* (1885; "The Labourer's Wife"), a feminist play that, like *Sylvi* (1893), shows the influence of Henrik Ibsen. Among her best works are the short story "Kauppa-Lopo" (1889) and the play *Anna-Liisa* (1895), the latter influenced by Tolstoy. As a dramatist she long ranked second only to the founder of Finnish drama, Aleksis Kivi, and as a personality she ranked among the most notable Finnish women.

canticle (from Latin *canticulum,* diminutive of *canticum,* "song"), a scriptural hymn text, used in various Christian liturgies, that is similar to a psalm in form and content but appears apart from the book of Psalms. In the Old Testament there are at least a dozen such hymns (called the *cantica minora,* or lesser canticles). A few of these are known to have been used by the Jews, in the services both at the Temple and at the synagogue. Of several New Testament canticles (the *cantica majora,* the greater, or Evangelical, canticles), three are used daily in the Roman Catholic rite: *Benedictus,* the canticle of Zechariah, at Lauds; *Magnificat,* the canticle of the Virgin Mary, at Vespers; and *Nunc Dimittis,* the canticle of Simeon, at Compline. The *Book of Common Prayer* of the Church of England applies the word canticle only for the *Benedicite,* but, in practice, the term has been adopted for the psalms and hymns used daily in the Morning and Evening Prayers. A number of other texts not originating in the Bible are also generally regarded as canticles; these include the Lord's Prayer, the Apostles' Creed, and the Te Deum, which has been one of the canticles of Morning Prayer in Anglican Church music since 1549. "Canticles" is sometimes used as an abbreviation for *Canticum canticorum* (Song of Songs), an alternative name for the Songs of Solomon, selections from which have been frequently used in the composition of motets.

cantiga, genre of 13th-century Spanish monophonic, or unison, song, often honouring the Virgin Mary. The most famous collection is a manuscript, the *Cantigas de Santa María,* compiled by King Alfonso X the Wise of Castile and Leon in the second half of the century and preserved in three manuscript copies at the library of El Escorial, northwest of Madrid, the Biblioteca Nacional, Madrid, and the Biblioteca Nazionale Centrale, Florence. The collection contains the words and music of more than 400 songs in the Galician language, celebrating the miracles of the Virgin. Most of the songs are in virelai (*q.v.*) form (found in medieval French poetry and music) and show an affinity with the songs of the contemporary troubadours (poet-musicians of Provence).

cantilena, in late medieval and early Renaissance music, term for certain vocal forms as they were known in the 15th century; also a musical texture used widely in both secular and sacred compositions of that century. Cantilena, or ballade, style (now more generally termed treble-dominated style) is characterized by a predominant vocal top line supported by less complex and usually instrumental tenor and countertenor lines; it occurred both in homophonic, or chordal, music and in polyphonic music having a contrapuntal (interwoven melody) texture.

Cantilena was defined by the Flemish music theorist Johannes Tinctoris (1436–1511) as one of the smaller forms that usually treated love, although any subject was suitable. In England, homophonic carols of the period were called *cantilenae* if the texts were entirely Latin. Rondeaux and virelais (medieval French poetic forms) as well as ballades were set to music with this texture, as were some masses and motets.

The French composer Guillaume de Machaut (*c.* 1300–77) and the Burgundian Guillaume Dufay (*c.* 1400–74) were the most important composers who wrote in this style. It was thus primarily a French idiom in the early 1400s, though it soon surfaced in Italy in works by such composers as Corrado da Pistoia and Ludovico da Rimini.

cantilever, beam supported at one end and carrying a load at the other end or distributed along the unsupported portion. The upper half of the thickness of such a beam is subjected to tensile stress, tending to elongate the fibres, the lower half to compressive stress, tending to crush them. Cantilevers are employed extensively in building construction and in machines. In building, any beam built into a wall and with the free end projecting forms a cantilever. Longer cantilevers are incorporated in a building when clear space is required below, with the cantilevers carrying a gallery, roof, canopy, runway for an overhead travelling crane, or part of a building above.

In bridge building a cantilever construction is employed for large spans in certain sites, especially for heavy loading; the classic type is the Forth Bridge, Scotland, composed of three cantilevers with two connecting suspended spans. Cantilever cranes are necessary when a considerable area has to be served, as in steel stockyards and shipbuilding berths. In the lighter types a central travelling tower sustains the cantilever girders on either side; the big hammerhead cranes (up to 300-ton capacity) used in working on ships that have proceeded from the yards to fitting-out basins have a fixed tower and revolving pivot reaching down to rotate the cantilever in a circle.

cantillation, in music, intoned liturgical recitation of scriptural texts, guided by signs originally devised as textual accents, punctuations, and indications of emphasis. Such signs, termed ecphonetic signs, appear in manuscripts of the 7th–9th century, both Jewish and Christian (Syrian, Byzantine, Armenian, Coptic). Although first intended to clarify the reading of the texts, they were apparently adopted as mnemonic devices to help the singer recall various melodic formulas. Their musical interpretation is thus dependent on a knowledge of the oral tradition through which the melodic formulas are transmitted. Today cantillation refers almost exclusively to the Jewish service.

The cantillation of biblical texts was apparently part of Hebrew temple ritual and was later adopted in the synagogue. The present system of signs, or *ṭe'amim,* was developed among the Tiberian Masoretes (keepers of a cumulative body of biblical text tradition) and has strong similarities with the ecphonetic notation of early Byzantine chant. It was preceded by two less satisfactory systems, the Babylonian (6th–7th century) and the Proto-Palestinian (5th–6th century); the musical motifs represented by the signs of these systems, however, are much older.

Both in the melodic modes used and in the melodic formulas attached to the individual signs, the interpretation of the *ṭe'amim* varies considerably among the three main traditions of Jewish liturgical music, Oriental, Sephardic, and Ashkenazic; however, a few similarities at important points indicate a common origin.

Within any single tradition, the rendition of the melodic formula associated with a given sign varies with the book of the Bible. Each book has its own melodic mode, which prescribes certain notes and intervals around which melodies gravitate; a melodic motif sung in two different modes retains its basic contour but varies in the specific narrow or wide intervals used and in other details.

Cantillation is also used in Islāmic religious services in the recitation of the Qur'ān and in the muezzin's call to prayer, or *adhān.* Neither it nor the cantillation of the Qur'ān are considered to be music, however, and music as such is forbidden in religious services.

Originally simply intoned, the call to prayer today is often highly florid; melodically it varies from region to region. The cantillation of the Qur'ān is an outgrowth of the nature of the text, which is in groups of rhythmical prose lines that are rhymed. The punctuation of the reading follows fixed rules, but there are no prescribed melodic formulas, and the recitations thus also vary with locale. Apparently they were at first slow and chantlike, but by the 9th century they had incorporated elements of popular melody.

Cantillon, Richard (b. late 17th century, Ballyheige, County Kerry, Ire.—d. May 14, 1734, London), Irish economist and financier who wrote one of the earliest treatises on modern economics.

Cantillon was an Irishman of Norman origins and Jacobite connections who spent much of his life in France. He took over the bankrupt banking business of an uncle of the same name in Paris and made a fortune from the collapse of John Law's Mississippi Scheme (a colonial development project whose profits could not match the expectations stirred up by speculators). He operated as a financier in a number of centres, including Amsterdam, where his transactions were on a large scale.

Cantillon was murdered by a dismissed cook who then robbed and set fire to his house. Cantillon's fame rests entirely on the one work which survived the blaze, his *Essai sur la nature du commerce en général,* written about 1730–34 and published by the Marquis de Mirabeau in 1755. Its treatment of population influenced Mirabeau and Adam Smith and, through the latter, Malthus. It contained a theory of relative wages which was used by Smith; the famous *Tableau économique* of the Physiocrats was probably inspired by

the *Essai,* and the treatment of the theory of money was of pioneering importance. Cantillon was a quantity theorist who estimated the determinants of rapidity and magnitude of currency circulation, advanced a theory of the self-regulation of the international distribution of precious metals, and explored the effects of the different channels by which increases in the quantity of money comes into circulation upon economic activity.

Cantinflas, original name MARIO MORENO (b. Aug. 12, 1911, Mexico City), the most popular entertainer in the history of Latin-American cinema. An internationally known clown, acrobat, musician, bullfighter, and satirist, he is identified with the comic figure of a poor Mexican slum dweller, a *pelado,* who wears trousers held up with a rope, a battered felt hat, a handkerchief tied around his neck, and a ragged coat.

Cantinflas left school to join a traveling tent show as a dancer and was soon performing as a comic satirist and pantomime artist. Leaving the itinerant group, he appeared at the Folies Theatre in Mexico City, then in short advertising films. Cantinflas' first feature film was *Ahí está el detalle!* (1941; "Here's the Point"). *Ni sangre, ni arena* (1941; "Neither Blood nor Sand"), a satire on bullfighting, broke box-office records for Mexican-made films throughout the Spanish-speaking countries. An internationally successful entertainer by the 1950s, Cantinflas was introduced to English-speaking audiences as Passepartout, the manservant of Phineas Fogg in *Around the World in Eighty Days* (1956). After the box-office failure of his next Hollywood film, *Pepe* (1960), he returned to Mexico, where he continued to reign as the undisputed king of Latin-American comedy.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

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canto, major division of an epic or other long, narrative poem. An Italian term, derived from the Latin *cantus* (song), it probably originally indicated a portion of a poem that could be sung or chanted by a minstrel at one sitting. Though early oral epics, such as Homer's, are divided into discrete sections, the name canto was first adopted for these divisions by the Italian poets Dante, Boiardo, and Ariosto. The first long English poem to be divided into cantos was Edmund Spenser's *Faerie Queene* (1590–1609). Byron structured his long poems *Childe Harold* (1812) and *Don Juan* (1819–24) in cantos. An ambitious, unfinished epic by the U.S. poet Ezra Pound is known simply as *The Cantos.*

Canton, Wade–Giles romanization KUANG-CHOU, Pinyin GUANGZHOU, city, capital of Kwangtung Province, southeastern China. It is situated just upstream of the head of the Pearl River Estuary (Chu Chiang K'ou), more than 90 mi (145 km) inland, west of the South China Sea. Because of its geographic position, Canton has long been one of China's main commercial and trading centres and a portal for foreign influence. The city is also a historic centre of learning, and, as the centre of Sun Yat-sen's political activities, it was the cradle of the Nationalist revolution.

The following article treats briefly the modern city of Canton. Fuller treatment is provided in the following MACROPAEDIA articles. For history and contemporary life, *see* Canton; for additional perspective on the city in its national context, *see* China.

Canton, originally lying within the county (*hsien*) of P'an-yü, has been expanded to embrace several additional counties. The old city centre stretches along a waterfront (the Chang Ti, or Long Quay), which runs for 5 mi from east to west along the Pearl River. The Old City (dating to the Ming Dynasty) lies on the north bank, and industrial and residential suburbs, many incorporated in expansions after the 1911 revolution, are located on both banks. Canton has three seasons: a hot and humid summer with frequent, though usually benign, typhoons; a mild and snow-free winter; and a muggy spring.

Canton's heavy industries include the production of machinery, chemicals, iron and steel, and trucks and tractors. Since 1950 there has been substantial growth of such light industries as the manufacture of textiles, newsprint, refined sugar, processed foods, and small appliances. Traditional handicrafts, such as the carving of ivory and jade objects, continue to thrive. Canton is the trade centre of Kwangtung and Kwangsi provinces. Among the city's exports are fruits, sugar, and silk; manufactured goods are transshipped via Canton into the interior.

Old Canton was a crowded city of narrow, winding streets and polluted canals. A vigorous modernization program was carried out in the 1920s and '30s, resulting in a more livable city of wide, tree-lined streets, modern sewers, parks, and a landscaped waterfront. The Communist government has continued this program with the construction of new housing, modern shops, and handsome government buildings. The main north–south thoroughfare of Chieh-fang Lu (Liberation Avenue) is bisected by the east–west Chung-shan Lu (Sun Yat-sen Avenue). Hai-chu Square overlooks the waterfront and is bordered by exhibition halls used for trade fairs.

Institutions of higher learning include Sun Yat-sen University, Chinan University, and various technical, medical, and scientific institutes. The large number of museums and libraries include the Canton Municipal Museum, with its historical exhibits, the Sun Yat-sen Museum, the museum of the Peasant Movement Institute, and the Sun Yat-sen Library of Kwangtung Province, with its large collection of works in Cantonese.

Buses, bicycles, and cars are the principal means of city transportation. Oar-propelled sampans, steamers, and motor launches travel on the city's canals. Canton, a focal point of coastal and ocean navigation, enjoys well-developed land transportation as well; it is served by three railroads and one of China's most extensive highway networks. Canton's municipal airport is the largest in South China. Area municipality, 6,433 sq mi (16,662 sq km). Pop. (1984 est.) city, 3,170,000; municipality, 6,870,000.

Canton, city, Fulton County, west central Illinois, U.S., in the Illinois River Valley. Founded in 1825 by Isaac Swan, a native of Vermont, it was named in the belief that it was diametrically opposite Canton, China. It developed as a manufacturer of farm tools and became the site of one of the largest tillage-implement factories in the Middle West when, in 1919, the International Harvester Company absorbed the P. & O. Plow Works; the plant ceased production in 1983. Other economic activity includes bituminous-coal mining and farming (corn, wheat, and livestock). Wee-Ma-Tuk, a recreation area covering 3,200 ac (1,300 ha) of reclaimed strip-mining land, is 10 mi (16 km) west. Spoon River (junior) College was established in Canton in 1959. Inc. 1849. Pop. (1980) 14,626.

Canton, urban town (township), Norfolk County, eastern Massachusetts, U.S., on the Neponset River, 14 mi (23 km) south of Boston. Settled in 1650, it was known by its Indian name, Punkapoag, and was part of Stoughton. Separately incorporated in 1797, it was renamed because of local belief that the town was antipodal to Canton, China. It was an early industrial centre, where Paul Revere established a gunpowder factory during the Revolutionary War and built (1808) the first copper rolling mill and brassworks in the United States. Although mainly residential, it now manufactures textiles, rubber and plastic products, and technical and radio apparatus. Canton is the site of the Massachusetts Hospital and School for Crippled Children and the Blue Hills Regional Technical Institute (1966). Pop. (1980) 18,182.

Canton, city, seat (1808) of Stark County, northeastern Ohio, U.S., 60 mi (97 km) south-southeast of Cleveland. It is the focus of a metropolitan area that includes the cities of North Canton, East Canton, and Massillon. Laid out in 1805, it was probably named by its founder, Bezaleel Wells, for the Canton estate in Baltimore, Md. (a private home founded on trade profits from China), of his friend Capt. John O'Donnell.

The community developed from a manufacturer of plows, reapers, and farm equipment

The National Professional Football Hall of Fame, Canton, Ohio
Milt and Joan Mann from CameraMann

into an important industrial centre. Diversified products now include electric sweepers, alloy steel, tapered roller bearings, safes and bank vaults, streetlight standards, heavy steel presses, water softeners, voting machines, internal-combustion engines, rubber products, and bricks and ceramics.

William McKinley opened (1867) a law office in Canton, from where he later conducted his "front-porch campaign" for the presidency. After his assassination in 1901 his body was returned there for burial. He, his wife, and two daughters are now entombed in the McKinley Memorial in Westlawn Cemetery. The American Professional Football Association was formed in Canton in 1920 with Jim Thorpe of the Canton Bulldogs as its first president. To honour the city's role in organizing the sport, the National Professional Football Hall of Fame was established there in 1963.

Canton is the seat of Malone College (a Quaker institution founded in 1892 in Cleveland as a Bible college and moved in 1957), the Stark Campus of Kent State University (1967), Walsh College (1960, Roman Catholic), and Stark Technical College (1970). The Cultural Center for the Arts (1970) houses the Canton Art Institute, the Players Guild, and the Canton Symphony Orchestra, Civic Opera, and Poetry Society. The city's Stark County Historical Center includes the McKinley Museum, the Hall of Science and Industry, and the Hoover-Price Planetarium. Inc. village, 1828; town, 1834; city, 1854. Pop. (1970) 110,053; (1980) 94,730.

Canton, city, seat (1862) of Lincoln County, southeastern South Dakota, U.S., on the Big Sioux River at the Iowa border, 18 mi (29 km) southeast of Sioux Falls. Founded in 1860, it was first called Commerce City but was renamed (1867) by settlers who believed that it was diametrically opposite Canton, China. It became the centre of a Norwegian community and was used by Ole Rölvaag as a setting for his novel *Giants in the Earth* (1927). The agriculture-based economy (grain, livestock, poultry, commercially raised pheasants, and dairy products) is augmented by light industries. Inc. 1881. Pop. (1982 est.) 2,848.

canton, political subdivision in France, Switzerland, and other European countries.

In France the canton, a subdivision of the *arrondissement,* is a territorial division rather than a genuine unit of local government; it is only a convenient administrative subdivision for purposes of elections, tax collection, and the *gendarmerie.* The cantons were created by a law of Dec. 22, 1789, but their governmental character was taken away by the consular constitution of the year VIII (Dec. 24, 1799).

In Switzerland, canton is the name given to each of the 23 states comprising the Swiss Confederation. Three cantons—Unterwalden, Basel, and Appenzell—are subdivided into demicantons, or half cantons, which function as full cantons; thus, there is often reference to 26 states of Switzerland. Each of the cantons and half cantons has its own constitution, legislature, executive, and judiciary. Obwalden, Nidwalden, Glarus, Appenzell Inner-Rhoden, and Appenzell Ausser-Rhoden have preserved their ancient democratic assemblies (*Landsgemeinden*), in which all male citizens of full age meet annually for the purpose of legislation, taxation, and the election of an annual administrative council and of the members of the cantonal supreme court. In the remaining cantons the legislature (Kantonsrat, Grosser Rat, or Grand Conseil) is composed of representatives chosen by universal suffrage and usually by proportional representation. These councils deal with legislation and all questions not reserved to the federal government. They decide on cantonal taxes and appoint judges as well as cantonal representatives to the federal Ständerat (Council of States) unless the cantonal constitution demands public elections. All cantons have the referendum and the popular initiative, the application of which varies.

Canton, John (b. July 31, 1718, Stroud, Gloucestershire, Eng.—d. March 22, 1772, London), British physicist and teacher.

The son of a weaver, Canton became the clerk to the master of a school in London in 1737; he succeeded the master as teacher in 1745 and ran the school himself until his death in 1772. Canton's invention of a new way to make artificial magnets helped procure him the Copley Medal (1751) and a fellowship in the Royal Society. He was the first in England to experimentally verify Benjamin Franklin's hypothesis of the identity of lightning and electricity (1752). He then made several important discoveries about electrostatic induction. He was the first to refute the Florentine Academy's dictum that water is incompressible. He also discovered (1768) the phosphorescent material that became known as Canton's phosphorus.

Canton Atoll (Kiribati): *see* Kanton Atoll.

Canton Delta: *see* Pearl River Delta.

Canton enamel, Chinese painted enamel, so named for the principal place of its manufacture, Canton. Painted enamel techniques were originally developed in Limoges, Fr., from about 1470. These techniques were introduced into China in the 18th century, probably by French missionaries. This is reflected in the translation of the Chinese term for painted enamels, "foreign porcelain." A metal object, usually copper but sometimes silver or gold, is covered with a background layer of enamel (often white), is fired, and then is painted with coloured enamels in much the same manner as porcelains. The finished piece is then fired again.

A thriving industry for the manufacture and export of Canton enamels grew up in the 18th century. More refined enamels made in the emperor's workshops and in private shops in Peking also became popular export items. Most of the Canton enamels used the *famille rose* colours peculiar to Europe. Some of this "foreign porcelain" became the medium for humour and satire, often caricaturing foreigners. The quality of Canton enamels began to deteriorate at the end of the 18th century, but they were still made in large numbers during the 19th century.

Canton system, trading pattern that developed between Chinese and foreign merchants, especially British, in the South China trading city of Canton from the 17th to the 19th century. The major characteristics of the system developed between 1759 and 1842, when all foreign trade coming into China was confined to Canton and the foreign traders entering the city were subject to a series of regulations by the Chinese government.

Canton was historically the major southern port in China and the main outlet for the country's tea, rhubarb, silk, spices, and handcrafted articles that were sought by Western traders. As a result, the British East India Company, which had a monopoly on British trade with China, made Canton its major Chinese port early in the 17th century, and other Western trading companies soon followed their example. The Canton trade came to consist of three major elements: the native Chinese trade with Southeast Asia; the "country" trade of Europeans, who attempted to earn currency to buy Chinese goods by carrying merchandise from India and Southeast Asia into China; and the "China trade" between Europe and China.

The Ch'ing dynasty (1644–1911/12) appointed merchant firms, which in return for paying a large fee to the authorities were given a monopoly on all trade coming into China from one of these three groups. The merchant guild, or hong, that handled trade between China and the West was known to the Westerners as the cohong (a corruption of *kung-hung,* meaning "officially authorized merchants"). The cohong merchants had to guarantee every foreign ship coming into the harbour and take full responsibility for all persons connected with the ship. In turn, the East India Company was responsible to the cohong for all British ships and personnel. The two governments of Britain and China had no dealings with one another but related to each other only through the intermediary merchant groups.

In response to a British attempt to expand their trade to some of the North China ports, the Ch'ing emperor in 1759 issued a decree explicitly ordering that Canton be made the only port opened to foreign commerce. This had the effect of tightening Chinese regulations on foreign traders. Foreign merchants became subject to numerous demanding regulations, including the exclusion of foreign warships from the area, the prohibition of foreign women or firearms, and a variety of restrictions on the merchants' personal freedom. While in Canton they were confined to a small riverbank area outside the city wall where their 13 warehouses, or "factories," were located. They were also subject to Chinese law, in which a prisoner was presumed guilty until proved innocent and was often subject to torture and arbitrary imprisonment. Furthermore, ships coming into the harbour were liable to a host of petty exactions and fees levied by the Chinese authorities.

In the early 19th century, British traders began to chafe at these restrictions placed on their trade with China. The complaints grew more numerous with the abolition of the East India Company monopoly in 1834 and the ensuing influx of private traders into China. At the same time, the British "country trade" increasingly centred on the importation of opium into China from India as a means of paying for the British purchases of tea and silk. Chinese attempts to halt the opium trade resulted in the first Opium War (1839–42) between Britain and China. Britain's victory in this conflict forced the Chinese to abolish the Canton system and replace it with five treaty ports in which foreigners could live and work outside Chinese legal jurisdiction, trading with whomever they pleased.

Cantonese language, also called YÜEH, variety of Chinese spoken in Kwangtung and southern Kwangsi provinces, including the important cities of Canton, Hong Kong, and Macau. Cantonese preserves more features of Ancient Chinese than do the other major Chinese languages; it retains most of the final consonants of the older language and has six tones, in contrast to the four tones of Modern Standard Chinese, to distinguish meaning between words or word elements that have the same arrangement of consonant and vowel sounds. The language has fewer initial consonants than Modern Standard Chinese and about twice as many distinctively different syllables. The majority of Chinese emigrants are from areas where Cantonese is spoken.

cantor (Latin: "singer"), also spelled KANTOR, also called CHANTER, Hebrew ḤAZZAN ("overseer"), also spelled ḤAZAN, CHAZZAN, or CHAZAN, in Judaism and Christianity, an ecclesiastical official in charge of music or chants.

In Judaism, the cantor, or *ḥazzan,* directs liturgical prayer in the synagogue and leads the chanting. He may be engaged by a congregation to serve for an entire year or merely to assist at the ceremonies of Rosh Hashana and Yom Kippur. Cantors in many U.S. congregations also act as religious-school directors.

In former times the duties of the Jewish *ḥazzan* ranged over a broad area: he had overall care of the synagogue, announced the beginning and the end of the sabbath, removed the Torah scrolls from the ark of the Law and replaced them after the service, cared for the sick and the needy, and saw to the religious education of children. His knowledge of music and Hebrew gradually transformed his role of assistant to the reader into that of director of the chanting during liturgical services.

In medieval Christianity the cantor was an official in charge of music at a cathedral. His duty, later undertaken by the organist, was to supervise the choir's singing, particularly the singing of the psalms and the canticles. (In responsorial chants—those divided between a choir and a soloist—the term cantor still refers to the soloist.) The term was also used for the head of a college of church music—*e.g.,* the Roman schola cantorum of the early Middle Ages and the singing schools founded by Charlemagne.

In German Protestant churches of the 17th and 18th centuries, the cantor was the choirmaster and organist of a school or college subordinate to the rector; Johann Sebastian Bach held this post at the Thomasschule in Leipzig.

Cantor, Eddie, original name EDWARD ISRAEL ISKOWITZ (b. Jan. 31, 1892, New York City—d. Oct. 10, 1964, Hollywood), American comedian and star of vaudeville, burlesque, the legitimate stage, radio, and television.

Cantor was cared for by his grandmother on

New York's Lower East Side when he was orphaned at age two. From early childhood he clowned and sang for coins on street corners, and developed a talent for mimicry. When he was 12 he attended a summer camp for youngsters sponsored by the YMHA where his impersonations were enthusiastically received. He dropped out of elementary school to work but could not keep a job because of his irrepressible clowning. He won an amateur-night competition at a theatre in the Bowery district, and was on his way into vaudeville as a blackface song-and-dance man. He toured with various U.S. theatre companies including Ziegfeld's and the Schuberts. He appeared in such Broadway reviews as *Broadway Brevities* (1920) and *Make It Snappy* (1922), and from 1923 to 1926 he was a star in *Kid Boots.*

After he had attained Broadway stardom Cantor turned to radio with "The Chase and Sanborn Hour" in September 1931. Taking the part of a standup comedian, he used his vaudeville experience to outstanding effect, and combined the expression of patriotism and personal values with humour; audiences responded enthusiastically. With changes of name, the show continued for 18 years on the National Broadcasting Company (NBC) and the Columbia Broadcasting System (CBS) networks. He also served as host of "The Eddie Cantor Variety Theater," a half-hour television variety show that was syndicated in 1955.

Cantor, Georg (Ferdinand Ludwig Philipp) (b. March 3, 1845, St. Petersburg, Russia—d. Jan. 6, 1918, Halle, Ger.), German mathematician who founded set theory and introduced the mathematically meaningful concept of transfinite numbers, indefinitely large but distinct from one another.

Early life and training. Cantor's parents were Danish. His artistic mother, a Roman Catholic, came from a family of musicians, and his father, a Protestant, was a prosperous merchant. When his father became ill in 1856, the family moved to Frankfurt. Cantor's mathematical talents emerged prior to his 15th birthday while studying in private schools and at *gymnasien* at Darmstadt first and then at Wiesbaden; eventually, he overcame the objections of his father, who wanted him to become an engineer.

After briefly attending the University of Zürich, Cantor in 1863 transferred to the University of Berlin to specialize in physics, philosophy, and mathematics. There he was taught by the mathematicians Karl Theodor Weierstrass, whose specialization of analysis probably had the greatest influence on him; Ernst Eduard Kummer, in higher arithmetic; and Leopold Kronecker, a specialist on the theory of numbers who later opposed him. Following one semester at the University of Göttingen in 1866, Cantor wrote his doctoral thesis in 1867, *In re mathematica ars propendi pluris facienda est quam solvendi* ("In mathematics the art of asking questions is more valuable than solving problems"), on a question that Carl Friedrich Gauss (*q.v.*) had left unsettled in his *Disquisitiones Arithmeticae* (1801). After a brief teaching assignment in a Berlin girls' school, Cantor joined the faculty at the University of Halle, where he remained for the rest of his life, first as lecturer (paid by fees only) in 1869, then assistant professor in 1872, and full professor in 1879.

In a series of 10 papers from 1869 to 1873, Cantor dealt first with the theory of numbers; this article reflected his own fascination with the subject, his studies of Gauss, and the influence of Kronecker. On the suggestion of Heinrich Eduard Heine, a colleague at Halle who recognized his ability, Cantor then turned to the theory of trigonometric series, in which he extended the concept of real numbers. Starting from the work on trigonometric series and on the function of a complex variable done by the German mathematician Bernhard Riemann (*q.v.*) in 1854, Cantor in 1870 showed that such a function can be represented in only one way by a trigonometric series. Consideration of the collection of numbers (points) that would not conflict with such a representation led him, first, in 1872, to define irrational numbers in terms of convergent sequences of rational numbers (quotients of integers) and then to begin his major lifework, the theory of sets and the concept of transfinite numbers.

Set theory. An important exchange of letters with Richard Dedekind (*q.v.*), mathematician at the Brunswick Technical Institute, who was his lifelong friend and colleague, marked the beginning of Cantor's ideas on the theory of sets. Both agreed that a set, whether finite or infinite, is a collection of objects (*e.g.,* the integers, $\{0, \pm1, \pm2 \ldots\}$) that share a particular property while each object retains its own individuality. But when Cantor applied the device of the one-to-one correspondence (*e.g.,* $\{a, b, c\}$ to $\{1, 2, 3\}$) to study the characteristics of sets, he quickly saw that they differed in the extent of their membership, even among infinite sets. (A set is infinite if one of its parts, or subsets, has as many objects as itself.) His method soon produced surprising results.

In 1873 Cantor demonstrated that the rational numbers, though infinite, are countable (or denumerable) because they may be placed in a one-to-one correspondence with the natural numbers (*i.e.,* the integers, as 1, 2, 3, . . .). He showed that the set (or aggregate) of real numbers (composed of irrational and rational numbers) was infinite and uncountable. Even more paradoxically, he proved that the set of all algebraic numbers contains as many components as the set of all integers and that transcendental numbers (those that are not algebraic, as π), which are a subset of the irrationals, are uncountable and are therefore more numerous than integers, which must be conceived as infinite.

But Cantor's paper, in which he first put forward these results, was refused for publication in *Crelle's Journal* by one of its referees, Kronecker, who henceforth vehemently opposed his work. On Dedekind's intervention, however, it was published in 1874 as "Über eine Eigenschaft des Inbegriffes aller reellen algebraischen Zahlen" ("On a Characteristic Property of All Real Algebraic Numbers").

While honeymooning the same year with his bride, Vally Guttman, at Interlaken, Switz., Cantor met Dedekind, who gave a sympathetic hearing to his new theory. Cantor's salary was low, but the estate of his father, who died in 1863, enabled him to build a house for his wife and five children. Many of his papers were published in Sweden in the new journal *Acta Mathematica,* edited and founded by Gösta Mittag-Leffler, one of the first persons to recognize his ability.

Cantor's theory became a whole new subject of research concerning the mathematics of the infinite (*e.g.,* an endless series, as 1, 2, 3, . . . , and even more complicated sets), and his theory was heavily dependent on the device of the one-to-one correspondence. In thus developing new ways of asking questions concerning continuity and infinity, Cantor quickly became controversial. When he argued that infinite numbers had an actual existence, he drew on ancient and medieval philosophy concerning the "actual" and "potential" infinite and also on the early religious training given him by his parents. In his book on sets, *Grundlagen einer allgemeinen Mannigfaltigkeitslehre* ("Foundations of a General Theory of Aggregates"), Cantor in 1883 allied his theory with Platonic metaphysics. By contrast, Kronecker, who held that only the integers "exist" ("God made the integers, and all the rest is the work of man"), for many years heatedly rejected his reasoning and blocked his appointment to the faculty at the University of Berlin.

Transfinite numbers. In 1895–97 Cantor fully propounded his view of continuity and the infinite, including infinite ordinals and cardinals, in his best known work, *Beiträge zur Begründung der transfiniten Mengelehre* (published in English under the title *Contributions to the Founding of the Theory of Transfinite Numbers,* 1915). This work contains his conception of transfinite numbers, to which he was led by his demonstration that an infinite set may be placed in a one-to-one correspondence with one of its subsets. By the smallest transfinite cardinal number he meant the cardinal number of any set that can be placed in one-to-one correspondence with the positive integers. This transfinite number he referred to as aleph-null. Larger transfinite cardinal numbers were denoted by aleph-one, aleph-two, ... He then developed an arithmetic of transfinite numbers that was analogous to finite arithmetic. Thus, he further enriched the concept of infinity. The opposition he faced and the length of time before his ideas were fully assimilated represented in part the difficulties of mathematicians in reassessing the ancient question: "What is a number?" Cantor demonstrated that the set of points on a line possessed a higher cardinal number than aleph-null. This led to the famous problem of the continuum hypothesis, namely, that there are no cardinal numbers between aleph-null and the cardinal number of the points on a line. This problem has, in the first and second halves of the 20th century, been of great interest to the mathematical world and was studied by many mathematicians, including the Czech-Austrian-American Kurt Gödel and the American Paul J. Cohen.

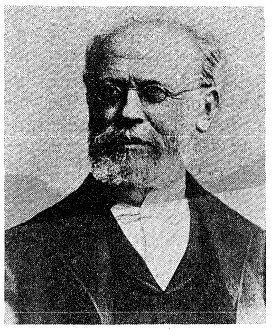
Although mental illness, beginning about 1884, afflicted the last years of his life, Cantor remained actively at work. In 1897 he helped to convene in Zürich the first international congress of mathematics. Partly because he had been opposed by Kronecker, he often sympathized with young, aspiring mathematicians and sought to find ways to ensure that they would not suffer as he had because of entrenched faculty members who felt threatened by new ideas. At the turn of the century, his work was fully recognized as fundamental to the development of function theory, of analysis, and of topology. Moreover, his work stimulated further development of both the intuitionist and the formalist schools of thought in the logical foundations of mathematics; it has substantially altered mathematical education in the United States and is often associated with the "new mathematics."

BIBLIOGRAPHY. *Gesammelte Abhandlungen,* ed. by Ernst Zermelo (1932), contains the collected works of Cantor edited by an authority on set theory. For biographical information, see Eric T. Bell, *Men of Mathematics* (1937, reprinted 1961), a well-developed history of mathematics with a full chapter on Cantor; Dirk J. Struik, *A Concise History of Mathematics* (1948), which discusses the principal mathematicians of the times and their influence on Cantor; and Herbert Meschkowski, *Denkweisen grosser Mathematiker* (1961; *Ways of Thought of Great Mathematicians,* 1964), which devotes a chapter to an elementary account of Cantor's theory of sets.

Cantor, Moritz Benedikt (b. Aug. 23, 1829, Mannheim, Baden—d. April 10, 1920, Heidelberg, Ger.), German historian of mathematics, one of the greatest of the 19th century.

Cantor spent his career at the University of Heidelberg, where he began as a tutor in 1853. His first important book was *Mathematische Beiträge zum Kulturleben der Völker* (1863; "Mathematical Contributions to the Cultural Life of the People"). It was followed by his *Vorlesungen über Geschichte der Mathematik* ("Lectures on the History of Mathematics"), the first volume of which was published in 1880, the second in 1892, and the third in

successive parts between 1894 and 1896. By this time Cantor was too old to undertake the fourth volume; consequently, the work was divided among nine men under his editorship and was finished in 1908. Considered one of the finest published histories of mathematics, the work traces mathematical development from earliest times up to 1799.



Moritz Cantor

Presse-und Informationsamt der Bundesregierung, Bonn

Between 1856 and 1898 Cantor wrote a number of papers that were published chiefly in the *Zeitschrift für Mathematik und Physik* ("Journal of Mathematics and Physics"), of which he was an editor.

Cantù, town, Como province, Lombardia (Lombardy) region, northern Italy, southeast of Como city. The town has miscellaneous industries, principally the manufacture of furniture, lace, and hardware. There is a school of carpentry. Among its several medieval churches S. Teodoro has a 13th-century apse, and the campanile of the parish church dates from the same period. Pop. (1981 prelim.) mun., 36,754.

cantus firmus (Latin: "fixed song"), preexistent melody, such as a plainchant excerpt, underlying a polyphonic musical composition (one consisting of several independent voices or parts). The 11th- and 12th-century organum added a simple second melody (*duplum*) to an existing plainchant melody (the *vox principalis*, or principal voice), which by the end of the 12th century was stretched so as to accommodate a florid melody. The 13th-century polyphonic motet, for its part, featured the plainchant cantus firmus in the tenor (from Latin, *tenere*, "to hold"; *i.e.*, the voice part that was holding the plainchant).

During the Renaissance, masses and motets commonly featured a cantus firmus in the tenor, which was by then no longer the lowest voice. At times, though, the cantus firmus appeared ornamented or paraphrased in the top voice. The plainchant had symbolic as well as purely musical connotations. By the same token, Renaissance composers also seized upon secular tunes, whether folk songs or top lines of chansons (French polyphonic songs). One popular song, "L'Homme armé" ("The Armed Man"), inspired over 30 masses, including one each by Guillaume Dufay (*c.* 1525–94), Josquin des Prez (*c.* 1445–1521), and Giovanni da Palestrina (*c.* 1525–94).

Another cantus firmus source was the hexachord *ut, re, mi, fa, sol, la,* which Josquin employed as a *soggetto cavato* ("carved-out subject") for his *Missa Hercules Dux Ferrariae*, honouring the Duke of Ferrara, the vowels of whose Latin name yielded the solmization syllables of the hexachord. Popular songs also furnished cantus firmi for keyboard variations by William Byrd (1543–1623), Antonio de Cabezón (1510–66), and others.

Sixteenth-century composers of German polyphonic *Lieder*, too, used the cantus firmus technique, as did the Lutheran composers of the Baroque era, including J.S. Bach, in their chorale (German hymn) settings for both voices and instruments, the organ in particular. Many organists continued to improvise on chorale cantus firmi in the late 20th century. As a compositional tool, however, the cantus firmus fell virtually out of use, reappearing only occasionally, as in one section of the *Canti di prigionia* (*Prison Songs*) by Luigi Dallapiccola (1904–75).

Canusium (ancient town, Italy): *see* Canosa di Puglia.

Canute, also spelled CNUT, name of rulers grouped below by country and indicated by the symbol •.

Foreign-language equivalents:
Danish ..... Knud
Norwegian ..... Knut

DENMARK

• **Canute I:** *see* Canute (England).

• **Canute II,** byname CANUTE THE HOLY, or SAINT CANUTE, Danish KNUD DEN HELLIGE (b. *c.* 1043—d. July 10, 1086, Odense, Den.; canonized 1101; feast days January 19, July 10), martyr, patron saint, and king of Denmark from 1080.

The son of King Sweyn II Estrithson of Denmark, Canute succeeded his brother Harold Hen as king of Denmark. Canute opposed the aristocracy and kept a close association with the church in an attempt to create a powerful and centralized monarchy.

In ecclesiastical matters, Canute generously patronized several churches, including the cathedral of Lund, Denmark's archbishopric; established a Benedictine abbey at Odense; and supported apostolic preaching throughout Denmark. In temporal matters, he attempted an administrative reform, particularly an enforced levying of tithes that incurred the wrath of the rural aristocracy. In 1085 he reasserted the Danish claims to England and, with the count of Flanders and King Olaf III of Norway, prepared a massive invasion fleet that alarmed the English king William I the Conqueror.

Canute's plan, however, had to be abandoned suddenly, for those aristocrats who opposed his tax policy revolted as he embarked for England. He fled from the rebels, led by his brother Prince Olaf, to St. Alban's Church, Odense, which he had founded, and was assassinated there with the entire royal party.

Canute was buried in St. Alban's, renamed *c.* 1300 St. Canute's Cathedral. Miracles were recorded at his tomb, and, at the request (1099) of King Erik III Evergood of Denmark, he was canonized (1101) by Pope Paschal II.

• **Canute IV** (b. 1163, Denmark—d. Nov. 12, 1202, Denmark), king of Denmark (co-regent, 1170–82; king, 1182–1202), during whose reign Denmark withdrew from the Holy Roman Empire and extended its dominion along the southern Baltic coast to Pomerania, Mecklenburg, and Holstein. Canute's role in the Danish expansion was overshadowed by that of his more active brother Valdemar, duke of Schleswig (later king as Valdemar II), and of the Danish archbishop Absalon.

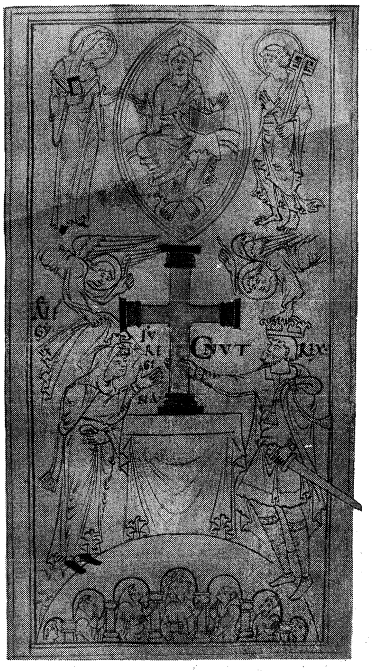
The son of the Danish king Valdemar I, Canute was anointed as co-regent with his father in 1170, beginning the hereditary reign of the Valdemar dynasty. He succeeded to the throne in 1182 and, at the insistence of his closest adviser, the archbishop Absalon, developed policies independent of Frederick I Barbarossa, Holy Roman emperor. As the result of successful military campaigns by Absalon (1184), Canute assumed sovereignty over Pomerania (now in East Germany and Poland) in 1185. He soon also acquired the Slavic territories covering modern Mecklenburg (now in East Germany) and the holdings of German frontier princes. Canute commemorated his triumphs by adding *Slavorumque rex* (King of the Slavs) to his regal title.

Denmark's heightened role in European politics was shown by the marriage of Canute's sister Ingeborg to the French king Philip II Augustus and by Danish intervention in disputes between German rulers. After 1192, Danish policy toward the south was conducted by Canute's brother Valdemar, who extended Danish domination throughout the eastern Baltic territories to beyond the Oder. Canute died childless.

ENGLAND

• **Canute,** byname CANUTE THE GREAT, Danish KNUD DEN STORE, Norwegian KNUT DEN MEKTIGE (d. Nov. 12, 1035), Danish king of England (1016–35), of Denmark (as Canute I; 1019–35), and of Norway (1028–35), who was a power in the politics of Europe in the 11th century, respected by both emperor and pope.

Even more remarkable than his acquisition of an empire was his development from a typical Viking to an enlightened monarch, to the surprise of contemporaries such as Fulbert, bishop of Chartres, who wrote to him: "We



Canute the Great, drawing from the *Newminster liber vitae, c.* 1016–20; in the British Library (Stowe MS. 944)

By courtesy of the trustees of the British Library

were amazed at your wisdom and equally at your piety." In England he was remembered chiefly as a wise ruler, but in Scandinavia his minstrels praised his courage and military success, and the sagas his wiliness and diplomatic skill.

Neither the place nor date of Canute's birth is known. As a youth he accompanied his father, Sweyn I Forkbeard, king of Denmark, on his invasion of England in 1013. Canute was left in charge of the fleet at Gainsborough, Lincolnshire, and it was probably then that he met Aelfgifu, daughter of an ealdorman (chief officer) of Northumbria who had been murdered with King Aethelred II's connivance in 1006; she bore him two sons, Sweyn and Harold. Sweyn I Forkbeard was accepted as king of England by the end of 1013 but died in February 1014, and the English invited Aethelred to return. Canute and the men of Lindsey planned a combined expedition, but Canute deserted his allies at Easter and sailed to Denmark, putting his hostages, savagely mutilated, ashore at Sandwich. In 1015 he

returned and began a long struggle with Aethelred's son Edmund II Ironside. Earl Uhtred of Northumbria submitted to Canute in 1016 and was murdered in his hall. After Aethelred died in April 1016, the English *witan* (council) elected Canute king at Southampton, but those councillors who were in London, with the citizens, elected Edmund. Canute won a victory at Ashingdon, Essex, on October 18, and the kingdom was then divided; but Edmund died on November 30, and Canute succeeded to the whole.

His first actions were ruthless: he gave Englishmen's estates to reward his Danish followers; he engineered the death of Edmund's brother Eadwig; and he had some prominent Englishmen killed or outlawed. Edmund's infant sons, however, eventually reached an asylum in Hungary. Already in 1016, Canute had given the earldom of Northumbria to the Norwegian Viking Eric of Hlathir, and in 1017 he put the renowned Viking chief Thorkell the Tall over East Anglia. Yet Canute did not rule like a foreign conqueror for long: by 1018 Englishmen were holding earldoms in Wessex and Mercia. The Danish element in his entourage steadily decreased. Thorkell was outlawed in 1021, and, during the rest of the reign, of his three most influential advisers only one was a Dane. Canute paid off most of his fleet in 1018, and the Danes and the English reached an agreement at Oxford, one authority adding "according to Edgar's law." A draft of the treaty survives, written in the style of Archbishop Wulfstan of York, who later drew up Canute's laws, mainly based on previous legislation. It is likely that it was Wulfstan who aroused in the young Canute an ambition to emulate the best of his English predecessors, especially King Edgar. Canute proved an effective ruler who brought internal peace and prosperity to the land. He became a strong supporter and a generous donor to the church, and his journey to Rome was inspired by religious as well as diplomatic motives. He needed English support against external dangers. King Aethelred's sons were in Normandy, and Canute married their mother, Emma, in 1017 to prevent her brother, Duke Richard II, from espousing their cause. English forces helped to secure Canute's position in Scandinavia in 1019, when he went to Denmark to obtain the throne on his brother's death; in 1023, when the outlawed Thorkell was causing trouble; and again in 1026 when his regent in Denmark, Ulf Jarl, the husband of his sister Estrid, joined the King of Norway and the King of Sweden in a coalition against Denmark. Though Canute was defeated at the Battle of the Holy River, Sweden, terms were made. Scandinavian sources attribute to Canute Ulf's death soon afterward. Canute fomented with bribes the unrest of Norwegian landowners against their king, Olaf II Haraldsson, and was able to drive him out in 1028. He put Norway in charge of Haakon, son of Eric of Hlathir, and, after Haakon's death, of his concubine Aelfgifu and their son Sweyn. Olaf attempted to return in 1030 but fell at Stiklestad. Aelfgifu and Sweyn became unpopular and fled to Denmark in 1035 before Canute's death.

In England, peace was broken only by Canute's expedition to Scotland in 1027, by which he secured recognition from three of the Scottish kings. English trade profited by Canute's control of the Baltic trade route. On his pilgrimage to Rome, timed for him to attend the coronation of the emperor Conrad II in 1027, he secured from the latter and other princes whom he met reductions in tolls for English traders and pilgrims. Denmark benefitted from his friendly relations with the Emperor, who surrendered Schleswig and territory north of the Eider River when negotiations were begun before Canute's death for the marriage of the Emperor's son Henry to Canute's daughter Gunhild.

Neither Canute's illegitimate son Harold, who ruled England until 1040, nor his legitimate son Hardecanute, who succeeded to Denmark in 1035 and to England in 1040, inherited his qualities. The English reverted to their old royal line in 1042, and Denmark passed to Sweyn II, son of Earl Ulf and Estrid.

(D.W.)

BIBLIOGRAPHY. There is an excellent account of Canute II by Frank M. Stenton in *Anglo-Saxon England,* 3rd ed. (1971); see also the full-scale biography by L.M. Larson, *Canute the Great* (1912); and an assessment by G.N. Garmonsway, *Canute and His Empire* (1963). Several of the sources, *i.e.,* the Anglo-Saxon Chronicle, the skaldic verse, and the laws and charters, are translated by Dorothy Whitelock in *English Historical Documents c. 500–1042* (1955); see also *Encomium Emmae reginae,* ed. by Alistair Campbell (1949). For Scandinavian sources that have not been translated into English, see the bibliography in Larson.

NORWAY

• **Canute:** *see* Canute (England).

Canute, SAINT, also called CANUTE THE HOLY: *see* Canute II *under* Canute (Denmark).

canvas, stout cloth probably named after *cannabis* (Latin: "hemp"). Hemp and flax fibre have been used for ages to produce cloth for sails. Certain classes are termed sailcloth or canvas synonymously. After the introduction of the power loom, canvas was made from flax, hemp, tow, jute, cotton, and mixtures of them. Flax canvas is essentially of double warp, for it is invariably intended to withstand pressure or rough usage.

Articles made from canvas include carrying devices for photographic and other apparatus; bags for fishing, shooting, golf, and other sporting equipment; shoes for games, running, and yachting; tents; and mailbags. Large quantities of flax and cotton canvases are tarred and used for covering goods on railways, wharves, and docks.

Canvas yarns (usually cotton, flax, or jute) are almost invariably two or more ply, an arrangement that tends to produce a uniform thickness. A plain weave is extensively used for these fabrics, but in many cases special weaves are used that leave the open spaces well defined.

Artists' canvas, a single-warp variety, used for painting in oils, is much lighter than sail canvas. The best qualities are made of cream or bleached flax fibre about 10 inches (25 cm) long (line). An admixture of shorter linen fibre (tow), and even of cotton is found in the commoner kinds. When the cloth comes from the loom it is treated to prepare the surface for the paint.

canvasback (*Aythya valisineria*), bay duck, or pochard (*q.v.*), of the family Anatidae, one of the most popular of game birds. The male canvasback is a relatively large duck, weighing about 1.4 kilograms (3 pounds). During the breeding season he has a red head and neck and a black breast, with white back and sides finely lined in gray. In eclipse plumage he resembles the female, with tan head and gray-brown back. Canvasbacks breed in northwestern North America and winter along the coasts from British Columbia and Massachusetts south to central Mexico. Canvasbacks prefer the roots of wild celery (eelgrass) where it is available but will eat many other plants and even some animal foods.

Canvey Island, low-lying island of the Thames Estuary, Castle Point district, county of Essex, England. It is connected to the mainland by a bridge at South Benfleet. The island's marine defenses were first constructed by a Dutch engineer in 1623, but it has continued to be vulnerable to exceptional tidal flooding. It is the site of petroleum-refining development and has extensive storage facilities for liquefied natural gas imported from Algeria. Pop. (1981 prelim.) 35,293.

Canyon, city, seat (1889) of Randall County, northern Texas, U.S., in the Texas Panhandle, 16 mi (26 km) south of Amarillo, at a point where the Palo Duro and Terra Blanca creeks meet to form the Prairie Dog Town Fork of the Red River. It originated in 1878 as headquarters for the T-Anchor Ranch. Although still a ranching and farming centre, the major economic influence is West Texas State University (with the Panhandle-Plains Historical Museum on its campus), which was established there as a college in 1910.

The city is also a tourist gateway to the scenic Palo Duro Canyon State Park, 12 mi east; with an area of 16,046 ac (6,494 ha), it is the largest state park in Texas, extending across the tabletop expanse of the High Plains of the Panhandle. Palo Duro (Spanish: "hard stick") Canyon (about 120 mi long) was carved by the main channel of the Red River, aided by rains and wind erosion; it has ravines that plunge 1,000 ft (305 m), exposing multicoloured rock strata covering 300 million years of four geologic ages. It was the scene of the last great Indian battle in Texas (1874) when U.S. cavalry under Col. R.S. Mackenzie routed a camp of Comanches who had left their reservations. The Canyon Pioneer Amphitheatre, within the park, is the setting each summer for *Texas,* a musical drama by Paul Green. Buffalo Lake National Wildlife Refuge and Six Gun Territory (a replica of a frontier town) are additional local attractions. Pop. (1980) 10,724.

Canyon de Chelly National Monument, national monument in northeastern Arizona, U.S., on the Navajo Indian reservation immediately east of Chinle. The name is a Spanish corruption of *tsegi,* a Navajo word meaning "rock canyons." The monument, established in 1931, occupies 131 sq mi (339 sq km) and includes several hundred pre-Columbian cliff dwellings, built at the base of red sandstone cliffs or in caves on the steep canyon walls. They cover a longer period than any other ruins in the Southwest, many dating from the 11th century. Relics of the Basket Maker culture have been found under those of the later Cliff Dweller and Pueblo cultures. Modern Navajo Indian homes and farms occupy the canyon bottoms. Thunderbird Ranch Campground is the monument headquarters.

Canyon Diablo (meteor crater, Arizona): *see* Meteor Crater.

Canyon Series, division of Pennsylvanian rocks in the U.S. (the Pennsylvanian Period, roughly equivalent to the Upper Carboniferous, began about 325,000,000 years ago and lasted about 45,000,000 years). It was named for exposures studied near Canyon, Palo Pinto County, Texas. Rocks of the Canyon Series underlie those of the Cisco Series, overlie rocks of the Strawn Series, and are correlative with the Missourian Series of standard usage. The Canyon Series consists of limestones, sandstones, and shales; the limestones are fossiliferous.

Canyonlands National Park, wilderness of water-eroded sandstone spires, canyons, and mesas, with Indian petroglyphs, in southeastern Utah, U.S., near Moab. Established in 1964, it occupies an area of 527 sq mi (1,366 sq km). It surrounds the confluence of the Green and Colorado rivers. The Island in the Sky (northern section) includes the Upheaval Dome (a sheer-walled crater) and Grandview Point, affording an impressive view of the park, while in the Needles section to the south are the Angel and Druid arches, gigantic balanced rock formations. The Land of Standing

Rocks is at the park's western edge. Wildlife is limited largely to deer, foxes, and coyotes, and vegetation to wild flowers that grow only in the more moist areas.

canzona, also spelled CANZONE (Italian: "song," or "chanson"), 16th-century Italian polyphonic genre as well as an important type of instrumental music in the 16th and 17th centuries. In 18th- and 19th-century music, canzona refers to a lyrical song or songlike instrumental piece.

The 16th-century vocal canzona was characterized by free musical form and texts of high literary quality. Later in the century, the term canzona or its diminutive, canzonetta, referred to polyphonic songs whose music and text were in a lighter vein than the madrigal. These include the *canzoni villanesche* ("rustic songs") popular in mid-century.

The instrumental canzona derived its form from the French polyphonic chanson known in Italy as *canzon(a) francese;* many early canzonas were instrumental arrangements of chansons, alternating between polyphonic and homophonic (based on chords) sections. Typically, the opening motif consisted of one long and two short notes of identical pitch. Although Italy remained the principal home of the canzona, it spread to other countries, notably Germany.

In the late 16th century two varieties emerged: for keyboard and for instrumental ensemble. The keyboard canzona was more intensely polyphonic, and in its frequent treatment of a single theme prepared the way for the fugue; in early 17th-century Germany "canzona" was in fact often synonymous with "fugue." Notable composers of keyboard canzonas include the Italians Girolamo Cavazzoni, Andrea Gabrieli, Claudio Merulo, and, especially, Girolamo Frescobaldi, and the German Johann Jakob Froberger.

Unlike the keyboard canzonas, which emphasized unity of musical texture, the ensemble canzonas of Giovanni Gabrieli and Frescobaldi, with their contrasting tempos, metres, and rhythms, led the way to the trio sonata, the dominant chamber genre of the Baroque era. Toward the middle of the 17th century, the multi-sectional canzona was systematically transformed into a four-movement instrumental composition, as a rule for two treble and two bass instruments, known as the *sonata da chiesa* or church form of the trio sonata, although the term canzona was still occasionally used for a movement in fugal style.

canzonetta, also called ARIA, form of 16th-century (*c.* 1565 and later) Italian vocal music. It was the most popular of the lighter secular forms of the period in Italy and England and perhaps in Germany as well. The canzonetta follows the poetic form of the same name; it is strophic (stanzaic) and often in an AABCC pattern. It is considered a refinement of the villanella (a three-voice form imitating rustic music) but bears some resemblance to the more serious madrigal, one of the major forms of the century. It is light in mood, with a clear four- to six-voice texture, and is characterized by dancelike rhythms, some word painting (musical depiction of certain words like "flight" or "fire"), and much use of simple melodic imitation.

Although Claudio Monteverdi and other celebrated composers wrote excellent works in this form, Orazio Vecchi is considered to be the most outstanding canzonetta composer. The English composer Thomas Morley and the German Hans Leo Hassler were also important composers of canzonette.

Although the canzonetta was primarily a secular genre, examples with religious texts were also composed. Instrumental accompaniment and even entirely instrumental writing were frequent in later canzonette. They were also sometimes performed as vocal solos with instrumental accompaniment.

Cão, Diogo, Cão also spelled CAM (fl. 1480–86), Portuguese navigator and explorer and the first European to discover the mouth of the Congo River (August 1482). There he set up a stone pillar to mark Portuguese overlordship of the area. Sailing a short way upstream, he found that the inhabitants along the banks appeared willing to trade. He then travelled southward along the present Angola coast and erected a second pillar at Cape Santa Maria (Monte Negro, 13°26′ S). Upon his return to Lisbon in 1484 he was ennobled by King John II, granted an annuity, and authorized to add two pillars to his coat of arms in memory of those he had erected. On a second voyage (1485–86) he reached Cape Cross, 21°50′ S, now in South West Africa.

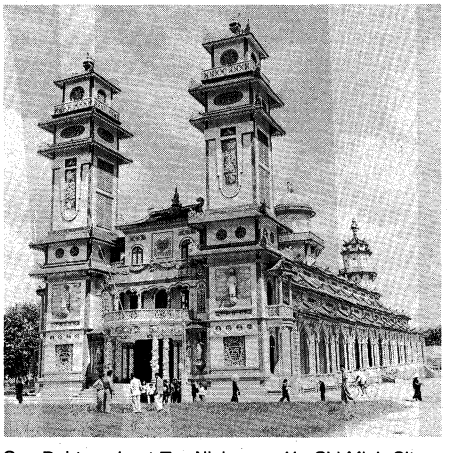
Cao Bang, town and *tinh* (province) in northwestern Vietnam. Cao Bang town is the seat of the province and a market centre, located about 16 mi (25 km) south of the Vietnam–China border on the Song (river) Bang Giang. The Tinh Tuc mines nearby produce tin.

The province borders China's Kwangsi Province to the north and east. The province is mountainous: one peak to the east of Cao Bang town rises to 2,936 ft (895 m). The Song Bang Giang runs in a southeasterly direction through the province. Formerly part of the Viet Bac autonomous region, it was merged with Lang Son province, and the two together were known as Cao Lang province. In 1979 Cao Bang again became a separate province. It has an area of 3,261 sq mi (8,445 sq km). Its principal products include livestock (beef, pork, and goats), zinc, and lumber from the forests that cover one-third of the land. Since 1976 the province has become a specialized growing area for tobacco, fruits (peaches and persimmon), mushrooms, medicinal plants, honey, and chestnuts. Ethnic groups, including the predominant Nung and the Tay, Zao, and Meo, make up almost all of the population. Chi Lang Pass between Vietnam and China is a historic invasion route. Pop. (1979) province, 479,823.

Consult the INDEX *first*

Cao Cao (Chinese general): *see* Ts'ao Ts'ao.

Cao Dai, in full CAO-DAI TIEN-ONG (His Excellency the Grandfather Immortal), eclectic modern Vietnamese religious sect with a strongly nationalist political character. The sect draws upon ethical precepts from Confucianism, occult practices from Taoism, theories of *karman* and rebirth from Buddhism, and a hierarchical organization (including a pope) from Roman Catholicism. Its pantheon of saints includes such diverse figures as the Buddha, Confucius, Jesus Christ, Pericles, Julius Caesar, Joan of Arc, Victor Hugo, and Sun Yat-sen. In Cao Dai, God is represented as an eye in a triangle, a symbol that appears on the facades of the sect's temples.



Cao Dai temple at Tay Ninh, near Ho Chi Minh City (formerly Saigon)
Harrison Forman

The sect was established in 1926 by Ngo Van Chieu (*q.v.*), an administrator for the French in Indochina, after he received a communication from the supreme deity during a table-moving séance. A Cao Dai army was established in 1943 during the Japanese occupation of Indochina. After the war the Cao Dai was an effective force in national politics; it first supported, then opposed, Premier Ngo Dinh Diem. In 1955–56 Diem disbanded the Cao Dai army and forced the sect's pope, Pham Cong Tac, into exile.

Cao Dai continues to be an important religious sect in Vietnam. Headquarters of the sect are at Tay Ninh (*q.v.*), near Ho Chi Minh City (formerly Saigon).

Cao Guojiu (in Chinese mythology): *see* Ts'ao Kuo-chiu.

Cao Lanh, provincial seat of Dong Thap *tinh* (province), southwestern Vietnam. It is located on the left bank of the Song (river) Tien Giang, on the southern edge of the Dong Thap Muoi (Plain of Reeds). It is a rice-trading centre, has a hospital, and is linked by road with Hong Ngu on the Kampuchean (Cambodian) border.

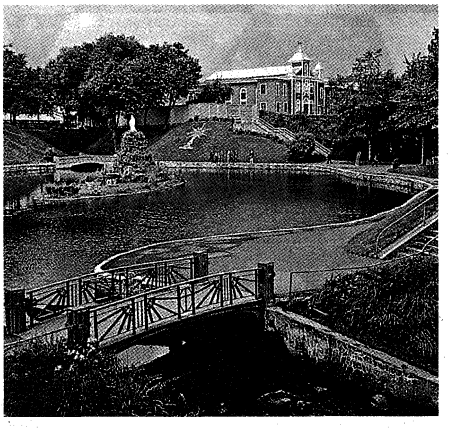
Cao Pei (Chinese emperor): *see* Ts'ao P'ei.

Cao Zhan (Chinese author): *see* Ts'ao Chan.

Cao Zhi (Chinese poet): *see* Ts'ao Chih.

caoshu (script): *see* ts'ao-shu.

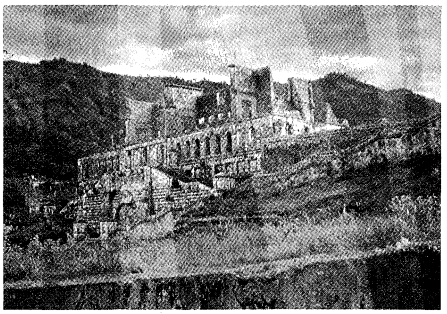
Cap-de-la-Madeleine, city, Trois-Rivières (Three Rivers) region, southern Quebec province, Canada, on the north shore of the St. Lawrence River, at the mouth of the Saint-Maurice River, opposite Trois-Rivières city and midway between Quebec and Montreal cities. Named after an abbot of Sainte-Marie-Madeleine-de-Châteaudun, France, it was first settled in the 17th century but developed only after 1900, when sawmills and pulp mills were established. Major industries include the manufacture of pulp, paper products, aluminum foil, clothing, and abrasives. The city is the site of a famous shrine to Our Lady of the Rosary (1714) and of a large basilica honouring Our Lady of the Cape (1964). Inc. 1845. Pop. (1981) 32,626.



Shrine to Our Lady of the Rosary, Cap-de-la-Madeleine, Que.
By courtesy of the Canadian Government Travel Bureau, Ottawa; photograph, John de Visser

Cap-Haïtien, also called LE CAP, capital of Nord *département,* northern Haiti, and the republic's second city (after Port-au-Prince). Founded in 1670 by the French, it was known as Cap-Français and gained renown as the

"Paris of the Antilles." It served as capital of the colony (then known as Saint-Domingue) until 1770 and was the scene of slave uprisings in 1791. United States ships used its harbour during the dispute with France (1798–1800) and during the American Civil War.



Sans-Souci, palace near Cap-Haïtien, Haiti
Walter Aguiar—EB Inc.

Haitian and French troops razed the city in 1802. Henry Christophe, self-proclaimed king of Haiti, rebuilt much of it, but an earthquake in 1842 and a hurricane in 1928 destroyed many historic buildings; its colonial parish church survived.

Cap-Haïtien's modernized harbour handles about one-ninth of Haiti's import–export trade. It is also a market for local produce, including bananas, pineapples, sugarcane, coffee, and cacao. One of the world's largest sisal (rope fibre) plantations (45,000 acres [18,000 hectares]) is just outside the city, as is a government stock-feeding station. There is some industrial development.

A new highway reduced traveling time between Port-au-Prince and Cap-Haïtien from 11 to 3 hours and effectively opened the area to tourism. Attractions include the nearby palace of Sans-Souci and the fortress of La Citadelle Laferrière, both built by Henry Christophe. The latter, often called the Eighth Wonder of the World, was begun in 1804 and took 13 years and 200,000 slaves to complete. It is accessible only by a two-hour ascent by mule. The nearly ruined palace of Napoleon's sister, the wife of Gen. Charles Leclerc, recalls Leclerc's ill-fated invasion ordered by Napoleon in 1801. Pop. (1986 est.) 70,539.

Cap Saint-Jacques (Vietnam): *see* Vung Tau.

Cap Vert, Presqu'île du (Senegal): *see* Cape Verde Peninsula.

Capa, Robert, original name ANDREI FRIEDMANN (b. 1913, Budapest—d. May 25, 1954, Thai Binh, Vietnam), photographer, whose pictures of war made him one of the great photojournalists of the 20th century.

He first established himself in Paris by representing his photographs as the work of Robert Capa, a fictitious American photographer who was so rich he refused to sell his work at normal prices. The deception was soon discovered, but he retained the pseudonym.

Capa, self-portrait photograph
Robert Capa—Magnum

Capa first achieved fame as a war correspondent in the Spanish Civil War. His mature style fully emerged in 1936 in such grim, close-up views of death as "Loyalist Soldier, Spain." In World War II he covered much of the heaviest fighting in Africa, Sicily, and Italy for *Life* magazine, and his photographs of the Normandy invasion are some of the most memorable of the war.

In 1947 Capa joined with the photographers Henri Cartier-Bresson and David ("Chim") Seymour to found Magnum Photos, the first cooperative agency of international free-lance photographers. Although he covered the fighting in Palestine in 1948, most of his time was spent selling and guiding the work of newer members of Magnum. In 1954, however, he volunteered to photograph the French Indochina war for *Life* and was killed by a land mine.

Capablanca, José Raúl (b. Nov. 19, 1888, Havana—d. March 8, 1942, New York City), Chess master who won the world championship (1921) from Emanuel Lasker and lost it (1927) to Alexander Alekhine.

Capablanca learned the moves at the age of four by watching his father play and defeated Cuba's best player in 1901. He attended Columbia University, New York City, in 1906–07 and in 1913 joined the Cuban diplomatic service, an occupation that facilitated his Chess career by permitting travel. From 1916 until 1924 he did not lose a game. He also played baseball, Bridge, and tennis well. He was felled by a stroke while watching a game at the Manhattan Chess Club and died the next day. His Chess style had a deceptive appearance of simplicity; at his best, he could make the defeat of another master look easy.

capacitance, property of an electric conductor, or set of conductors, that is measured by the amount of separated electric charge that can be stored on it per unit change in electrical potential. Capacitance also implies an associated storage of electrical energy. If electric charge is transferred between two initially uncharged conductors, both become equally charged, one positively, the other negatively, and a potential difference is established between them. The capacitance C is the ratio of the amount of charge q on either conductor to the potential difference V between the conductors, or simply $C = q/V$.

In both the practical and the metre–kilogram–second scientific systems, the unit of electric charge is the coulomb and the unit of potential difference is the volt, so that the unit of capacitance—named the farad (symbolized F)—is one coulomb per volt. One farad is an extremely large capacitance. Convenient subdivisions in common use are one-millionth of a farad, called a microfarad (μF), and one-millionth of a microfarad, called a picofarad (pF; older term, micromicrofarad, $\mu\mu$F). In the electrostatic system of units, capacitance has dimensions of distance.

Capacitance in electric circuits is deliberately introduced by a device called a capacitor. It was discovered by the Prussian scientist Ewald Georg von Kleist in 1745 and independently by the Dutch physicist Pieter van Musschenbroek at about the same time, while in the process of investigating electrostatic phenomena. They discovered that electricity obtained from an electrostatic machine could be stored for a period of time and then released. The device, which came to be known as the Leyden jar, consisted of a stoppered glass vial or jar filled with water, with a nail piercing the stopper and dipping into the water. By holding the jar in the hand and touching the nail to the conductor of an electrostatic machine, they found that a shock could be obtained from the nail after disconnecting it, by touching it with the free hand. This reaction showed that some of the electricity from the machine had been stored.

A simple but fundamental step in the evolution of the capacitor was taken by the English astronomer John Bevis in 1747 when he replaced the water by metal foil forming a lining on the inside surface of the glass and another covering the outside surface. This form of the capacitor with a conductor projecting from the mouth of the jar and touching the lining had, as its principal physical features, two conductors of extended area kept nearly equally separated by an insulating, or dielectric, layer made as thin as practicable. These features have been retained in every modern form of capacitor.

A capacitor, also called a condenser, is thus essentially a sandwich of two plates of conducting material separated by an insulating material, or dielectric. Its primary function is to store electrical energy. Capacitors differ in the size and geometrical arrangement of the plates and in the kind of dielectric material used. Hence, they have such names as mica, paper, ceramic, air, and electrolytic capacitors. Their capacitance may be fixed or adjustable over a range of values for use in tuning circuits.

The energy stored by a capacitor corresponds to the work performed (by a battery, for example) in creating opposite charges on the two plates at the applied voltage. The amount of charge that can be stored depends on the area of the plates, the spacing between them, the dielectric material in the space, and the applied voltage.

A capacitor incorporated in an alternating-current (AC) circuit is alternately charged and discharged each half cycle. The time available for charging or discharging thus depends on the frequency of the current, and if the time required is greater than the length of the half cycle, the polarization is not complete. Under such conditions, the dielectric constant appears to be less than that observed in a direct-current circuit and to vary with frequency, becoming lower at higher frequencies. During the alternation of polarity of the plates, the charges must be displaced through the dielectric first in one direction and then in the other, and overcoming the opposition that they encounter leads to a production of heat known as dielectric loss, a characteristic that must be considered when applying capacitors to electrical circuits, such as those in radio and television receivers. Dielectric losses depend on frequency and the dielectric material.

Except for the leakage (usually small) through the dielectric, no current flows through a capacitor when it is subject to a constant voltage. Alternating current will pass readily, however, and is called a displacement current (*q.v.*).

capacitance heating: *see* dielectric heating.

Čapajevsk (Russian S.F.S.R.): *see* Chapayevsk.

Çapakçur (Turkey): *see* Bingöl.

Capannori, commune comprising 38 small localities in Lucca province, Toscana (Tuscany) region, central Italy. Capannori village is a market centre, with paper mills and button and paint factories. The parish church has a 13th-century facade and a Lombardesque campanile. The church of Sta. Margherita dates in part from the 12th century. Pop. (1984 est.) mun., 44,308.

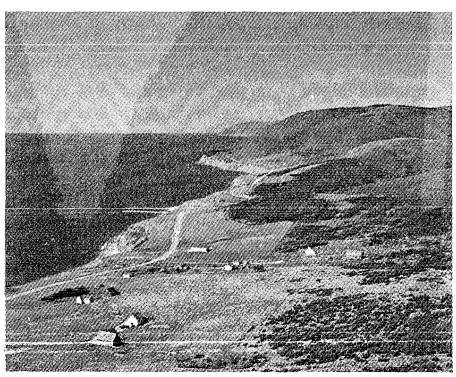
Cape, (Herbert) Jonathan (b. Nov. 15, 1879, London—d. Feb. 10, 1960, London), British publisher who in 1921 cofounded (with George Wren Howard) the firm that bears his name; it became one of the outstanding pro-

ducers of general and high-quality books in the United Kingdom.

At the age of 16 Cape worked as an errand boy for a London bookseller. Later he became a salesman for the New York City publishing firm of Harper and Brothers. In 1904 he began to sell books for Gerald Duckworth Co., becoming sales manager before entering the Royal Army Ordnance Corps during World War I. In 1918 he returned to Duckworth but two years later accepted an offer to manage the Medici Society, makers of coloured art reproductions and occasional publishers of books. In that capacity he met George Wren Howard; the two became friends, decided to set up on their own, and on Jan. 1, 1921, opened Jonathan Cape, Publishers. Their first publication was a reissue of C.M. Doughty's 1888 classic, *Travels in Arabia Deserta;* the partners persuaded T.E. Lawrence ("Lawrence of Arabia") to write an introduction to the volume, which helped make it a success. Cape and Howard employed the critic Edward Garnett as literary adviser; his sound judgment also contributed to their success. Cape visited the United States to look for authors; eventually the firm published such prominent American writers as Sinclair Lewis, Ernest Hemingway, Eugene O'Neill, and Robert Frost. Among Cape's English authors were Duff Cooper, Ian Fleming, Wyndham Lewis, and Mary Webb. Also published were the famous "Doctor Dolittle" children's stories, by Hugh Lofting.

Cape ———: *see under* substantive word (Horn, Cape; Hatteras, Cape; Cod, Cape), except as below.

Cape Breton Highlands, forested upland, northernmost Nova Scotia, Canada, on Cape Breton Island. The highlands, which occupy a large peninsula bounded by the Atlantic Ocean on the east and the Gulf of St. Lawrence

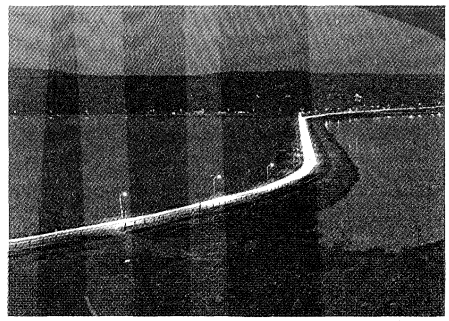


The Cabot Trail in Cape Breton Highlands National Park, Nova Scotia

By courtesy of the Canadian Government Travel Bureau, Ottawa; photograph, George Hunter

on the west, are the most prominent feature of Nova Scotia. Rising abruptly from either coast, they form an undulating plateau that averages 1,200 feet (370 m) above sea level; their maximum elevation, 1,747 feet, is the highest point in the province. Uninhabited, except along a narrow coastal fringe, the highlands are a popular scenic and recreational area, partially embraced by Cape Breton Highlands National Park (368 square miles [954 square km]). Cabot Trail, a highway 184 miles (296 km) long, encircles most of the region.

Cape Breton Island, northeastern portion of Nova Scotia, Canada, separated from the remainder of the province and the Canadian mainland by the Strait of Canso (southwest), 2 miles (3 km) wide and bounded by the Gulf of St. Lawrence and Cabot Strait (north), the Atlantic Ocean (east and south), and Northumberland Strait (west). It is 110 miles long, up



The causeway linking Cape Breton Island with the mainland across the Strait of Canso, Nova Scotia

Malak—Shostal/EB Inc.

to 75 miles wide, and has an area of 3,981 square miles (10,311 square km). Administratively it is composed of the counties of Cape Breton, Inverness, Richmond, and Victoria.

Mostly hilly and forested and with a highly indented coastline, the island rises in the north to 1,747 feet (532 m) above sea level as Cape Breton Highlands. The island's centre comprises the 360-square-mile tidal saltwater Bras d'Or Lake (*q.v.*), a popular recreational area.

Originally called Île Royale, when it was a French colony, it later took on the name of its eastern cape—believed to be the first land visited by John Cabot on his 1497–98 voyage and afterward probably named by Basque fishermen from Cap Breton (near Bayonne, Fr.). It was captured in 1758 by the British, to whom formal cession was made in 1763 in the Treaty of Paris. It was joined to Nova Scotia but in 1784 became an independent crown colony. It was rejoined to Nova Scotia in 1820.

Economic activities include coal mining, lumbering, fishing, and summer tourism. Since 1955 the island has been linked to the mainland by a causeway across the Strait of Canso, making it the eastern land terminus of both the Trans-Canada Highway and the Canadian National Railway. Pop. (1985 est.) 173,200.

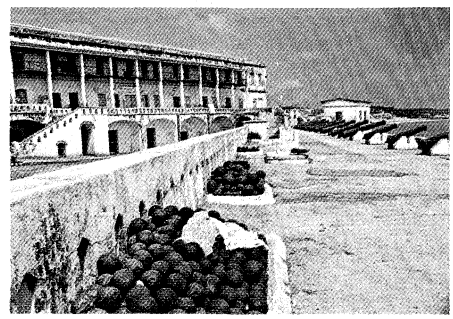
Cape buffalo, large, black, horned buffalo that has ranged Africa from the Sahara to the Cape of Good Hope. *See* buffalo.

Cape Coast, town in the centre of the seaboard of Ghana, West Africa, on a low promontory jutting into the Gulf of Guinea (Atlantic Ocean). It is about 75 miles (120 km) southwest of the Ghanaian capital of Accra.

In the 15th century the Portuguese established a post on the site, and in the 16th century the British arrived. The town, one of the country's oldest, grew around Cape Coast Castle, built by the Swedes in 1655 and taken over by the British in 1663. An important seat of Ashanti traders, Cape Coast became a roadstead port and was the British commercial and administrative capital of the Gold Coast until 1877, when Accra became the capital. Its decline came with the railways, built in the early 1900s from Sekondi and Accra inland to Kumasi.

Its harbour functions totally ceased with the opening of Tema port in 1962. Cape Coast, however, retained its importance as an educational centre; several secondary schools and the University of Cape Coast (founded 1962) are located there.

Economic activity includes fishing, trade, and government administration (housed in the Castle). An industrial area was completed

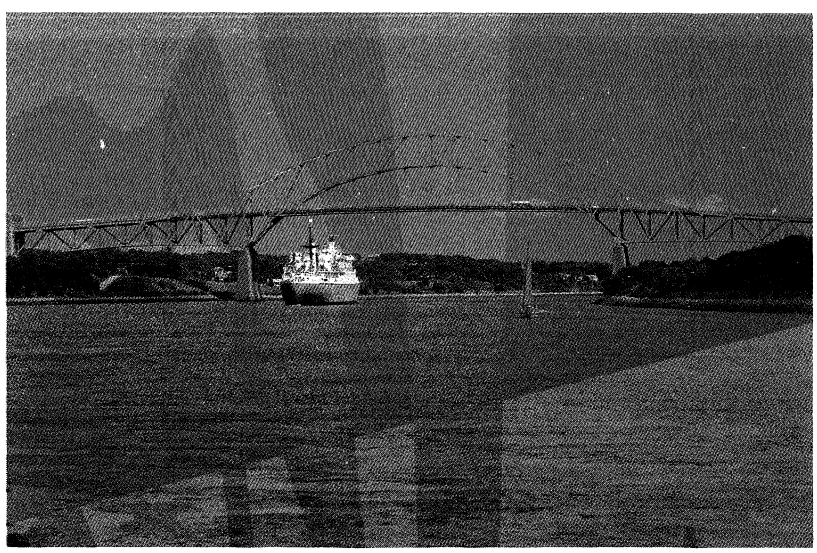


Cape Coast Castle, Ghana

Juliet Highet—Black Star/EB Inc.

in 1976. The town produces bricks and tiles, tobacco products, cotton textiles, soap, sugar, cocoa products, beverages, salt, and chemicals. Notable buildings include Christ Church (1865; the first Anglican church in the country), Wesley Chapel (1838), and the Cathedral of St. Francis, seat of the Roman Catholic archbishop of Ghana. A polytechnic school was initiated in 1974, and the Cape Coast Urban Health Centre was completed in 1976. The name is a corruption of the Portuguese Cabo Corso ("Corsican Cape"); the local people call the town Gua, or Oegua. Pop. (1984 prelim.) 57,700.

Cape Cod Canal, artificial waterway joining Cape Cod Bay, Mass., U.S., with the waters of Buzzards Bay, an inlet of Long Island Sound, and traversing the narrow isthmus of Cape Cod. The canal is 17.5 miles (28 km) long, including its dredged approaches. It has a controlling width of 450 feet (140 m) and a minimum depth of 30 feet (9 m). There



Sagamore Bridge on Cape Cod Canal, Massachusetts

George Kubica, Jr.—Shostal Associates

are no locks, but there are considerable tidal movements.

Begun in 1909 and put into operation in July 1914 by private capital, the canal cut the distance for waterborne traffic between New York City and Boston (via the East River, Long Island Sound, and the canal) by more than 75 miles (120 km) and also eliminated the treacherous, often windy voyage around the cape, especially through the shallows along the tip near Provincetown. The Cape Cod Canal was purchased by the U.S. government in 1927 and is operated toll free.

Cape Colony, British colony established in 1806 in what is now South Africa. With the formation of the Union of South Africa (1910), the colony became the province of the Cape of Good Hope (*q.v.*), also called Cape Province.

Cape Coloured (people): *see* Coloured.

Cape Dutch language: *see* Afrikaans language.

Cape emerald, gem-quality prehnite (not emerald). *See* prehnite.

Cape Fear River, river in central and southeast North Carolina, U.S., formed by the confluence of the Deep and Haw rivers in Chatham County. It flows generally southeast, past Fayetteville, Elizabethtown, and Wilmington, to enter the Atlantic Ocean at Southport, opposite Smith Island, after a course of about 200 miles (320 km). The chief tributary is the South River, which joins the Cape Fear 50 miles from its mouth. The south estuary forms part of the Atlantic Intracoastal Waterway. A series of locks and dams makes the river navigable from Wilmington to Fayetteville. The river is named for Cape Fear at the southern tip of Smith Island, the site of dangerous shoals.

Cape Flats, low, sandy area extending inland from the peninsular Cape of Good Hope, Cape Province, S.Afr., and occupying the greater part of the isthmus between Table Bay and False Bay. In comparatively recent geological times, the flats were under the sea. Once covered by low bushes, it was stripped barren by early settlers seeking firewood, and not until the late 19th century was the area cultivated. Much of Cape Flats is now a truck-farming region and an area of large housing estates occupied mostly by Coloureds (South Africans of mixed race). A small (8-acre [3.2-hectare]) Cape Flats Flora Reserve is operated by the National Botanic Gardens of South Africa.

In 1928 the "Cape Flats skull" of an early man of the australoid type was discovered in a sand quarry in the area.

Cape flora, a scrubland vegetation found along a narrow strip of the extreme southern coast of Africa, composed of many species of broad-leaved evergreen shrubs, especially plants of the family Proteaceae (brownish or grayish shrubs often containing oil or resin). There are few trees in the flora, but many small herbaceous plants cover the ground during the rainy season.

Cape fox: *see* bat-eared fox.

Cape Frontier Wars, also called KAFFIR, or KAFIR, WARS (1779–1879), 100 years of intermittent warfare between the Cape colonists and the Xhosa agricultural and pastoral peoples of the Eastern Cape, in South Africa. One of the most prolonged struggles by African peoples against European intrusion, it ended in the annexation of Xhosa territories by the Cape Colony and the incorporation of its peoples.

In the first three wars (1779, 1793, and 1799–1801) frontier Dutch colonists fought against members of several minor Xhosa chiefdoms that had moved westward from the main body of the Xhosa east of the Great Kei River into the area known as the Zuurveld, between the Great Fish and Boesmans rivers. These wars were caused by disagreements regarding the cattle trade that dominated the colonial economy, and they ended in a stalemate. For the colonists the third of these wars, in which the Xhosa were joined by an uprising of Khoisan servants, who deserted their white masters, taking guns and horses, was particularly serious. British troops, occupying the Cape during the Napoleonic Wars, appeared on the eastern frontier in 1811, in the fourth war, and drove the Xhosa from the Zuurveld.

Tensions east of the Great Fish River led to warfare on the frontier again in 1818–19, both between sections of the Xhosa and between the British and the Xhosa under Ndlambe and their prophet, Makana. After this war, the territory between the Great Fish and the Keiskamma was declared neutral (and later "ceded"), and the British government tried to clear it of its Xhosa inhabitants, but in vain. From this time, congestion on the land was increased by the influx of Mfengu refugees from the Mfecane in Natal, and the settlement of British colonists on the frontier in 1820 led to increased restlessness there.

In 1834–35 fighting erupted again, and for the first time the war was carried into the territory of the Gcaleka Xhosa, whose paramount chief, Hintsa, was shot while in British custody. After the failure of several treaties, war broke out again in 1846 over a trivial incident, and in a bitter struggle the Xhosa were defeated once more. After this war the British government annexed the old neutral territory as the Crown Colony of British Kaffraria; after the deposition of the Xhosa paramount, Sandile, in 1851, it was reserved, apart from the British military outposts, for occupation by Africans. Resentments in British Kaffraria, however, resulted in the eighth and most costly of the wars. Once again the Xhosa resistance was immensely strengthened by the participation of Khoisan tribesmen, who rebelled at their settlement of Kat River. By 1853 the Xhosa had been defeated, and the territory to the north of British Kaffraria was annexed to the Cape Colony and opened to white settlement.

In 1857 the Xhosa were induced by a prophecy to slaughter their cattle in a mass sacrifice that was to be followed by a miraculous overthrow of the British. This disastrous act, itself the product of the undermining of Xhosa society by white penetration, caused widespread starvation and effectively ended Xhosa military resistance for two decades. In 1877–78 the Ngika and Gcaleka sections of the Xhosa, who had acquired guns on the diamond fields and were anxious to regain lost lands, took up arms against the colonists and their allies, the Mfengu. After these wars the remaining Xhosa territories were gradually incorporated into the Cape Colony.

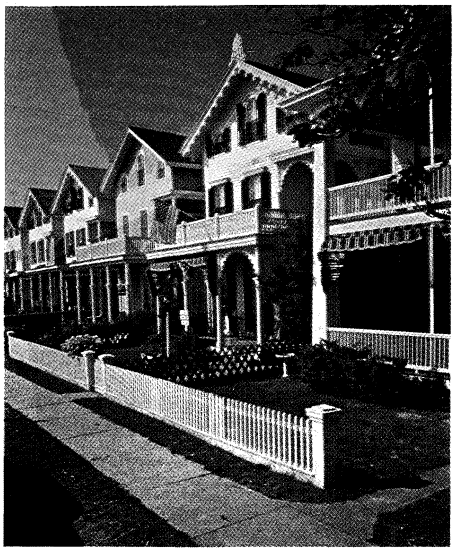
Cape Girardeau, city, Cape Girardeau County, southeastern Missouri, U.S., on the Mississippi River (there bridged to Illinois) at the southeast edge of the Ozark Plateau. Established before 1793 by French-Canadian Louis Lorimier, it was named for Jean B. Girardot (or Girardeau), who had built a trading post (*c.* 1705) at nearby Cape Rock. Until occupation by Federal troops during the Civil War, it was a bustling river port. A bitter struggle to obtain adequate rail service ended when Louis Houck organized the Gulf System (1902) and linked Cape Girardeau with the West (via St. Louis) and the Gulf. Manufactures include paper products, clothing, shoes, and electrical appliances. The city is the seat of Southeast Missouri State University (1873) and St. Vincent's College (1843). Inc. town, 1806; city, 1843. Pop. (1982 est.) 34,483.

Cape hunting dog: *see* African hunting dog.

Cape Indians (people): *see* Nauset.

Cape Krusenstern National Monument, national monument in northwestern Alaska, U.S., on the coast of the Chukchi Sea. Proclaimed a monument in 1978, the area underwent boundary changes in 1980. Located along a succession of 114 lateral beach ridges, the monument's remarkable archaeological sites illustrate the cultural evolution of the Arctic people, dating back some 4,000 years and continuing to modern Eskimos. Wildlife includes seals and other marine mammals. The monument covers 660,000 acres (267,100 hectares).

Cape May, city, Cape May County, at the southern tip of New Jersey, U.S. Originally called Cape Island, it was renamed in 1869 for the Dutch explorer Cornelius Jacobsen Mey, who visited there in 1623. It is one of the oldest beach resorts in the nation; in the 1850s



Victorian houses, Cape May, N.J.
John Henry Sullivan, Jr.—Photo Researchers/EB Inc.

the Mount Vernon (later destroyed by fire), accommodating 2,000 guests, was the largest resort hotel in the United States. The city's concentration of Victorian houses remains a major attraction. The beach promenade, more than 1 mile (1.6 km) long, replaced the original boardwalk destroyed by storms in 1962. Cape May lighthouse (dating from 1794; reconstructed 1823 and 1859) and a U.S. Coast Guard base are near the city. The dunes provide vantage points for observing bird migrations along the Atlantic Flyway.

Cape May Courthouse, the county seat (1745) is 18 miles (29 km) north-northeast and also has fine examples of Victorian homes. The Wildwood resorts, with a 3-mile boardwalk and sandy beaches, are on a barrier island to the northeast. Inc. 1851. Pop. (1982 est.) 4,958.

Cape of Good Hope, also called CAPE PROVINCE, Afrikaans KAAP DIE GOEIE HOOP, or KAAPPROVINSIE, province, Republic of South Africa, situated in the southern extremity of the African continent. The provincial capital, Cape Town, is the nation's legislative capital. Occupying the southern and western regions of the republic, Cape Province, the largest of the republic's four provinces, has more than half of the total area of South Africa. Within its internationally recognized boundaries are located the black republic (former Bantu homeland) of Ciskei and half or more of two others, Transkei and Bophuthatswana.

A brief treatment of the Cape of Good Hope follows. For full treatment, *see* MACROPAEDIA: South Africa.

The Portuguese navigator Bartolomeu Dias reached the southern tip of Africa in 1488 and named it the Cape of Good Hope (Portuguese: Cabo da Boa Esperança). Dutch traders arrived in 1652, followed by settlers who established farms. In 1814 the Dutch ceded the Cape settlement to Britain, which ruled the area as the Colony of the Cape of Good Hope. The discovery of diamonds in 1867 stimulated immigration, an influx of foreign capital, and the development of railroads. Thereafter, the population expanded rapidly. In 1910 the province became part of the Union of South Africa and, from 1961, of the Republic of South Africa.

Most of the province lies at an elevation of between 3,000 and 5,000 feet (900 and 1,500 m), occupying part of the great interior plateau of southern Africa. Escarpments separate the main plateau area from a coastal zone and from the Doorn Karroo and Great Karroo basins to the southwest and south, respectively. A maritime climate and accompanying vegetation are found in the coastal region. Much of the remainder of the land ranges from semiarid to arid. The mean annual precipitation over most of the province amounts to less than 15 inches (380 mm), and areas of the northwest receive less than 5 inches (125 mm). Years of drought are common. Inland daily maximum temperatures usually range from 68° F (20° C) in winter to 90° F (32° C) in summer. Snow occasionally covers the mountain peaks.

In the late 20th century, about one-third of the Cape Province population was black, about one-quarter was white, and most of the remainder were Coloured (racially mixed); Asians (mostly Indians) constituted about 1 percent. About two-fifths of the population was urban, mostly concentrated in the four largest cities—Cape Town, Port Elizabeth, East London, and Kimberley. Both Afrikaans and English are official languages, while Xhosa, a Bantu language, is spoken by most blacks.

Although the Cape Province economy is diversified, agriculture dominates, employing about three-fifths of the black population. In the late 1980s, most of South Africa's wool, wheat, hay, mohair, and fruit came from Cape Province, as did almost all of its wine. The Karroo is the main sheep-raising region. Cattle raising is important in the thornveld north of the Orange River, while cotton is grown under irrigation along the Orange near Upington.

Ostrich feathers were once an important Cape Province product, but their value is now far surpassed by that of alfalfa seed, hay, fruit, tobacco, wool, and mohair. The area enjoys a steady export trade in fresh fruit, table grapes, wine, brandy, and canned goods. Timber is a valuable product in the area between Mossel Bay and Humansdorp on the south coast. Citrus fruit is grown under irrigation in the valleys of the Gamtoos, Sundays, Great Fish, and Kat rivers.

Rich fishing grounds, ranging from the Agulhas Bank to South West Africa/Namibia, supply an important fish meal and canning industry. Other industries include textiles, clothing, footwear, motor vehicles, tires, fertilizers, pesticides, mining explosives, and pharmaceuticals, along with marine engineering and ship repairing. The province's mineral resources include copper, diamonds, asbestos, manganese, and iron ore, although mining employs relatively few people.

Universities for whites are located at Cape Town, Grahamstown, Port Elizabeth, and Stellenbosch. There is a university for blacks at Fort Hare near Alice and one for Coloureds at Bellville. Cape Town has numerous libraries and museums—including the South African Museum. A provincial library service operates several hundred library centres. Traveling companies sponsored by Capab (the Cape Performing Arts Board) stage theatrical and ballet performances throughout the province. An amateur organization of Cape Coloureds, the Eoan Group, is renowned for its operatic productions, as are Malay choirs for their repertoire of colonial folk songs. Numerous Afrikaner groups present *volkspele* (traditional folk dances). Area, excluding former Bantu homelands, 247,638 square miles (641,379 square km). Pop. (1985 prelim.), including Ciskei, 5,041,137.

Cape of Good Hope (South African cape): *see* Good Hope, Cape of.

Cape Palmas (Liberia): *see* Harper.

Cape Photographic Durchmusterung (CPD), star catalog listing more than 450,000 stars of the 11th magnitude or brighter, between 19° south declination and the south celestial pole. The photographic plates required were made between 1885 and 1890, at Cape Town, by the British astronomer Sir David Gill. Jacobus Cornelis Kapteyn spent 10 years (1886–96) at Groningen, Neth., compiling the catalog from measurements of the positions of the star images on the plates.

Cape polecat: *see* zorille.

Cape Province (South Africa): *see* Cape of Good Hope.

Cape ruby, deep-red pyrope garnet (not a ruby). *See* pyrope.

Cape Town, Afrikaans KAAPSTAD, city and seaport, legislative capital of South Africa and capital of Cape Province. It lies at the northern end of the Cape Peninsula, some 30 miles (50 km) north of the Cape of Good Hope.

A brief treatment of Cape Town follows. For full treatment, *see* MACROPAEDIA: Cape Town.

Located in one of the world's most scenic natural settings for urban life, much of the city and its suburbs winds about the steep slopes of Table Mountain and its neighbouring peaks. Most of the city proper spreads across the area's extensive flatlands. Cape Town is situated in the extreme southwestern portion of South Africa and until recently was the country's major seaport, but by the early 1980s it had been surpassed by the port at Durban.

The nearby Benguela Current off southwestern Africa's Atlantic coast has an overall cooling effect on Cape Town's mild climate. About half of the 26-inch (660-millimetre) average annual rainfall occurs during the mild winter (June to August), when temperatures average 55° F (13° C); summers are warm (70° F [21° C]) and dry (rainfall averages less than 2 inches [51 mm]). Lacking a major river, Cape Town meets its freshwater needs with a system of reservoirs.

Petroleum refining, chemical and fertilizer processing, cement production, and automobile assembly are the principal industries in the metropolitan area. Within the city proper the most important industry is ship repair; one of the world's largest dry docks is located in Cape Town. Light industry includes food processing, wine making, and the manufacture of clothing, plastics, and leather goods. Tourism is increasing in importance.

The Castle of Good Hope, built by the Dutch between 1666 and 1679, is South Africa's oldest monument. Situated in the city centre, directly south of Cape Town Station (the major railway station), the castle forms a triangle with the colourful Malay Quarter (about 1 mile [1.5 km] to the northwest) and the National Botanical Gardens, which are flanked by historic Government Avenue (about 1 mile to the west). The reclamation of 480 acres (194 hectares) from Table Bay during World War II allowed the extension of the central business district northeastward from the older historic centre. South African College (1829) became the University of Cape Town, the city's principal educational institution, in 1918.

Since the late 1950s, Cape Town has developed a modern freeway network that serves the entire Cape Peninsula. Cape Town is also the terminus of rail and road networks that extend the length of the country northeastward to Zimbabwe and beyond. The city's D.F. Malan Airport is one of South Africa's three international airports. Area city, 116 square miles (300 square km); metropolitan area (Cape Peninsula), 170 square miles (440 square km). Pop. (1985 prelim.) city, 776,617; metropolitan area, 1,911,521.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

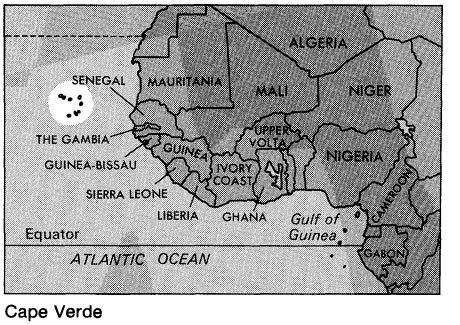
Cape tulip, also called BLOODLILY, any plant of the genus *Haemanthus* of the family Amaryllidaceae, consisting of about 50 species of ornamental South African herbs. Most species have dense clusters of red flowers and broad, blunt leaves that are grouped at the base of the plant.

Cape tulip (*Haemanthus puniceus*)
Sven Samelius

A few species have white flowers. Some species are variously known as natal paintbrush, catherine wheel, giant paintbrush, and African bloodlily.

Cape Verde, officially REPUBLIC OF CAPE VERDE, Portuguese REPÚBLICA DE CABO VERDE, island republic in the central Atlantic Ocean about 385 miles (620 km) off the west coast of Senegal, covering an area of 1,557 square miles (4,033 square km). Lying between 14°48′ and 17°12′ N and between 22°40′ and 25°22′ W, Cape Verde consists of 10 islands and 5 islets, which are divided into the Windward and Leeward groups. The capital is Praia on São Tiago Island. The population in 1988 was estimated to be 359,000.

The article that follows is a summary of significant detail about Cape Verde. Fuller treatment is provided in the following MACROPAEDIA articles. For geography and history, *see* Western Africa. For information about the



Cape Verde

country in its continental setting, *see* Africa. For information about major cultural manifestations, *see* African Arts.

For current history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the *Britannica Book of the Year.*

The land. The mountainous Windward islands are craggy and deeply furrowed by erosion, while the flat Leeward islands are largely plains and lowlands. The islands are volcanic in origin. Fogo island has an active volcano that erupted in 1951; it is also the location of the highest peak (9,281 ft [2,829 m]). The rugged relief and inadequate rainfall combined result in a predominance of lithosols and immature soils. On most of the islands the cliffs rise sheer from the sea. On the mountainous islands, there are no permanent streams, and water flows only during the rainy seasons.

Moderate, stable temperatures and extreme aridity characterize Cape Verde's climate. February is the coolest month with an average temperature of 71° F (22° C), and September is the warmest with an average temperature of 80° F (27° C). Rainfall is irregular, and periodic droughts cause famines. At Praia the average precipitation is 9.5 in. (241 mm). Sandstorms blowing from the Sahara sometimes form a dense sand mist that obscures the Sun. Springs flowing in the hills during the rainy season provide water for irrigation in the valleys below. A sea mist on the higher hills permits agriculture, and salt areas on Maio and Sal have xerophilous plants (plants adapted to growth with a limited water supply). The shrubs in the windward areas are mostly thorny, bitter, and toxic. Animal life includes gecko, and several species of lizard and skink.

Nearly one-tenth of Cape Verde's land area is arable, and cattle and sheep are grazed on another 7 percent.

The people. About three-fifths of Cape Verde's population is younger than 20 years of age. Many older inhabitants emigrate to seek work abroad, mostly in Venezuela and Brazil.

The average population density is about 198 persons per sq mi (76 per sq km). The most densely populated regions are the coastal areas of São Tiago, Santa Antão, and São Vicente islands. One-fifth of the country's population is urban, and one-half of the urban population lives in Praia. The rural population is found mainly in the few fertile valleys or in small villages on the coasts.

During the 20th century, several disastrous droughts caused the death of more than 200,000 people and heavy emigration from the islands to African countries, Brazil, and the United States. Since the 1940s the population has been increasing despite continuing emigration. During 1970–80 the average annual rate of population increase was less than 1 percent, but the rate of natural increase was more than 18 percent. The birth rate was almost 28 per 1,000 population, and the death rate was approximately 9 per 1,000.

More than two-thirds of the islands' population is creole (mulatto) and the remainder are European and black African. Apart from Portuguese, the language of the educated people of Cape Verde, the inhabitants speak a Portuguese dialect called Crioulo. Most of the population is officially Roman Catholic, but a flourishing Protestant mission based in São Tiago has a church and schools on most of the islands. Many animist customs are still preserved.

Economy. Cape Verde has a developing mixed economy based largely on agriculture. Economic conditions have deteriorated rapidly since the beginning of a severe drought cycle in 1968, and starvation has been prevented only by large-scale international food aid.

Agriculture accounts for about one-third of the GNP and employs more than one-third of the population, yet more than four-fifths of the nation's food requirements must be met by imports. Even in periods of normal rainfall only 4 of the 10 islands (Santo Antão, Brava, Fogo, and São Tiago) support significant agricultural activity, with livestock raising as the main occupation. Food crops are corn (maize), beans, cassava, and sweet potatoes. Cash crops such as bananas, sugarcane, coffee, and peanuts (groundnuts) are encouraged, but agricultural development has proceeded only very slowly. Government efforts to combat drought include well sinking and the construction of thousands of dams and dykes to hold the all too infrequent rains. More than 2,000,000 drought-resistant trees were planted in the early 1980s.

Mining is of little significance. Salt is produced on the islands of Sal, Mario, and Boa Vista. Volcanic rock, a pozzolana used in making cement, is exported in small quantities. The fishing industry has potential, and modern boats and equipment are gradually being acquired. Cape Verde has a cold storage plant at Mindelo and tuna canneries at Praia and on Sal Island.

Manufacturing and construction together contribute close to one-quarter of the GNP. Construction accounts for most of this activity. The main manufacturing industries are food processing and textiles. There are plans for the construction of an oil refinery, a naval yard, and a cement yard. In the early 1980s, construction began on a desalinization plant, intended to reduce or eliminate the islands' severe water shortage.

Services and transportation account for about one-half of the GNP. Cape Verde's strategic location at the crossroads of central Atlantic air and sea routes has been enhanced by harbour and airport improvements, and the tourism possibilities inherent in the islands' location and climate stimulated the construction of a hotel complex at Praia in the early 1980s.

Cape Verde has a chronic balance of trade deficit that shows signs of worsening. Chief trade partners are Portugal and The Netherlands. In spite of substantial international assistance, funds have been insufficient to implement the government's development policies. Remittances from former nationals and emigrants abroad alleviate the situation somewhat, but economic progress remains largely dependent on additional foreign aid.

Administrative and social conditions. Cape Verde is a one-party republic governed by the African Party for the Independence of Cape Verde. A constitution adopted in 1980 was not promulgated in the early 1980s; the existing republican government functioned in general conformity with it. It vested legislative power in a unicameral National Assembly, which would select the president and prime minister. The judicial system is headed by the National Council of Justice.

Limited social security programs have been introduced, and implementation of a national health service was begun. Although poor, health conditions in Cape Verde compare favourably to those of other Western African countries. Poor health and sanitation services and widespread malnutrition contribute to the high incidence of infectious and parasitic diseases, particularly tuberculosis, pneumonia, bronchitis, and gastrointestinal and childhood diseases. The average life expectancy is about 50 years, and the infant mortality rate is about 100 per 1,000 live births. Education is compulsory and free between the ages of 7 and 14; about 90 percent of the school-age children attend primary schools. Students traditionally travel abroad, often to Portugal, for higher education.

Cultural life. Cape Verde's rich creole culture is noted for its distinctive contributions in literature and music. The melancholic musical compositions known as *mornas* and Criouli poetry are characteristic.

History. When the islands were visited by the Portuguese between 1456 and 1460, they were uninhabited. In 1460 the Portuguese navigators Diego Gomes and António da Nola sighted and named Maio and São Tiago, and in 1462 the first settlers from Portugal landed on São Tiago, eventually founding the city of Ribeira Grande. Ribeira Grande's importance and wealth grew with the development of the slave trade, and the city was attacked by pirates in 1541 and by the English in 1585 and 1592. After a French attack in 1712, the city was finally abandoned. The prosperity of the islands vanished with the decline of the slave trade after 1876, and recurrent drought and famine were worsened by corruption and maladministration. The end of the 19th century saw some improvement, and the islands' position on the great trade routes between Europe, South America, and South Africa led to the opening of a coaling and submarine cable station at Mindelo. After World War I, prosperity declined due to a reduction in shipping, and not until after World War II did trade increase and relative prosperity return.

In 1951 the Portuguese colony was changed to an overseas province. In 1961 all of the islanders obtained full Portuguese citizenship. Despite these developments, a strong independence movement remained active, led by the African Party for the Independence of Guinea-Bissau and Cape Verde (PAIGC). (Guinea-Bissau, on the African mainland, was another former Portuguese colony granted provincial status but seeking full independence.) The Cape Verde Islands became an independent republic in 1975 with Aristide Pereira as the first president. In 1981 Cape Verde left the PAIGC and formed its own African Party for the Independence of Cape Verde (PAICU). The 1981 constitution approved by the National Assembly in 1981 formalized the split from Guinea-Bissau.

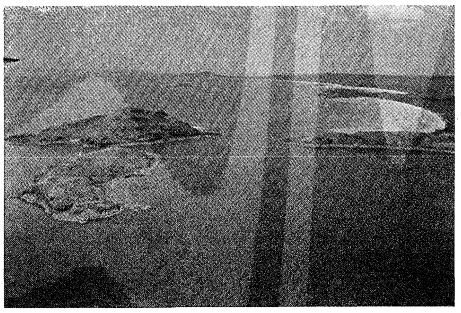
Cape Verde Basin, Portuguese BACIA DO CABO VERDE, submarine depression in the Atlantic Ocean that rises to meet the submerged Mid-Atlantic Ocean Ridge to the west and the West African coast to the east. With the contiguous Canary Basin (north), it forms an arc that swings around the western coast of Africa west and southwest of the Cape Verde islands. Though the greater part of the Atlantic Ocean floor is covered by oceanic oozes, in the Cape Verde Basin, which has an average depth of more than 23,600 ft (7,200 m) below sea level, the ooze is replaced by red clay. Here the waters are warmer and saltier, and are joined by cooler waters from the Sierra Leone Basin on the south. The Canary Current flowing southward into the basin blends with and is warmed by the Atlantic Equatorial Countercurrent in the west and the Guinea Current to the south.

Cape Verde Peninsula, French PRESQU'ÎLE DU CAP VERT, peninsula in west central Senegal, West Africa. Formed by a combination of volcanic offshore islands and a land bridge produced by coastal currents, it projects into the Atlantic Ocean, bending back to the southeast at its tip, and is the westernmost point of the African continent. Exposure to southwesterly winds contributes to Cape Verde's verdant appearance, in contrast to the undulating yellow dunes to the north.

The peninsula embraces a bay and an excellent natural harbour in the southwest. Since *c.* 1444, when the Portuguese first sighted the cape, it has been an entrepôt for African–European trade. Dakar, established there by the French in 1857, is now the capital of the Republic of Senegal.

Cape York Peninsula, northernmost extremity of Australia, projecting into Torres Strait between the Gulf of Carpentaria (west)

and the Coral Sea (east). From its tip at Cape York it extends southward in Queensland for about 500 mi (800 km), widening to its base, which spans 400 mi from Cairns (east) to the Gilbert River (west). The larger rivers, all emptying into the Gulf, are the Wenlock, Archer, Holroyd, Mitchell, Staaten,



Cape York Peninsula and offshore islands in the Torres Strait, Queensland
Frederick Ayer—Photo Researchers

and Gilbert. Princess Charlotte Bay, in the northeast, is the deepest coastal indentation. Annual rainfall varies from about 30 in. (760 mm) in the south to 70 in. at the cape. The peninsula is sparsely populated, although there are Aboriginal reserves on both coasts. Rock paintings are found in the area. The raising of beef cattle is the chief occupation of the area, but the rich bauxite deposits at Weipa are the main resource of the peninsula. Reached in 1606 by Willem Jansz, the peninsula was called Carpentaria Land by Abel Tasman, who charted the west coast in 1644. It was renamed by Capt. James Cook in 1770.

Čapek, Karel (b. Jan. 9, 1890, Malé Svatoňovice, Bohemia, Austria-Hungary—d. Dec. 25, 1938, Prague), internationally renowned Czech novelist, short-story writer, playwright, and essayist.

The son of a country doctor, Čapek suffered all his life from a spinal disease, and writ-

Čapek
Telepress, Prague

ing seemed a compensation. His first writings were published when he was 14. He studied philosophy in Prague, Berlin, and Paris and in 1917 settled in Prague as a writer and journalist. From 1907 until well into the 1920s much of his work was written with his brother Josef, a painter, who illustrated several of Karel's books.

Almost all Čapek's literary works are inquiries into philosophical ideas. The early short stories—in *Zářivé hlubiny* (with Josef, 1916; "The Luminous Depths"), *Krakonošova zahrada* (with Josef, 1918; "The Garden of Krakonoš"), and *Trapné povídky* (1921; in *Money and Other Stories,* 1929)—are mainly concerned with man's efforts to break out of the narrow circle of destiny, an attempt both doomed to failure and dangerous to the race. Another series of works presents Čapek's "black utopias," showing how scientific discoveries and technological progress tempt man into titanic rebellions. Thus, in the play *R.U.R.* (published 1920, performed 1921; Eng. trans., 1923), man constructs a manlike machine (its name, robot, has become an international word) more precise and reliable than man himself, which soon dominates him and threatens him with extinction, though at the last moment he is saved.

Other works, following the pattern of *R.U.R.*, include the novel *Továrna na absolutno* (1922; *The Absolute at Large,* 1944); *Krakatit* (1924; *An Atomic Phantasy,* 1948); and *Válka s mloky* (1936; *The War with the Newts,* 1937).

In another vein, Čapek's comic fantasy *Ze života hmyzu* (with Josef, 1921; *The Insect Play,* 1923) satirizes human greed, complacency, and selfishness, emphasizing the relativity of human values and the need to come to terms with life. His faith in democracy made him support his friend Jan Masaryk (*q.v.*) and write a biography of him. The quest for justice inspired most of the stories in *Povídky z jedné kapsy* and *Povídky z druhé kapsy* (1929; *Tales from Two Pockets,* 1932).

The problem of identity and the mystery of the motivations that lie beneath the surface of the apparently most ordinary life are the theme of Čapek's most mature work, a trilogy of novels that together present three aspects of knowledge. *Hordubal* (1933; Eng. trans., 1934) contrasts an inarticulate man's awareness of the causes of his actions with the world's incomprehension; *Provětroň* (1934; *Meteor,* 1935) illustrates the subjective causes of objective judgments; and *Obyčejný život* (1934; *An Ordinary Life,* 1936) explores the complex layers of personality underlying the "self" an "ordinary" man thinks himself to be. The realistic novel *Prvni parta* (1937; *The First Rescue Party,* 1940) stressed the need for solidarity. In his last plays the appeal became more direct. *Bílá nemoc* (1937; *Power and Glory,* 1938) presented the tragedy of the noble pacifist; *Matka* (1938; *The Mother,* 1940) vindicated armed resistance to barbaric invasion.

Capel, Arthur: *see* Essex, Arthur Capel, 1st earl of.

capelin (*Mallotus villosus*), marine food fish, a species of smelt, in the family Osmeridae (order Salmoniformes). The capelin is an inhabitant of the cold Arctic seas around the world but extends southward to coastal waters in the northern temperate regions. Unlike many other species of smelt, which are anadromous, the capelin does not enter fresh water to spawn but remains instead in shallow marine habitats. Like other smelt, however, capelin are sleek, slender fishes with silvery colouring and a forked tail fin. They have small scales and large eyes. Capelin do not reach lengths of more than about 20 centimetres (8 inches) but are sought after as a food fish by commercial fishers.

Capella (Latin: She-Goat) also called ALPHA AURIGAE, sixth brightest star in the night sky and the brightest in the constellation Auriga, with an apparent visual magnitude of 0.05. Capella forms a spectroscopic binary with a 10th-magnitude red companion star. It lies about 50 light-years from the Earth.

Capella, Martianus Minneus Felix (fl. late 4th and early 5th century AD), a native of North Africa and an advocate at Carthage whose prose and poetry introduction to the liberal arts was of immense cultural influence down to the late Middle Ages.

Capella's major work was written perhaps *c.* AD 400 and certainly before 439. Its overall title is not known. Manuscripts give the title *De nuptiis Philologiae et Mercurii* to the first two books and entitle the remaining seven *De arte grammatica, De arte dialectica, De arte rhetorica, De geometrica, De arithmetica, De astrologia,* and *De harmonia.* Mercury gives his bride, who is made divine, seven maidens, and each declaims on that one of the seven liberal arts that she represents. The prose style is often dry, but in parts it is influenced by the style of the *Metamorphoses* of Apuleius and is even more mannered and bizarre than that work's. The verse is mostly competent.

Capellanus, Andreas: *see* André le Chapelain.

Capellen, Godert Alexander Gerard Philip, baron van der (b. Dec. 15, 1778, Utrecht, Neth.—d. April 10, 1848, De Bilt), governor general of the Dutch East Indies (1816–26) who helped draw up a new Dutch colonial policy for the Indies.

Van der Capellen first saw service in the Dutch judiciary and as minister of the interior (1809–10). As governor general, van der Capellen experienced serious difficulties. Faced with revolts in the Moluccas (also known as the Spice Islands), he abolished the Dutch monopoly there. Further, he found that granting freedom of trade to everyone allowed the Europeans with their superior skills to take advantage of the Indonesians, who were soon reduced to serfdom. As a remedy he forbade the native states to sell more lands to Europeans and thus infuriated not only the Europeans but also the Indonesian aristocrats, whom he ordered to reclaim their former lands and pay indemnities for improvements. This program sparked the outbreak of the bloody Java War (1825–30).

Meanwhile, the financial condition of the Indies had been steadily deteriorating. To raise funds van der Capellen arranged a loan from Britain, mortgaging the Indies in the process. That step brought him his dismissal.

Capello, Bianca, Capello also spelled CAPPELLO (b. 1548, Venice—d. Oct. 20, 1587, Poggio, near Florence), Venetian noblewoman, renowned for her beauty and intelligence, whose court intrigues were the scandal of her time.

Against the will of her family, Bianca ran off and married a young Florentine named Pietro Buonaventuri. She soon became the mistress of Francesco I de' Medici, at first secretly and then openly after the murder of her husband (1569). She succeeded in marrying Francesco (1578) by means of a bizarre plot in which she feigned a pregnancy and presented him the baby of a common woman as her own son.

Her conduct and machinations aroused much enmity at the Florentine court, especially that of the powerful Cardinal Ferdinando I de' Medici, brother of Francesco. Bianca and Francesco fell ill at Poggio and died within a day of each other; they may have been poisoned with the consent of Ferdinando.

Bianca Capello, tempera by Alessandro Allori; in the Uffizi, Florence
Alinari—Art Resource/EB Inc.

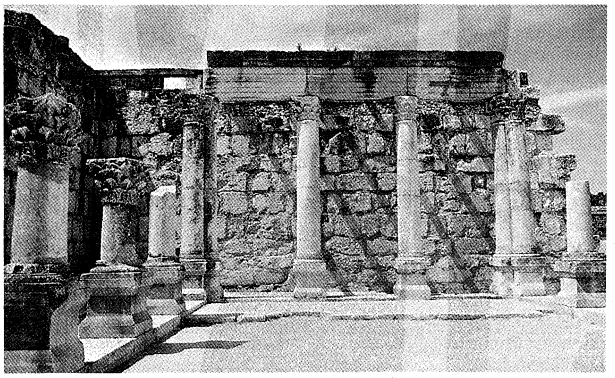
Capellus, Ludovicus: *see* Cappel, Louis.

Capena, ancient city of southern Etruria, Italy, frequently mentioned with the ancient Etruscan cities of Veii and Falerii. It was probably a colony of Veii, but after Veii's fall it became subject to Rome.

Out of its territory the Stellatine tribe (one of the tribes of the Roman people) was formed in 367 BC. In addition to remains of Roman buildings, many tombs, especially of the 8th and 7th centuries BC, have been found in the neighbouring hills.

capercaillie, European game bird of the grouse family. *See* grouse.

Capernaum, Douai CAPHARNAUM, modern KEFAR NAḤUM, ancient city on the northwestern shore of the Sea of Galilee, Israel. It was Jesus' second home and, during the period of his life, a garrison town, an administrative centre, and a customs station. Jesus chose his disciples Peter, Andrew, and Matthew from Capernaum and performed many of his miracles there. The long dispute over Kefar Nahum's identification with Capernaum was settled by excavations begun in 1905 by H. Kohl and C. Watzinger, and completed by the Franciscans. Among the remains discovered during the excavations was a rectangular synagogue dating from the 2nd–3rd century AD; an older synagogue dating from the time of Christ may be buried beneath its foundation.



The synagogue at Capernaum, 2nd–3rd century AD
Lee Boltin

Capetian DYNASTY, the ruling house of France from 987 to 1328, during the feudal period of the Middle Ages. By extending and consolidating their power, the Capetian kings laid the foundation of the French nation-state.

The Capetians all descend from Robert the Strong (died 866), count of Anjou and of Blois, whose two sons, usually styled Robertian rather than Capetian, were both crowned kings of the Franks: Eudes in 888, Robert I in 922. Though Robert I's son Hugh the Great restored the Carolingian dynasty in 936, his son Hugh Capet (*q.v.*) was elected king in 987, thus removing the Carolingians forever.

The 13 kings from Hugh Capet to the infant John I, who succeeded one another from father to son, and John I's two uncles, Philip V and Charles IV (d. 1328), are designated as the Capetians "of the direct line." They were followed by the 13 Capetian kings of the House of Valois (*see* Valois dynasty). Of these, seven kings (from Philip VI to Charles VIII) succeeded from father to son, after whom Louis XIII began the House of Valois-Orléans, continued in the branch of Valois-Orléans-Angoulême (five kings from Francis I to Henry III) until 1589. Then the Capetians of Bourbon succeeded (*see* Bourbon, House of).

Hugh Capet's rule was limited to his own domain around Paris, while the rest of the French kingdom was in the hands of powerful local lords. His direct successors gradually increased the territory over which they had control through conquest and inheritance and also by skillfully exploiting their rights as suzerains in areas not under their direct authority. Under the Capetians, many of the basic administrative institutions of the French monarchy, including Parlements (royal law courts), the States General (representative assembly), and the *baillis* (royal local officials), began to develop.

Among the most notable of the Capetians was Philip II Augustus (reigned 1180–1223 as "king of France" rather than "king of the Franks"), who wrested from the Angevin rulers of England much of the empire that they had built up in western France. Another notable Capetian was Louis IX, or Saint Louis (reigned 1226–70), whose devotion to justice and saintly life greatly enhanced the prestige of the monarchy.

Apart from the French kings, there were in the Middle Ages two lines of Capetian dukes of Burgundy (1032–1361 and 1363–1477); the Capetian House of Dreux, a line of dukes of Brittany (1213–1488); three Capetian emperors of Constantinople (1216–61), of the House of Courtenay; various counts of Artois (from 1237), with controversial succession; the first Capetian House of Anjou, with kings and queens of Naples (1266–1435) and kings of Hungary (1310–82); the House of Évreux, with three kings of Navarre (1328–1425); the second Capetian House of Anjou, with five counts of Provence (1382–1481); and other lesser branches.

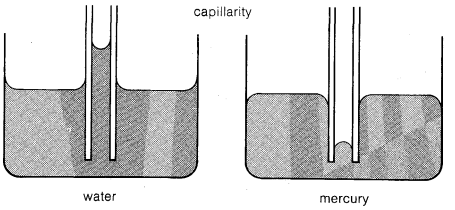
Capgrave, John (b. April 21, 1393, Lynn, Norfolk, Eng.—d. Aug. 12, 1464, Lynn), historian, theologian, and hagiographer who wrote an English *Life of St. Katharine,* vigorous in its verse form and dramatically energetic in its debate. His work illustrates well the literary tastes and circumstances of his time.

Capgrave became a priest, lectured in theology at Oxford University, and later joined the Augustinian order of hermits at Lynn, where he probably became prior. He was provincial of his order in England and made at least one journey to Rome, the wonders of which are described in his *Solace of Pilgrims* (ed. C.A. Mills, 1911).

Most of his theological works seem to have been compiled from other authors, or freely translated, and consist of biblical commentaries, lectures, sermons, treatises, and lives of saints. His history in honour of Henry VI is of little historical value, but the latter part of his unfinished *Chronicle of England* is of some interest. He wrote several lives of saints in English, both in verse and in prose, but the huge Latin collection of the lives of English saints, the *Nova Legenda Angliae,* attributed to him in the 16th century, was at most edited by him.

Capharnaum (ancient Israel): *see* Capernaum.

capillarity, rise or depression of a liquid in a small passage such as a tube of small cross-sectional area, like the spaces between the fibres of a towel or the openings in a porous material. Capillarity takes place not only in the vertical direction. Water is drawn into the fibres of a towel, no matter how the towel is oriented.



Capillarity of water and mercury

Liquids that rise in small-bore tubes inserted into the liquid are said to wet the tube, whereas liquids that are depressed within thin tubes below the surface of the surrounding liquid do not wet the tube. Water is a liquid that wets glass capillary tubes; mercury is one that does not.

Capillarity is the result of surface, or interfacial, forces. The rise of water in a thin tube inserted in water is caused by forces of attraction between the molecules of water and the glass walls and among the molecules of water themselves. These attractive forces just balance the force of gravity of the column of water that has risen to a characteristic height. The narrower the bore of the capillary tube, the higher the water rises. Mercury, conversely, is depressed to a greater degree, the narrower the bore.

capillary, any of the minute blood vessels that form networks throughout the bodily tissues; it is through the capillaries that oxygen, nutrients, and wastes are exchanged between the blood and the tissues. The capillary networks are the ultimate destination of arterial blood from the heart and are the starting point for flow of venous blood back to the heart. Between the smallest arteries, or arterioles, and the capillaries are intermediate vessels called precapillaries, or metarterioles, that, unlike the capillaries, have muscle fibres that permit them to contract; thus the precapillaries are able to control the emptying and filling of the capillaries.

The capillaries are about 8 to 10 microns (a micron is 0.001 millimetre) in diameter, just large enough for red blood cells to pass through them in single file. The single layer of cells that form their walls are endothelial cells, like those that form the smooth channel surface of the larger vessels.

The networks of capillaries have meshes of varying size. In the lungs and in the choroid—the middle coat of the eyeball—the spaces between capillaries are smaller than the vessels themselves, while in the outer coat of arteries—the tunica adventitia—the intercapillary spaces are about 10 times greater than the diameter of the capillaries. In general, the intercapillary spaces are smaller in growing parts, in the glands, and in mucous membranes; larger in bones and ligaments; and almost absent in tendons.

The smallest vessels in the lymphatic system are also called capillaries, as are the minute channels for bile in the liver. *See also* artery; vein.

capillary wave, small, free, surface-water wave with such a short wavelength that its restoring force is the water's surface tension, which causes the wave to have a rounded crest and a V-shaped trough. The maximum wavelength of a capillary wave is 1.73 centimetres

(0.68 inch); longer waves are controlled by gravity and are appropriately termed gravity waves. Unlike the velocity of gravity waves, the velocity of capillary waves increases with decreasing wavelength, the minimum velocity being 23.1 centimetres per second, where the wavelength is the maximum 1.73 cm.

capital, in architecture, crowning member of a column, pier, anta, pilaster, or other columnar form, providing a structural support for and a visual transition to the horizontal member (entablature) or arch above. In the Classical styles, the capital is the architectural member that most readily distinguishes the order (*see* orders of architecture).

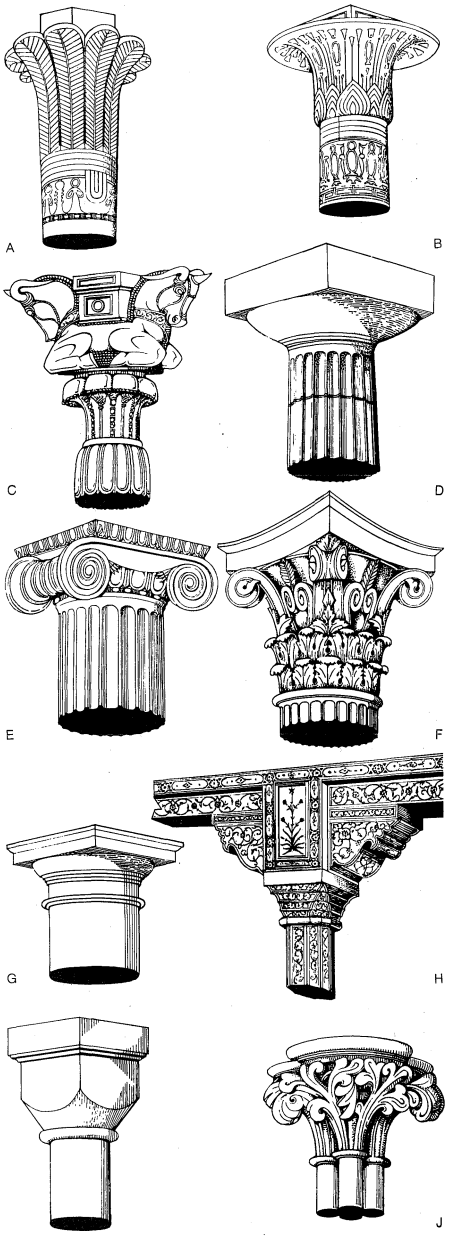
Two simple forms of the capital are a square wooden block called an abacus, placed on the top of a post, and an oblong block called a billet, set with its greatest dimensions parallel to the beam above. Shaping the ends of such blocks produced a laterally spreading form of capital, later elaborated by multiplication of parts, addition of moldings, and ornamentation with floral, zoomorphic, or abstract forms.

Primitive abacus capitals were known in Egypt and Mesopotamia, and two kinds of simple stone capital have been found in the stepped-pyramid complex at Saqqārah (*c.* 2890–*c.* 2686 BC). One, a saddlelike shape, suggests bent reeds or leaves; the other, an upturned bell, derives from the papyrus plant. Later Egyptian architecture used capitals derived from such plant forms as the palm and lotus, as well as anthropomorphic forms and simple abacus shapes. Volute capitals were known in Hittite architecture in Anatolia and in Mesopotamia as early as 870 BC. Very elaborate capitals were created in Achaemenian Persia.

Three widely used forms of the capital were created by the Greeks. The Doric capital consists of a square abacus surmounting a round form with an egg-shaped profile called the echinus, below which are several narrow, ridgelike moldings linking the capital with the column. The Ionic capital—probably related to the volute capitals of western Asia—has a tripartite design consisting of a pair of horizontally connected volutes inserted between the abacus and echinus. The Corinthian capital is basically an abacus supported on an inverted bell surrounded by rows of stylized acanthus leaves. The Romans added the Tuscan, a modified form of the Doric, and the Composite, which combined Ionic volutes with the Corinthian bell shape.

Islāmic capitals, following the nonrepresentational requirement of the Muslim aesthetic, used primarily abstract forms derived from repetition of small moldings and multiplication of miniature arches. Some form of bracketed capital and a bell-shaped capital decorated with lotus motifs were used most frequently in India, China, and Japan.

Design of capitals in medieval Europe usually stemmed from Roman sources. Cubiform, or cushion, capitals, square on top and rounded at the bottom, served as transitional forms between the angular springing of the arches and the round columns supporting them. Grotesque animals, birds, and other figurative motifs characterize capitals of the Romanesque period. At the beginning of the Gothic period, exotic features tended to disappear in favour of simple stylized foliage, crockets, and geometric moldings, particularly in France and England. During the later Middle Ages the emphasis on clustered columns and compound piers that soared in an unbroken line to the high vaults tended to decrease the importance of the capital.



Types of ancient and medieval capitals
(A) Egyptian palm capital; (B) Egyptian bell or papyrus capital; (C) Achaemenian Persian bull capital; (D) Greek Doric capital; (E) Greek Ionic capital; (F) Greek Corinthian capital; (G) Roman Doric capital; (H) Islāmic bracketed capital from India; (I) Romanesque cushion capital; (J) Early English Gothic foliated capital

From (A,B,C) Sir Banister Fletcher, *A History of Architecture on the Comparative Method*, pp. 55, 76 (1961), (G, I, J) M.S. Briggs, *Everyman's Concise Encyclopaedia of Architecture*; E.P. Dutton & Co., Inc., and J.M. Dent & Sons Ltd.

capital, in economics, a stock of resources that may be employed in the production of goods and services. In classical economics it is one of the three factors of production, the others being labour and land.

A brief treatment of capital follows. For full treatment, *see* MACROPAEDIA: Economic Theory.

Capital may be so broadly defined as to include all possible material, nonmaterial, and human inputs into a productive system, but it is usually more useful to confine the term to material assets in the hands of productive enterprises. In this sense, there are two forms of capital. Money or financial capital is a fluid, intangible form used for investment. Capital goods, *i.e.*, real or physical capital, are tangible items such as buildings, machinery, and equipment produced and used in the production of other goods and services. Money capital is raised by selling stocks and bonds in order to finance the acquisition of real capital or capital goods. Capital goods are similar to savings because both require postponing current consumption to provide for future production and consumption.

In an accounting sense, the capital of a business firm is that part of the net worth that has not been produced by the operation of the enterprise, or, in other words, the original stock of net assets of the firm before any income is earned. The economist is more likely to speak of "real" assets, such as plant and equipment, factory and office buildings, and inventories of raw materials and of partly finished and finished goods, regardless of their financial status.

Economists of the classical school, beginning with Adam Smith, developed the earliest theory of capital, according to which capital arose out of the excess of production over consumption. The income earned by capital is profit, the counterpart to the wages and rent earned by the other factors of production. No thoroughly satisfactory theory of capital has been presented, and since the 19th century interest in developing such a theory has flagged.

To make the best use of the Britannica, consult the INDEX *first*

Capital (book by Karl Marx): *see* Kapital, Das.

capital gains tax, tax levied on gains realized from the sale or exchange of capital assets. Capital gains have been taxed in the U.S. since the advent of federal income taxation. Since 1921, certain capital gains have been afforded preferential treatment.

Several arguments are used to support preferential treatment of capital gains. One is that encouraging the investment of risk capital stimulates economic growth. A second is that to tax in a single year the full value of several years' appreciation is unfair. A third is that taxing capital gains at the regular rates would tend to lock investors into their current patterns of investment. On the other hand, it is argued that preferential treatment results in distorted patterns of investment because regular income is converted into capital gains in order to avoid paying tax.

From an economic point of view, the crux of the issue of capital gains taxation is whether or not capital gains are part of ordinary income. If one defines income as the sum of the change in the individual's consumption and the change in his net worth, then capital gains should logically be taxed as ordinary income. If the definition of income operative in the British tax system is accepted, capital gains will not be taxed because they do not represent a continuing source of income.

In Great Britain until 1962, capital gains were not taxable and capital losses were not deductible. In 1962 speculative short-term (six months or less) gains were made taxable at the regular rates. In the U.S., only 40 percent of long-term (12 months or more) capital gains are subject to taxation.

capital levy, strictly defined, a direct tax assessed simultaneously on the capital resources of all persons possessing taxable wealth in excess of a minimum value and paid at least partly out of capital resources. This definition excludes death duties because in any given year their application is necessarily limited to the estates of deceased persons. Various taxes have at times been popularly termed capital levies, even though they were assessed on current incomes or their burden did not exceed capacity to pay out of current income.

In its narrowest sense, the capital levy aims at achieving the surrender of a relatively substantial portion of the taxpayers' wealth to enable the government to cope with some nonrecurrent major emergency or to bring about with one stroke a major redistribution

of wealth or a major reduction of the note circulation or the national debt. Capital levies were introduced in a number of European countries after both World War I and World War II.

capital punishment, execution of a criminal convicted of a crime. Capital punishment was once meted out for a large number of crimes. In England, for example, during the 18th century, death was decreed for several hundred specific offenses, particularly for those against property. During that century, however, limitations began to be placed on the number and type of offenses for which criminals were put to death. The writings of 18th-century Enlightenment thinkers—such as Montesquieu, Voltaire, and Cesare Beccaria—proved a powerful stimulus to reform, as did the strength of the industrial working class and the humanitarian movements.

By the 1970s death had been eliminated as a statutory punishment in many countries, including Portugal, Denmark, Venezuela, Austria, Brazil, Switzerland, and Great Britain (except for treason and piracy). In some other countries it was seldom or never invoked. In the United States, there are death penalty statutes in some states but not in others. In 1972 the U.S. Supreme Court ruled that capital punishment laws, as then enforced, were unconstitutional. A later Supreme Court ruling, however, upheld the constitutionality of capital punishment per se, and many states have since passed laws that meet the court's requirements of specifying the crimes or circumstances for which the death penalty is to be invoked.

Those persons favouring capital punishment maintain that it deters people from committing crime; life imprisonment, it is said, would not be equally effective as a deterrent and would expose prison staffs and fellow prisoners to dangerous murderers. This risk later extends to the community, as such persons may escape or be pardoned or paroled. Opponents of capital punishment maintain that it cannot be proved to be a better deterrent or to protect the community better than does life imprisonment; that errors of justice sometimes lead to the execution of innocent persons; and that the death penalty is applied unequally, mostly to the poor and the defenseless, who cannot afford lawyers or appeals.

capitalism, also called FREE MARKET ECONOMY, or FREE ENTERPRISE ECONOMY, economic system, dominant in the Western world since the breakup of feudalism, in which most of the means of production are privately owned and production is guided and income distributed largely through the operation of markets. Although the continuous development of capitalism as a system dates only from the 16th century, antecedents of capitalist institutions existed in the ancient world, and flourishing pockets of capitalism were present during the later Middle Ages.

The development of capitalism was spearheaded by the growth of the English cloth industry during the 16th, 17th, and 18th centuries. The feature of this development that distinguished capitalism from previous systems was the use of the excess of production over consumption to enlarge productive capacity rather than to invest in economically unproductive enterprises, such as pyramids and cathedrals. This characteristic was encouraged by several historical events.

In the ethic encouraged by the Protestant Reformation of the 16th century, traditional disdain for acquisitive effort was diminished, while hard work and frugality were given a stronger religious sanction. Economic inequality was justified on the grounds that the wealthy were also the virtuous.

Another contributing factor was the increase in Europe's supply of precious metals and the resulting inflation in prices. Wages did not rise as fast as prices in this period, and the main beneficiaries of the inflation were the capitalists. The early capitalists (1500–1750) also enjoyed the benefits of the rise of strong national states during the mercantilist era. The policies of national power followed by these states succeeded in providing the basic social conditions, such as uniform monetary systems and legal codes, necessary for economic development and eventually made possible the shift from public to private initiative.

Beginning in the 18th century in England, the focus of capitalist development shifted from commerce to industry. The steady capital accumulation of the preceding centuries was invested in the practical application of technical knowledge during the Industrial Revolution. The ideology of classical capitalism was expressed in Adam Smith's *Inquiry into the Nature and Causes of the Wealth of Nations* (1776), which recommended leaving economic decisions to the free play of self-regulating market forces. After the French Revolution and the Napoleonic Wars had swept the remnants of feudalism into oblivion, Smith's policies were increasingly put into practice. The policies of 19th-century political liberalism included free trade, sound money (the gold standard), balanced budgets, and minimum levels of poor relief.

World War I marked a turning point in the development of capitalism. After the war, international markets shrank, the gold standard was abandoned in favour of managed national currencies, banking hegemony passed from Europe to the United States, African and Asian peoples began successful revolts against European colonialism, and trade barriers multiplied. The Great Depression of the 1930s brought the policy of laissez-faire (noninterference by the state in economic matters) to an end in most countries and for a time cast doubt on the capitalist system as a whole. The performance of capitalism since World War II in the United States, the United Kingdom, West Germany, and Japan, however, has given evidence of its continued vitality.

Capitano, stock character of the Italian theatrical form known as the commedia dell'arte. He was the prototype of a pretentious but cowardly military man. One of the earliest of the commedia characters, he was a descendant of the Miles Gloriosus, the braggart soldier of ancient Roman comedy. An unsympathetic character, he was originally a parody of the French and Spanish mercenaries who overran 16th-century Italy. His blustering claims to wealth and military and amatory successes were exploded, often by the roguish asides of his squire and confidant. By the late 17th century Capitano had lost most of his political overtones and simply represented an arrogant boaster.

Capitano, detail from "The Gelosi Company," oil painting by unknown artist, *c.* 1580; in the Drottningholms Teatermuseum, Stockholm

By courtesy of the Drottningholms Teatermuseum, Stockholm

The character of the Capitano had several different names that varied as different actors interpreted the role. In the late 16th century he was called Capitano Mattamoros (Captain Death to the Moors) and wore an immense starched ruff, wide plumed hat, and boots with scalloped edges. His mask was flesh coloured and had an enormous protruding nose. Somewhat later the role of Capitano Spavento della Valle Inferno (Captain Fearsome of Hell's Valley) was created by another commedia dell'arte actor. Other names include Capitano Cocodrillo, Capitano Rodomante, and Capitano Rinoceronte.

capitation, major direct tax in France before the Revolution of 1789, first established in 1695 as a wartime measure. Originally, it was to be paid by every subject, the amount varying according to class. For the purpose of the tax, French society was divided into 22 classes, ranging from members of the royal family who owed 2,000 livres (basic monetary unit of pre-Revolutionary France) to dayworkers who owed only one livre. The tax became permanent in the early 18th century, with apportionment by an intendant (royal agent) replacing the class system of payment. In practice the capitation was merely an addition to the taille, the long-existing royal tax, falling mainly on the nonprivileged classes of the French people, who paid the bulk of the taxes. It was abolished with the Revolution.

Capito, Wolfgang Fabricius, original name WOLFGANG KÖPFEL (b. 1478, Hagenau, Alsace—d. Nov. 4, 1541, Strassburg), Christian Humanist and Catholic priest who, breaking with his Roman faith, became a primary Reformer at Strassburg.

Educated at the German universities of Ingolstadt and Freiburg, he became a diocesan preacher (1512) in Bruchsal, where he met the future Reformers John Oecolampadius and Conrad Pellicanus. Appointed cathedral preacher at Basel, Switz., in 1515, he lectured at the university and met the celebrated Humanist Desiderius Erasmus and the leader of the Swiss Reformation, Huldrych Zwingli.

To Capito's dismay, the elector Archbishop Albrecht of Mainz summoned him in 1519 to Mainz, as cathedral preacher and, later, as chancellor. Badly torn in conscience, he twice visited Martin Luther at Wittenberg. By 1523 he fully believed in the cause of the Reformation; he resigned his post at Mainz and went to Strassburg, where he joined forces with the German Protestant Martin Bucer in reforming Strassburg and southern Germany and in consolidating the leading German, French, and Swiss Evangelical ministers. In 1530 he and Bucer drafted the *Confessio Tetrapolitana,* an attempt to mediate the differences between Zwingli and Luther over the Augsburg Confession.

Unlike Bucer, Capito remained friendly to the Anabaptists, the radical wing of the Reformation, and other dissenters disturbing the Strassburg Reformation, until 1534, when he clearly repudiated them. His most important work is considered to be *Berner Synodus* (after the synod held at Bern, Switz., in 1532), which deals essentially with church discipline and pastoral instruction. An active participant in several important church synods, he died of plague while returning from the Colloquy of Regensburg. O.E. Strasser's *La pensée théologique de Wolfgang Capiton dans les dernières années de sa vie* appeared in 1938.

Capitol, United States, Washington, D.C., the meeting place of the U.S. Congress and one of the nation's most familiar landmarks, on Capitol Hill, situated where Pennsylvania Avenue intersects Constitution Avenue (on the northwest) and Independence Avenue (on

the southeast). To its west lies the Mall, and to its east the Supreme Court and the Library of Congress. Various Congressional (House and Senate) office buildings adjoin it to the north and south. The building also served as the meeting place of the Supreme Court until its own building was completed (in 1935).

In 1792 the competition for the design of the Capitol was won by William Thornton, a versatile West Indian doctor who had lived for a time in Philadelphia, but had had no previous architectural experience. The cornerstone was laid by George Washington on September 18, 1793. Because Thornton had no knowledge of building technology, the construction was initially supervised by the runner-up in the competition, Stephen Hallet. Attempting to change too many of Thornton's plans, he was soon succeeded in his post by James Hoban, the architect who had designed the White House. The north wing was finished first, and Congress convened there in November 1800.

Benjamin Latrobe was appointed Surveyor of Public Buildings in 1803 by Thomas Jefferson and among his duties was the completion of the Capitol. He continued to follow Thornton's conception of the exterior closely, but used his own designs for the interior. Perhaps the best known feature introduced by Latrobe were tobacco-leaf and corn-cob capitals. The south wing was completed by 1807. In 1814 the British set fire to the Capitol, and after the war Latrobe began its reconstruction, but resigned his post in 1817. His successor was the distinguished Boston architect Charles Bulfinch, who by 1827 had joined the two wings and built the first dome, again adhering to Thornton's original design. In 1850 a Philadelphia architect, Thomas Ustick Walter, won a congressional competition to expand the wings: the House of Representatives extension was completed by 1857 and two years later the Senate extension was finished. Walter also designed the 287-foot- (87-m-) high cast-iron dome, which was based on Michelangelo's dome for St. Peter's Basilica in Rome. At Lincoln's insistence work on the dome was continued during the Civil War as a symbol of national solidarity, and on Dec. 2, 1863, Thomas Crawford's bronze statue of "Freedom" (19½-ft high) was installed on top of the dome's crowning cupola. With the exception of such modernization features as the installation of central heating, electricity, elevators, etc., no significant architectural alterations or additions were made until 1959–60 when the east front was extended 32½ feet under the supervision of J. George Stewart, the architect of the Capitol. The building stands in a 131-ac (53-ha) park, is 751 ft long, 350 ft wide and contains about 540 rooms.

Capitol Reef National Park, national park in south central Utah, U.S., just east of Torrey. Established as a national monument in 1937, it became a national park in 1971. It comprises a great buttressed cliff of coloured sandstone extending for 20 mi (32 km) along the western edge of the Water Pocket Fold. The Fremont River and its tributaries, Sulphur and Pleasant creeks, cross the reef through deep canyons that rise to more than 1,000 ft (300 m). The park, which occupies 378 sq mi (979 sq km), was named Capitol Reef because its rock towers and pinnacles reminded early geologists of coral reefs, and its dome-shaped formations were reminiscent of capitol architecture. The smooth cliff walls are covered with pre-Columbian petroglyphs. The sparse, desert-like vegetation includes piñons and junipers on the talus slopes and cottonwoods along the streams. Lizards are numerous, and deer, foxes, bobcats, porcupines, and small rodents are common to the area.

Capitoline Museums, Italian MUSEI CAPITOLINI, complex of art galleries on the Capitoline Hill in Rome. The collection was initially founded in 1471 by Pope Sixtus IV, who donated statuary recovered from ancient ruins. It was augmented by gifts from later popes and, after 1870, by acquisitions from archaeological sites on city property. The Palazzo del Museo Capitolino was designed by Michelangelo (1536), finished about 1603, and opened to the public in 1734. It dominates the Forum from the eastern edge of the Capitoline Hill, incorporating the impressive remains of the facade of the Tabularium, built in 78 BC. The Palazzo dei Conservatori (1546–68) was constructed after a design by Michelangelo. Antique sculpture is displayed in the courtyard and on the first floor. The second floor is occupied by the Pinacoteca Capitolina (Capitoline Picture Gallery), founded in 1749 by Pope Benedict XIV, which contains notable European paintings of the 14th to 17th century. The Palazzo Caffarelli, adjoining the Palazzo dei Conservatori to the south, was built in 1580 and for a time before 1918 was the German Embassy. Museo Nuovo houses ancient works of art formerly in several municipal collections.

capitulary, ordinance, usually divided into articles (*capitula*), promulgated by the Carolingian sovereigns (Charlemagne and his heirs) in western Europe (8th–10th century). These ordinances dealt with various issues of administration, the royal domains, and public order and justice, as well as with ecclesiastical problems. Similar acts had been promulgated earlier by the Merovingians, though not under the same name.

In Carolingian times capitularies that dealt with ecclesiastical matters were separated from those dealing with secular affairs. The latter fell into three main categories. The first, *capitula legibus addenda,* were intended to supplement or modify the national laws of the Carolingian peoples. They were concerned with penal law, with rules of procedure, or with private law. The second, *capitula per se scribenda,* were ordinances resulting from an agreement between the king and his assembly of notables. These were directed at the territories within the realm and dealt with the relationships of the subjects to it. The last, *capitula missorum,* were instructions, resulting from the king's personal decisions, to the *missi dominici* (*q.v.*), who were sent to the provinces to supervise the local administration and to ensure obedience to royal commands.

No capitularies exist in their original form, and it is necessary to study copies or copies of copies that often contain numerous errors. For this reason it is often difficult to make an absolute determination of their nature. The Carolingians did not legislate according to a fixed system, and the foregoing distinctions are only approximate. Even though certain capitularies are confined to one subject, most contain various unrelated measures, and, consequently, the categories often overlap.

After the death of Louis I the Pious (840), the Carolingians of Germany ceased to promulgate capitularies. In France the practice continued until the end of the 9th century.

Capitulation, any of the economic privileges granted by the Ottoman sultans to the subjects of friendly non-Muslim states. The privileges included the creation of communities of foreign merchants in the Ottoman cities; representation by consuls with judicial authority to arbitrate in disputes within their communities; security of person and property; the right to free travel, transport, and sale of goods in Ottoman lands; and free navigation on the Ottoman-dominated seas. The merchants had to pledge "friendship and sincerity," and the Ottomans expected reciprocal advantages.

Until the late 16th century the Ottoman sultans, following the precedents set by earlier rulers of Anatolia, granted Capitulations mainly to the Republic of Venice, which enjoyed commercial predominance in the Levant. On the eve of the Ottoman–Venetian War of 1570–72, however, the Ottomans, seeking friendly relations with France, granted Capitulations to the French (1569). When a Franco-Spanish rapprochement occurred in 1573, the Ottomans decided to grant trade concessions to the English (1580), thus heralding a period of commercial rivalry between France and England in the Levant.

Beginning in 1683, when the Ottomans suffered military setbacks on the Austrian front and needed European diplomatic support, they began to grant further economic concessions to European states in return for political assistance. When France made peace with Austria (1697), the Ottomans gave England a monopoly of the trade between Istanbul and Egypt, and a British consulate was opened in Egypt. France, however, won the most extensive concessions ever granted when it mediated in negotiations between Austria, Russia, and the Ottoman Empire leading to the Treaty of Belgrade (1739), which was favourable to the Ottomans.

In the 18th century Austria and Russia acquired capitulatory privileges because of military victories over the Ottomans. By the Treaty of Carlowitz (1699) the Ottomans extended privileges to the Habsburg Empire; and after the Treaty of Passarowitz (1718) Austria acquired full capitulatory privileges, including free navigation on the Danube and the establishment of consulates. Russia gained capitulatory privileges by the Treaty of Küçük Kaynarca (Kuchuk Kainarji) in 1774.

By the end of the 18th century European abuses of capitulatory privileges were widespread. Europeans extended privileges to non-Muslim Ottoman subjects, who obtained patents from consuls as protected persons or as members of the consular staff. Moreover, attempts by the Ottoman government to increase revenue by establishing a monopoly on exports and to keep internal trade outside the scope of Capitulations failed when, by the Convention of Balta Liman (1838), the British obtained free movement within the empire, an end of the monopolies, and the rights of most favoured Ottoman subjects in internal trade. This agreement was soon repeated by other capitulatory nations, making the Ottoman Empire an open market for European manufactured goods.

When the Ottoman Empire joined the European community of nations in 1856, it demanded the abolition of the Capitulations, but the privileges were renewed in 1862. Thenceforth efforts of Ottoman reformists were directed toward obliterating the abuses of the Capitulations, but by the 1890s the European powers had extended their capitulatory privileges to all public services. With the outbreak of World War I (1914–18), the Ottoman government brought the issue of abolition before the Allied Powers as a condition of its neutrality; but, faced with ambiguity, the Sultan abolished the Capitulations unilaterally in 1914 and entered the war on the side of the Central Powers. Following the Ottoman defeat, the Treaty of Sèvres (1920) restored the Capitulations, but they were finally abolished by the Treaty of Lausanne on July 24, 1923.

Capiz, province, northern Panay Island, Philippines. Its coastline borders on the Sibuyan Sea to the north and is indented by Sapian and Pilar bays. It has an area of 1,017 sq mi (2,633 sq km) and is one of the wealthiest provinces in the Philippines. Capiz occasionally produces surplus rice that is sent to both western Panay and nearby islands. Sugarcane is also an important cash crop. Coastal fishing and the maintenance of fishponds are the most important economic activity in the northern section. Roxas, the provincial cap-

ital, is a chartered city and interisland port. Other population centres include Tapaz, Pontevedra, and Pilar. The area around Dumalay is noted for a natural stone bridge and caves. Nearly all of the people speak Hiligaynon as their native language. Pop. (1980) 492,231.

Caplin, Alfred Gerald: *see* Capp, Al.

Capo d'Istria, Giovanni Antonio (Greek statesman): *see* Kapodístrias, Ioánnis Antónios, Count.

Capodimonte, Museo e Gallerie Nazionali di (Italian: National Museum and Gallery of Capodimonte), art museum in Naples, occupying the mid-18th-century Palazzo di Capodimonte. It is composed of the private collections of Charles III, the Bourbon king of Naples and later of Spain.

As well as presenting a representative survey of Italian painting from the 13th through the 17th century, the museum maintains collections of arms, armour, gold- and silverwork, and examples of other decorative arts, including Capodimonte porcelain. Its three major divisions are the Museum, the 19th Century Gallery, and the National Gallery.

Capodimonte porcelain, soft-paste porcelain produced by a factory established in 1743 at the palace of Capodimonte by Charles III of Naples. For 16 years ware was produced in large quantity and wide variety before the concern was dismantled and removed to Buen Retiro, near Madrid, when Charles became king of Spain in 1759. Capodimonte is to be distinguished from the products of the royal factory at Naples that Charles's son, Ferdinand IV, founded in 1771 and that was active until 1806. Giuseppe Gricci was chief modeller during the life of the Capodimonte factory, and J.S. Fischer and Luigi Restile were, successively, chief painters.

Capodimonte porcelain beaker decorated with chinoiserie, *c.* 1755; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

The soft-paste body of the porcelain, which has a lustrous glaze, is usually pure white but is sometimes slightly tinged. Early productions—Rococo snuffboxes, cane handles, soup tureens, and tea services—were put on sale at annual fairs. Painted designs included battle scenes, seascapes, landscapes, figures, and cupids in monochrome red, blue, violet, or black; occasionally a turquoise ground, derived from Meissen, was used. Numerous figures and groups were modelled by Gricci, drawing on mythological, religious, or rustic themes. A range of commedia dell'arte characters are vivid creations, distinctive in the restrained use of soft colours and gold. But the decorative masterpiece of the Capodimonte factory is the Rococo "Porcelain Room" originally at the Villa Reale at Portici but moved to the Capodimonte palace in 1805. Executed between 1757 and 1759, it is still intact except for a chandelier destroyed in World War II. Gricci and Fischer were principally responsible for the room which, apart from the door and five mirrors, consists entirely of porcelain plaques, vases, and large relief chinoiserie (decoration reflecting Chinese influence) groups lavishly gilded and brightly painted in polychrome enamel.

Porcelain cups and saucers and similar ornamental wares decorated with mythological scenes in relief and coloured were not at any time made here, but at the Doccia factory. The Bourbon fleur-de-lis, impressed or painted, was the factory mark (the same mark subsequently used by Buen Retiro), though it was seldom used.

Capodistria (Yugoslavia): *see* Koper.

Capodistrias, John, Count: *see* Kapodístrias, Ioánnis Antónios.

capoeira, folk dance popular in the Brazilian northeast. It was brought to Brazil by slaves from Angola. *Capoeira* was originally a deadly sport in which the participants, often with blades strapped to their ankles, swung their legs high in attack, somersaulted, and passed within a hairsbreadth of their opponent's knees, head, groin, or stomach. Flexibility and rapidity of movement were more important than sheer muscular strength. In the modern dance the same quick, graceful movements are employed in dance; usually two men face each other, emulating the blows and parries of "the fight" in time with the rhythms of the *berimbau,* or musical bow. Clubs in Bahia and Rio de Janeiro train dancers in the arts of precise kicking and passing.

Capoid local race, a subgroup, roughly equivalent to a breeding isolate in genetics, of the Negroid (African) geographical race. It comprises the San (Bushmen) and Khoikhoin (Hottentots) peoples of southern Africa. The chief physical characteristics of the Capoid peoples are short stature, with small hands and feet; yellowish skin; peppercorn hair (sparse tufts of tightly spiralled hair) and minimal body hair; flat face with prominent forehead; eyes frequently with epicanthic (Mongolian) eyefolds and fat padding around the eye sockets. Steatopygia (massive fat deposits in the buttocks, supported by fibrous tissue) in the females, high placement of the nipples in both sexes with constriction of the areolae in women, and early loss of excess body fat are also particularly characteristic of the San. The Capoids also show several distinctive haptoglobins and hemoglobins (blood proteins) and rare blood groups. *See also* local race; Negroid geographical race.

Capone, Al, byname of ALPHONSE CAPONE, also called SCARFACE (b. Jan. 17, 1899, Brooklyn, N.Y., U.S.—d. Jan. 25, 1947, Palm Island, Fla.), the most famous U.S. gangster, who dominated organized crime in Chicago from 1925 to 1931.

Capone's parents immigrated to the U.S. from Naples in 1893; Al, the fourth of nine children, quit school in Brooklyn after the fourth grade and ran about with the local slum youth, including Johnny Torrio (*q.v.*). In a youthful scrape in a brothel-saloon, a young hoodlum slashed Capone with a knife or razor across his left cheek, prompting the later nickname "Scarface."

Torrio moved from New York to Chicago in 1910 to help run the giant brothel business there and, in 1919, sent for Capone, who allegedly assassinated Torrio's boss, Big Jim Colosimo, making way for Torrio's rule. In 1920, when Prohibition began, new bootlegging operations opened up and drew in immense wealth. In 1925 Torrio retired, and Capone became crime czar of Chicago, running gambling, prostitution, and bootlegging rackets and expanding his territories by the gunning down of rivals and rival gangs. His wealth in 1927 was estimated at close to $100,000,000. The most notorious of the bloodlettings was the St. Valentine's Day Massacre (*q.v.*), in which members of Bugs Moran's gang were machine-gunned in a north-side garage on Feb. 14, 1929.

In June 1931 Capone was indicted for federal income tax evasion and in October was tried, found guilty, and sentenced to 11 years in prison and $80,000 in fines and court costs. He entered Atlanta penitentiary in May 1932 but was transferred to the new Alcatraz prison in August 1934. In November 1939, suffering from the general deterioration of general paresis (a late stage of syphilis), he was released and entered a Baltimore hospital. Later he retired to his Florida estate, where he died in 1947 a powerless recluse.

Caporetto, Battle of (Oct. 24, 1917), Italian military disaster during World War I in which Italian troops retreated before an Austro-German offensive on the Isonzo front, northwest of Trieste, where the Italian and Austrian forces had been stalemated for two and a half years. In the wake of the successful Austrian and German advance, more than 600,000 war-weary and demoralized Italian soldiers either deserted or surrendered. Total military collapse threatened until November 7, when the Italian line held at the Piave River near Venice, some 70 miles (110 kilometres) from the Isonzo front.

The defeat prompted Italy's allies, France and Great Britain, to send reinforcements and eventually to establish the Supreme War Council to unify the Allied war effort. In Italy the disaster of Caporetto brought about a change in military command and the formation of a new ministry, which reorganized the condition of the home front.

Capote, Truman, original name TRUMAN STRECKFUS PERSONS (b. Sept. 30, 1924, New Orleans—d. Aug 25, 1984, Los Angeles), U.S. novelist, short-story writer, and playwright, whose early writing extended the Southern Gothic tradition. He later developed a more journalistic approach, notably with *In Cold Blood* (1966; copyright 1965), an account of a multiple murder committed by two sociopsychopaths in Kansas, which he called a "nonfiction novel."

His parents were divorced when he was young, and he was sent to live with various elderly relatives in small towns in Louisiana and Alabama. (He owed his surname to his mother's remarriage, to Joseph Garcia Capote.) Two short autobiographical pieces deal with this period: "A Christmas Memory" (1965, television; published 1966) and "Thanksgiving Visitor" (1968, television; published 1969). He joined his mother and stepfather at Millbrook, Conn., and completed his education at Greenwich High School.

His first novel, *Other Voices, Other Rooms* (1948), acclaimed as the work of a young writer of great promise, tells of a 13-year-old boy's search for his father and his own identity through a nightmarishly decadent Southern world. Two years earlier he had won an O. Henry Award for his story "Shut a Final Door." This and other tales of loveless and isolated persons were collected in *A Tree of Night* (1949).

The Grass Harp (1951) is a story of nonconforming innocents who retire temporarily from life to a tree house, returning renewed to the real world. He also dramatized the novel for the stage. In 1954, with the composer

Harold Arlen, Capote wrote *The House of Flowers,* a musical set in a West Indies bordello. He also wrote the screenplays for *Beat the Devil* (1954), a film directed by John Huston, and an adaptation of Henry James's *Turn of the Screw,* retitled *The Innocents* (1961). *Local Color* (1950) is a collection of travel sketches.

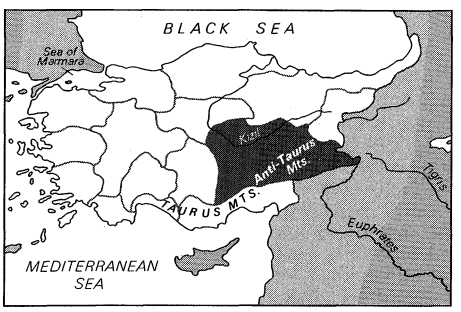
Capote's accompaniment of a tour in the Soviet Union of *Porgy and Bess* resulted in *The Muses Are Heard* (1956). *Breakfast at Tiffany's* (1958; filmed 1961) is a novella about a young, fey Manhattan prostitute.

His increasing preoccupation with journalism—as well as with celebrity—was reflected in *Observations* (1959; photographs by Richard Avedon), a group of sketches of celebrities. *The Dogs Bark* (1973) consists of collected essays and profiles over a 30-year span, while *Music for Chameleons* (1980) includes both fiction and nonfiction. Selections from a work that he considered to be his supreme achievement, *Answered Prayers,* appeared in *Esquire* magazine in 1975, but it was unfinished at the time of his death.

Capp, Al, byname of ALFRED GERALD CAPLIN (b. Sept. 28, 1909, New Haven, Conn., U.S.—d. Nov. 5, 1979, New Haven), U.S. cartoonist who created the popular comic strip "Li'l Abner."

Capp studied landscape architecture at the Boston Museum of Fine Arts school and the Pennsylvania Academy of the Fine Arts in Philadelphia. In 1933 he was hired as an assistant to Ham Fisher, the creator of "Joe Palooka." "Li'l Abner" first appeared in the *New York Mirror* in 1934. The broadly humorous comic strip was set in the fictitious backwoods community of Dogpatch, U.S.A., and featured Li'l Abner, a shy and awkward rustic; Daisy Mae, a persistent damsel who finally caught Abner after a 17-year pursuit; the pipe-smoking Mammy Yokum; and various social caricatures. "Li'l Abner" ended upon Capp's retirement in 1977.

Cappadocia, ancient district in east central Anatolia in the rugged plateau north of the Taurus Mountains, important as a Roman ally, client, and, later, province. The earliest records of Cappadocia date from the 6th century BC, when its feudal nobility was dominated by a Persian satrapy and Zoroastrian temple cults were widespread. The area retained its Persian character until the time of the Roman occupation. Alexander the Great bypassed Cappadocia but sent troops under his general Perdiccas (322 BC). Cappadocia fell into the dynastic orbit of the Seleucids until the Roman victory at Magnesia (190 BC). Afterward, it maintained a faithful allegiance to Rome despite the Pontic and Armenian attacks of the 1st century BC. Retained as a client state by Rome until annexed by Tiberius in AD 17, Cappadocia, with command over strategic passes in the Taurus, remained a bulwark of the Eastern Empire until the 11th century.



Cappadocia

From W. Shepherd, *Historical Atlas,* Harper & Row, Publishers (Barnes & Noble Books), New York; revision copyright © 1964 by Barnes & Noble, Inc.

Capparales, the diverse caper order of flowering plants, belonging to the class called dicotyledon (*q.v.*; characterized by two seed leaves). It is composed of 427 genera and about 4,000 species in eight families. The more commonly known members of this order belong to the caper (Capperaceae) and the mustard (Brassicaceae) families, which together account for more than 400 genera and more than 4,000 species.

A brief treatment of Capparales follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

The Brassicaceae family is widespread and is native to the temperate and arctic regions of North America. Its members are chiefly annual or perennial herbs. Their habitats are diverse, but cultivated mustards thrive in rich garden soil. It is a family of considerable economic importance, containing such cool-weather food plants as radish (*Raphanus sativus*) and Chinese cabbage (*Brassica rapa*). Horticultural varieties of the cabbage group *B. oleraceae* include collards, kale, broccoli, cauliflower, head and Savoy cabbages, Brussel sprouts, and kohlrabi. Various turnips belong to subgroups of *Brassica rapa.* The black mustard (*B. nigra*) is the main source of table mustard. Many other members of this family are grown as ornamentals, including stock (*Matthiola incana*), sweet alyssum (*Lobularia maritima*) and the candytufts (Iberis).

The genera *Capparis, Cleome,* and *Crateva* of the Capparaceae are native to the tropics. Fifteen genera are restricted to Africa. Other members are indigenous to Australia and Asia; a few belong to the New World.

The economic value of the caper family is low. The European caperbush (*Capparis spinosa*) is known for its flower buds pickled in vinegar and used as a spicy condiment. Buds of *C. decidua* are eaten as potherbs and curries are prepared from seeds and fruits of *Capparis zeylandica* and *Cleome icosandra.*

Although several species of Capparales reproduce vegetatively, the major form of propagation is sexual. In the caper and mustard families, flowers usually are clustered in inflorescences; in several smaller families, flowers arise singly at the juncture of leaf and stem.

Flowers are bisexual (containing both male and female organs), with numerous to few stamens and an ovary of two or more fused carpels. Following pollination and fertilization, the ovule becomes the seed, and the ovary the fruit.

Cappel, Louis, Latin LUDOVICUS CAPELLUS (b. Oct. 15, 1585, St. Elier, Fr.—d. 1658), French Huguenot theologian and Hebrew scholar.

Cappel studied theology at Sedan and Saumur, both in France, and Arabic at Oxford, where he spent two years. In 1613 he accepted the chair of Hebrew at Saumur, and in 1633 he became professor of theology there. Cappel was the first scholar to conclude that vowel points and accents were not an original part of the Hebrew language but had been inserted by the Masoretic Jews of Tiberias, not earlier than the 5th century AD, and that the primitive Hebrew characters are those now known as Samaritan, while the square characters are Aramaic and were substituted for the more ancient at the time of the captivity.

Cappel's important *Critica Sacra* (1634) met with such theological opposition that he was not able to print it until 1650, at Paris, and then only with the aid of a son who had turned Roman Catholic. The various readings in the Old Testament text and the differences between the ancient versions and the Masoretic text convinced him that the integrity of the Hebrew text, as held by Protestants, was untenable. This amounted to an attack on the verbal inspiration of Scripture. Bitter as was the opposition, however, it was not long before his results were accepted by scholars.

Cappellari, Bartolomeo Alberto (pope): *see* Gregory XVI.

Cappello, Bianca (Venetian adventuress): *see* Capello, Bianca.

Capponi, Gino, Marchese (Marquess) (b. Sept. 13, 1792, Florence—d. Feb. 3, 1876, Florence), historian, statesman, and leader of liberalism in Tuscany who played an extremely influential role in the rise of the Risorgimento. His salon in Florence was long a centre for the leading liberal thinkers of Europe.

Capponi founded two periodicals, *L'Antologia* (1821; "Anthology"), modelled after the *Edinburgh Review,* and *Archivio storico italiano* (1839; "Italian Historical Review"). Although completely blind by 1840, he continued an active political life, striving for the liberal government he had so long envisioned. King Leopold II of Tuscany regarded him so highly that he appointed him, successively, counsellor of state (1847) and minister of state (1848). After a long and successful battle to gain a liberal constitution from Leopold, Capponi served as senator in the Tuscan Assembly (1859) and was nominated senator of the newly created kingdom of Italy in 1860 after the annexation of Tuscany that year by King Victor Emmanuel II of Sardinia–Piedmont. His failing health, however, prevented him from taking his seat in the Senate, and he spent his last years writing his great work, *Storia della repubblica di Firenze* (1875; "History of the Republic of Florence").

Capra, Frank (b. May 18, 1897, Palermo), U.S. motion-picture director best known for a series of gently satiric situation comedies during the 1930s. Executed with technical competence and characterized by straightforward construction, whimsical sentimentality, and freshness of dialogue, his films were the forerunners of the witty comedies that became a highly developed Hollywood genre during the late 1930s and '40s.

Capra's family emigrated to Los Angeles when he was six. After graduating from the California Institute of Technology, Pasadena, in 1918, he became an Army engineering instructor. From 1921 Capra was a director of motion-picture shorts, a property man, film cutter, writer of film titles, a gag writer for Mack Sennett comedies, and a director of such popular Harry Langdon comedies as *Long Pants* (1927).

Capra emerged as a major director with such box-office successes as *That Certain Thing* (1928) and *Platinum Blonde* (1931). Collaborating with scriptwriter Robert Riskin, he released the comedy hit *Lady for a Day* (1933), followed by three classic comedies that brought him Academy Awards for best director: *It Happened One Night* (1934), *Mr. Deeds Goes to Town* (1936), and *You Can't Take It with You* (1938). Similar in their humorous presentation of a naive idealistic hero, the films evidence an essential optimism as the hero triumphs over the shrewd representatives of the world.

Capra departed from his comedy style in the fantasy *Lost Horizon* (1937) and *Meet John Doe* (1941), an exposé of fascist elements in American society. During World War II he made a series of Army orientation films, *Why We Fight,* and other documentaries. His notable films of the postwar period included *It's a Wonderful Life* (1946), *State of the Union* (1948), and *Pocketful of Miracles* (1961). An autobiography, *Frank Capra: The Name Above the Title,* appeared in 1971.

Capraia Island, Italian ISOLA CAPRAIA, Latin CAPRARIA (from *capra,* "wild goat"), island of the Arcipelago Toscano, in the Tyrrhenian Sea, between the Italian mainland and the north point of Corsica. Part of Livorno province, it is mountainous and volcanic, rising to 1,467 ft (447 m). Capraia produces wine and is a centre of anchovy fishing. About

one-third of its area of 7.4 sq mi (19 sq km) has been occupied since 1872 by an agricultural penal colony. The village and port of Capraia has a 15th-century fortress and is a bathing resort. Pop. (1981 prelim.) 396.

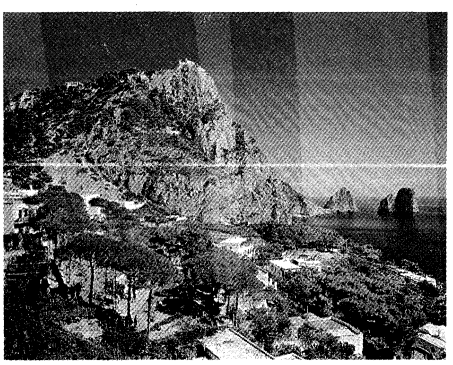
Caprara, Giovanni Battista (b. May 29, 1733, Bologna, Papal States—d. June 21, 1810, Paris), Roman Catholic churchman and diplomat who negotiated between the Vatican and Napoleon Bonaparte.

After serving as papal vice legate of Ravenna and nuncio at various places (1767–92), Caprara was named cardinal-priest in 1792 and bishop of Jesi in 1800. Despite his long diplomatic career, Caprara was too timid and pliant to be an effective defender of papal interests in a period of exceptional difficulty, including negotiations with the Holy Roman emperor Joseph II. Knowing Caprara's weaknesses, Napoleon requested that he be appointed legate in France to implement the terms of the Concordat of 1801. In 1802, Napoleon procured for Caprara the archbishopric of Milan. At his formal reception in Paris (1802), Caprara appeared to commit himself to respect the Gallican liberties (the relatively autonomous status of the French church), and he agreed to compromises unacceptable to the Vatican. He assisted in the negotiations leading to Napoleon's coronation by Pope Pius VII in 1804 and then crowned Napoleon king of Italy in 1805.

Capréolus, Jean (b. *c.* 1380, Rodez, Rouergue—d. April 6, 1444, Rodez), Dominican scholar whose *Four Books of Defenses of the Theology of St. Thomas Aquinas* (written 1409–33), generally known as the *Defensiones,* contributed to a revival of Thomistic theology and won for the author the sobriquet Prince of the Thomists. He began the project while lecturing at the University of Paris, where he later (1411, 1415) took degrees in theology. After some time in Toulouse, he returned (1426) to Rodez, where he completed the work.

Caprera Island, Italian ISOLA CAPRERA, island in the Tyrrhenian Sea (of the Mediterranean) off northeastern Sardinia, Italy. Administratively part of La Maddalena commune within Sassari province, it has an area of 6 sq mi (16 sq km) and is connected by causeway with the adjacent island of Maddalena (*q.v.*). The Italian nationalist leader Giuseppe Garibaldi established himself there in 1856 and died there on June 2, 1882. His house and tomb are national monuments. Pop. (1971) 73.

Capri, Island of, Italian ISOLA DI CAPRI, Latin CAPREAE, island near the southern entrance to the Bay of Naples, Napoli province, Campania region, southern Italy; it lies opposite the Sorrento peninsula, to which it was joined in prehistoric times. The island is a single block of limestone 3.9 mi (6.25 km) long, with a maximum width of 1.8 mi and an area of 4 sq mi (10 sq km), rising to 1,932 ft (589 m) at Monte Solaro in the west. Two indentations in its precipitous cliff-lined coast serve as landing places: the Marina Grande on the north shore, protected by a breakwater, and the open Marina Piccola on the south, used when the north wind is particularly strong.



Cliff-lined coast of Capri, Italy
SCALA—Art Resource

Inhabited in prehistoric times, the island later became a Greek colony and then a resort (Capreae) of emperors in the early years of the Roman Empire. The emperor Augustus resided there, and Tiberius built several villas, one of which, the Villa Iovis on the island's northeastern tip overlooking Naples, has been excavated. During the 10th century the population, fearing pirate raids, moved from seaside settlements to the present towns, Capri (east) and Anacapri (west), high above the shore. Until a carriage road was built in the 19th century between Capri and Anacapri, the latter could only be reached from the sea by a flight of 800 steps called the Scala Fenicia (Phoenician Stairs). In the Middle Ages Capri belonged to the Abbey of Montecassino and to the republic of Amalfi before passing to the Kingdom of Naples. It changed hands between the French and the British several times during the Napoleonic Wars, before being returned to the Kingdom of the Two Sicilies in 1813. Stone artifacts have been found in one of the caves with which the rocky shores of Capri abound; the most notable of these is the Blue Grotto (Grotta Azzurra), rediscovered in 1826 and accessible only by boat. Sunlight entering through the water that fills most of the entrance gives it an extraordinary blue light, whence its name. There are ruins of two medieval castles, the Castello di Barbarossa and the Castiglione, and the oldest church (10th–11th centuries) is that of S. Costanzo, the island's patron saint. The Villa San Michele, built by the Swedish writer Axel Munthe, is on the site of a Tiberian villa.

Since the second half of the 19th century, Capri has gradually become one of the most popular resorts in southern Italy, famous for its magnificent scenery and the mild climate in which vegetation flourishes despite a general lack of water. The flora is among the most varied in Italy, and large numbers of migratory birds rest there for days. The name of the island has two possible origins, either *capra* ("goat") or *kapros* ("wild boar"). There are fine bathing beaches and numerous hotels and villas, and Capri is connected with Naples and Sorrento by frequent steamer and hydrofoil services. Besides tourism, agriculture (vineyards, olives, citrus fruits) and fishing are carried on. An undersea aqueduct bringing fresh water from the mainland to support all these activities was completed in 1978. Pop. (1981 prelim.) mun., 7,489.

capriccio (Italian: "caprice"), lively, loosely-structured musical composition often incorporating a well-known or popular tune. As early as the 16th century the term was occasionally applied to such seemingly eccentric novelties as canzonas, fantasias, and ricercari (often modelled on vocal imitative polyphony). Baroque composers from Frescobaldi to J.S. Bach wrote keyboard capriccios displaying strictly fugal as well as whimsical characteristics. Bach's earliest dated keyboard work is his *Capriccio* "on the Departure of His Beloved Brother," which cites among other musical references a coachman's horn calls.

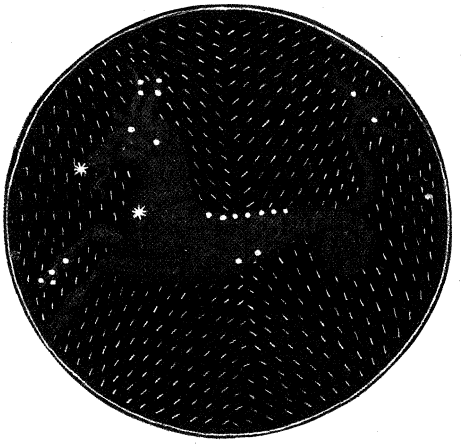
Pietro Locatelli's 24 violin capriccios served as models for those of Niccolò Paganini in the 19th century, when the genre enjoyed a certain vogue. Weber, Mendelssohn, and Brahms so entitled a number of pieces for piano, whereas Beethoven limited himself to the occasional addition of the adjective capriccioso to such standard tempo modifiers as andante and allegro. Later in the century Tchaikovsky wrote his *Capriccio italien* for orchestra and Rimsky-Korsakov his *Capriccio espagnol.* More recently, Igor Stravinsky conceived his *Piano Concerto* (1929) as a capriccio. *Capriccio* is also the title of Richard Strauss's last opera (1942).

Capricorn, Tropic of: *see* Cancer and Capricorn, Tropics of.

Capricorn-Bunker Group, cluster of 13 islands at the southern extremity of the Great Barrier Reef off the eastern coast of Queensland, Australia, on the Tropic of Capricorn between Capricorn Channel and Keppel Bay. They are true coral cays, comprising sandy detritus on coral platforms with typical screw-pine vegetation. Sparsely populated, the main islands (Heron, One Tree, Wreck, and North West) are used primarily as tourist resorts and for prawn fishing. Pop. (1971) 108.

Capricornus (Latin: Goat-horned), also called THE GOAT, in astronomy, zodiacal constellation lying between Aquarius and Sagittarius, at about 21 hours right ascension (the coordinate on the celestial sphere analogous to longitude on the Earth) and 20° south declination (angular distance south of the celestial equator). Its stars are faint.

In astrology, Capricornus (also Capricorn) is the 10th sign of the zodiac, considered as governing the period *c.* December 22–*c.* January 19. One explanation of the fishtail with which the goat is often represented is found in the Greek myth of Pan, who, to avoid the monster Typhon, jumped into the water just as he was changing into animal shape. The half above water assumed the shape of a goat while the lower half, the tail, assumed the shape of a fish.



Capricorn, illumination from a Book of Hours, Italian, *c.* 1475; in the Pierpont Morgan Library, New York City (MS. G.14)
By courtesy of the Pierpont Morgan Library, New York, the Glazier Collection

Caprifoliaceae, the honeysuckle family of the teasel order (*Dipsacales*), well known for its many ornamental shrubs and vines, primarily composed of north temperate species but including some tropical mountain plants. The family has 18 genera and about 500 species, mostly woody shrubs and vines. One member of the family, Japanese honeysuckle (*Lonicera japonica*), is a fragrant flowering vine that kills other plants by climbing over them and shutting out the light.

An outstanding evergreen shrub is Mexican abelia (*Abelia floribunda*) with bright-green, oval leaves and small clusters of fragrant, pinkish-purple, tubular flowers. It may reach 1.8 metres (6 feet) but usually is shorter. The glossy abelia (*A. grandiflora*), about the same height but with pinkish-white blooms, is evergreen in warm climates and deciduous farther north. It is a hybrid between two Chinese species, *A. chinensis* and *A. uniflora.*

Alseuosmia macrophylla, an evergreen shrub from New Zealand, has fragrant, crimson

flowers and berries. The elderberries of the *Sambucus canadensis* of North America are used for making wines and jellies. Large, showy bracts (leaflike structures) enclose the fruits of *Dipelta,* a genus of ornamental, fragrant flowering, tall shrubs native to China. Himalaya honeysuckle (*Leycesteria formosa*) has long leaves and produces drooping spikes of purple flowers with purple bracts.

caprimulgiform, avian order (Caprimulgiformes) that comprises the soft-plumaged birds known as nightjars, nighthawks, potoos, frogmouths, and owlet frogmouths; it also includes the unique oilbird of South America.

A brief treatment of caprimulgiforms follows. For full treatment, *see* MACROPAEDIA: Birds.

The order's closest relatives are the owls (strigiforms), from which caprimulgiforms differ in having the eyes placed laterally on the head and in lacking the raptorial bill and feet.

Caprimulgiforms range in size from 5 to 22 inches (14 to 55 cm) in length. Their mouths, a prominent feature, are huge and when open seem to split the head in two. The wings of most species are long and rounded, although they are pointed in some nighthawks (Chordeilinae). During the breeding season some nightjars (Caprimulgidae) grow long tail feathers or inner wing white patches that are prominent in their aerial courtship displays. In other species the tail is of medium length.

The members of this order exhibit some of the most effective cryptic colorations (camouflage) found among the birds. They are all coloured in rust to yellow browns, black, grays, and white. Tree-dwellers like the potoos and frogmouths are streaked like the bark of trees. The woodland-dwelling nightjars, which roost on the ground, are mottled like fallen leaves and other forest detritus. Species that roost on open ground are often patterned differently from the ground itself and look like the stones lying about on the surface. The plumage is soft and fluffy and makes these birds appear much heavier bodied than they actually are.

The caprimulgiforms are basically crepuscular (active at dawn and at dusk) and so exploit a niche with little competition from other species. They are mostly insectivorous—except for the aberrant, frugivorous (fruit-eating) oilbird (*Steatornis caripensis*)—and some of the larger species will take small vertebrates such as frogs or mice. Frogmouths (Podargidae) will also eat fruit. Nightjars and nighthawks generally feed on the wing in savannas and forest clearings. Frogmouths, which prefer woody or forested areas, take most of their prey on the ground, as do the smaller owlet frogmouths (*Aegotheles*), but the latter will also hunt flying insects from a perch.

Oilbirds are nocturnal and live wholly on the fruits of trees such as palms and laurels. The fruit is swallowed whole, and the large hard seeds are regurgitated. These are among the few birds that employ scent in finding some of their food. Oilbirds mostly feed in the air, hovering next to a tree while plucking fruit.

Vocal calls are important in these birds for both mating and territorial purposes. These calls vary widely in sound, from the odd, bawling cry of the great potoo (*Nyctibius grandis*) to the warbling, churring, or whistling songs of various nightjars. Some of these calls are so distinctive that the birds have derived their names from them, for instance the whippoorwill (*Caprimulgus vociferus*) and the pauraque (*Nyctidromus albicollis*). Oilbirds make various calls, but their rapid, pulsing clicks are used for echolocation in the dark caves within which they nest and roost. Except for some cave-swiftlets, oilbirds are the only birds known to employ echolocation. It is not known if they use echolocation when outside of their caves.

Nightjars exhibit the greatest amount of migration, but most of the tropical forms are sedentary. The poorwill (*Phalaenoptilus nuttallii*) is a true hibernator, remaining in the temperate zone during winter. Other members of the order are able to enter a temporary torpor by slowing down their metabolism, which condition enables them to survive periods of inclement weather that can prevent feeding during their limited hours of crepuscular activity.

Reproductive behaviour varies within the order. Nightjars make no nest, laying their eggs directly on the ground (or sometimes on rooftops). Frogmouths such as *Podargus* build nests of twigs in tree branches. The owlet frogmouths lay their eggs in hollow trees, or occasionally in tunnels in earthen banks. Oilbirds construct nests on ledges in their caves; these nests are composed of regurgitated fruits, which solidify into hardened structures that are used in succeeding years.

Incubation ranges from 19 days in some nightjars to about 35 days in potoos and oilbirds. Nightjar chicks are fed by both parents. At first they eat a regurgitated viscous matter, but later they are fed partially digested insects. They fledge between three and four weeks of age. Oilbird chicks are fed whole fruit after the first two weeks but do not fledge until they are 100 to 120 days old.

Caprivi, (Georg) Leo, Graf von (count of) (b. Feb. 24, 1831, Berlin-Charlottenburg—d. Feb. 6, 1899, near Crossen-an-der-Oder, Ger.), distinguished soldier who was Bismarck's successor as Germany's imperial chancellor during 1890–94.

Caprivi was educated in Berlin and entered the army in 1849; he took part in the Austrian campaign of 1866, being attached to the staff

Caprivi, 1894
By courtesy of the Staatsbibliothek, Berlin

of the I Army. In 1870–71, in the Franco-German War, he served as chief of staff to the X Army Corps, which formed part of the II Army, and took part in battles before Metz as well as in those around Orléans. In 1883 he was made chief of the admiralty, in which post he commanded the fleet and represented the department in the Reichstag. He resigned in 1888 and was appointed commander of the X Army Corps. Bismarck had already referred to Caprivi as a possible successor, for Caprivi had shown great administrative ability and was unconnected with any political party, and in March 1890 he was appointed chancellor, Prussian minister president, and foreign minister.

Caprivi's first achievement as chancellor was the conclusion in July 1890 of a general agreement with Great Britain regarding the spheres of influence of the two countries in Africa. But the abandonment of an aggressive policy in East Africa and Nigeria and the withdrawal of German claims to Zanzibar (in exchange for Heligoland) aroused the hostility of the colonial parties, who bitterly attacked the new chancellor. The Anglo-German agreement of 1890 was followed by commercial treaties with Austria, Romania, and other states; by concluding them he earned the express commendation of the emperor William II and the title of count, but he was from this time relentlessly attacked by the Agrarians, and he had to depend greatly on the support of the Liberals and other parties that had been formerly in opposition. The reorganization of the army caused a parliamentary crisis, but Caprivi carried it through successfully, only, however, to earn the enmity of the more old-fashioned soldiers, who would not forgive him for shortening the period of service. His position was seriously compromised by the failure in 1892 to carry an education bill, which he had defended by saying that the question at issue was Christianity or atheism, and he resigned the presidency of Prussian ministry, which was then given to Count Eulenburg. In 1894 a difference arose between Eulenburg and Caprivi concerning the bill for an amendment of the criminal code (the *Umsturz Vorlage*), and in October the Emperor dismissed both. The last years of his life were spent in absolute retirement.

Caprivi Strip, German CAPRIVI ZIPFEL, long, narrow extension of South West Africa/Namibia, running about 280 miles (450 km) from the northeast corner of the main block of the country eastward to the Zambezi River. Its width varies from about 20 to 65 miles. The physical geography of the region is an extremely flat plain, about 3,100 feet (950 m) in elevation lying on the swampy northern margin of the Kalahari, mostly between the Zambezi River on the northeast (beyond which is Zambia) and the Kwando-Linyandi-(Mashi-Linyanti-) Chobe river system on the south and southwest (beyond which, for the most part, is Botswana). Angola borders the area on the north, and the Okavango River traverses the strip in the west.

A sparsely populated land of small villages, the main inhabitants of the eastern part of the Caprivi Strip are related to the Bantu-speaking Lozi (Barotse) of southwestern Zambia. They practice a mixed economy consisting of cattle ownership, fishing, hunting, and subsistence agriculture; corn (maize), cereals, melons, and cassava are grown. People residing in the extreme eastern part of the region are seasonally displaced by the floodwaters of the Zambezi. The western part of the strip is inhabited by bands of San (Bushmen). Dense river vegetation (especially reeds), dense forests, sand beds, or marshes make travel difficult throughout the region; the reserve's few roads are essentially unimproved tracks. Concentrations of big game (including rare species of antelope such as the sassaby) are notable in the environs of the Linyandi Marshes in the south. The mid-19th-century chiefs of the Kololo people (later decimated by the Lozi), whose capital was at Linyandi (Linyanti) in the marshes, encouraged the British explorer and missionary David Livingstone to use their kingdom as a reconnaissance point for both his second and third journeys into the interior of Africa. Part of German South West Africa during 1884–1919, the strip was ceded by Britain in order to give the German colony riparian access to the Zambezi and was named for Leo, Graf von Caprivi, German chancellor during 1890–94. After World War I, the strip became part of South West Africa/Namibia under mandate to the Union (now Republic) of South Africa.

The village of Katima Mulilo on the Zambezi River is the Caprivi Strip's main population centre. The limited educational, medical, and religious facilities in the region were originally introduced by Roman Catholic missionaries. South African troops use the area as a training ground for tropical warfare.

Caproli, Carlo, also called CARLO DEL VIOLINO, Caproli also spelled CAPRIOLI (b. *c.* 1615/20, Rome—d. *c.* 1692/95, Rome?), Ital-

ian composer, violinist, and organist, considered by Angelo Berardi and others to be one of the best composers of cantatas of his time.

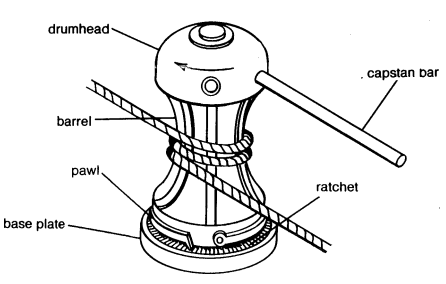
Caproli wrote his earliest datable cantata about the time that he was working as an organist at the German College in Rome (1643–45). He was a violinist at San Luigi dei Francesi from 1649 to 1670, in addition to performing a number of other music-related functions for various organizations in Rome. At the behest of Abbé Francesco Buti, who was literary agent of Jules Cardinal Mazarin (the first minister of France), Caproli composed, to Buti's libretto, *Le nozze de Peleo e di Theti* (1654; music now lost), one of the first Italian operas heard in France. About 70 of his cantatas and canzoni are still extant.

capsaicin, also spelled CAPSAICINE, the most abundant of the pungent principles of the red pepper (*Capsicum*). It is an organic nitrogen compound belonging to the lipid group, but it is often erroneously classed among the alkaloids, a family of nitrogenous compounds with marked physiological effects.

The name capsaicin was applied to a colourless, crystalline substance first isolated from capsicum oleoresin in 1876 and considered a single compound until about 1960. During the 1960s the natural product was found to contain small amounts of other compounds very similar to the one for which the name capsaicin had become established.

Capsian industry, a Mesolithic (8000 BC–2700 BC) cultural complex prominent in the inland areas of North Africa. Its most characteristic sites are in the area of the great salt lakes of what is now southern Tunisia, the type site being Jabal al-Maqṭa', near Qafṣah (Capsa, French Gafsa). Although the tool kit of the Capsian is a classic example of the industries of the late Würm Glacial Period, and, while it is apparently related to the Gravettian stage of Europe's Perigordian industry (which dates from about 17,000 years ago), it does not properly belong to the glacial period at all but clearly occurs in Neothermal (postglacial) times. Like its predecessor, the Ibero-Maurusian industry (or Oranian industry), the Capsian was a microlithic (tiny-flaked-blade) tool complex. It differed from the Ibero-Maurusian, however, in displaying a far more varied tool kit distinguished by large backed blades and burins in its earlier phase and a gradual development of geometric microliths later. These became its leading feature by the 6th millennium BC, when they seem to have been transmitted to the final Ibero-Maurusian groups along the coast. Some North African rock paintings are attributed to people of the Capsian industry. *Compare* Perigordian industry; Ibero-Maurusian industry.

capstan, mechanical device used chiefly on board ships or in shipyards for moving heavy weights by means of ropes, cables, or chains. Capstans also have been used in railroad yards for spotting (positioning) freight cars. A capstan consists of a drum, driven either manually or by steam or electricity, that rotates about a vertical axis to wind in a line (rope, cable, or chain) that has been wrapped around it (*see* illustration). The grip between the line and the drum depends on friction and on the number of times the line is wrapped around the drum. Speed of drawing in the load can be controlled by allowing partial slippage of the line around the capstan. A notched track (ratchet) on the base plate and pawls attached to the drum prevent backward rotation.



Capstan

capsule, in botany, dry fruit that opens when ripe. It splits from apex to base into separate segments known as valves, as in the iris, or forms pores at the top (poppy), or splits around the circumference, with the top falling off (pigweed and plantain). The spore-forming organ of liverworts and mosses also is called a capsule.

captain, a rank in the military and maritime service, and the highest-ranking company officer. In most armies and in some air forces, a captain is the commander of the largest group of soldiers that an officer can be expected to know personally—a company in the infantry, a battery in the artillery, a flight in the air force.

On the sea a captain is usually the commander of a large warship—a cruiser, battleship, or aircraft carrier in the navy and any sizable ship in the mercantile marine service. In the British and U.S. navies the rank corresponds to the army rank of colonel, as does group captain in the Royal Air Force. An officer of lower rank is customarily given the courtesy title of captain when he is in command of a ship, so that he is addressed orally as captain, but he cannot claim the rank or be so addressed in writing. The position of commodore in the British Navy is not a separate rank but a special appointment of captain. In the U.S. Navy a commodore is ranked above a captain and below a rear admiral; the designation has usually been used only in wartime. Outside the navies, the master of any vessel is addressed as captain, and the term is usually applied as a courtesy to marine pilots.

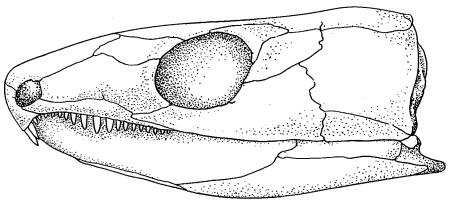
captain general, Spanish CAPITÁN GENERAL, in colonial Spanish America, the governor of a captaincy general, a division of a viceroyalty. Captaincies general were established districts that were under serious pressures from foreign invasion or Indian attack. Although under the nominal jurisdiction of their viceroys, captains general, because of their special military responsibilities and the considerable distance of their territories from the viceregal capital, became virtual viceroys, having a direct relationship with the king and the Council of the Indies, in Madrid.

Like the governors of other provinces into which each viceroyalty was divided, captains general presided over the provincial *audiencia* (court and administrative board) but did not participate in its strictly judicial functions unless they were trained in the law.

The first captaincy general created was Santo Domingo (1540), which included the coast of Venezuela. The second, Guatemala (1560), had jurisdiction over Central America; shortly thereafter, New Granada was formed, roughly comprising the modern nations of Colombia and Ecuador; Venezuela was added to New Granada in 1739, when it was made a viceroyalty. In the colonial reorganization of the 18th century, when the independence of captaincies general from viceregal jurisdiction was even more accentuated, three additional ones were created: Cuba (1764; including the Louisiana Territory acquired from France in 1763), Venezuela (1777), and Chile (1778).

The captaincy system was also adopted by the Portuguese in their colonial possessions, especially Brazil, where the recipient of a captaincy was called a *donatário*.

Captorhinus, genus of extinct reptiles found as fossils in Early Permian rocks of North America (the Permian Period began 280,000,000 years ago and lasted 55,000,000 years). *Captorhinus* was small with slender limbs; the skull was only about 7 cm (2.75 inches) long. Although primitive, *Captorhinus* was more specialized than other contemporaneous forms. *Captorhinus* is representative of the captorhinomorphs, a group that persisted into the Early Permian before becoming extinct.


Captorhinus skull

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capture, in nuclear physics, process in which an atomic nucleus absorbs a smaller particle. *See* beta decay; neutron capture.

Capua, modern SANTA MARIA CAPUA VETERE, in ancient times, the chief city of the Campania region of Italy; it was located 16 miles (26 km) north of Neapolis (Naples) on the site of modern Santa Maria Capua Vetere. The nearby modern city of Capua was called Casilinum in antiquity. Ancient Capua was founded in *c.* 600 BC, probably by the Etruscans, and came to dominate many of the surrounding communities (*e.g.,* Casilinum, Calatia, and Atella). After the period of Etruscan domination, it fell to the Samnites, an Italic people (*c.* 440 BC). The people of Capua spoke the Oscan dialect of Italic. They supported the Latin Confederacy in its war against Rome in 340 BC. After Rome's victory in the war, Capua passed under Roman control as a municipium (self-governing community), and its people were granted limited Roman citizenship (without the vote). The city kept its own magistrates and language. In 312 BC Capua was connected with Rome by the Appian Way (Via Appia). Its prosperity increased and it became the second city of Italy, famous for its bronzes and perfumes. During the Second Punic War (218–201 BC) Capua sided with Carthage against Rome. When the Romans recaptured the city in 211 BC, they deprived its citizens of political rights and replaced their magistrates with Roman prefects. The Roman colonies of Volturnum and Liternum were founded on Capuan territory in 194 BC. Spartacus, the slave leader, began his revolt at Capua in 73 BC. Although it suffered during the Roman civil wars in the last decades of the republic, it prospered under the empire (after 27 BC). The Vandals under Gaiseric sacked Capua in AD 456; later Muslim invaders (*c.* 840) destroyed everything except the church of Sta. Maria, which gave its name to the medieval and modern town.

Early tombs and traces of two 6th-century-BC temples survive. Capua's Roman monuments include an amphitheatre (where Spartacus fought as a gladiator), baths, a theatre, and a temple dedicated to the god Mithra.

Capua, Latin CASILINUM, town and episcopal see, Caserta province, Campania region, southern Italy, on the Volturno River and the ancient Appian Way, north of Naples. Casilinum was a strategic road junction and was contended for by the Carthaginian general Hannibal and the Romans from 216 to 211 BC, during the Second Punic War; it lost its importance to ancient Capua (now Santa Maria Capua Vetere), 3 miles (5 km) southeast. Modern Capua was founded on the site of Casilinum in AD 856 by the citizens of ancient Capua, which had been destroyed by the Saracens. Modern Capua changed hands frequently in the Middle Ages and was part of the Kingdom of Naples until 1860. The

town is medieval in appearance, dominated by the cathedral (founded 856), which was rebuilt after destruction in 1943. Other landmarks include the Norman castle (1050), the towers of the castle of the Holy Roman emperor Frederick II (1239), and several churches and palaces, one of which houses the Museo Campano, a museum containing important archaeological collections.

Capua has good road and rail connections, and its industry includes munition, chemical, and sugar factories. Pop. (1981 prelim.) mun., 18,053.

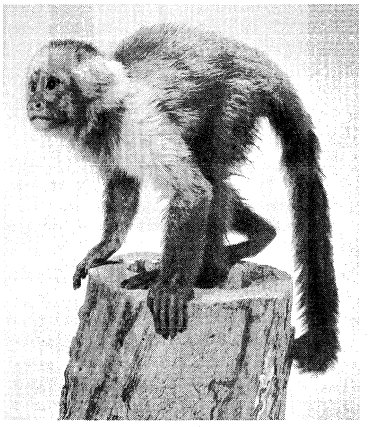
Capuana, Luigi (b. May 28, 1839, Mineo, Sicily—d. Nov. 29, 1915, Catania), Italian critic, short-story writer, playwright, and novelist, who was one of the earliest Italian writers of Realism. Capuana influenced many writers more important than himself, such as the novelist Giovanni Verga and the playwright Luigi Pirandello, who were his friends.

Born of a wealthy Sicilian family, Capuana studied law for two years at the University of Catania. Thereafter, he lived in Florence, was a dramatic critic for *La Nazione,* and familiarized himself with Balzac, Zola, and other French Naturalistic writers. Following a seven-year stay in Mineo, he went to Milan, writing again for a newspaper. In 1877 the first of 15 volumes of short stories appeared, *Profili di donne* ("Studies of Women") and in 1879 the first of his six novels, *Giacinta,* a psychological study of a promiscuous woman; this was followed, three years later, by *C'era una volta* (1882; Eng. trans., *Once upon a Time,* 1892), his first volume of stories for children. Other important works include the novel *Il marchese di Roccaverdina* (1901; "The Marquis of Roccaverdina"), as well as the short-story collections *Le appassionate* (1893; "The Impassioned Ones"), *Fausto Bragia* (1897), and *Le paesane* (1894; "The Countrywomen"), the last considered his best regional work. His best critical works are *Studi sulla letteratura contemporanea* (1880, 1882), essays on Balzac, the Goncourts, Zola, and Verga; and *Gli "ismi" contemporanei* (1898; "Contemporary 'Isms' ").

Capuana taught for a time in Rome and at the University of Catania. He spent his last years in Sicily.

Capuchin, member of ORDER OF FRIARS MINOR CAPUCHIN (O.F.M.Cap.), an autonomous branch of the Franciscan order of religious men, begun as a reform movement in 1525 by Matteo da Bascio, who wanted to return to a literal observance of the rule of St. Francis of Assisi and to introduce elements of the solitary life of hermits. Matteo was concerned that the habit, or religious uniform, worn by the Franciscans was not one that St. Francis had worn; accordingly he made himself a pointed hood (in Italian *capuccino,* from which the order takes its name), allowed his beard to grow, and went about barefooted. Matteo was soon joined by others. Their life was one of extreme austerity, simplicity, and poverty; and, though this has been to some extent mitigated, the order remains very strict. The Capuchins had a rough passage through the 16th century. They were harassed by the established groups of Franciscans and forbidden by the pope to extend outside of Italy. The defection to Protestantism of their vicar general, Bernardino Ochino, in 1542 all but ruined them. Nevertheless, they increased rapidly and, by 1571, numbered 17,000 members. They played almost as important a part as the Jesuits in the later stages of the Counter-Reformation, appealing especially to the common and country people. They were allowed to expand freely from 1574 and, in 1619, were constituted into an independent order. They reached a maximum of 34,000 members in the middle of the 18th century but suffered a decline during the French Revolution. The Capuchins were noted for their heroic ministry during the dreadful epidemics that plagued Europe and elsewhere from the 16th to the 18th century. They have been actively engaged in missionary and social work.

capuchin monkey, also called SAPAJOU, tropical American monkey, genus *Cebus,* family Cebidae, found from Nicaragua to Paraguay. Capuchins, considered among the most intelligent monkeys in the New World, are named for their caps of crown hair, which resemble the cowls of capuchin monks. They are stockily built, round-headed monkeys with comparatively short, fully haired, prehensile tails. They are 30–55 centimetres (12–22 inches)



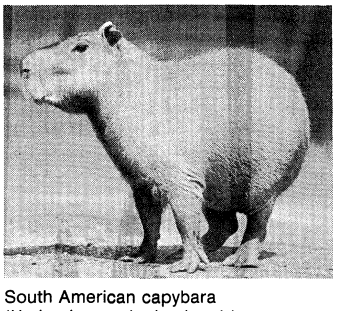
White-throated capuchin monkey (*Cebus capucinus*)
By courtesy of the New York Zoological Society

long, with a tail of about the same length, and are pale to dark brown or black, with white markings in some of the four species.

Capuchins are often separated into two groups. The crested, or tufted, group includes the brown capuchin (*C. apella*), in which the crown bears a dark cap of long, erect hairs that often form tufts or crests. The uncrested, or untufted, group includes the more lightly built white-throated (*C. capucinus*), white-fronted (*C. albifrons*), and weeper (*C. nigrivittatus*) capuchins in which the crown bears a smooth, dark, more or less pointed cap. The name "black capped capuchin" has been applied to both *C. apella* and *C. nigrivittatus.*

Capuchins go about in troops, frequenting the summits of tall forest trees. Very active, diurnal monkeys, they feed on fruit and small animals and at times raid plantations for oranges and other food. Little is known of their habits in the wild. They apparently breed at any time of year; gestation takes about six months and births are usually single. In captivity, these monkeys are easily trained and are valued as gentle pets and performers. They are the ones most commonly kept by organ grinders.

capybara (*Hydrochoerus*), either of two species of semiaquatic Central and South



South American capybara (*Hydrochoerus hydrochoeris*)
By courtesy of the New York Zoological Society

American rodents usually placed in the family Hydrochoeridae (order Rodentia), but sometimes placed with the cavy and guinea pig in the family Caviidae. Also called carpinchos, or water hogs, capybaras are the largest living rodents. The South American *H. hydrochoeris* may be 1.25 metres (50 inches) long and weigh 50 kilograms (110 pounds) or more; *H. isthmius* of Panama is smaller and weighs about 27 kg. (60 lb).

Capybaras are sparsely haired, brownish rodents, with blunt snouts, short legs, small ears, and almost no tail. They are shy and associate in groups along the banks of lakes and rivers. They normally feed in the morning and evening and spend most of the day resting under cover along the banks. They are vegetarian and in cultivated areas sometimes become pests by eating melons, grain, and squash. They swim and dive readily and commonly enter water to elude predators. They are edible, but are not considered especially palatable. The female bears a single litter of three to eight young each year; gestation takes about 100 to 110 days.

Caquetá, department, southeastern Colombia, bounded south by the Río Caquetá and northeast by the Río Apaporis. Given commissary status in 1910, raised to intendency level in 1950, and to department status in the late 1970s, the territory, 34,350 sq mi (88,965 sq km), consists of forested lowlands except in the west, where it rises abruptly into the Andean Cordillera (mountains) Oriental. The region is known for its cedar, mahogany, rubber, ipecac, and other trees. Tropical plants such as bananas and other fruits are cultivated in the lowlands, and corn (maize) predominates in the highlands. Cattle raising is widespread around the department capital, Florencia (*q.v.*). The only major road runs from Neiva in Huila department across the Andes to Florencia. Other transport is by river or by air. Pop. (1981 est.) 290,452.

Caquetío, also spelled CAIQUETIO, or CAIQUETIA, Indians of northwestern Venezuela living along the shores of Lake Maracaibo at the time of the Spanish conquest. They moved inland to avoid enslavement by the Spaniards but were eventually destroyed as were their neighbours, the Quiriquire and the Jirajara.

The Caquetío and the Jirajara spoke an Arawakan language, and their cultures were quite similar. They were intensive farmers, growing corn (maize), sweet potatoes, and manioc as staples in irrigated fields. They also hunted extensively and gathered cactus fruits and other wild plants. Their villages of thatched huts were laid out in rows and blocks of two to four houses each. Clothing consisted of a small genital covering, various ornaments, and body paint. The major craft was pottery; weaving was of little importance because so little clothing was worn. Little is known of their social and political organization except that there were various chiefs and apparently a class of nobles who may have practiced polygyny. They worshipped the Sun and the Moon, and human sacrifices were apparently made to them. Each family also worshipped its household idols.

Caraballo Mountains, mountains in central Luzon, Philippines. The range lies largely in Nueva Vizcaya and Quirino provinces and reaches an altitude of about 5,500 ft (1,680 m). It joins the Cordillera Central to the north and the Sierra Madre to the east. Drained by the headwaters of the northward-flowing Cagayan River, the mountains contain major forestry resources. The principal inhabitants of the region are Ilongo (Visayan).

Carabiniere, plural CARABINIERI, member of L'ARMA DEI CARABINIERI (Italian: Corps of Carabinieri), byname L'ARMA BENEMERITA (The Meritorious Army), one of the three na-

tional police forces of Italy. Originally an elite military organization in the Savoyard states, the corps became part of the Italian armed forces at the time of national unification (1861) and is still considered part of the army. Members of the corps wear military-style uniforms (with a Napoleonic-type hat) and are housed in barracks, and the corps has a variety of military duties: it polices the armed forces, guards military installations, enforces recruiting laws, and has specific military responsibilities in the event of war. In these capacities it is responsible to the minister of defense.

The corps also acts as a civil police force, with responsibility for protecting public order and detecting crime. In these areas, its function overlaps that of the *Guardie di Pubblica Sicurezza* (Public Security Guards), and like the guards, it is responsible to the ministry of the interior.

Carabobo, state, northwestern Venezuela, bounded north by the Caribbean Sea, and by the states of Aragua (east), Guárico and Cojedes (south), and Yaracuy (west). It has an area of 1,795 sq mi (4,650 sq km) and was named in commemoration of the battle that proved decisive in the Venezuelan independence movement. At the time the Spaniards conquered Venezuela, there were Indians known as the Carabobos.

The state is important both agriculturally and industrially. Rice, cotton, corn (maize), tobacco, coffee, cocoa, and sugar are produced. The expanding dairy industry partly supplies the requirements of Caracas. Cattle from the Llanos (plains) are fattened on the pastures surrounding Lago (lake) de Valencia, which lies almost entirely within eastern Carabobo. One of the nation's main experiments in planned agricultural communities is carried on at Chirgua, where Venezuelans and immigrants work together. Cement, powdered milk, textiles, and shoes are manufactured in the state, primarily in Valencia, the state capital. There is a major petrochemical plant between Valencia and Puerto Cabello, one of the busiest Venezuelan ports. The state is well served by highways and airlines and has some rail facilities. Pop. (1983 est.) 951,295.

Carabobo, Battle of (June 24, 1821), during the Latin-American wars of independence, a victory won by South American patriots over Spanish royalists on the plains near Caracas; it virtually freed Venezuela from Spanish control. Following the instructions of the recently installed liberal government in Spain, Gen. Pablo Morillo had signed an armistice with Simón Bolívar, commander of the revolutionary forces in northern South America, in November 1820. Subsequently, the patriots broke the terms of the agreement by moving against the royalist garrison on Lake Maracaibo. At Carabobo, Bolívar led his somewhat numerically superior army of about 6,500 troops, including volunteers from the British Isles, to victory over the Spaniards, commanded by General La Torre. Gen. José Antonio Páez and his *llaneros* ("plainsmen") and the British and Irish volunteers routed the Spanish right wing while the patriot cavalry crushed their centre.

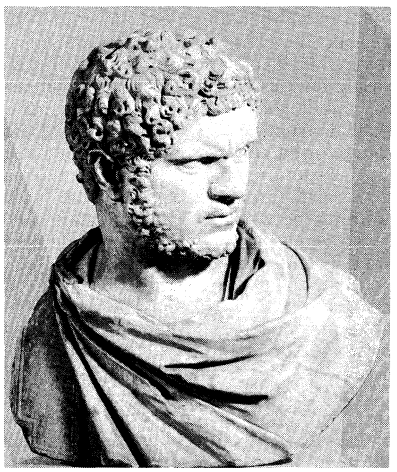
caracal, also called DESERT LYNX, or PERSIAN LYNX (*Felis caracal*), short-tailed cat (family Felidae) found in hills, deserts, and plains of Africa, the Middle East, and central and southwestern Asia. The caracal is a sleek, short-haired cat with a reddish brown-coat and long tufts of black hairs on the tips of its pointed ears. Long legged and short tailed, it stands 40–45 centimetres (16–18 inches) at the shoulder and varies from 66 to 76 cm in length excluding its 20–25-cm tail. The swift caracal is generally solitary and nocturnal in habit. It preys on birds and mammals, such as gazelles, hares, and peafowl. In Asia, where

Caracal (*Felis caracal*)
Tierbilder Okapia, Frankfurt am Main

it has become rare, it has been trained as a hunting animal. The female bears litters of one to four young, which resemble the adults. The caracal sometimes is given the scientific name *Lynx caracal* or *Caracal caracal.*

Caracalla, also spelled CARACALLUS, byname of MARCUS AURELIUS SEVERUS ANTONINUS AUGUSTUS, original name (until AD 196) SEPTIMIUS BASSIANUS, also called (AD 196–198) MARCUS AURELIUS ANTONINUS CAESAR (b. April 4, AD 188, Lugdunum [Lyon], Gaul—d. April 8, 217, near Carrhae, Mesopotamia), Roman emperor, ruling jointly with his father, Septimius Severus, from 198 to 211 and then alone from 211 until his assassination in 217. His principal achievements were his colossal baths in Rome and his edict of 212, giving Roman citizenship to all free inhabitants of the empire. Caracalla, whose reign contributed to the decay of the empire, has often been regarded as one of the most bloodthirsty tyrants in Roman history.

Caracalla was the elder son of the future emperor Lucius Septimius Severus, a North African, and Julia Domna, a Syrian. He was originally named Bassianus, after his maternal grandfather, who had been high priest of the



Caracalla, marble bust, 3rd century; in the Art Museum, Princeton University
The Art Museum, Princeton University, Carl Otto von Kienbusch, Jr., Memorial Collection

Syrian sun god Elagabalus. He assumed the name Marcus Aurelius Antoninus and added the title Caesar because his father wanted to connect his family with the famous dynasty of the Antonines. In 198 he was given the title of Augustus, which nominally meant he had equal rank with his father. The byname Caracalla was based on his alleged designing of a new cloak of that name. Another of his nicknames, Tarautas, was that of an ugly, insolent, and bloodthirsty gladiator whom he was thought to resemble.

The ancient sources concerning his life and character are by no means reliable. One of them, for example, recounts that as a boy he was amiable, generous, and sensitive and only later became insufferable; but the same source reports in another context that he was fierce by nature. Modern treatments emphasize Caracalla's Syrian heritage as one of the most important elements in his character, although here, too, due caution must be applied, since Eastern origin was in no way incompatible with a high degree of Romanization. Julia herself was well acquainted with Greco-Roman culture and hired excellent teachers to give her son the best education available. It is reported that he studied the Greek orators and tragedians and was able to quote long passages from the Greek playwright Euripides but also that he strongly despised education and educated people. This may have been the result of his passion for military life, which probably developed when he accompanied his father on his many military expeditions.

At the age of 14 he was married to Fulvia Plautilla, the daughter of the influential and ambitious commander of the imperial guard, Fulvius Plautianus; he is said to have hated Plautianus and played an important role in having him executed on the charge of a conspiracy against the imperial dynasty. He also exiled his own wife to an island and later killed her.

A significant development was the growing rivalry between Caracalla and his younger brother Geta, a rivalry that was aggravated when Severus died during a campaign in Britain (211), and Caracalla, nearing his 23rd birthday, passed from the second to the first position in the empire. All attempts by their mother to bring about a reconciliation were in vain, and Caracalla finally killed Geta, in the arms of Julia herself, it is said. There can be no doubt about the savage brutality of Caracalla's act, but a solution that would have been at once moral and practicable was not in sight.

Caracalla next showed considerable cruelty in ordering many of Geta's friends and associates put to death. Probably in order to regain goodwill, he granted an amnesty to exiles, a move denounced as hypocritical in ancient sources, which also slander Caracalla's most famous measure, the so-called Constitutio Antoniniana de Civitate, as a device designed solely to collect more taxes.

His expeditions against the German tribes in 212/213, when he senselessly massacred an allied German force, and against the Parthians in 216–217 are ascribed by ancient sources to his love of military glory. Just before the Parthian campaign, he is said to have perpetrated a "massacre" among the population of Alexandria, probably in response to a disturbance there.

Caracalla's unpredictable behaviour is said to have prompted Macrinus, the commander of the imperial guard and his successor on the throne, to plot against him: Caracalla was assassinated at the beginning of a second campaign against the Parthians.

Important for the understanding of his character and behaviour is his identification with Alexander the Great. Admiration of the great Macedonian was not unusual among Roman emperors, but, in the case of Caracalla, Alexander became an obsession that proved to be ludicrous and grotesque. He adopted clothing, weapons, behaviour, travel routes, portraits, perhaps even an alleged plan to conquer the Parthian empire, all in imitation of Alexander. He assumed the surname Magnus, the Great, organized a Macedonian phalanx and an elephant division, and had himself represented as godlike on coins.

Another important trait was Caracalla's deeply rooted superstition; he followed magi-

cal practices and carefully observed all ritual obligations. He was tolerant of the Jewish and Christian faiths, but his favourite deity was the Egyptian god Sarapis, whose son or brother he pretended to be. He adopted the Egyptian practice of identifying the ruler with god and is the only Roman emperor who is portrayed as a pharaoh in a statue.

In the many portraits of him, the expression of vehemence and cruelty is obvious, and some sources say that he intentionally reinforced this impression, perhaps because it flattered his vanity to spread fear and terror. It is also said, contradictorily, that he was of small size but excelled in bodily exercises, that he shared the toils of the rank and file but also weakened his virility by a dissolute life and was not even able to bear the weight of a cuirass.

A similar inconsistency characterizes the judgments about his mental state. He was said to be mad but also sharp minded and ready witted. His predilection for gods of health, as documented by numerous dedicatory inscriptions, may support the theory of mental illness.

If Caracalla was a madman or a tyrant, the fact had no great consequences for his administration of the empire, which may or may not have been vitally influenced by Julia Domna and the great jurists who surrounded him. He was venerated by his soldiers, who forced the Senate to deify him after his death, and there is no indication that he was especially disliked among the general population. In any case, the Roman Empire at that time was still strong enough to bear a ruler who certainly lacked the qualities of an outstanding emperor.

(F.P.K.)

BIBLIOGRAPHY. English translations of the ancient sources in the "Loeb Classical Library": Cassius Dio, *Dio's Roman History,* trans. by E. Cary, book 77–79; *Herodian,* trans. by C.R. Whittaker, book 3 and 4; *Scriptores Historiae Augustae,* vol. 2, trans. by D. Magie. The most reliable of these sources is Cassius Dio. The most detailed treatment of Caracalla's life and reign is the dissertation of D.C. Mackenzie, *The Reign of Caracalla* (1949).

Caracalla, Baths of, outstanding example of Roman building construction in concrete and the only one of the great Roman bathing establishments to have survived in large part. The structure, completed in AD 217 by Alexander Severus, consisted of a block of large vaulted bath chambers covering an area of 750 by 380 feet (230 by 115 metres), with courts and auxiliary rooms, surrounded by a garden with space for exercise and games.

There were three main bath chambers: the frigidarium, or cold room; the caldarium, or hot room; and the tepidarium, or lukewarm room. Between the frigidarium and the tepidarium was the great hall, roofed by an enormous vault with clerestory windows, a prototype of the vaulted naves of the medieval churches. There were also large open-air swimming pools. Marble was used lavishly, and sculpture and other decorations ornamented the interior. The Baths of Caracalla, like other Roman buildings, were severely damaged by pillage during the Middle Ages.

caracara, also called CARRION HAWK, any of about ten species of birds of prey of the New World subfamily Polyborinae (or Daptrinae) of the family Falconidae. Caracaras feed largely on carrion, birds, reptiles, and amphibians. They are gregarious and aggressive. In spite of their smaller size, they dominate vultures when feeding. Caracaras are recognized by their long legs and by the reddish naked skin of the cheeks and throat. They range in size from 40 to 60 centimetres (16 to 24 inches) long.

The common, or crested, caracara (*Polyborus plancus*) occurs from Florida, Texas, Arizona, Cuba, and the Isle of Pines south to the Falkland Islands and Tierra del Fuego. The subspecies occurring in the U.S. is called Audubon's caracara (*P. p. auduboni*).

Other species occurring in South America include the chimango, or beetle eater (*Milvago chimango*), and the black caracara (*Daptrius ater*). The smaller South American species eat insects.

Caracas, city and capital of Venezuela. One of the most developed and cosmopolitan of Latin-American cities, it lies 3,025 ft (922 m) above sea level in a high rift valley surrounded by two mountain groups of Venezuela's central highlands, the Cordillera del Litoral and the Serranía del Interior. The Caribbean Sea is 7 mi (11 km) to the north.

The following article treats briefly the modern city of Caracas. Fuller treatment is provided in the following MACROPAEDIA articles. For history and contemporary life, *see* Caracas; for additional perspective on the city in its national context, *see* Venezuela.

Caracas' metropolitan area includes the municipal area (city), the four surrounding parishes, and five towns in the state of Miranda; it extends more than 9 mi from north to south and more than 17 mi from east to west. Almost all of the valley's inhabitable area has been blanketed by urban development, most of it occurring after 1950. Caracas' principal river is the Guaire, once large and important but now reduced to a small volume. The climate is mild, with a summer dry season and a winter rainy season.

The city's industries include wood processing and the production of sugar, processed foods, tobacco, and clothing. The construction industry has created expansion in auxiliary industries such as the production of cement and construction materials. Caracas is the country's centre of both domestic and foreign commerce, the principal centre of petroleum-related activities, and the seat of the major banking houses.

Construction and urban development reached a peak beginning in the mid-20th century, and the change in the appearance of the city has been abrupt and overwhelming. Large-scale building of cooperative apartment houses, public housing developments, and commercial structures has accommodated the city's burgeoning population. One of the most imposing structures in the downtown area is the massive Centro Simón Bolívar, with its adjoining network of shops, restaurants, and passageways; its twin towers are flanked by Santa Teresa Church and a seven-block commercial and residential area that replaced extensive slums. The colonial city has been preserved around the Plaza Bolívar. On its perimeter are located the old cathedral, the archbishop's residence, the municipal council building, and the ministry of foreign affairs.

The most important centre of higher education is the Central University of Venezuela (also known as the University of Caracas, 1725). Other educational institutions are Simón Bolívar University (1970), Andrés Bello Catholic University (1953), and technical and medical schools. Among the many cultural institutions are the Writer's House, the Athenaeum of Caracas, and the Venezuelan Association of Journalists. Art galleries augment the city's older museums and libraries.

Within the city a great number of buses, private automobiles, taxis, and jitneys contribute to increasing traffic congestion. Caracas has several large expressways, and it is linked by highway to the coast and to other Venezuelan towns. A major railroad leads to the southwest. La Carlota Airport provides domestic air service, while Maiquetía Airport, located on the coast 12 mi away, serves international flights. Two aerial cable cars go to Cerro el Avila. Most consumer merchandise and much of Venezuela's capital goods are imported through Caracas' ports, La Guaira and Puerto Cabello. Area city, 30 sq mi (78 sq mi); metropolitan area, 139 sq mi (361 sq km). Pop. (1981 est.) city, 2,299,700; metropolitan area, 3,041,000.

Caracas Company (colonial trading company): *see* Guipúzcoa Company.

Caracciola, Rudolf (b. Jan. 30, 1901, Remagen, Ger.—d. Sept. 28, 1959, Kassel, W.Ger.), German automobile racing driver, who was one of the most successful and versatile of modern times. He participated in hill climbs and speed trials as well as races.

Caracciola began racing in 1922 and from 1923, except for a brief period, drove on the Mercedes team. He won more than 100 races and was European champion (1935, 1937–38). He won his first Grand Prix race in 1926 (the German) and a total of 28 during his career. He also won the European Mountain (hill climb) Championship three straight years (1930–32). His driving skill in wet weather won him the nickname Regenmeister ("rain master"). Severe injury in a sports-car race accident in 1952 ended his driving career.

Caracciolo, Francesco, DUCA (duke) DI BRIENZA (b. Jan. 18, 1752, Naples—d. June 28, 1799, Naples), Neapolitan admiral. Considered a traitor by some Italians, he at first supported King Ferdinand IV of Naples but later accepted command of the navy of the Parthenopean Republic, which was declared Jan. 23, 1799, when the French took over Naples.

Caracciolo gained most of his experience as a naval officer fighting for the British against the Americans in the War of Independence (1775–83). He returned to Naples in 1781 and, under the British admiral Horatio Nelson, fought the French at Toulon in 1793. Caracciolo continued to fight them even after Ferdinand signed an armistice with Napoleon. Later, in 1798, the French captured Naples, and Ferdinand fled to Palermo aboard Nelson's ship, with Caracciolo following behind. During the voyage, a storm arose that nearly caused Nelson's ship to founder, while Caracciolo sailed through it easily; afterward, Ferdinand praised Caracciolo's seamanship, thus allegedly arousing Nelson's jealousy.

Caracciolo returned to Naples (then the Parthenopean Republic), perhaps with Ferdinand's permission, because the estates of those who were absent were being seized. Caracciolo was offered command of the Parthenopean navy, which was in a state of disrepair, and he soon turned it into an efficient force. Ferdinand recaptured Naples from the French in 1799. Though the terms of the armistice forbade reprisals, Nelson summarily tried and then hanged Caracciolo for treason aboard his flagship, the "Minerva."

Caractacus (British chieftain): *see* Caratacus.

Caradeuc de la Chalotais, Louis-René de: *see* La Chalotais, Louis-René de Caradeuc de.

Caradoc (British chieftain): *see* Caratacus.

Caradoc Series, rocks of Ordovician age between the Llandeilo Series below and the Ashgill Series above; the Caradoc was first recognized on the basis of exposures studied in the region of Caer Caradoc, Wales. The Caradoc and overlying Ashgill are sometimes grouped together in the Bala Series of the Upper Ordovician (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years). In many areas, the beginning of Caradocian time is marked by a break in the record at the base of the graptolite fossil zone of *Nemagraptus gracilis.*

The Caradoc of North Wales is seen as graywackes, mudstones, thin, impure limestones, and fine-grained black shales. Silica-

rich rhyolitic lavas and tuffs also occur and can be seen at Snowdon Mountain. In North Wales, Caradoc rocks reach a total thickness of about 200 metres (6,000 feet). Other important Caradoc sections can be seen in the southern Scottish uplands and the Girvan district, where some 4,900 metres (16,000 feet) of rocks occur. The Partry Series, 4,600 metres (15,000 feet) of Caradoc, occurs in the Midland Valley of Ireland.

In the Oslo district, Norway, the Caradoc is represented by shales and limestones. Fossils have allowed this section to be subdivided and correlated with sections elsewhere.

Caradoc exposures are known on a worldwide basis and occur in Sweden, the Soviet Union, southern China, Australia, New Zealand, and South America.

Caradon, district, county of Cornwall and Isles of Scilly, England, between Bodmin Moor and the English Channel; the River Tamar forms the boundary with Devon to the east. With an area of 256 sq mi (664 sq km), it depends on Plymouth for many services and is linked by road and rail bridges at Saltash, car ferry at Torpoint, and pedestrian ferry at Cremyll.

Bodmin Moor is formed of a granite intrusion, reaching heights of more than 980 ft (300 m) and capped with tors. The valleys on the moor are open, but they become incised and wooded on the granite boundary. The upland is covered with moorland vegetation, and local farmers have extensive grazing rights, used for both sheep and cattle. The moor was a barrier to both roads and settlement. During the Bronze Age, however, the climate was both drier and warmer, resulting in the moor being occupied for both agriculture and settlement; the remains of hut circles can still be seen. To the south of the moor the granite gives way to Devonian shales, slates, and gritstones.

Calstock and Gunnislake in the Tamar Valley are linked with Plymouth by a branch railway and have become residential areas. The lower Tamar Valley is an area of intensive cultivation; the southern aspect, cold air drainage on the steep slopes, and influence of the sea penetrating inland up the submerged ria give it a climate relatively free of frosts. Strawberries and other soft fruits are important, and flowers, grown both outside and in greenhouses, are a major source of income. Some early vegetables are also cultivated for markets in London and the Midlands. In recent years the number of growers has declined, with the trend to larger, more economic holdings.

The lower courses of the river valleys are incised and wooded, with meadowland in their narrow floors. The flat land between the rivers forms the main farming areas with their patchwork pattern of small fields enclosed by stone walls. Stock raising (dairy and beef cattle, sheep, and pigs) is important.

Liskeard is the major market and service centre, and it has expanded as a residential area, with a small industrial estate to the west. Saltash has developed strong links with nearby Plymouth and is a growth point for light industry and services as well as for residential development. At Torpoint a ferry connects with Devonport across the Hamoaze (lower Tamar). The south coast is picturesque, with cliffs, sandy bays, and submerged inlets. Small fishing ports have grown at Looe and Polperro, which have expanded as tourist centres, with chalets and sites for tents and caravans. Pop. (1982 est.) 68,700.

Carafa, Gian Pietro: *see* Paul IV *under* Paul (Papacy).

Caragiale, Costache (b. March 29, 1815, Bucharest—d. Feb. 13, 1877, Bucharest), actor-manager who helped to encourage the development of a unique Romanian drama.

Caragiale made his stage debut in 1835 in Bucharest, and in 1838 he organized a theatre of contemporary drama in Iaşi (now Jassy). During the next 15 years he worked with regional theatres, notably those in Iaşi, Botoşani, and Craiova, where he promoted the plays of the most talented dramatists of the period, including Vasile Alecsandri and Constantin Negruzzi. He returned to Bucharest in 1850, and two years later he was named director of the National Theatre.

His nephew Ion Luca Caragiale became one of Romania's greatest playwrights, and his younger brother Iorgu was a successful actor and director in Iaşi and other provincial towns. In 1887 Iorgu constructed his own theatre in Bucharest.

Caragiale, Ion Luca (b. Jan. 30, 1852, Haimanale, Walachia—d. June 10, 1912, Berlin), playwright and prose writer of great satirical power. His comedies expose the effects on Romanian urban society of hasty introduction of a modern way of life and the comical results of social and political change. *Conul Leonida* (1879; "Mr. Leonida"), *O noapte furtunoasă* (1880; "A Stormy Night"), and *O scrisoare pierdută* (1884; "A Lost Letter") are among the most popular. With *Năpasta* (1890; "The False Accusation"), he created the peasant drama. His short stories, *O făclie de Paşte* (1889; "An Easter Torch"), *Păcat* (1892; "The Sin"), and *Kir Ianulea* (1909), are among the best prose works in Romanian literature; *Momente* and *Schiţe* are vivid sketches of the change from rural to urban society.

Carajá, also spelled KARAJÁ, tribe of South American Indians living along the Araguaia River, near the inland island of Bananal, in central Brazil. Their language may be distantly related to Ge, which is spoken by most of the surrounding tribes. The three subtribes of the Carajá—the Carajá proper, the Shambioá, and the Javahé—have almost identical cultures and are all oriented toward the river rather than toward the forest. The principal source of food is fish, with agricultural produce of almost equal importance. Clearings are made in the jungle flanking the river and planted with cassava, corn (maize), and a variety of other crops. The Carajá wear little clothing but use a variety of ornaments. Men wear labrets in the lower lip, as well as earplugs, while both sexes use a great deal of body paint and tattoo a small circle on each cheek as a tribal mark.

In the wet season large, permanent thatched houses are occupied by the members of several related families; during the dry season flimsy shelters are built on the sandy beaches along the river. Within the village the social unit is the extended family, and the heads of these families are the effective leaders of the society. The village chief, although granted considerable deference, has little authority. For most purposes the villages are independent of one another, but some adjoining villages cooperate in religious ceremonies.

The Carajá are noted for the singing and dancing that are prominent features of all ceremonies. The religion is dominated by the men, who hold masked dances during which they impersonate spirits and the ghosts of slain enemies.

Caralis, plural **Carales** (Roman city, Sardinia): *see* Cagliari.

caramel, candy substance obtained by boiling sugar to or beyond approximately 240° F (115° C), at which point its mass takes on a slightly yellowish colour and pleasantly burnt smell.

Caramels vary in consistency between the short, or soft, and the long, or more chewy types depending upon the proportions of ingredients. Corn syrup added to the basic sugar constituent controls graining and contributes body. Milk, essential to the traditional "carmel-candy" flavour, imparts a creamy, collapsible consistency. The blended ingredients, including fats and starches, are stirred continuously during cooking and then poured into vessels or over cooling slabs in preparation for cutting and wrapping.

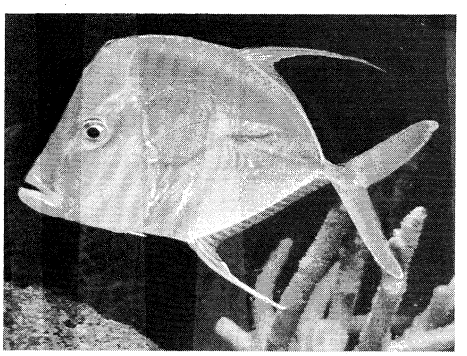
Although the making of cream caramels requires a high degree of skill, caramel is a basic candy more important to the mass-production of sweets than to the individual confectioner. Various grains of caramel may be dipped, coated, or coloured and flavoured with fruit and nuts, as well as coffee. Apples coated with caramel and skewered on sticks are a popular form of the candy associated in the United States with autumn fairs.

Cāraṇ, Hindu caste of hereditary genealogists, bards, and storytellers located in Gujarāt state (western India). They claim origin from the Rājput caste of Rājasthān and may be of mixed Brahman (priestly) and Rājput extraction. Many of their customs are similar to those of their northern Indian counterparts, the Bhāṭs; both groups had a reputation of preferring death to breaking a promise. The Cāraṇ compose their ballad poetry, which treats of warriors and kings, in a special western Rājasthān dialect, called Dingal, not used for any other purposes.

Caran d'Ache, pseudonym of EMMANUEL POIRÉ (b. 1858, Moscow—d. Feb. 26, 1909, Paris), caricaturist and illustrator whose line drawing was notable for its crisp, forceful simplicity. The name Caran d'Ache transliterates the Russian word for pencil.

He was educated in Moscow but settled in Paris, where he gained great popularity as a contributor to several periodicals. He was an early exponent of the episodic strip cartoon technique and was also a well-known illustrator. The grandson of a Napoleonic officer, he spent five years in the French Army and often favoured military subjects in his illustrations. Essentially self-taught, he was particularly influenced by the contemporary German caricaturists Wilhelm Busch and Adolf Oberländer.

carangid, any fish of the family Carangidae (order Perciformes), which contains more than 200 species of marine fishes, including such well-known forms as the jacks and pompanos. Carangids are swift, predatory, usually silvery fishes found throughout the world in warm and tropical regions. They are primarily marine, but some live in brackish water or fresh water.



Lookdown (*Selene vomer*)
By courtesy of the Miami Seaquarium

The members of the family vary greatly in form, from elongated and streamlined to very deep bodied and thin from side to side. In general, however, they bear the following features in common: two dorsal fins, the first of which may be reduced to a few small spines; anal and second dorsal fins, usually high in front; pectoral fins slim and often sickle-shaped; tail base very slender; tail strong, either forked or crescent-shaped; scales small; lateral line (series of small sense organs along the head

and sides) often partly or wholly covered with large, hard, keeled scales (scutes).

Many of the carangids are small, but some grow to a large size. The greater amberjack (*Seriola dumerili*), for example, reaches a length and weight of about 1.8 m (6 feet) and 70 kg (150 pounds). The members of the family are known by various common names. There are the moonfish, pompano, pilot fish, runner, jack (*qq.v.*), and others. One of the most unusual-looking Atlantic carangids is the lookdown (*Selene vomer*), with an exceptionally thin body and high "forehead." The first rays of the second dorsal fin extend into filaments that reach to the tail. Many of these fishes are valued for food or sport. Certain species, however, such as the greater amberjack and several jacks, may at times carry a toxic substance in their flesh and, when eaten, cause ciguatera, a form of poisoning.

Caraquet, town and fishing port, Gloucester County, northeastern New Brunswick, Canada. It lies along Caraquet Bay (an inlet of Chaleur Bay), near the mouth of the Caraquet River, 42 miles (68 km) northeast of Bathurst. Founded *c.* 1760 by shipwrecked French seamen, it is one of the province's oldest French settlements and was named for the bay, which may have derived its name from a French nautical term, *caraque,* meaning "carrack," or "large galleon." After 1784 the town became strongly French Acadian. It is now the home port for a large Atlantic fishing fleet and has a fisheries school, boatbuilding facilities, and fish-, crab-, and oyster-packing plants. Historical associations are reflected by its Acadian Museum and the nearby reconstructed Acadian Village. The blessing of the fleet by the bishop of Bathurst is a notable annual (July) event. Inc. 1961. Pop. (1981) 4,315.

Caraş-Severin, *judeţ* (district), southwestern Romania. It occupies an area of 3,283 square miles (8,503 square km) and is bounded on the south and west by Yugoslavia. The Transylvanian Alps (Southern Carpathians), including the ranges of Semenic, Cernei, and Poiana Ruşcă, rise above settlement areas in the intermontane valleys. The eastward-flowing Danube River and its tributaries, including the Timiş River, drain the district. Reşiţa (*q.v.*) is the district capital.

The district's agricultural activities include livestock raising and cereal and fruit cultivation. Iron, manganese, feldspar, pyrite, coal, and anthracite mines operate in the district, and marble is quarried near Ruschiţa. Reşiţa, Bocşa, and Oţelu Roşu have metal-products and machinery industries. Building materials are produced in Căvăran, and several towns in the area have factories producing wood products and foodstuffs. A hydroelectric plant operates on the Nerganiţa River near Văliug.

The battle of Tapae, fought between the Dacians and Romans, took place at the Iron Gate of Transylvania Pass (2,293 feet [697 m]), located about 24 miles (39 km) east of Caransebeş. Extending south from Caransebeş, a highway follows a Roman road built along the Timiş River. Plugova, Mechadia, Teregova, and Băile Herculane are towns in the Timiş valley, in which the Romans built camps. Flint implements from the Paleolithic Age (about 2,500,000 years ago) and Neolithic objects were found in caves near Băile Herculane. The nearby Mount Domogled Nature Reserve (3,629 feet [1,106 m]) has a large variety of butterflies and moths. Borlova and Văliug are mountain resorts. Railway and highway connections extend through Reşiţa and Caransebeş. Pop. (1984 est.) 402,-191.

carat, unit of weight for diamonds and certain other precious gems. Before 1913 the weight of a carat varied in different gem centres. Originally based on the weight of grains or leguminous seeds, which, of course, varied in size from place to place, the carat was equivalent to 0.2053 gram (3.168 troy grains) in London; 0.1972 g in Florence; and 0.2057 g in Amsterdam. The weight of a gemstone was calculated in terms of whole carats plus fractions (1/2, 1/4, 1/8, 1/16, 1/32, or 1/64) of a carat; thus, a stone might be said to weigh $3 + 1/4 + 1/16$ carats. After various unsuccessful attempts to standardize the carat, the metric carat, equal to 0.200 g, and the point, equal to 0.01 carat, was adopted by the United States in 1913 and subsequently by most other countries. The weights of diamond, ruby, sapphire, emerald, topaz, aquamarine, garnet, tourmaline, zircon, spinel, and sometimes opal and pearl are expressed in carats.

carat (gold): *see* karat.

Caratacus, also spelled CARACTACUS, Celtic CARADOC (fl. 2nd and 3rd quarters of the 1st century AD), king of the British tribe of Trinovantes, and the son of Cunobelinus (*q.v.*).

Caratacus' kingdom, embracing the Atrebates of Hampshire and probably the Dobunni of Gloucestershire, lay in the west. At the time of the Roman invasion of Britain during the reign of Claudius, he led the native resistance against Aulus Plautius (AD 43–47) and, after being defeated, withdrew into south Wales. He was finally defeated by Ostorius Scapula in AD 50, somewhere on the Welsh marches, in the territory of the Ordovices. He himself fled to the Brigantes, whose queen, Cartimandua, delivered him to the Romans. He and his family were featured in a victory parade of Claudius, who granted them pardon and life.

Caratasca Lagoon, Spanish LAGUNA DE CARATASCA, lagoon in northeastern Honduras. The nation's largest lagoon, Caratasca extends inland from the Caribbean Sea for approximately 25 miles (40 km) and measures up to 55 miles (88 km) from northwest to southeast. It is linked to the Caribbean by a 3-mile (5-kilometre) channel, on the bank of which stands the village of Caratasca. Many islands, the largest of which is Tansín, dot its waters, and its low-lying shores are lined with dense tropical rain forests, which yield mahogany and cedar; shrimp are caught in the lagoon. The principal town is Puerto Lempira, on the southern shore.

Carathéodory, Constantin (b. Sept. 13, 1873, Berlin—d. Feb. 2, 1950, Munich), German mathematician of Greek origin who made important contributions to the theory of real functions, to the calculus of variations, and to the theory of point-set measure.

After two years as an assistant engineer with the British Asyūṭ Dam project in Egypt, Carathéodory began his study of mathematics at the University of Berlin in 1900. In 1902 he entered the University of Göttingen, where he received his Ph.D. (1904) under the German mathematician Hermann Minkowski. After teaching at the universities of Hannover (1909), Breslau (1910–13), Göttingen (1913–18), and Berlin (1918–20), he accepted a post at the University of Smyrna, which the Greeks were setting up in Anatolia. When the Turks razed Smyrna in 1922, Carathéodory managed to save the university library, which he moved to the University of Athens, where he taught until 1924. He then was appointed professor of mathematics at the University of Munich.

Carathéodory's contributions to the calculus of variations include a comprehensive theory of discontinuous solutions, in which previously there had been only limited findings. He also added important results to the relationship between first-order partial differential equations and the calculus of variations. His work on the problems of variation of *m*-dimensional surfaces in an *n*-dimensional space marked the first far-reaching results for the general case. He contributed important findings to the theory of the functions of several variables and simplified the proof of the main theorem of conformal representation of simply connected regions on the unit-radius circle. His investigations of the geometrical-set theoretic properties of boundaries resulted in his theory of boundary correspondence. He also contributed to thermodynamics and helped to develop Einstein's special theory of relativity.

His published works include *Vorlesungen über reelle Funktionen* (1918; "Treatise on Real Functions"), *Conformal Representation* (1932), *Geometrische Optik* (1937; "Geometrical Optics"), *Reelle Funktionen* (1939; "Real Functions"), and *Funktionentheorie,* 2 vol. (1950; "Function Theory").

Carausius, Marcus Aurelius Mausaeus (d. AD 293, Britain), officer in the Roman military service who created a short-lived independent state in Britain.

Born in Menapia, a district between the Scheldt and Meuse rivers (now in Belgium), Carausius was a pilot by profession. He had won honour in the Roman war against the Bagaudae. In about AD 285, Maximian, coruler with the emperor Diocletian, had assembled a naval force to counter the Franks and Saxons who were then plundering the coasts of Spain and Gaul. Carausius was given command of this fleet, which was based at Gesoriacum (modern Boulogne).

Apparently Carausius would wait until after the pirates had carried out raids, then attack the pirates and seize their cargoes for himself. Enraged by this, Maximian ordered Carausius' death, but Carausius quickly escaped with his troops into Britain, where he set himself up as ruler, with the title of Augustus. He trained the local barbarians as sailors and soon controlled the western sea.

Very little is known of Carausius' character. He was, of course, maligned by imperial chroniclers. Diocletian and Maximian failed in several attempts to dislodge him and were temporarily forced to acknowledge him as ruler of Britain, probably in 290. Carausius was slain by his own chief officer, Allectus, in 293.

Caravaca, city, in the province and *comunidad autónoma* ("autonomous community") of Murcia, southeastern Spain, about 40 miles (65 km) west-northwest of Murcia city. The city's churches include El Salvador (16th century), designed by Juan de Herrera, and La Santísima Cruz (1617), which once housed the miraculous Cross of Caravaca. Given to the Knights Templars by Ferdinand III of Castile, who took it from the Moors in 1241, Caravaca later passed to the military Order of Santiago. It is now a centre of shoe and sandal manufacturing and also produces textiles, brandy, and chocolate. Pop. (1981) 20,231.

Caravaggio, byname of MICHELANGELO MERISI (b. 1571?, Milan?—d. July 18, 1610, Port'Ercole, Tuscany), Italian painter whose revolutionary technique of tenebrism, or dramatic, selective illumination of form out of deep shadow, became a hallmark of Baroque painting. Scorning the traditional idealized interpretation of religious subjects, he took his models from the streets and painted them realistically. His three paintings of St. Matthew (*c.* 1597–1602; S. Luigi dei Francesci, Rome) caused a sensation and were followed by such masterpieces as "The Supper at Emmaus" (1596–98) and "Death of the Virgin" (1605–06).

Early life. Caravaggio was the son of Fermo Merisi, steward and architect of the Marquis of Caravaggio. Orphaned at age 11, Caravaggio was apprenticed in the same year to the painter Simone Peterzano of Milan.

At some time between 1588 and 1592, Caravaggio went to Rome. He was already in possession of the fundamental technical skills

"The Calling of St. Matthew," oil on canvas by Caravaggio, c. 1597–98; in the Contarelli Chapel, S. Luigi dei Francesci, Rome
Anderson—Alinari from Art Resource/EB Inc.

of painting and had acquired, with characteristic eagerness, a thorough understanding of the approach of the Lombard and Venetian painters, who, opposed to idealized Florentine painting, had developed a style that was nearer to representing nature and events. Travelling from Milan to Rome, the young painter must certainly have stopped at Parma, Bologna, Florence, and Assisi and seen the works of the Carracci, contemporary innovators from Bologna, and the earlier masterpieces of Masaccio and Giotto. These encounters probably influenced Caravaggio to temper with a firmer line his Milanese technique, vibrant with chromatic and atmospheric transparency, and to discipline in formal composition the passionate, almost instinctive adherence to reality that appears in his plainest and most humble subjects.

First years in Rome. Caravaggio arrived in Rome at the beginning of the last decade of a century that had been dominated artistically by Michelangelo, held to be without equal, and dominated intellectually by the Council of Trent, which launched the energetic and exuberant period of the Counter-Reformation. Rome was a city in ferment, overflowing with visitors, among whom were artists from all over the world, like Caravaggio moved by ambition and necessity, seeking glory and fortune. Caravaggio settled into the cosmopolitan society of the Campo Marzio. This decaying neighbourhood of inns, eating houses, temporary shelter, and little picture shops in which Caravaggio came to live suited his circumstances and his temperament. He was virtually without means, and his inclinations were always toward anarchy and against tradition.

These first five years were an anguishing period of instability and humiliation. According to his biographers, Caravaggio was "needy and stripped of everything" and moved from one unsatisfactory employment to another, working as an assistant to painters of much smaller talent. He earned his living for the most part with hackwork and never stayed more than a few months at any studio. Finally, probably in 1595, he decided to set out on his own and began to sell his pictures through a dealer, a certain Maestro Valentino, who brought Caravaggio's work to the attention of Cardinal Francesco del Monte, a prelate of great influence in the papal court. Caravaggio soon came under the protection of Del Monte and was invited to receive board, lodging, and a pension in the house of the Cardinal.

Despite spiritual and material deprivations, Caravaggio had painted up to the beginning of Del Monte's patronage not fewer than some 40 works, many of them ambitious compositions. They form a series of astonishing pictorial inventions, which show great taste and delicacy in their craftsmanship and a sureness and felicity of expression that is in sharp contrast to the daily quality of Caravaggio's disorderly and dissipated life. These were works for private collectors. In each composition there is proof of Caravaggio's professional attitude toward painting. In particular, these early paintings proclaim his conviction that "it takes as much hard work to do flowers as a human figure" and that "the painter who is worth something can execute natural things well." In "Basket of Fruit" the fruits, painted with brilliance and vivid realism, are handsomely disposed in a straw basket, and they form a striking composition in their visual apposition.

Major Roman commissions. With these works reality won its battle with manner, but it is in the cycle of the life of St. Matthew in the Contarelli Chapel that Caravaggio's realistic naturalism first fully appears. Probably through the agency of Del Monte, Caravaggio obtained, in 1597, the commission for the decoration of the Contarelli Chapel in the church of S. Luigi dei Francesci in Rome. This commission established him, at the age of 24, as a *pictor celeberrimus,* a "renowned painter," with important protectors and clients. The task was an imposing one. The scheme called for three large paintings of scenes from the saint's life: "St. Matthew and the Angel," "The Calling of St. Matthew," and "The Martyrdom of St. Matthew." The execution of all three, in which Caravaggio substituted a dramatic realism imbued with disquieting social attitudes for the illustrative formulas of the hagiographic tradition, provoked public astonishment. Perhaps Caravaggio was waiting for this test, on public view at last, to reveal the whole range of his diversity. His novelty in these works is not only one of the surface appearance of structure and subject, but it involves the artistry itself, the sense of time and the light. The first version of the canvas that was to go over the altar, "St. Matthew and the Angel," was so offensive to the canons of S. Luigi dei Francesci, who had never seen such a representation of a saint, that it had to be redone. The Evangelist has the physical features of a plowman or a common labourer. His big feet seem to stick out of the picture, brutally thrown in the face of the faithful, and his posture, legs crossed, is awkward almost to the point of vulgarity. The angel does not stand graciously by but forcefully pushes Matthew's hand over the page of a heavy book, as if he were guiding an illiterate. What the canons did not understand was that Caravaggio, in elevating this humble figure, was copying Christ, who had himself raised Matthew from the street.

The other two scenes of the St. Matthew cycle are no less disconcerting in the realism of their drama. "The Calling of St. Matthew" shows the moment at which two men and two worlds confront each other: Christ, in a burst of light, entering the room of the toll collector, and Matthew, intent on counting coins in the midst of a group of gaily dressed idlers with swords at their sides. In the glance between the two men, Matthew's world is dissolved. In "The Martyrdom of St. Matthew" the event is captured just at the moment when the executioner is forcing his victim to the ground. The scene is a public street, and, as Matthew's acolyte flies in terror, passersby glance at the act with idle unconcern. The most intriguing aspect of these narratives is that they seem to be reconstructions of visual testimony, in a scenic fiction as close as possible to the truth, as if they were being performed in thick darkness when a sudden illumination revealed them and fixed them in memory at the instant of their most intense drama.

Light is the instrument of Caravaggio's pictorial revolution: it is as active and determining of the structure of the work as line and colour. A 20th-century art critic, Robert Longhi, compared the importance of Caravaggio's use of light to that of the Renaissance discovery of perspective. His light is not that of nature; it is a magical light that falls solidly from above, almost always from a point at the onlooker's shoulder, a stage light that modifies the colour scheme so that it loses affected subtleties like the iridescence of skin and becomes terse, emphatically dark in tone. The 17th-century painter Francesco Albani said Caravaggio "ground flesh" instead of colours.

The decoration of the Contarelli Chapel was completed by 1602. Caravaggio, though not yet 30, overshadowed all his contemporaries. There was a swarm of orders for pictures, private and ecclesiastical. Some of these paintings, done at the high point of Caravaggio's artistic maturity, provoked violent reaction. The "Madonna with Pilgrims," or "Madonna di Loreto," for the church of S. Agostino, was a scandal because of the "dirty feet and torn, filthy cap" of the two old people kneeling in the foreground. The "Death of the Virgin" was refused by the Carmelites because of the indignity of the Virgin's plebeian features, bared legs, and swollen belly like that of a drowned woman. At the advice of Rubens, the picture was bought by the Duke of Mantua in April 1607 and displayed to the community of painters at Rome for one week before removal to Mantua.

Culmination of mature style. Artists, men of learning, and enlightened prelates were fascinated by the subtle magic implicit in the robust and bewildering art of Caravaggio, but the negative reaction of church officials reflected the self-protective irritation of academic painters and the instinctive resistance of the more conservative clergy and much of the populace. The more brutal aspects of Caravaggio's paintings were condemned without recognition of the riddling and disquieting message Caravaggio had linked to them. It is true that Caravaggio's common people bear no relation to the graceful suppliants popular in much of Counter-Reformation art. They are plain working men, muscular, stubborn, tenacious of the only good they have: a hard life that will pass away in martyrdom, death, and poverty. The 20th-century art historian Maurizio Calvesi sees in Caravaggio's iconography an inclination away from orthodoxy. In the "Madonna of the Serpent," the Virgin is small in relation to the figure of Jesus, and while she steps on the serpent's head, it is the

force of his foot pressing down on hers that crushes it. The act belongs to Jesus and not to the Virgin, immaculate symbol of the church, as tradition would have the scene. Calvesi suggests that the reason God the Father does not appear in "The Conversion of St. Paul," where he is traditionally present, is that Caravaggio's lighting is based on a principle close to the teachings of the heretic Giordano Bruno of immanent divinity, which holds that the divine participates and is inherent in nature and man.

Criticism did not cloud Caravaggio's success. His reputation and income increased, and he began to be envied. The despairing bohemian of the early Roman years had disappeared, but, although he moved in the society of cardinals and princes, the spirit was the same, still given to wrath and riot.

The details of the first Roman years are unknown, but after the time of the Contarelli project Caravaggio had many encounters with the law. In 1600 he was accused of blows by a fellow painter, and the following year he wounded a soldier. In 1603 he was imprisoned on the complaint of another painter and released only through the intercession of the French ambassador. In April 1604 he was accused of throwing a plate of artichokes in the face of a waiter, and in October he was arrested for throwing stones at the Roman Guards. In May 1605 he was seized for misuse of arms, and on July 29 he had to flee Rome for a time because he had wounded a man in defense of his mistress. Within a year, on May 29, 1606, again in Rome, during a furious brawl over a disputed score in a game of tennis, Caravaggio killed one Ranuccio Tomassoni.

Flight from Rome. In terror of the consequences of his act, Caravaggio, himself wounded and feverish, fled the city and sought refuge on the nearby estate of a relative of the Marquis of Caravaggio. He then moved on to other places of hiding and eventually reached Naples, probably in early 1607. He remained at Naples for a time, painting a "Madonna of the Rosary" for the Flemish painter Louis Finson and one of his late masterpieces, "The Seven Works of Mercy," for the chapel of Monte della Misericordia. It is impossible to ignore the connection between the dark and urgent nature of this painting and what must have been his desperate state of mind. It is also the first indication of a shift in his painting style.

At the end of 1607 or the beginning of 1608, Caravaggio travelled to Malta, where he was received as a celebrated artist. He worked hard, completing several works, the most important of which was "The Beheading of St. John the Baptist" for the cathedral. In this scene of martyrdom, shadow, which in earlier paintings stood thick about the figures, is here drawn back, and the infinite space that had been evoked by the huge empty areas of the earlier compositions is replaced by a high, overhanging wall. This high wall, which reappears in later works, can be linked to a consciousness in Caravaggio's mind of condemnation to a limited space, the space between the narrow boundaries of flight and prison. On July 14, 1608, Caravaggio was received into the Order of Malta as a "Knight of Justice"; soon afterward, however, either because word of his crime had reached Malta or because of new misdeeds, he was expelled from the order and imprisoned. He escaped, however.

Caravaggio took refuge in Sicily, landing at Syracuse in October 1608, restless and fearful of pursuit. Yet his fame accompanied him; at Syracuse he painted his late, tragic masterpiece, "The Burial of St. Lucy," for the church of Sta. Lucia. In early 1609 he fled to Messina, where he painted "The Resurrection of Lazarus" and "The Adoration of the Shepherds"; then to Palermo where he did the "Adoration with St. Francis and St. Lawrence" for the Oratorio di S. Lorenzo. The works of Caravaggio's flight, painted under the most adverse of circumstances, include some of the greatest compositions of his career. Although the structural designs are more grandly impressive than ever before, these works show a subdued tone and a delicacy of the expression of emotion that renders feeling even more intense than do the overt dramatics of his earlier paintings. The unfailing excellence of these calm, intense works is remarkable in view of the distractions that must have beset him.

His desperate flight could be ended only with the Pope's pardon, and Caravaggio may have known that there were intercessions on his behalf in Rome when he again moved north to Naples in October 1609. Bad luck pursued him, however; at the door of an inn he was attacked and wounded so badly that rumours reached Rome that the *pittore celebre* was dead. After a long convalescence he sailed in July 1610 to Port'Ercole, a Spanish possession within the Papal States. He was arrested by mistake and detained in prison. On his release, he discovered that the boat that was to take him to Rome had sailed, taking his belongings. Misfortune, exhaustion, and a revival of fever were at last too much for him. He collapsed on the beach in sight of the departing boat and died a few days later, not yet 37.

Assessment. Caravaggio was probably the most revolutionary artist of his time. Abandoning the Platonic ideal of representing human and religious experience through idealized types that had guided a century of art before him, he kept his eye firmly on man, discovering that life is always a drama and that all experience, even mystical, seems to take its first steps within the concreteness and sensuality of physical phenomena.

Possessed of an intensely emotional and rebellious personality and with a thorough understanding of the significance of real events in a physical world, he became in his work a master of the dramatic moment; his paintings reveal dramatic tension drawn to the snapping point. His view of man remains unique in his period of art, however, and, although he was widely admired and his techniques imitated, he was a solitary figure in his own time.

(L.Ca.)

MAJOR WORKS. "The Young Bacchus" (1593; Uffizi, Florence); "Boy Bitten by a Lizard" (1593; Louvre, Paris); "Boy with a Basket of Fruit" (1593; Borghese Gallery, Rome); "The Fortune-teller" ("La Zingara"; 1594; Louvre); "Rest on the Flight into Egypt" (*c.* 1590; Galleria Doria-Pamphili, Rome); "The Sacrifice of Isaac" (1594–96; Uffizi); "Lute Player" (Hermitage, Leningrad); "The Magdalene" (Galleria Doria-Pamphili); "Basket of Fruit" (1596; Pinacoteca Ambrosiana, Milan); "The Supper at Emmaus" (1596–98; National Gallery, London); "The Calling of St. Matthew" (S. Luigi dei Francesci, Rome); "St. Matthew and the Angel" (S. Luigi dei Francesci); "The Martyrdom of St. Matthew" (1598–1601; S. Luigi dei Francesci); "The Conversion of St. Paul" (Sta. Maria del Popolo, Rome); "The Crucifixion of St. Peter" (1601; Sta. Maria del Popolo); "The Deposition of Christ" (1602–04; Vatican Museum); "Madonna with Pilgrims" ("Madonna di Loreto"; 1603–06; S. Agostino, Rome); "Madonna dei Palafrenieri" ("Madonna of the Serpent"; Borghese Gallery); "Death of the Virgin" (1605–06; Louvre); "St. Jerome" (Borghese Gallery); "Ecce Homo" (Galleria di Palazzo Rosso, Genoa); "The Supper at Emmaus" (Brera, Milan); "Madonna of the Rosary" (Kunsthistorisches Museum, Vienna); "The Seven Works of Mercy" (1607; Monte della Misericordia, Naples); "The Beheading of St. John the Baptist" (1608; Cathedral, Valletta, Malta); "Portrait of Alof de Wignacourt" (1608; Louvre); "Sleeping Cupid" (Pitti Palace, Florence); "St. John the Baptist" (Borghese Gallery); "Salome Receives the Head of St. John the Baptist" (National Gallery, London); "The Burial of St. Lucy" (1608; Sta. Lucia, Syracuse, Italy); "The Resurrection of Lazarus" (1609; Museo Nazionale, Messina, Italy); "The Adoration of the Shepherds" (1609; Museo Nazionale, Messina); "Adoration with St. Francis and St. Lawrence" (1609; Oratorio di S. Lorenzo, Palermo).

BIBLIOGRAPHY. R. Longhi, the introduction to the catalog of the exhibition *Il Caravaggio e dei Caravaggeschi* (1951); and *Il Caravaggio* (1952), in French and Italian (with complete bibliography to date of publication), are fundamental for understanding both the man and the artist. Other important studies are: L. Venturi, *Il Caravaggio* (1951); B. Berenson, *Del Caravaggio, delle sue incongruenze e della sua fama* (1951; *Caravaggio: His Incongruity and His Fame,* 1953); W.F. Friedlaender, *Caravaggio Studies* (1955); H. Wagner, *Michelangelo da Caravaggio* (1958); A. Berne-Joffroy, *Le Dossier Caravage* (1959); R. Jullian, *Caravage* (1961), perhaps the best monograph (well documented); R.P. Hinks, *Michelangelo Merisi du Caravaggio: His Life, His Legend, His Works* (1953); F.E. Baumgart, *Caravaggio: Kunst und Wirklichkeit* (1955); and G. DeLogu, *Caravaggio* (1962). Among the popular monographs are: C. Baroni, *Tutta la pittura del Caravaggio,* 4th ed. (1956); S. Bottari, *Caravaggio* (1966; Eng. trans. 1971); R. Causa, *Caravaggio,* 2 vol. (1966); and A. Ottino della Chiesa, *L'opera completa del Caravaggio* (1967), which contains the most ample iconography of the works attributed to Caravaggio. S. Samek Ludovici, *Vita del Caravaggio* (1966), condenses all material on Caravaggio by the authors in his own time.

Caravanche (Yugoslavia–Austria): *see* Karawanken.

caravansary, also spelled CARAVANSERAI, in the Middle East, building for sheltering caravans. Commonly constructed outside the walls of a town or village, the structure is quadrangular, enclosed by a massive wall with small windows near the top and a few narrow air holes near the bottom. A heavy-doored gateway, wide enough to admit loaded camels, is the sole entrance.

Caravansary near Alanya, Tur.
V-DIA—SCALA from Art Resource/EB Inc.

Inside, a cloister-like arcade surrounded by cellular storerooms forms the ground floor and is connected by broad, open, stone stairways to an arcaded second story. The ground floor is used for storing the bales of merchandise, and meals are cooked in the corner of the quadrangle; upstairs rooms are for lodging. The paved central court, usually large enough to contain 300 or 400 crouching camels or tethered mules, is open to the sky and has a well with fountain basin in its centre. Neither food nor provender is supplied, but municipally appointed porters protect the travellers and maintain order.

Khans, often confused with caravansaries, are more analogous to inns and hotels. They are generally located within the town or village precincts, provide food and more elaborate lodgings, and are much smaller than caravansaries.

caravel, sailing ship, in its later form equipped with lateen (fore-and-aft) sails, originating in the Mediterranean in the late Middle Ages. The term is evidently a corruption of "carvel," referring to the edge-to-edge joining of a ship's

planks. Columbus' ships "Pinta" and "Niña" were caravels.

caraway, the dried fruit, commonly called seed, of *Carum carvi,* a biennial herb of the parsley family (Apiaceae, or Umbelliferae), native to Europe and western Asia and cultivated since ancient times. Caraway has a distinctive aroma reminiscent of anise and a

Caraway (*Carum carvi*)
Walter Dawn

warm, slightly sharp taste. It is used as a seasoning in meat dishes, breads, and cheese, and in such vegetables as sauerkraut and cabbage. Caraway of The Netherlands has traditionally had a reputation for high quality.

The plant has finely cut leaves and compound umbels of small white flowers. The fruit, or seed, light to dark brown in colour, is a crescent about 0.2 inch (5 millimetres) long with five prominent longitudinal dorsal ridges.

The essential oil content is about 5 percent; *d*-carvone and *d*-limonene are the principal components. The oil is used to flavour alcoholic beverages, notably aquavit and kümmel, and in medicine as an aromatic stimulant and carminative.

Carazo, department, southwestern Nicaragua, bounded on the southwest by the Pacific Ocean. The 398-sq-mi (1,032-sq-km) department rises from the coastal lowlands into a range of volcanic mountains. Most of the population is concentrated in the valleys and on the lower slopes in its eastern half. This area, with deep fertile soils and 47 in. (1,200 mm) of rainfall annually, produces coffee, tobacco, corn (maize), beans, and other fruits and vegetables. Jinotepe (*q.v.*), the departmental capital and a coffee-growing centre, and Diriamba (*q.v.*), its largest city, are linked by railroad and the Pan-American Highway with Managua, the national capital. Pop. (1981 est.) 109,450.

carbamide (chemistry): *see* urea.

carbanion, any member of a class of organic compounds in which a negative electrical charge is located predominantly on a carbon atom. Carbanions are formally derived from neutral organic molecules by removal of positively charged atoms or groups of atoms, and they are important chiefly as chemical intermediates—that is, as substances used in the preparation of other substances. Important industrial products, including useful plastics, are made using carbanions.

The simplest carbanion, the methide ion (CH_3^-), is derived from the organic compound methane (CH_4) by a loss of a proton (hydrogen ion, H^+) as shown in the following chemical equation:

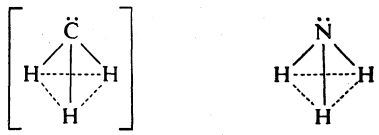
$$CH_4 \rightleftharpoons CH_3^- + H^+$$

methane methide ion proton

in which the symbols C and H represent, respectively, carbon and hydrogen atoms; the subscripts indicate the numbers of atoms of each kind included in the molecules; the superscript plus and minus signs indicate, respectively, positive and negative charges; and the double arrows indicate that the reaction shown can proceed in either the forward or the reverse direction, a condition known as reversibility.

Molecular structures. In discussing the structures of carbanions it is necessary to distinguish between localized and delocalized ions. In the former, the negative charge is confined largely to one carbon atom, whereas, in the latter, it is distributed over several atoms.

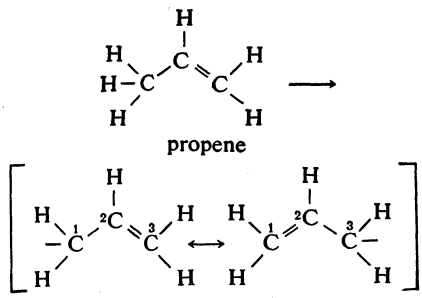
Localized ions. The simplest localized carbanion is the methide ion (CH_3^-). It is isoelectronic (it has identical electron configuration) with the neutral molecule ammonia (formula NH_3, N being the chemical symbol for the nitrogen atom). The geometry of the methide ion is best represented by a pyramid with the carbon atom at the apex, a structure similar to that of the ammonia molecule. Both structures are shown below:



methide ion ammonia molecule

in which the solid lines represent bonds between atoms and the dotted lines merely indicate the bases of the pyramids.

Delocalized ions. The allyl carbanion (formula, $C_3H_5^-$), a somewhat more elaborate unit than the methide ion, serves as the prototype for the structures of delocalized carbanions. It is derived from the substance propene by loss of a proton, as shown in the equation below, and its structure is best characterized by the "resonance" relationship expressed by the two formulas enclosed within square brackets:

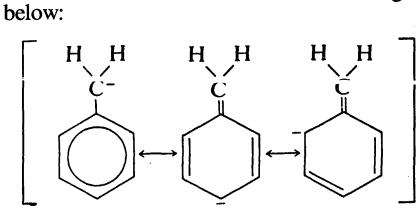


propene

resonance forms of the allyl carbanion

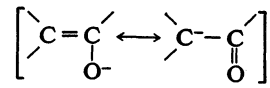
A substance (like the allyl carbanion), whose structural formula is expressed in terms of separate resonance forms, is considered to have a hybrid structure similar to all the resonance forms but truly expressed by none of them alone.

An additional example of this kind of carbanion is the benzylic anion (shown below), in which the negative charge can be distributed over a much more extended pi-bond system, which includes an aromatic ring (a circle of carbon atoms joined by sigma and pi bonds). A resonance formulation of this anion is given below:



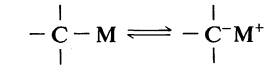
resonance forms of benzylic anion

Closely related to the allyl carbanion are the enolate anions, in which one of the carbon atoms is replaced by an oxygen atom. Enolate ions are derivatives of ketones and aldehydes (compounds containing a double bond between carbon and oxygen atoms), from which they can be generated by abstraction of a proton from the carbon atom located next to the carbon of the carbonyl group. The resonance forms of an enolate ion are as shown below:



Because of the greater attraction for electrons (electronegativity) of oxygen as compared to carbon, the resonance structure with negative charge on oxygen contributes more than half to the true representation of the compound. In a typical enolate ion, in other words, the oxygen atom bears more of the negative charge than the carbon atom.

Ion pairs. In a solution containing carbanions there must exist a corresponding cation (positive ion) for each carbanion. If the two ions of opposite charge are in close contact with each other, a covalent (nonionic) bond may form. This reaction is represented by the equilibrium that follows:



compound with covalent bond ion pair

in which M in most cases is a metal atom. Because for a given carbanion the reaction of ionization is favoured by a low electron affinity of the cation, the largest carbanion character of such a compound is exhibited when the atom M is an alkali metal—lithium, sodium, potassium, cesium, and rubidium. Even in cases in which the tendency to form covalent bonds is negligible, however, the properties of free carbanions cannot always be observed. This situation arises from the fact that there is a strong attraction between the cation and the anion, leading to the pairing of these ions of opposite charge. The resulting "tight" ion pairs can be broken up only if the interactions of the individual ions with the solvent are large enough to overcome the attraction between the ions. Therefore, only in solvents that strongly solvate at least one type of the ions can free carbanions be observed. Examples of solvents with strong tendencies to solvate the cations are ethers and dimethyl sulfoxide. In general, the energy needed to separate ion pairs is larger when the charge on the anion is localized than when it is delocalized. In fact, if the carbanion is derived from a simple alkane compound of carbon and hydrogen, as for example the methide ion (above), no common solvent exists that provides enough solvation energy to separate the ion pairs and that is, at the same time, inert to chemical reaction with the anion. Therefore, alkyl alkali-metal compounds do not dissociate to free ions, and their properties are characteristic of the ion pairs only.

Preparation. Any preparation of organic-alkali-metal compounds is a source of carbanions. The reaction of organic compounds containing atoms of chlorine, bromine, or iodine with alkali metals is one of the most often used methods. This reaction can be expressed:

$$R\text{-}X + 2M \longrightarrow R^-M^+ + M^+X^-$$

R-X: organic halide 2M: metal atoms

R^-M^+: carbanion-metal ion pair M^+X^-: metal ion-halide ion pair

in which R is an organic group; X is an atom of chlorine, bromine, or iodine; and M is an atom of an alkali metal.

The conversion of one carbanion into another can be accomplished with either hydrocarbons or organic halides, as shown by the equations below:

$$\underset{\text{organic halide}}{\text{R-X}} + \underset{\text{carbanion-metal ion pair}}{\text{R}'^{-}\text{M}^{+}} \longrightarrow$$

$$\underset{\text{carbanion-metal ion pair}}{\text{R}^{-}\text{M}^{+}} + \underset{\text{organic halide}}{\text{R}'\text{-X}}$$

$$\underset{\text{hydrocarbon}}{\text{R-H}} + \underset{\text{carbanion-metal ion pair}}{\text{R}'^{-}\text{M}^{+}} \longrightarrow$$

$$\underset{\text{carbanion-metal ion pair}}{\text{R}^{-}\text{M}^{+}} + \underset{\text{hydrocarbon}}{\text{R}'\text{-H}}$$

Reactions. Perhaps the most common reaction of carbanions is their action as bases—as shown in the first equation in this article. It is useful to redefine this acid–base equilibrium by the equation:

$$\underset{\text{hydrocarbon}}{-\overset{|}{\underset{|}{\text{C}}}-\text{H}} + \underset{\text{base}}{\text{Y}} \rightleftharpoons$$

$$\underset{\text{carbanion}}{-\overset{|}{\underset{|}{\text{C}^{-}}}} + \underset{\text{conjugate acid}}{\text{YH}^{+}}$$

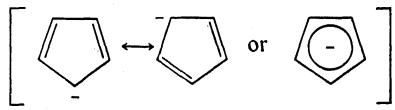
in which Y is a proton acceptor (base).

Consideration of carbanion formation in terms of such an equilibrium makes it possible to assign a numerical value to the basicity (proton-attracting power) of the carbanion. This is done by determining an equilibrium constant for the equilibrium reaction above; the equilibrium constant is the ratio

$$K_a = \frac{\left[-\overset{|}{\underset{|}{\text{C}^{-}}}\right]\left[\text{YH}^{+}\right]}{\left[-\overset{|}{\underset{|}{\text{C}}}-\text{H}\right]\left[\text{Y}\right]}$$

in which K_a is the acid equilibrium constant, and the terms in square brackets are the concentrations of the enclosed entities. For convenience equilibrium constants are frequently converted to another quantity, the acidity exponent, which is almost invariably referred to by its symbolic representation, pK_a. The pK_a is the negative logarithm of the equilibrium constant, or mathematically, $pK_a = -\log K_a$. For a given base (Y), increasing basicity of a carbanion is reflected in a decreasing equilibrium constant (K_a) and an increasing pK_a.

The pK_a's of most carbon acids range from approximately 15 to above 40, indicating that carbanions are much stronger bases than water (which has a pK_a of 15.7). The large variation in pK_a among the different carbon acids reflects the varying degree of internal stabilization in the corresponding carbanions. Generally, three different mechanisms of stabilizing carbanions have been recognized. The first is the already mentioned stabilization by resonance. Examples of resonance-stabilized carbanions are the allyl and benzyl carbanions, each of which has a pK_a of about 35. Particularly large resonance stabilization is encountered in the cyclopentadienyl anion (pK_a about 15), which has an aromatic pi electron system not present in the corresponding hydrocarbon, as shown below:



cyclopentadienyl anion

A second factor lending stability to carbanions is the inductive (electron-withdrawing) effect of neighbouring electronegative atoms. An example is provided by the comparison of the pK_a's of methane (formula, CH_4), pK_a about 40, and chloroform ($CHCl_3$), pK_a less than 25. The greater stability of the trichloromethide ion,

$$\begin{array}{l} \text{Cl} \\ | \\ {}^{-}\text{C}-\text{Cl} \\ | \\ \text{Cl} \end{array}$$

trichloromethide ion

which results from removal of a proton from chloroform, can be understood in terms of the inductive effect of the chlorine atoms, which reduces the free charge on carbon and distributes it to the chlorine atoms.

The third effect is based on a change in electronegativity of the carbon atom carrying the negative charge. An example of this effect is the sequence of decreasing pK_a's from ethane through ethylene to acetylene (the respective pK_a's being 42, 36, and 25). In the corresponding carbanions, shown below, the negative charge resides on carbon atoms that are, respectively, sp^3, sp^2, and sp hybridized.

$$\underset{\text{ethide carbanion}}{\text{CH}_3\text{CH}_2^{-}}, \quad \underset{\text{ethenide carbanion}}{\text{H}_2\text{C}{=}\text{CH}^{-}}, \quad \underset{\text{acetylide carbanion}}{\text{HC}{\equiv}\text{C}^{-}}$$

Since the electronegativity of the carbon increases with increasing *s*-character of the bonding (that is, in the order sp^3, sp^2, and sp) the carbanion stability follows the same trend.

A type of reaction that makes carbanions valuable synthetic intermediates is their ability to function as nucleophiles (positive-charge seeking groups) in displacement reactions. Methylsodium, for example, reacts with methyl bromide to give ethane, as follows:

$$\underset{\text{methylsodium}}{\text{CH}_3{}^{-}\text{Na}^{+}} + \underset{\text{methyl bromide}}{\text{CH}_3\text{Br}} \longrightarrow$$

$$\underset{\text{ethane}}{\text{CH}_3\text{CH}_3} + \underset{\text{sodium bromide}}{\text{NaBr.}}$$

This reaction type is extensively used for the alkylation of ketones. In the process, the ketones are first converted into their enolate ions and then alkylated with a suitable alkyl halide, as in the example below:

$$\underset{\text{ketone}}{-\overset{|}{\underset{\text{H}}{\text{C}}}-\overset{\text{O}}{\overset{\|}{\text{C}}}-\text{R}} \xrightarrow{\text{base}}$$

$$\underset{\text{enolate ion}}{-\overset{|}{\underset{}{\text{C}}}-\overset{\text{O}}{\overset{\|}{\text{C}}}-\text{R}} \xrightarrow[\text{(alkyl halide)}]{\text{R}'-\text{X}} \underset{\text{alkylation product}}{-\overset{|}{\underset{\text{R}'}{\text{C}}}-\overset{\text{O}}{\overset{\|}{\text{C}}}-\text{R}}$$

Another synthetically useful reaction is the addition of carbanions to carbonyl groups; for example, methyllithium adds to acetone to give lithium *tert*-butoxide, as shown

$$\underset{\text{methyllithium}}{\text{CH}_3\text{Li}} + \underset{\text{acetone}}{\text{H}_3\text{C}-\overset{\text{O}}{\overset{\|}{\text{C}}}-\text{CH}_3} \longrightarrow$$

$$\underset{\text{lithium } \textit{tert}\text{-butoxide}}{\begin{array}{l} \text{CH}_3 \\ | \\ \text{H}_3\text{C}-\text{C}-\text{CH}_3. \\ | \\ \text{OLi} \end{array}}$$

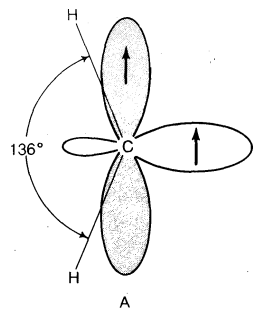
BIBLIOGRAPHY. A basic reference is D.J. Cram, *Fundamentals of Carbanion Chemistry* (1965).

(G.L.C./Ed.)

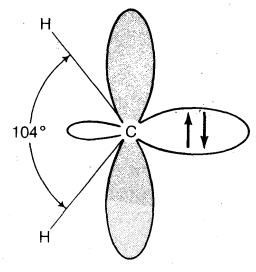
carbene, any member of a class of highly reactive molecules containing divalent carbon atoms—that is, carbon atoms that utilize only two of the four bonds they are capable of forming with other atoms. Occurring usually as transient intermediates during chemical reactions, they are important chiefly for what they reveal about chemical reactions and molecular structure. In addition, some chemical compounds, particularly those in which the molecules contain carbon atoms arranged in small rings, can best be prepared by the use of carbenes.

According to the electronic theory of bonding, bonds between atoms are formed by a sharing of electrons. In terms of this theory, then, a carbene is a compound in which only two of the four valence, or bonding, electrons of a carbon atom are actually engaged in bonding with other atoms. By contrast, in multiple bonded compounds, such as hydrogen cyanide, all four of the valence electrons of the atoms are involved in bonds with other atoms. Because there is no excess or deficiency of electrons in the molecules of carbenes, they are electrically neutral (nonionic).

Early investigations. Because of the great reactivity of carbenes, they normally have very short lifetimes, and it is not surprising, therefore, that unambiguous and direct experimental evidence of their existence has been obtained only recently. Divalent carbon



A



B

Nonbonding orbitals in the (A) triplet and (B) singlet state of methylene; the axis of the shaded orbital is perpendicular to the plane defined by the carbon atom (C), the hydrogen atoms (H), and the unshaded orbital

compounds had been postulated, however, as long ago as 1876, when it was proposed that dichlorocarbene, Cl—C—Cl, was an intermediate in the base-catalyzed hydrolysis (decomposition brought about by water) of chloroform ($HCCl_3$). Toward the end of the 19th century, an extensive theory had been developed that postulated divalent carbon compounds as intermediates in many reactions. Later work, however, disproved many of these postulates, and, as a result, carbenes were no longer put forward as hypothetical reaction intermediates. Carbene chemistry revived in the 1950s after unambiguous evidence had demonstrated their existence and studies by several methods had yielded detailed information about their structures.

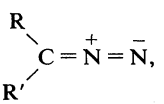
Electronic configuration and molecular structure. The theory of chemical bonding predicts two fundamentally different electron configurations for carbenes, either one of which may correspond to the ground state of the molecules (state of lower energy content) depending only on the nature of the atoms and groups attached to the divalent carbon atom. This duality arises from the fact that the two bonds of the carbene utilize only two of the four valence orbitals on carbon—orbitals being the regions occupied by the various electrons in an atom. The two valence orbitals of the carbon atom not used in bonding are available to accept the two nonbonding electrons. In general, each orbital can accommodate two electrons if their spins are paired—that is, if the angular momenta are of opposite sign. There are thus two possible distributions of the nonbonding electrons: they may be in the same orbital and have paired (opposite) spins, or they may be divided between the two available orbitals and have parallel spins. Substances with electrons having parallel (or unpaired) spins show a magnetic effect (moment). In a magnetic field this moment may be parallel, perpendicular, or antiparallel (parallel but proceeding in the reverse direction) to the direction of the field; these three possible alignments correspond to three forms of slightly different energy, and, as a result, substances with unpaired electrons can exist in all three forms and are said to be in a triplet state. By contrast, substances with all electrons paired show no net magnetic moment and are referred to as singlet states. In principle, carbenes can exist in either the singlet or triplet state (depending upon whether the electrons are in the same or different orbitals, respectively).

In most organic compounds (compounds of carbon), the singlet state is more stable than the triplet state, and the normal or ground state of the molecule is of this form. In these compounds triplets occur only as excited or high-energy states. In carbenes, on the other hand, because of the two nonbonding electrons and the two vacant orbitals, it is expected on theoretical grounds that the triplet state should be of comparable stability to the singlet state and may, in fact, be the ground state.

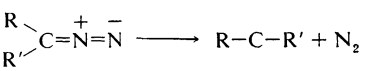
Theoretical considerations also suggest that the carbene carbon atom and the two atoms joined to it are arranged in a "V" rather than in a linear fashion—that is, the bonds from the carbon atom to the two substituent atoms are situated at an angle that is less than 180°—in both the triplet and the singlet states. The bond angle for the singlet state, however, is predicted to be larger than that for the triplet state. These predictions are fully supported by experiments. The simplest carbene, methylene, has been shown by a technique called electron magnetic resonance spectroscopy to have a triplet ground state, in which the angle between the carbon–hydrogen bonds equals 136°. The singlet state of methylene, which can be obtained in special circumstances, has been studied by another technique, optical spectroscopy, and its bond angle has been determined to be 104°. The structures and the configurations of the nonbonding electrons of the triplet and singlet states of methylene are shown as A and B in the accompanying drawing; the loops represent the orbitals not used in bonding, and the pairing and nonpairing of electron spins are indicated by antiparallel and parallel arrows, respectively. This schematic orbital representation shows both nonbonding orbitals occupied in A (the triplet state) and an empty orbital in B (singlet).

The structural features that determine whether a singlet or a triplet state corresponds to the lower energy form of the carbene molecule may be summarized by the rule that, with few exceptions, carbenes having only carbon or hydrogen atoms attached to the divalent (carbene) carbon atom have triplet ground states, whereas those with nitrogen, oxygen, and halogen substituents have singlet ground states. Examples of triplet carbenes are methylene (H—C—H), phenylmethylene (C_6H_5—C—H), diphenylmethylene (C_6H_5—C—C_6H_5) and propargylene (HC≡C—C—H). Carbenes with known singlet ground states are methoxymethylene (CH_3O—C—H), chloromethylene (Cl—C—H), and phenylchloromethylene (C_6H_5—C—Cl).

Formation. Because carbenes are molecules with high energy content, they must be made from high-energy precursors, or extra energy must be provided from external sources. Chemical transformations induced by light, so-called photochemical reactions, often are used to prepare carbenes, because the energy of the absorbed light is taken into the high-energy structures. Organic compounds containing a diazo group (two nitrogen atoms joined to one another and to a carbon atom by a double bond) are the most frequently used precursors of carbenes. The molecular structure of diazo compounds is represented by the generalized formula



in which R and R′ represent two organic groups, which may be the same or different. On either photolysis or pyrolysis (treatment with light or heat, respectively), diazo compounds cleave to yield the corresponding carbene and a free molecule of nitrogen gas. Diazirins, which are ring, or cyclic, compounds, with a structure similar to that of the diazo compounds, undergo the same cleavage reaction and are frequently used as precursors of carbenes. The production of a carbene from a diazo compound occurs as shown below:

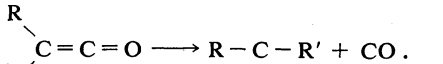


diazo compound — carbene — nitrogen

When the photolysis of diazo compounds is carried out at very low temperature in an unreactive solid medium, it is often possible to prevent the resulting carbene from undergoing further reaction. Measurable amounts of the carbene may persist, therefore, in the solid medium, or matrix, for a long time. For example, methylene, the most reactive carbene of all, has been generated in a crystalline matrix of the inert gas xenon (cooled to the boiling point of helium) in which it persisted long enough to be studied. Many other carbenes have been produced by similar matrix isolation techniques.

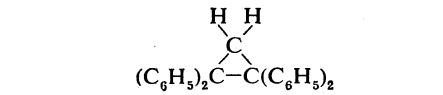
The photolytic decomposition of certain ketenes, substances the molecules of which contain two carbon atoms and an oxygen atom joined by double bonds,

gives carbon monoxide and carbenes, as shown in the following equation:

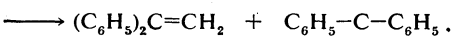


ketene — carbene — carbon monoxide

Under certain circumstances, cyclopropanes, the molecules of which contain three-membered carbon rings, can serve as carbene precursors in photochemical reactions. For example, 1,1,2,2,-tetraphenylcyclopropane is converted to diphenylcarbene by the reaction



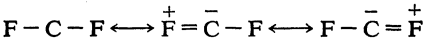
1,1,2,2-tetraphenylcyclopropane



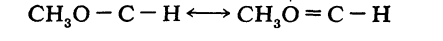
1,1-diphenylethylene — diphenylcarbene

The formation of carbenes by way of electrically charged, or ionic, intermediates is exemplified by the reaction of chloroform with a strong base, potassium *tert*-butoxide. In the first step of this reaction, a proton or hydrogen ion (H^+) is removed from the chloroform molecule in a normal acid–base reaction. The resulting potassium trichloromethide then loses potassium chloride to give dichlorocarbene. Other haloforms, compounds conforming to the formula HCX_3, in which X equals an atom of chlorine, bromine, or iodine, react in an equivalent way to form the corresponding dihalocarbenes.

Reactions. Methylene is one of the most reactive molecules known and there are few organic compounds able to resist attack by this substance. The reactivity of carbenes is somewhat reduced when stabilization results from the phenomenon known as resonance, which is said to occur when alternate electronic structures (called resonance forms) can be written for a single molecular type. The actual state of the molecule is then thought to include characteristics of all the forms and to be more stable than any of them individually. Difluorocarbene and methoxycarbene, for example, are much less reactive than methylene, presumably because the resonance forms shown in the formulas below contribute to internal stabilization.



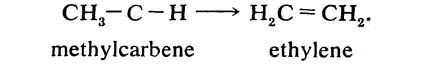
resonance forms of difluorocarbene



resonance forms of methoxycarbene

In these representations, the various resonance forms of a single hybrid structure are connected by double-headed arrows, and the plus and minus signs indicate positive and negative charges produced by shifts of electrons.

The various chemical reactions that carbenes undergo can be classified as either intramolecular or intermolecular reactions. Intramolecular reactions, or rearrangements, involve only the carbene itself and include no other outside substances; if structurally possible, they lead to stable molecules in which the carbon atom is in its normal, or tetravalent, state. An example of an intramolecular reaction is the rearrangement of methylcarbene to ethylene, in which a hydrogen atom undergoes a shift from one carbon atom to the next:



methylcarbene — ethylene

Such an intramolecular rearrangement, of course, is not possible for carbenes composed of only three atoms, such as methylene itself or the halomethylenes.

Intermolecular reactions are those involving two or more separate molecules. Three important classes of intermolecular reaction of carbenes are known: dimerization, addition, and insertion reactions. Dimerization of carbenes—combination of two molecules of the carbene—gives olefins, the molecular formulas of which are exactly twice that of the carbene. An example is the formation of tetramethoxyethylene from dimethoxycarbene.

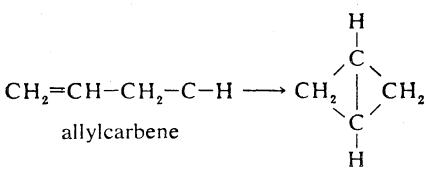
$$2CH_3O-C-OCH_3$$

dimethoxycarbene

$$\longrightarrow (CH_3O)_2C=C(OCH_3)_2$$

tetramethoxyethylene

The addition of carbenes to olefins and acetylenes is a very useful reaction because it constitutes a simple way to synthesize cyclopropanes and cyclopropenes having a great variety of structures. Intramolecular versions of this type of addition reaction are also possible, as shown by the cyclization of allylcarbene generated from the corresponding diazo compound. The resulting bicyclobutane—an unusual compound, which contains a ring system with considerable strain resulting from abnormal angles between bonds—demonstrates the value of carbene reactions for the synthesis compounds difficult to obtain by other methods.



allylcarbene

bicyclobutane

Analytical and physical study. Because carbenes occur chiefly as intermediates in the course of chemical reactions, much of their study is conducted by kinetic methods, as the general field of investigation of rates of reaction and the factors that influence them is known. Much of the available information about the structures of carbenes has been obtained by optical spectroscopic methods—that is, by the study of light absorption patterns—which have revealed, for example, the bond lengths and angles in the various carbenes. Electron-spin resonance spectroscopy, the physical method that gives information about the angular momenta of electrons, has been especially useful in differentiating triplet from singlet states. (G.L.C.)

BIBLIOGRAPHY. W. Kirmse, *Carbene Chemistry* (1964); G.L. Closs, *Topics in Stereochemistry*, vol. 3 (1968).

Carbet Mountains, French PITONS DU CARBET, volcanic massif on the Caribbean island of Martinique, in the Lesser Antilles, French West Indies. The peaks are about 3½ mi (6 km) from the west coast, standing between Saint-Pierre and Fort-de-France. They include Lacroix (3,924 ft [1,196 m]), Piquet (3,806 ft), Dumauzé (3,638 ft), Alma (3,625 ft), and Boucher (3,510 ft). The massif extends in a northwest to southeast direction for about 50 mi. It is the source of the water that wells up in hot springs at the town of Absalon. An observatory for studying Mt. Pelée (*see* Pelée, Mount) was built in 1932.

carbide, any of a class of chemical compounds in which carbon is combined with a metallic or semimetallic element. Calcium carbide is important chiefly as a source of acetylene and other chemicals, whereas the carbides of silicon, tungsten, and several other elements are valued for their physical hardness, strength, and resistance to chemical attack even at very high temperatures. Iron carbide (cementite) is an important constituent of steel and cast iron.

On the basis of their atomic structures, the carbides fall into three groups: ionic (saltlike), interstitial (metallic), and covalent (diamondlike). Metals of groups I, IIa, and IIIb of the periodic table commonly form ionic carbides, pure samples of which are transparent solids that are poor conductors of electricity; treatment with acids—or, in certain cases, even water—decomposes them into hydrocarbons and metal hydroxides. Metallic carbides most often are formed from metals of groups IVb, Vb, VIb, VIIb, and VIII; these compounds are very hard and electrically conductive; several of them, especially tungsten carbide and the carbides of titanium, tantalum, and niobium, are important components of the composite materials called cermets. Boron carbide and silicon carbide (Carborundum) resemble diamond in structure and approach it in hardness; they are highly resistant to chemical attack and are used as abrasives.

Carbides usually are prepared from carbon and either a metal or a metal oxide at temperatures of 1,000°–2,800° C (1,800°–5,100° F); in certain cases, a hydrocarbon or hydrogen is used to reduce a metal oxide or chloride.

carbine, light, short-barrelled musket or rifle. The word, the source of which is obscure, seems to have originated in the late or mid-16th century. The carbine, in various versions corresponding to the different full-sized military arms, was chiefly a cavalry weapon until the 18th century. Then some unmounted officers, artillerymen, and other specialists began to carry carbines. By the 1980s the trend toward general use of light assault rifles (*e.g.,* the Soviet AK-47 or the U.S. M16) was making the carbine obsolete as a military weapon. However, its light weight and short length had long made it a popular sporting arm for hunting in heavy brush and also as a scabbard weapon for horseback use.

Carbo, Gaius Papirius (d. 119 BC), Roman politician who supported the agrarian reforms of Tiberius Sempronius Gracchus but later deserted the Gracchan party.

As tribune in 131, Carbo carried a measure that extended voting by ballot to the enactment and repeal of laws. A year later he became a member of the Gracchan land commission but in 122 left the Gracchans to join their opponents, the Optimates (conservative senatorial aristocracy). His new allies rewarded him with the consulship in 120. Although he successfully defended Lucius Opimius, murderer of the reformer Gaius Gracchus, Carbo was nevertheless mistrusted by the Optimates. He committed suicide after being impeached on a charge of treason or extortion.

Carbo, Gnaeus Papirius (b. *c.* 130 BC—d. 82, Lilybaeum, Sicily), Roman general, leader of the forces of Gaius Marius in the civil war between Marius and Lucius Cornelius Sulla. In 87 he took part in Marius' blockade of Rome, which was at that time held by pro-Sullan forces. Rome capitulated, and Carbo and Lucius Cornelius Cinna, both consuls in 85, made preparations against the return of Sulla from the east.

Carbo and Cinna illegally declared themselves consuls again for the following year, and Carbo became sole consul when Cinna was murdered by his own soldiers. After fighting an indecisive battle with Sulla near Clusium (modern Chiusi, Italy) in 82, Carbo, then in his third consulate, was defeated by Sulla's general Metellus Pius, near Faventia. He fled but was captured on the island of Cossyra, south of Sicily, by Pompey (Gnaeus Pompeius), who had him executed.

carbohydrate, any member of a very abundant and widespread class of natural organic substances that includes the sugars, starch, and cellulose. The first carbohydrates analyzed (in the early 19th century) were determined to be composed of carbon (C), along with hydrogen (H) and oxygen (O) in the proportions found in water (H_2O). Many carbohydrates have the general formula $C_x(H_2O)_x$, but the class is so broad that no simple definition encompasses them all.

A brief treatment of carbohydrates follows. For full treatment, *see* MACROPAEDIA: Biochemical Components of Organisms.

Several classification schemes have been devised for carbohydrates. One of the most common divides them into four major groups—monosaccharides, disaccharides, oligosaccharides, and polysaccharides. Molecules of monosaccharides, or simple sugars, contain from three to nine carbon atoms, most commonly five or six. Three of the most important simple sugars are glucose (also known as dextrose, grape sugar, or corn sugar), fructose (fruit sugar), and galactose. Two simple-sugar molecules are linked to each other in a disaccharide, or double sugar. The disaccharide sucrose (table sugar) consists of one molecule of glucose and one molecule of fructose. Lactose (milk sugar) and maltose are also disaccharides. Oligosaccharides, which consist of three to six monosaccharide units, are rare. Polysaccharides are large molecules, such as cellulose, starch, and glycogen, in which as many as 10,000 monosaccharide units are linked together. They include most of the structural and storage carbohydrates found in nature.

Green plants utilize the energy of sunlight to convert carbon dioxide and water into carbohydrates. This process, called photosynthesis, releases oxygen into the atmosphere and transforms light energy into the chemical energy of carbohydrates. Plants convert simple carbohydrates into sucrose, which is the sugar in many fruits; cellulose, their principal structural component; starch, which is stored; and a wide variety of other polysaccharides that function as essential structural components.

In most animals, carbohydrates provide a quickly accessible reservoir of energy. Glucose, the sugar circulating in the blood of higher animals, is absorbed by the cells, where its oxidation energizes the metabolic processes. Glycogen, which consists of branching chains of glucose molecules, is stored in the liver and muscles of higher animals, to be broken down into glucose under conditions of stress or muscular activity. In addition, polysaccharides function as structural components in certain animals. For example, chitin, which is similar to cellulose, makes up the exoskeleton of insects and other arthropods.

The names of the monosaccharides combine a prefix that designates the number of carbon atoms in the molecule (*e.g., pent-* means "five" and *hex-* means "six") and the generic suffix *-ose.* Thus, "pentose" denotes any monosaccharide containing five carbon atoms.

When a monosaccharide molecule assumes a straight-chain form, its carbon atoms make up the backbone of the molecule. Attached to most of these carbon atoms are a hydroxyl group (OH) and one hydrogen atom (two if it is a terminal carbon in the chain). The hydroxyl groups account for the great solubility of sugars in water. One carbon atom in the chain differs from the others, however, in that it is linked by means of a double bond to an atom of oxygen. This carbon and its double-bond oxygen form either an aldehyde group (if it occurs at a terminal carbon in the chain) or a ketone group (if it occurs at an internal carbon in the chain). Therefore, monosaccharides are either aldehydes or ketones; these are identified by the prefixes *aldo-*

and *keto-*, as, for example, "aldopentoses" and "ketohexoses." Glucose is an aldohexose, containing six carbon atoms and an aldehyde group.

Many carbohydrates are isomers—that is, they have the same atomic composition but different structures. Glucose, fructose, and galactose, for example, are all isomers with a formula of $C_6H_{12}O_6$.

The most common naturally occurring monosaccharides are glucose, mannose, fructose, and galactose among the hexoses, and xylose and arabinose among the pentoses. Two other monosaccharides—ribose and deoxyribose—are found in all cells, where they form the carbohydrate component of ribonucleic acid (RNA), and deoxyribonucleic acid (DNA), respectively. Xylose is prepared from cottonseed hulls, corncobs, or straw by chemical breakdown of xylan, a polysaccharide. Galactose is a common constituent of oligosaccharides and polysaccharides, such as agar and carrageenan. It also occurs in carbohydrate-containing lipids, called glycolipids, present in the brain and other nerve tissues of most animals. Galactose is generally prepared from lactose, a disaccharide composed of galactose and glucose. Glucose is found in fruits, honey, blood, and, under abnormal conditions, urine. It is also a constituent of the two most common naturally occurring disaccharides, sucrose and lactose, and it is the sole structural unit of the polysaccharides cellulose, starch, and glycogen. Glucose is produced commercially in large amounts by hydrolysis of cornstarch; the largest amount is sold as corn syrup, although its crystalline form is sometimes sold under the name dextrose. Fructose is one of the constituents of the disaccharide sucrose and is also present in uncombined form in honey, apples, and tomatoes. It is produced from sucrose and is used by the food industry. Arabinose can be obtained from plant gums (its name derives from gum arabic) and is a component of pectins. Mannose is obtainable from polysaccharides known as mannans.

Most monosaccharides can be oxidized easily. For a long time, this reaction was used to detect glucose in blood and urine. (Glucose in blood or urine is now analyzed with the aid of the enzyme glucose oxidase, which catalyzes the oxidation of glucose to products that include hydrogen peroxide, which in turn oxidizes a dye present in the reaction mixture.) When a terminal group (CH_2OH) of a monosaccharide is oxidized chemically or biologically, a uronic acid is formed. Glucuronic acid (formed from glucose) is a major component of the polysaccharides present in connective tissue; it and other uronic acids are involved in the detoxication of many poisons and their excretion in the urine (hence their name). Sugars may be reduced (by the addition of hydrogen) to alditols, or sugar alcohols. The product thus formed from glucose is sorbitol, which is commonly used as a sweetening agent. The reduction of mannose results in mannitol, also used as a sweetener.

Sugars in solution (including those inside the cell) assume a ring structure in which a hydroxyl group is attached to the carbon that carries the aldehyde or ketone group. This hydroxyl group is highly reactive, enabling the sugars to react with each other or with other classes of compounds to form derivatives called glycosides; glycosides formed from glucose are called glucosides. Among the wide variety of natural glycosides are plant pigments (*e.g.,* indican), heart-muscle stimulants (*e.g.,* digitalis), antibiotics (*e.g.,* streptomycin), and precursors of flavourings (*e.g.,* vanillin).

Other compounds formed from monosaccharides include those in which one hydroxyl group is replaced by an amino group (NH_2); these compounds, called amino sugars, are widely distributed in nature. In deoxy sugars, one hydroxyl group is replaced by a hydrogen atom; by far the most important of these is deoxyribose, derived from ribose and present in deoxyribonucleic acid (DNA), the carrier of genetic information.

Disaccharides are specialized glycosides in which a molecule of one sugar has combined with a molecule of a second. Among the few disaccharides of commercial or biological significance, the most important are sucrose, trehalose, lactose, and maltose. Sucrose (composed of glucose and fructose) is obtained commercially by treatment of sugarcane or sugar beet by crushing and extraction with water, purification, and crystallization. Less pure crystals deposited from the concentrated liquor are known as brown sugar. The residual syrupy material is called cane final molasses, or blackstrap molasses. Trehalose (composed of two glucose molecules) is similar in many respects to sucrose but is much less widely distributed. It is present in young mushrooms and in the resurrection plant; it is of considerable biological interest because it is also found in the circulating fluid of many insects.

Lactose (composed of glucose and galactose) is one of the sugars found most commonly in human diets; it composes about 5 percent of the milk of all mammals. Although not found uncombined in nature, maltose is biologically important because it is a product of the enzymatic breakdown of starches during digestion. Maltose consists of two molecules of glucose, but it differs structurally from trehalose.

Polysaccharides, or glycans, may be classified in a number of ways. Homopolysaccharides are polysaccharides formed from only one monosaccharide. These may be further subdivided into straight-chain, branched-chain, and cyclic representatives, depending on the arrangement of the monosaccharide units. Heteropolysaccharides contain two or more different monosaccharides; their molecules also may be either linear or branched.

The two best known polysaccharides, both homopolysaccharides, are cellulose and starch. Cellulose, the basic structural component of most plants, is a large, linear molecule composed of 3,000 or more glucose molecules. Cellulose is used for a wide variety of commercial purposes, including the manufacture of paper and cloth, and is prepared by treating plant material with hot alkali. Similar to cellulose is xylan, which contains xylose units and is also found in plant-cell walls. The term starch denotes a group of plant polysaccharides consisting of glucose units; most starches are composed of a mixture of two components—a linear component (amylose) and a branched component (amylopectin). In humans, utilization of starch requires breaking it into individual glucose units; this process is initiated by enzymes called amylases, which are present in saliva, and continues in the intestinal tract. The product of amylase action is maltose, which is hydrolyzed to glucose as it is absorbed through the walls of the intestine.

Another important homopolysaccharide is glycogen, which is found in all animal tissues and is the primary animal storage form of carbohydrate. Glycogen is composed of glucose units; it resembles starch but is more highly branched. Polysaccharides composed of galactose or galacturonic acid—*e.g.,* pectins and agars—are important because they can form gels. Pectins, which are obtainable from citrus fruit rinds, are used commercially in the preparation of jellies and jams. Agar is widely employed in biological laboratories in growth media for microorganisms and in the bakery industry as a gelling agent.

carbolic acid: *see* phenol.

carbon (C), a nonmetallic chemical element in Group IVa of the periodic table. Although widely distributed in nature, carbon is not particularly plentiful (it comprises only about 0.2 percent of the Earth's crust); yet it forms more compounds than all the other elements combined. In 1961 the isotope carbon-12 was selected to replace oxygen as the standard relative to which the atomic weights of all the other elements are measured; carbon-14, which is radioactive, is the isotope used in radiocarbon dating and radiolabelling.

Properties and uses. Elemental carbon exists in three forms, each of which has its own physical characteristics. Two of the forms, diamond and graphite, are crystalline in structure; but they differ in physical properties because the arrangements of the atoms in their structures are dissimilar. The third form, known as carbon black, includes charcoal, lampblack, coal, and coke; it is amorphous in structure, although X-ray examination has revealed that these substances do possess a low degree of crystallinity. Both diamond and graphite can be produced synthetically; they are chemically inert but do combine with oxygen at high temperatures, just as amorphous carbon does.

Pure diamond, the hardest substance known, is colourless and transparent and a poor conductor of electricity. Graphite, on the other hand, is a soft, slippery solid that is a good conductor of both heat and electricity. Because of their beauty, diamonds are valued as jewels and, because of their hardness, as abrasives for cutting, grinding, and drilling. Graphite is used as a lubricant, in paint, and, mixed with clay, as the "lead" of pencils; because it conducts electricity but does not melt, graphite also is used for electrodes in electric furnaces and dry cells as well as for making crucibles in which metals are melted.

Each of the amorphous forms of carbon has its own specific character; hence, each has its own particular applications. All are products of oxidation and other forms of decomposition of organic compounds. Coal and coke, for example, are used extensively as fuels; charcoal is used as an absorptive and filtering agent and as a fuel and in the manufacture of gunpowder. In addition to its uses in making inks, carbon paper, typewriter ribbons, and paints, carbon black also is added to the rubber used in tires to improve its wearing qualities. Bone black, or animal charcoal, can adsorb gases and colouring matter from many other materials; a major use is in decolourizing raw sugar.

Carbon has two stable isotopes, carbon-12 (which makes up 98.89 percent of natural carbon) and carbon-13 (1.11 percent); five radioactive isotopes are known, of which the longest lived is carbon-14, which has a half-life of 5,730 ±40 years.

Compounds. Carbon forms hundreds of thousands of compounds. Indeed, its compounds are so numerous, complex, and important that their study constitutes a specialized field of chemistry called organic chemistry, which derives its name from the fact that in the 19th century most of the then known carbon compounds were considered to have originated in living organisms.

With hydrogen, oxygen, nitrogen, and a few other elements, carbon forms compounds that comprise approximately 18 percent of all the matter in living things. The processes by which organisms consume carbon and return it to their surroundings constitute the carbon cycle (*q.v.*).

Carbon is present as carbon dioxide in the Earth's atmosphere in amounts of about 3 percent by volume, and it is dissolved in all natural waters. Carbon occurs in the crust of the Earth in the form of carbonates in such rocks as marble, limestone, and chalk, and in hydrocarbons—the principal constituents of coal, petroleum, and natural gas.

At ordinary temperatures, carbon is very unreactive—it is difficult to oxidize—and it does not react with acids or alkalies. At high temperatures it combines with sulfur vapour to

form carbon disulfide, with silicon and certain metals to form carbides, and with oxygen to form oxides, of which the most important are carbon monoxide, CO, and carbon dioxide, CO_2. Because at high temperatures carbon combines readily with oxygen that is present in compounds with metals, large quantities of coke (an inexpensive form of carbon) are used in metallurgical processes to reduce (remove oxygen from) metal oxide ores, such as those of iron and zinc.

For a detailed discussion on the organic compounds of carbon, *see* organic compound. Many of the industrially important carbon compounds (both organic and inorganic) are treated in separate entries.

atomic number	6
atomic weight	12.011
melting point	3,550° C (6,420° F)
boiling point	4,827° C (8,721° F)
density	
diamond	3.52 g/ml
graphite	2.25 g/ml
amorphous	1.9 g/ml
oxidation states	+2, +3, +4
electron config.	2-4 or $1s^2 2s^2 2p^2$

carbon-14 dating, also called RADIOCARBON DATING, method of age determination that depends upon the decay to nitrogen of radiocarbon (carbon-14). Carbon-14 is continually formed in nature by the interaction of neutrons with nitrogen-14 in the Earth's atmosphere; the neutrons required for this reaction are produced by cosmic rays interacting with the atmosphere.

Radiocarbon present in molecules of atmospheric carbon dioxide enters the biological carbon cycle (*q.v.*): it is absorbed from the air by green plants and then passed on to animals through the food chain. Radiocarbon decays slowly in a living organism, and the amount lost is continually replenished as long as the organism takes in air or food. Once the organism dies, however, it ceases to absorb carbon-14, so that the amount of the radiocarbon in its tissues steadily decreases. Carbon-14 has a half-life of 5,730 ±40 years—*i.e.*, half the amount of the radioisotope present at any given time will undergo spontaneous disintegration during the succeeding 5,730 years. Because carbon-14 decays at this constant rate, an estimate of the date at which an organism died can be made by measuring the amount of its residual radiocarbon.

The carbon-14 method was developed by the U.S. physicist Williard F. Libby about 1946. It has proven to be a versatile technique of dating fossils and archaeological specimens from 500 to 50,000 years old. The method is widely used by Pleistocene geologists, anthropologists, archaeologists, and investigators in related fields.

carbon black, any of a group of intensely black, finely divided forms of amorphous carbon, usually obtained as soot from partial combustion of hydrocarbons, used principally as reinforcing agents in automobile tires and other rubber products but also as extremely black pigments of high hiding power in printing ink, paint, and carbon paper. Carbon black is also used in protective coatings, plastics, and resistors for electronic circuits. As a reinforcing filler it greatly increases resistance to wear and abrasion. About one fourth of the weight of a standard automobile tire is carbon black. For tires on vehicles on which it is necessary to avoid building up an electrostatic charge, such as oil trucks and hospital operating carts, even more carbon black is added to make the rubber electrically conducting.

Carbon black particles are usually spherical in shape and less regularly crystalline than graphite. Carbon black changes into graphite if heated at 3,000° C (5,400° F) for a prolonged period. Among the most finely divided materials known, carbon blacks vary widely in particle size depending on the process by which they are made. Channel or impingement black is made by the impingement of smoky flames from tiny jets on iron channels; the deposited black is scraped off by moving the channels over stationary scrapers. Furnace blacks are made in refractory chambers by incomplete combustion of any of various types of gaseous or liquid hydrocarbons. Thermal blacks are produced in the absence of air when hydrocarbons are decomposed by contact with heated refractories. Lampblack, the oldest known black pigment, is produced by burning oil, usually coal-tar creosote, in shallow pans, in a furnace with the draft regulated to give a heavy smoke cloud. Acetylene black is produced in refractory chambers in the absence of air by the decomposition of acetylene gas preheated to 800° C (1,500° F). It is used in applications requiring high electrical conductivity, such as dry cells.

carbon cycle, in biology, circulation of carbon in various forms through nature. Carbon is a constituent of all organic compounds, many of which are essential to life on Earth. The source of the carbon found in living matter is carbon dioxide (CO_2) in the air or dissolved in water. Algae and terrestrial green plants (producers) are the chief agents of carbon dioxide fixation through the process of photosynthesis, through which carbon dioxide and water are converted into simple carbohydrates. These compounds are used by the producers to carry on metabolism, the excess being stored as fats and polysaccharides. The stored products are then eaten by consumer animals, from protozoans to man, which convert them into other forms. All animals return CO_2 directly to the atmosphere as a by-product of their respiration. The carbon present in animal wastes and in the bodies of all organisms is released as CO_2 by decay, or decomposer, organisms (chiefly bacteria and fungi) in a series of microbial transformations.

Part of the organic carbon—the remains of organisms—has accumulated in the Earth's crust as fossil fuels (*e.g.*, coal, gas, and petroleum), limestone, and coral. The carbon of fossil fuels, removed from the cycle in prehistoric time, is now being released in vast amounts as CO_2 through industrial and agricultural processes, much of it quickly passing into the oceans and there being "fixed" as carbonates. If oxygen is scarce (as in sewage, marshes, and swamps) some carbon is released as methane gas.

carbon cycle, also called CARBON–NITROGEN CYCLE, sequence of thermonuclear reactions that provides most of the energy radiated by the hotter stars. It is only a minor source of energy for the Sun and does not operate at all in very cool stars. Four hydrogen nuclei are in effect converted into one helium nucleus, a fraction of the mass being released as energy (according to the law of mass–energy equivalence, $E = mc^2$). The German-U.S. physicist Hans Bethe, in 1938, first described the process.

The reactions are as follows: a carbon-12 (^{12}C) nucleus captures a hydrogen nucleus (^1H, a proton) to form a nucleus of nitrogen-13 (^{13}N); a gamma ray (γ) is emitted in the process. The nitrogen-13 nucleus emits a positive electron (positron, e^+) and becomes carbon-13 (^{13}C). This nucleus captures another proton, becomes nitrogen-14 (^{14}N), and emits another gamma ray. The nitrogen-14 captures a proton to form oxygen-15 (^{15}O); the resulting nucleus ejects a positron as above and is thereby transformed to nitrogen-15 (^{15}N). Eventually, the nitrogen-15 nucleus captures a fast-moving proton and breaks down into a carbon-12 nucleus plus a helium nucleus (alpha particle) of mass 4 (^4He).

In symbols:

$$^{12}C + {}^1H \rightarrow {}^{13}N + \gamma$$
$$^{13}N \rightarrow {}^{13}C + e^+$$
$$^{13}C + {}^1H \rightarrow {}^{14}N + \gamma$$
$$^{14}N + {}^1H \rightarrow {}^{15}O + \gamma$$
$$^{15}O \rightarrow {}^{15}N + e^+$$
$$^{15}N + {}^1H \rightarrow {}^{12}C + {}^4He + \gamma$$

carbon dioxide (CO_2), a colourless gas having a faint, sharp odour and a sour taste; it is a minor component of the Earth's atmosphere (about 3 volumes in 10,000), formed in combustion of carbon-containing materials, in fermentation, and in respiration of animals and employed by plants in the photosynthesis of carbohydrates. The presence of the gas in the atmosphere keeps some of the radiant energy received by the Earth from being returned to space, thus producing the so-called greenhouse effect (*q.v.*). Industrially, it is recovered for numerous diverse applications from flue gases, as a by-product of the preparation of hydrogen for synthesis of ammonia, from limekilns, and from other sources.

Carbon dioxide was recognized as a gas different from others early in the 17th century by a Belgian chemist, Jan Baptist van Helmont, who observed it as a product of both fermentation and combustion. It liquefies upon compression to 75 kilograms per square centimetre (1,071 pounds per square inch) at 31° C (87.4° F) or to 16–24 kg per sq cm (230–345 lb per sq in.) at −23° to −12° C (−10° to 10° F). By the mid-20th century, most carbon dioxide was sold as the liquid. If the liquid is allowed to expand to atmospheric pressure, it cools and partially freezes to a snowlike solid called Dry Ice (*q.v.*) that sublimes (passes directly into vapour without melting) at −78.5° C (−109.3° F) at the pressure of the normal atmosphere.

At ordinary temperatures, carbon dioxide is quite unreactive; above 1,700° C (3,100° F) it partially decomposes into carbon monoxide and oxygen. Hydrogen or carbon also convert it to carbon monoxide at high temperatures. Ammonia reacts with carbon dioxide under pressure to form ammonium carbamate, then urea, an important component of fertilizers and plastics. Carbon dioxide is slightly soluble in water (1.79 volumes per volume at 0° C and atmospheric pressure, larger amounts at higher pressures), forming a weakly acidic solution. This solution contains the dibasic acid called carbonic acid (H_2CO_3).

Carbon dioxide is used as a refrigerant, in fire extinguishers, for inflating life rafts and life jackets, blasting coal, foaming rubber and plastics, promoting the growth of plants in greenhouses, immobilizing animals before slaughter, and in carbonated beverages.

Ignited magnesium continues to burn in carbon dioxide, but the gas does not support the combustion of most materials. Prolonged exposure of humans to concentrations of 5 percent carbon dioxide may cause unconsciousness and death.

carbon disulfide (CS_2), also called CARBON BISULFIDE, a colourless, toxic, highly volatile and flammable liquid chemical compound, large amounts of which are used in the manufacture of viscose rayon, cellophane, and carbon tetrachloride; smaller quantities are employed in solvent extraction processes or converted into other chemical products, particularly accelerators of the vulcanization of rubber or agents used in flotation processes for concentrating ores.

For many years carbon disulfide was manufactured by the reaction of charcoal with sulfur vapour at temperatures of 750°–1,000° C (1,400°–1,800° F), but, by the mid-20th century, that process had been superseded, especially in the United States, by one based on the reaction of natural gas (principally methane) with sulfur.

The use of carbon disulfide for extraction of

fats, oils, and waxes has been largely discontinued in favour of other solvents that are less toxic and flammable. The use of carbon disulfide in making rayon and cellophane depends upon its reaction with cellulose and caustic soda to form colloidal solutions of cellulose xanthate, which can be extruded into a dilute solution of sulfuric acid, which coagulates the cellulose films or fibres and sets free the carbon disulfide.

Carbon disulfide is denser than water and only slightly soluble in it. Its boiling point is 46.3° C (115.3° F) and its freezing point −110.8° C (−169.2° F); its vapour, which is heavier than air, is ignited with extraordinary ease.

Consult the INDEX *first*

carbon group element, any of the five chemical elements that make up Group IVa of the periodic table—namely, carbon (C), silicon (Si), germanium (Ge), tin (Sn), and lead (Pb).

A brief treatment of the carbon group elements follows. For full treatment, *see* MACROPAEDIA: Chemical Elements. *See also* MICROPAEDIA for entries on each member of the family.

Elemental carbon is a minor component in the crust of the Earth, but it is among the more plentiful elements in the universe. Only hydrogen, helium, oxygen, neon, and nitrogen are more abundant. Silicon is a basic constituent of the Earth's crust, exceeded only by oxygen in abundance; it is the seventh most plentiful element in the universe. Germanium, tin, and lead, on the other hand, are relatively scarce both in the upper terrestrial layer and in the cosmos.

The properties of the carbon group elements are intermediate between those associated with the elements of the adjacent boron and nitrogen groups of the periodic table. In all these groups the metallic properties, which result from the tendency to hold valence (outermost) electrons more loosely, increase with atomic number. This characteristic is most apparent in the case of the carbon group elements. Carbon is a nonmetal and silicon nearly so. Germanium resembles a metal in appearance and in certain other properties. Tin is almost completely metallic, whereas lead is a true metal in every respect.

The atoms of the carbon group elements have a similar electronic structure. They all have four electrons in their outermost shells. Every element of the group forms covalent bonds with nonmetallic atoms. Carbon and silicon cannot lose or gain electrons to form free ions, while germanium, tin, and lead do form metallic ions but only with two positive charges.

In the solid state, elemental carbon, silicon, germanium, and gray tin (alpha tin) occur as cubic crystals based on a three-dimensional arrangement of bonds. Each atom is covalently bonded to four neighbouring atoms, forming the corners of a tetrahedron. Decreasing melting points, boiling points, and heat energies associated with fusion, sublimation, and vaporization among these four elements with increasing atomic number and atomic size indicate a parallel weakening of the covalent bonds in this kind of structure.

carbon monoxide (CO), a highly toxic, colourless, odourless, flammable gas produced industrially for use in the manufacture of numerous organic and inorganic chemical products; it is also present in the exhaust gases of internal-combustion engines and furnaces as a result of incomplete conversion of carbon or carbon-containing fuels to carbon dioxide.

Carbon monoxide's toxicity is a consequence of its absorption by red blood cells in preference to oxygen, thus interfering with the transport of oxygen from the lungs to the tissues, in which it is required. Indication of carbon monoxide poisoning include headache, weakness, dizziness, nausea, fainting, and, in severe cases, coma, weak pulse, and respiratory failure. Treatment must be prompt and includes respiratory assistance and the administration of oxygen, often with 5 percent carbon dioxide and sometimes under high pressure.

For use in manufacturing processes, carbon monoxide is made by passing air through a bed of incandescent coke or coal, or by the reaction of natural gas with oxygen at high temperatures in the presence of a catalyst. The carbon monoxide resulting from these processes generally is contaminated with other substances, such as nitrogen or carbon dioxide, which may be removed if they are undesirable in the intended application.

Carbon monoxide condenses to the liquid at −192° C (−314° F) and it freezes at −199° C (−326° F). It is only slightly soluble in water, and its physical properties closely resemble those of nitrogen.

Carbon monoxide reacts with water vapour at high temperatures, forming carbon dioxide and hydrogen; this process has been used as a source of hydrogen for combination with nitrogen in the synthesis of ammonia. With caustic alkalies, carbon monoxide forms alkali formates, which can be converted into either formic acid or alkali oxalates for the production of oxalic acid. With certain metals, carbon monoxide forms compounds called carbonyls, many of which are volatile; this reaction has been used in the purification of nickel. Carbon monoxide and hydrogen are the starting materials in the manufacture of methanol and also are used in the preparation of aldehydes and alcohols from olefins and in making mixtures of liquid hydrocarbons suitable for use as fuels.

carbon–nitrogen cycle (astrophysics): *see* carbon cycle.

carbon steel, metal manufactured from the elements iron and carbon, with the carbon imparting hardness and strength and determining the degree to which such physical properties exist. *See* steel.

carbon tetrachloride, also called TETRACHLOROMETHANE, a colourless, dense, highly toxic, volatile, nonflammable liquid possessing a characteristic odour and belonging to the family of organic halogen compounds, used principally in the manufacture of dichlorodifluoromethane (a refrigerant and propellant).

First prepared in 1839 by the reaction of chloroform with chlorine, carbon tetrachloride is manufactured by the reaction of chlorine with carbon disulfide or with methane. The process with methane became dominant in the United States in the 1950s, but the process with carbon disulfide remains important in countries where natural gas (the principal source of methane) is not plentiful. Carbon tetrachloride boils at 77° C (171° F) and freezes at −23° C (−9° F); it is much denser than water, in which it is practically insoluble.

Formerly used as a dry-cleaning solvent, carbon tetrachloride has been almost entirely displaced from this application by tetrachloroethylene, which is much more stable and less toxic.

carbonaceous chondrite, any stony meteorite containing material associated with life (*e.g.,* hydrocarbons, amino acids, and forms resembling microscopic fossils) and for which some researchers have postulated an extraterrestrial biological origin. Instead of containing the anhydrous silicates found in most chondrites, the carbonaceous types have claylike hydrous silicate minerals. They also contain carbonate and sulfate minerals, iron oxides, and sulfur. Magnesium sulfate is found in narrow veins; and since it is water soluble, carbonaceous chondrites disintegrate rapidly because of weathering.

They comprise about 3 percent of all the meteorites collected after being seen in flight. Their texture, similar to that of the terrestrial rocks called volcanic tuffs, indicates that they have been repeatedly fragmented and recemented. *See also* chondrite.

carbonado, one of the varieties of industrial diamond (*q.v.*).

Carbonaro, plural CARBONARI (Italian dialect: Charcoal Burner), in early 19th-century Italy, member of a secret society (the Carbonaria) advocating liberal and patriotic ideas. The group provided the main source of opposition to the conservative regimes imposed on Italy by the victorious allies after the defeat of Napoleon in 1815. Their influence prepared the way for the Risorgimento movement, which resulted in Italian unification (1861).

The origins and even the political program of the Carbonari are matters of conjecture. The group may have begun as a mutual aid society in France and spread to Italy with the Napoleonic army, or it may have been an offshoot of the Freemasons, an anticlerical, philanthropic secret society widespread in the 18th century. The first lodges of the Carbonari were formed in southern Italy in the early 1800s. They acquired a republican and patriotic character, opposing Joachim Murat, the Napoleonic ruler of Naples. The movement spread northward into the Marches and the Romagna by 1814. In general, the Carbonari favoured constitutional and representative government and wished to protect Italian interests against foreigners. But they never had a single program: some wanted a republic, others a limited monarchy; some favoured a federation, others a unitary Italian state.

Like other secret societies of the age, the Carbonari had an initiation ceremony, complex symbols, and a hierarchical organization. Their members were recruited mainly from the nobility, officeholders, and small landowners. After 1815 the lodges spread rapidly among those dissatisfied with the post-Napoleonic settlement, especially among the middle classes, which had been favoured under French rule. Although the Carbonari had lodges throughout Italy, their main centres were in central Italy (the Papal States) and in the South (Naples), where the Bourbon Kingdom of the Two Sicilies was restored in 1815 and where they took up a decisively anti-Bourbon attitude. With the help of the army they led the successful Neapolitan revolution of 1820, which forced King Ferdinand I to promise a constitution. This was their most spectacular achievement, but Austrian intervention soon nullified it. Revolts in Bologna, Parma, and Modena in 1831 met with little success. In the same year, Giuseppe Mazzini founded a new movement, Young Italy, with an avowedly national and republican program, and the importance of the Carbonari began to wane.

Outside Italy a similar movement called the Charbonnerie had taken root in France. It participated in outbreaks in 1821, and Lafayette himself condescended to be its head. An international organization called the Charbonnerie Démocratique Universelle continued to operate for a few years after 1830 under the leadership of Filippo Buonarroti (1761–1837), but it achieved little.

carbonate, any member of two classes of chemical compounds derived from carbonic acid or carbon dioxide (*q.v.*). The inorganic carbonates are salts of carbonic acid (H_2CO_3), containing the carbonate ion, CO_3^{2-}, and ions of metals such as sodium or calcium. Inorganic carbonates comprise many minerals (*see* carbonate mineral) and are the principal constituents of limestones and dolomites; they also comprise the hard parts of many marine

invertebrates. Organic carbonates are esters; that is, compounds in which the hydrogen atoms of carbonic acid have been replaced by carbon-containing combining groups such as ethyl, C_2H_5.

carbonate-apatite, rare phosphate mineral belonging to the apatite series. *See* apatite.

carbonate mineral, any member of a family of minerals that contain the carbonate ion, CO_3^{2-}, as the basic structural and compositional unit. The carbonates are among the most widely distributed minerals in the Earth's crust.

A brief treatment of carbonate minerals follows. For full treatment, *see* MACROPAEDIA: Minerals and Rocks.

The crystal structure of many carbonate minerals reflects the trigonal symmetry of the carbonate ion, which is comprised of a carbon atom centrally located in an equilateral triangle of oxygen atoms. This anion group usually occurs in combination with calcium, sodium, uranium, iron, aluminum, manganese, barium, zinc, copper, lead, or the rare-earth elements. The carbonates tend to be soft, soluble in hydrochloric acid, and have a marked anisotropy in many physical properties (*e.g.,* high birefringence) as a result of the planar structure of the carbonate ion.

There are approximately 80 known carbonate minerals, but most of them are rare. The commonest varieties, calcite, dolomite, and aragonite, are prominent constituents of certain rocks: calcite is the principal mineral of limestones and marbles; dolomite occurs as a replacement for calcite in limestones, and when this is extensive the rock is termed dolomite; and aragonite occurs in some recent sediments and in the shells of organisms that have calcareous skeletons. Other relatively common carbonate minerals serve as metal ores: siderite, for iron; rhodochrosite, for manganese; strontianite, for strontium; smithsonite, for zinc; witherite, for barium; and cerussite, for lead.

Most such rock-forming carbonates belong to one of two structure groups—either calcite or aragonite. The calcite structure is usually described with reference to the sodium chloride structure in which the sodium and chlo-

Carbonate minerals

name formula	colour	lustre	Mohs hardness	specific gravity	habit	fracture or cleavage	refractive indices	crystal system space group	remarks
alstonite $CaBa(CO_3)_2$	colourless to snow-white; grayish, creamy, pink	vitreous	4–4½	3.7	pseudohexagonal dipyramids	uneven fracture	$\alpha = 1.526$ $\beta = 1.671$ $\gamma = 1.672$	orthorhombic	weakly fluorescent in long-wave ultraviolet light
aragonite $CaCO_3$	colourless to white, variable	vitreous	3½–4	2.9–3	twinned prismatic crystals; columnar aggregates; crusts	one distinct cleavage	$\alpha = 1.527–1.535$ $\beta = 1.676–1.690$ $\gamma = 1.680–1.695$	orthorhombic Pmcn	polymorphous with calcite and vaterite; fluorescent under electron beams, X-rays, and ultraviolet light; thermoluminescent
aurichalcite $(Zn, Cu)_5(OH)_6(CO_3)_2$	pale green to green-blue or sky blue	silky to pearly	1–2	3.6	feathery incrustations	one perfect cleavage	$\alpha = 1.654–1.661$ $\beta = 1.740–1.749$ $\gamma = 1.743–1.756$	orthorhombic	
azurite $Cu_3(OH)_2(CO_3)_2$	azure blue; various shades of blue	vitreous	3½–4	3.8	tabular or prismatic crystals; also massive	one perfect, but interrupted cleavage	$\alpha = 1.730$ $\beta = 1.755$ $\gamma = 1.836$	monoclinic $P2_1/a$	
bastnaesite $CeCO_3(OH,F)$	yellow to reddish brown	vitreous to greasy	4–4½	4.9–5.2	tabular crystals; massive	uneven fracture	$\omega = 1.717–1.722$ $\varepsilon = 1.818–1.823$	hexagonal C6c2	
bismutite $(BiO)_2CO_3$	straw yellow to brownish yellow; variable	vitreous	2½–3½	6.7–7.4	earthy masses; crusts			tetragonal	
calcite $CaCO_3$	colourless when pure; variable	vitreous	3 (a hardness standard)	2.7 (pure $CaCO_3$)	widely varied crystal habit; massive; parallel growths; crystal aggregates	one perfect cleavage	$\omega = 1.658$ $\varepsilon = 1.486$ (pure $CaCO_3$)	hexagonal R3c	polymorphous with argonite and vaterite; hydrates occur in nature (*e.g.,* ikaite, $CaCO_3 \cdot 6H_2O$); forms solid solution series with rhodochrosite, in which Mn replaces Ca, and toward siderite, in which Fe partially replaces Ca
cerussite $PbCO_3$	colourless to white	adamantine	3–3½	6.5–6.6	extremely varied; crystal clusters; massive	two distinct cleavages	$\alpha = 1.793–1.814$ $\beta = 2.060–2.092$ $\gamma = 2.061–2.093$	orthorhombic Pmcn	fluorescent in X-rays and long-wave ultraviolet light
cobaltocalcite $CoCO_3$	rose red, altering to gray, brown, black	vitreous	4	4.1	concentric spherical masses; crusts		$\omega = 1.85–1.86$ $\varepsilon = 1.59–1.61$	hexagonal $R\bar{3}c$	
dawsonite $NaAlCO_3(OH)_2$	colourless to white	vitreous	3	2.4	incrustations; rosettes; tufts	one perfect cleavage	$\alpha = 1.462–1.466$ $\beta = 1.537–1.542$ $\gamma = 1.589–1.596$	orthorhombic Imam	
dolomite $CaMg(CO_3)_2$	colourless to white; gray, greenish, pink, brown	vitreous to pearly	3½–4	2.8–3	compact or granular massive; rhombohedral crystals	one perfect cleavage	dolo anker $\omega = 1.679–1.750$ $\varepsilon = 1.500–1.548$	hexagonal $R\bar{3}$	forms solid solution series with ankerite in which Fe replaces Mg; triboluminescent; fluorescent in ultraviolet light
gaylussite $Na_2Ca(CO_3)_2 \cdot 5H_2O$	colourless to white, yellowish, or grayish	vitreous	2½–3	2	elongated or wedgelike crystals	one perfect cleavage	$\alpha = 1.4435$ $\beta = 1.516$ $\gamma = 1.523$	monoclinic	
kutnohorite $CaMn(CO_3)_2$	white to pale rose			3	granular to coarse masses	one perfect cleavage	$\omega = 1.727$ $\varepsilon = 1.535$		
magnesite $MgCO_3$	colourless; white, grayish; yellowish to brown	vitreous	4	3	granular or compact massive; earthy; fibrous	one perfect cleavage	$\omega = 1.700$ $\varepsilon = 1.509$ (pure $MgCO_3$)	hexagonal $R\bar{3}c$	triboluminescent; sometimes fluorescent in ultraviolet light; forms solid solution series with siderite in which Fe replaces Mg, and toward calcite and rhodochrosite in which Ca and Mn, respectively, partially replace Mg

ride of halite are replaced by calcium atoms and CO_3 groups, respectively. The unit cell of halite is distorted by compression along a three-fold axis, resulting in a rhombohedral cell. In calcite all CO_3 groups are parallel and lie in horizontal layers; CO_3 groups in adjacent layers, however, point in opposite directions. The calcium atoms are bonded to six oxygen atoms, one each from three CO_3 groups in a layer above and three from CO_3 groups in a layer below. The structure of dolomite, $CaMg(CO_3)_2$, is similar to that of calcite, $CaCO_3$, except that there is regular alternation of calcium and magnesium, and a lower symmetry, though still rhombohedral, results. The second structure group, that of aragonite, is orthorhombic. Like the calcite structure, the cation in the aragonite structure is surrounded by G carbonate groups; the CO_3 groups, however, are rotated about an axis perpendicular to their plane and the cation is coordinated to nine oxygen atoms instead of six.

Carbonate minerals other than simple carbonates include hydrated carbonates, bicarbonates, and compound carbonates containing other anions in addition to carbonate. The first two groups include nahcolite, trona, natron, and shortite; they typically occur in sedimentary evaporite deposits and as low-temperature hydrothermal alteration products. The members of the third group generally contain rare-earth elements and almost always result from hydrothermal alteration at low temperatures. Examples of these carbonate minerals are bastnäsite, doverite, malachite, and azurite.

carbonate rock, any rock composed mainly of carbonate minerals. The principal members of the group are the sedimentary rocks dolomite and limestone (*qq.v.*).

Carbondale, city, Jackson County, southern Illinois, U.S., at the northern edge of the Illinois Ozarks. Founded in 1852 after the arrival of the Illinois Central Railroad, and named for the local coalfields, it developed as a mining and agricultural centre. Its growth was boosted by the opening in 1874 of a normal school (since 1947, Southern Illinois University). Gen. John A. Logan, commander in chief of the Grand Army of the Republic, issued

Carbonate minerals (continued)

name formula	colour	lustre	Mohs hardness	specific gravity	habit	fracture or cleavage	refractive indices	crystal system space group	remarks
malachite $Cu_2CO_3(OH)_2$	bright green to dark or blackish green	adamantine; silky; dull or earthy	3½–4	4–4.1	tufts and rosettes of needlelike crystals; botryoidal massive; fibrous aggregates	one perfect, one fair cleavage	$\alpha = 1.652–1.658$ $\beta = 1.872–1.878$ $\gamma = 1.906–1.912$	monoclinic $P\frac{2_1}{a}$	
nahcolite $NaHCO_3$	colourless to white	vitreous	2½	2.2	prismatic crystals and friable crystal aggregates; porous masses	one perfect, one good cleavage	$\alpha = 1.377–1.378$ $\beta = 1.500–1.503$ $\gamma = 1.583–1.584$	monoclinic $P\frac{2_1}{n}$	easily soluble in water; water solution gives off CO_2 on heating
pirssonite $Na_2Ca(CO_3)_2 \cdot 2H_2O$	colourless to white; grayish	vitreous	3–3½	2.4	prismatic or tabular crystals	conchoidal fracture	$\alpha = 1.504$ $\beta = 1.510$ $\gamma = 1.575$	orthorhombic Fdd2	pyroelectric
rhodochrosite $MnCO_3$	various shades of pink; rose to rose-red	vitreous	3½–4	3.7	granular to compact massive; columnar massive; incrustations	one perfect cleavage	$\omega = 1.816$ $\varepsilon = 1.597$ (pure $MnCO_3$)	hexagonal $R\bar{3}c$	forms solid solution series with siderite and calcite in which Fe and Ca respectively replace Mn and toward magnesite in which Mg partially replaces Mn
schroeckingerite $NaCa_3UO_2(CO_3)_3SO_4F \cdot 10H_2O$	greenish yellow	weakly vitreous	2½	2.5	aggregates of flattened scales	one perfect cleavage	$\omega = 1.539–1.545$ $\varepsilon = 1.489–1.496$	hexagonal (?)	fluorescent in ultraviolet light
siderite $FeCO_3$	yellowish brown and grayish brown to brown	vitreous	4	4 (pure $FeCO_3$)	granular massive; rhombohedral crystals; botryoidal	one perfect cleavage	$\omega = 1.875$ $\varepsilon = 1.633$ (pure $FeCO_3$)	hexagonal $R\bar{3}c$	forms solid solution series with rhodochrosite and magnesite in which Mn and Mg respectively replace Fe and toward calcite in which Ca partially replaces Fe
smithsonite $ZnCO_3$	grayish white to dark gray, greenish, brownish white; variable	vitreous	4–4½	4.4 (pure $ZnCO_3$)	botryoidal, reniform or stalagtitic masses; crusts; granular to compact massive	one nearly perfect cleavage	$\omega = 1.842–1.874$ $\varepsilon = 1.619–1.633$	hexagonal $R\bar{3}c$	
strontianite $SrCO_3$	colourless to gray; yellowish, greenish	vitreous	3½	3.7–3.8	prismatic crystals; columnar to fibrous massive; granular massive	one nearly perfect cleavage	$\alpha = 1.518–1.522$ $\beta = 1.662–1.670$ $\gamma = 1.664–1.673$	orthorhombic Pmcn	fluorescent and phosphorescent in electron beams, X-rays, and ultraviolet light; sometimes thermoluminescent
thermonatrite $Na_2CO_3 \cdot H_2O$	colourless to white; grayish yellowish	vitreous	1–1½	2.3	crusts; efflorescences		$\alpha = 1.420$ $\beta = 1.506$ $\gamma = 1.524$	orthorhombic Pmmm	alkaline taste
trona $Na_3H(CO_3)_2 \cdot 2H_2O$	gray or yellowish white; colourless	glistening vitreous	2½–3	2.1	fibrous or columnar massive	one perfect cleavage	$\alpha = 1.412$ $\beta = 1.492$ $\gamma = 1.540$	monoclinic	alkaline taste; not dehydrated by dry air
vaterite $CaCO_3$				2.6	hexagonal platelets; spherulitic		$\omega = 1.550$ $\varepsilon = 1.640–1.650$	hexagonal	polymorphous with calcite and aragonite
witherite $BaCO_3$	colourless to milky, white, or grayish	vitreous	3–3½	4.3	pseudohexagonal twinned crystals; massive	one distinct cleavage	$\alpha = 1.529$ $\beta = 1.676$ $\gamma = 1.677$	orthorhombic Pmcn	fluorescent and phosphorescent in electron beams, X-rays, and ultraviolet light; thermoluminescent
zaratite $Ni_3CO_3(OH)_4 \cdot 4H_2O$	emerald green	vitreous to greasy	3½	2.6–2.7	incrustations; compact massive	conchoidal fracture	$n = 1.56–1.61$	isometric	

the order in Carbondale (1868) designating May 30 as Memorial (Decoration) Day. Crab Orchard National Wildlife Refuge, Shawnee National Forest, and Giant City State Park are nearby. Inc. 1856. Pop. (1980) 27,194.

Carbondale, city, Lackawanna County, northeastern Pennsylvania, U.S., on the Lackawanna River, in a coal-mining and mountain resort region, 16 mi (26 km) northeast of Scranton. Founded in 1822 by William and Maurice Wurts, coal prospectors, the site had been previously known as Ragged Island and Barrendale and was obviously renamed for the successful open-pit coal-mining operations there. The need for coal transport spurred the development of the Delaware and Hudson Canal (1825) and a gravity railroad, from Carbondale to Honesdale. The locomotive "Stourbridge Lion" (now in the Smithsonian Institution, Washington, D.C.) made its initial run on that line Aug. 9, 1829, but proved impractical. Hauling via horses and mules was resumed. In June 1831 the world's first underground anthracite mine was opened at Carbondale. With the decline of the coalfields economic emphasis was switched to light industry. The Elk Mountain Ski Center is 12 mi north, and Archbald, one of the world's largest glacial potholes, is 7 mi southwest. Inc. 1831. Pop. (1980) 11,255.

carbonic anhydrase, enzyme found in red blood cells, gastric mucosa, pancreatic cells, and renal tubules that catalyzes the interconversion of carbon dioxide (CO_2) and carbonic acid (H_2CO_3). Carbonic anhydrase plays an important role in respiration by influencing CO_2 transport in the blood. The enzyme also functions in the formation of hydrochloric acid by the stomach.

Carboniferous Period, interval of geologic time during which the rocks of the Carboniferous System were formed, and the fifth oldest of the 11 periods in the Earth's geologic history. Several epochs are encompassed within a period, which is in turn encompassed by a larger unit of geologic time known as an era. The Carboniferous Period follows the Devonian Period and precedes the Permian Period, and it is part of the Paleozoic Era. Its boundaries have been defined as 280,000,000 to 345,000,000 years ago; more recent research indicates that they lie at about 285,000,000 to 360,000,000 years ago.

A brief treatment of the Carboniferous Period follows. For full treatment, *see* MACROPAEDIA: Geochronology.

The Carboniferous System, containing distinctive rock types and fossils, was identified by W. D. Coneybeare and J. Phillips in Great Britain in 1822. Its name refers to the presence of coals in many parts of the succession of strata between the Old Red Sandstone (Devonian) and the New Red Sandstone (Permian) formations in Great Britain. In North America this period is represented by the Mississippian and Pennsylvanian periods, which are named after the states in which the strata are widely developed. The Mississippian Period spans the interval of time from 320,000,000 to 360,000,000 years ago; the Pennsylvanian spans from 285,000,000 to 320,000,000 years ago. In Europe the Carboniferous Period corresponds to divisions known as Dinantian (or Lower Carboniferous) and the Namurian, Westphalian, and Stephanian (or Upper Carboniferous). They represent epochs that have been further subdivided into a large number of ages based upon the stratigraphical ranges of ammonoids (goniatites), foraminifera, and other fossils. The classification of the Carboniferous rock units and their corresponding time units had become so complex by the end of the first quarter of the 20th century that the International Geological Congress and later the Carboniferous Subcommission of the International Union of Geological Sciences set out to establish criteria by which to define an international time scale for the period. The boundaries of the system and their time equivalents have been generally agreed on, but minor subdivisions are still subject to debate.

During the Carboniferous Period a slow but unwavering change in world geography was taking place. All the land masses were drawing closer together as continental drift gathered them into the Southern Hemisphere and equatorial regions. The great southern supercontinent of Gondwanaland gained in area as the ancestral continents of North America, Europe, and Siberia, and regions of the Far East pressed toward its northern margin. This was a long process that brought about episodes of vigorous crustal deformation, mountain-building and volcanic activity, especially towards the end of the period.

In Gondwanaland a heavy and prolonged continental glaciation occurred at a south polar centre situated in the vicinity of southern Africa. Later, as the ice diminished, the sea level was restored and the climate ameliorated. Swamps became widespread in both northern and southern continental areas and forest vegetation thrived. The coal seams of the later Carboniferous times were formed from the debris of these forests, and the widespread and repeated growth of the coal swamp forests was a most characteristic feature of the Carboniferous Period. This episode of coal formation was terminated by a rise in the land masses and an increasingly arid climate. The end of these environments presaged the great crisis that was to affect much of the living world in the following Permian Period.

The immense volume of carbon incorporated in plant debris during Carboniferous times came from the atmosphere. Some scientists have maintained that the removal of so much carbon dioxide from the atmosphere affected the climate, but this is disputed and not believed to have been a significant factor in the period. Coal, formed during the Carboniferous, is found on all continents. The process of coal formation lasted about 40,000,000 years, and no other period was to see the transformation of so much plant material into coal.

In addition to the great advances made by plants with their complex forest assemblages, the vertebrates were undergoing an evolutionary radiation. Amphibians became widespread and diverse, with some as large as two metres (six feet). Reptiles appeared for the first time and rapidly adapted to many habitats.

The Carboniferous Period thus was marked by great changes to world geography. Life made significant advances and adapted to a range of climates that included the periglacial, the equatorial rainy, and the hot arid. Continental climates characterized by seasonal extremes were probably as widespread as at any time in the history of the Earth.

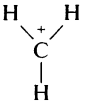
carboniferous shale: *see* black shale.

carbonium ion, any member of a class of organic molecules with positive charges localized at a carbon atom. Certain carbonium ions can be prepared in such a way that they are stable enough for study; more frequently they are only short-lived forms (intermediates) occurring during chemical reactions.

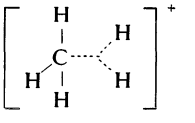
Carbonium ions are, in fact, one of the most common classes of intermediates in organic reactions, and knowledge of the structures and properties of these substances is fundamental to understanding reactions in which they occur. Many of these reactions are of synthetic, biochemical, or industrial importance.

The first carbonium ions were observed in 1901; it was not until 21 years later, however, that German chemist Hans Meerwein concluded that a neutral product (isobornyl chloride) was formed from a neutral reactant (camphene hydrochloride) by rearrangement involving a carbonium ion intermediate. This was the first conceptualization of a carbonium ion as an intermediate in an organic rearrangement reaction. The idea was generalized by U.S. chemist Frank Clifford Whitmore from 1932 onward and placed on a firm experimental basis by English chemists Sir Christopher Ingold and E.D. Hughes, beginning in the late 1920s. Although a great deal had been surmised about carbonium ions by indirect methods, it was only after 1960 that general methods for the formation of stable, long-lived carbonium ions became available.

Classification. Two distinct classes of carbonium ions have come to be recognized. The first are the "classical" carbonium ions, which contain a trivalent carbon atom centre. The carbon atom is in an sp^2 state of hybridization—that is, three electrons of the carbon atom occupy orbitals formed by the combination (hybridization) of three ordinary orbitals, one denoted *s* and two, *p*. All three orbitals lie in one plane; thus, the cationic centre of the molecule formed by bonding the carbon atom with three other atoms or groups tends to be planar. The parent for these ions is the methyl cation, with the formula CH_3^+. Schematically, the structure is as shown below (the solid lines representing bonds between atoms):



The second class of carbonium ions includes the pentacoordinated, or "nonclassical," carbonium ions, which have three single bonds, each joining the carbon atom to one other atom, and a two-electron bond that connects three atoms, rather than the usual two, with a single electron pair. The parent structure for these ions is that of the methonium ion, CH_5^+, in which the dotted lines represent a three-centre bond:



It is frequently possible to distinguish between these two types of carbonium ions experimentally, as, for example, by the use of certain instrumental methods—nuclear magnetic-resonance spectroscopy, which gives information about atomic nuclei; infrared and Raman spectroscopy, which are based on light absorption; and, more recently, X-ray-induced electron-emission spectroscopy, which gives information about bond energies.

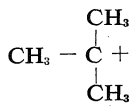
Preparation and stability. Several methods are known for the generation of carbonium ions. They may all, however, be classified in one of the following categories: (1) heterolytic (unsymmetrical) cleavage of the two-electron bond between a carbon atom and an attached group; (2) electron removal from a neutral organic compound; (3) addition of a proton, or other cation, to an unsaturated system; and (4) protonation, or alkylation (addition of an alkyl, or hydrocarbon, group), of a carbon–carbon or carbon–hydrogen single bond. Since carbonium ions are positively charged species, they are most readily formed in relatively polar solvents (solvents consisting of molecules with unsymmetrical distribution of electrons), which help disperse their charges or the charges on the accompanying negative ions throughout the medium. Commonly used solvents include methanol, aqueous acetone, acetic acid, and trifluoroacetic acid.

The fate of a carbonium ion produced by

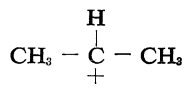
one of these methods is determined essentially by two factors: (1) the nature of the medium in which the ion is generated and (2) the inherent stability of the ion itself. Carbonium ions react rapidly with the solvent or with any available substance attracted to positively charged entities. Therefore carbonium ions have only a fleeting existence, and indirect methods must be used for their study. The common methods are kinetics (measurements of rates of reaction), chemical analysis of the product formed by reaction of the carbonium ion (particularly, determination of spatial arrangements of atoms in a molecule), and isotopic labelling (that is, the use of radioactive isotopes to identify particular atoms).

Solvents have been found that do not react with many carbocations. These solvents are hydrogen fluoride–antimony pentafluoride and fluorosulfuric acid–antimony pentafluoride with sulfur dioxide or sulfuryl chloride fluoride also present. In these solvents, the lifetime of many carbonium ions is sufficient to allow direct observation.

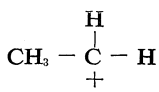
Tertiary carbonium ions are generally more stable than secondary carbonium ions, which, in turn, are more stable than primary ones. In tertiary carbonium ions, the sp^2 carbon is bonded to three alkyl groups; in secondary carbonium ions, the sp^2 carbon atom is bonded to two alkyl groups and one hydrogen atom; in primary carbonium ions, the sp^2 carbon is bonded to either one alkyl group and two hydrogen atoms or, in the case of the methyl cation, three hydrogen atoms. Examples of each are shown below.



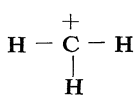
tertiary carbonium ion
tert-butyl cation



secondary carbonium ion
isopropyl cation



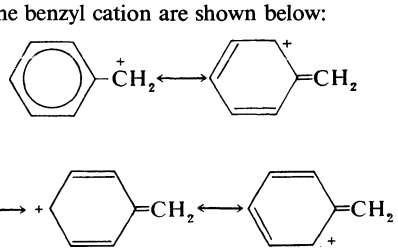
primary carbonium ion
ethyl cation



methyl cation

This order of relative stability is explained on the basis of the ability of an alkyl group to disperse the charge on the sp^2 carbon atom.

Benzyl cations are more stable than most primary cations because in the benzyl ions the positive charge can become distributed among the carbon atoms of the aromatic ring so the cation can exist in many forms, all of which contribute to the overall structure. Such forms of the benzyl cation are shown below:

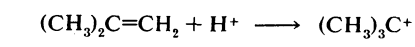


resonance forms of the benzyl cation

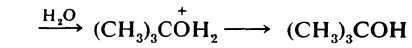
In these structures the benzene ring is indicated by a hexagon, each corner of which is considered to be a carbon atom (the attached hydrogens not being shown). The form with a circle in the hexagon represents structures with alternating single and double bonds in the ring; the other forms are those in which charges appear at various locations in the ring.

Reactions. Since carbonium ions are electron-deficient entities, they react with any electron-donor molecules, which are also referred to as nucleophiles. There are three types of nucleophiles: *n*-bases, pi bases, and sigma bases, in which *n*, pi, and sigma refer to the bonding state of the donor-electron pair in the nucleophile—that is, nonbonded, pi-bonded, and sigma-bonded, respectively. (Sigma bonds are ordinary covalent bonds between atoms, and pi bonds are the special bonds that occur in unsaturated and aromatic systems.) The nucleophile may be either external or internal (that is, constituting a portion of the cation itself). In the latter case, rearrangement may occur. Examples of the various possible reaction types are shown below:

1. Reaction with external *n*-base: acid-catalyzed hydration (addition of water) of isobutylene. In this reaction, there is an unshared (nonbonded) electron pair on the oxygen atom of the water molecule:



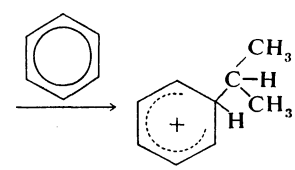
isobutylene proton *tert*-butyl cation



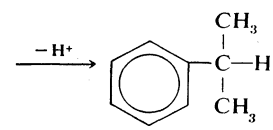
water *tert*-butyl alcohol

2. Reaction with external base: alkylation of benzene using isopropyl chloride (Friedel–Crafts reaction). Benzene acts as the donor molecule, with the donated electrons coming from the pi-bonded system of the benzene ring:

isopropyl chloride aluminum chloride isopropyl cation



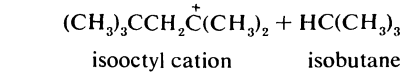
benzene



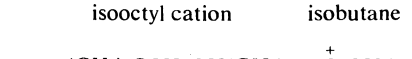
proton cumene

In the above equation, the partial circle with the plus charge in the hexagon stands for those forms of the cation in which the positive charge is distributed around the ring (as in the benzyl cation, pictured above).

3. Reaction with external sigma base: hydride transfer reaction in which the donor electron pair comes from the carbon–hydrogen sigma bond in isobutane:

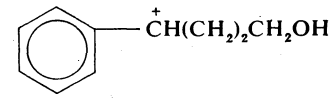


isooctyl cation isobutane

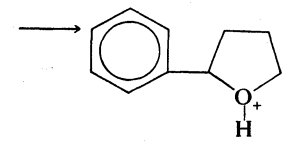


isooctane *tert*-butyl cation

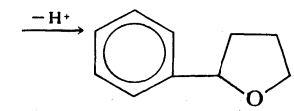
4. Reaction with internal *n*-base: cyclization reaction, with nonbonded electron pair on an oxygen atom serving as donor:



benzyl-type cation

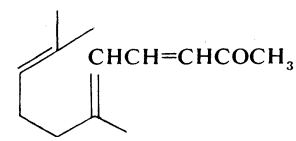


oxygen-protonated
2-phenyltetrahydrofuran

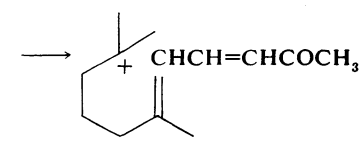


2-phenyltetrahydrofuran

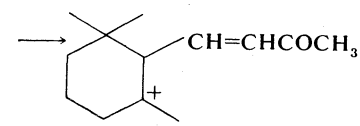
5. Reaction with internal pi base: acid-catalyzed cyclization to form β-ionone, with the donor electrons coming from the pi electrons of the unsaturated system:



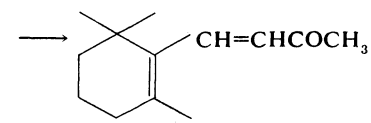
pseudoionone



intermediate cation

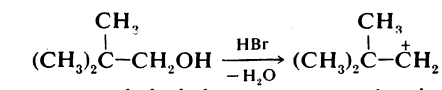


intermediate cation

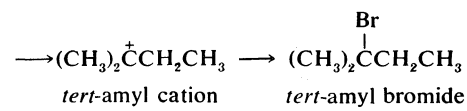


β-ionone

6. Reaction with internal sigma base: acid-catalyzed rearrangement of neopentyl alcohol, the electron pair coming from an internal carbon–carbon sigma bond:



neopentyl alcohol neopentyl cation



tert-amyl cation *tert*-amyl bromide

Each of these reaction types is widely employed in synthetic organic reactions, and the many acid-catalyzed hydrocarbon transformation reactions are fundamental in petroleum chemistry and in vital bio-organic processes. An important process in the manufacture of high-octane gasoline, for example, consists of the acid-catalyzed isomerization of straight-chain hydrocarbons to branched-chain hydrocarbons. One example of the significance of carbonium ions in bio-organic processes may be found in the biological synthesis of the important material cholesterol from a precursor, squalene, by way of another compound, lanosterol. In this transformation, acid-catalyzed rearrangements—reaction type 6, described earlier—occur repeatedly.

(G.A.O./P.R.Cd./Ed.)

BIBLIOGRAPHY. D. Bethell and V. Gold, *Carbonium Ions* (1967), is an excellent introduction and has an extensive bibliography. G.A. Olah and P.V.R. Schleyer (eds.), *Carbonium Ions,* 4 vol. (1968), is a review of particular aspects of carbonium-ion chemistry, with individual chapters written by active researchers in the field.

carbonyl, metal: *see* metal carbonyl.

carbonyl chloride: *see* phosgene.

carbonyl group, in organic chemistry, a divalent chemical unit consisting of a carbon (C) and an oxygen (O) atom connected by a double bond. The group is a constituent of carboxylic acids, esters, anhydrides, acyl halides, amides, and quinones, and it is the characteristic functional group (reactive group) of aldehydes and ketones. Carboxylic acids (and their derivatives), aldehydes, ketones, and quinones are also known collectively as carbonyl compounds.

Because of a difference in the electron affinities of the carbon and oxygen atoms, the electron pairs that constitute the double bond are held closer to the oxygen atom than to the carbon atom; the electron-rich oxygen atom acquires a negative charge and the electron-deficient carbon atom a positive charge. Thus, molecules containing the carbonyl group are polar. Compounds containing a carbonyl group have higher melting and boiling points than hydrocarbons containing the same number of carbon atoms and are more soluble in polar solvents such as water. The carbonyl group can enter into a variety of chemical reactions; nucleophilic reagents (electron-rich reagents) are attracted to the carbon atom, whereas electrophilic reagents (electron-seeking reagents) are attracted to the oxygen atom.

Aldehydes and ketones contain carbonyl groups attached to alkyl or aryl groups and a hydrogen atom or both. These groups have little effect on the electron distribution in the carbonyl group; thus, the properties of aldehydes and ketones are determined by the behaviour of the carbonyl group. In carboxylic acids and their derivatives, the carbonyl group is attached to one of the halogen atoms or to groups containing atoms such as oxygen, nitrogen, or sulfur. These atoms do affect the carbonyl group, forming a new functional group with distinctive properties.

carborane, any member of a class of organometallic compounds having the general formula $C_2B_nH_{n+2}$, in which C, B, and H represent, respectively, carbon, boron, and hydrogen atoms and n an integer; carboranes with n ranging from 3 to 10 have been characterized. The carboranes have polyhedral molecular structures based on networks of boron and carbon atoms, the carbon atoms occupying adjacent positions. They are generally prepared by reaction of acetylene or acetylene derivatives with boron hydrides.

The best-studied carborane is *o*-carborane, $C_2B_{10}H_{12}$, made by reaction of acetylene with decaborane in the presence of diethyl sulfide. Its molecular structure resembles an icosahedron with the 10 boron atoms and 2 adjacent carbon atoms forming the apices.

Carborundum: *see* silicon carbide.

carboxylic acid, any of a class of organic compounds in which a carbon atom is bonded to an oxygen atom by a double bond and to a hydroxyl group by a single bond. A fourth bond links the carbon atom to a hydrogen atom or to some other univalent combining group. Carboxylic acids occur in nature and also can be synthesized. They are used as solvents and to prepare many chemical compounds.

A brief treatment of carboxylic acids and their derivatives follows. For full treatment, *see* MACROPAEDIA: Chemical Compounds.

The simplest carboxylic acid is formic acid, in which a single hydrogen atom is attached to the carboxyl group. Formic acid, used as a disinfectant, occurs naturally in the tissue of ants and stinging nettles. If a methyl group is attached to the carboxyl group, the compound is acetic acid, a dilute form of which is vinegar.

A major class of carboxylic acid derivatives is the esters. In these compounds the hydroxyl is replaced by oxygen and hydrocarbons. A major commercial ester is ethyl acetate. It is used as a solvent and as an ingredient in flavours and perfumes. Esters are usually formed by reacting carboxylic acids with alcohols, removing water in the process. Anhydrides, halides, peroxy acids, amides, hydrazides, and azides form another major class of carboxylic acid derivatives. Each is derived from a carboxylic acid and a second compound (a halogen acid, for example) by removal of water. Not only are carboxylic acids readily converted into derivatives but the derivatives also can be converted into one another.

Carboxylic acids can be classified according to structure. Generally they are classified as aliphatic (related to, or derived from, fat), with straight or branched hydrocarbons. Aliphatic carboxylic acids may be further subdivided into saturated (containing all single bonds between the carbons) or unsaturated (containing at least one multiple bond). Some carboxylic acids are aromatic—*i.e.,* they possess ring-structured hydrocarbons.

Carboxylic acids may also be classified by function. For example, many aliphatic acids, particularly those with even numbers of carbon atoms, are constituents of fats. They are commonly classed together as fatty acids.

The chief chemical characteristic of the carboxylic acids is their acidity. They are generally more acidic than other organic compounds containing hydroxyl groups but are generally weaker than the familiar mineral acids. The acidity results from the removal of a hydrogen atom, which bears a positive charge. This leaves a carboxylate anion, a molecular unit bearing a negative charge.

Carboxylic acids and their derivatives react chemically in two major ways. In one, the added group is attached to the carbon atom next to the carboxyl group. In the other, one group attached to the carbonyl atom is replaced by another. This is the way derivatives are converted from one type into another.

Carboxylic acids occur widely in nature. The fatty acids are components of glycerides, which in turn are components of fat. Hydroxyl acids such as lactic acid (found in sour-milk products) and citric acid (found in citrus fruits) and many keto acids are important metabolic products that exist in most living cells. Proteins are made up of amino acids.

There are several ways to synthesize carboxylic acids. These include oxidation, or removal of electrons from a primary alcohol. Another method is Grignard synthesis, which makes use of powerful organometallic reagents called Grignard reagents. In addition, the acids can be synthesized from nitriles, which are nitrogen-containing derivatives of the carboxylic acids, and from esters.

Carboxylic acids and their derivatives have varied applications. In addition to its use as a disinfectant, formic acid is employed in textile treatment and as an acid reducing agent. Acetic acid is extensively used in the production of cellulose plastics and esters. Aspirin, the ester of salicylic acid, is prepared from acetic acid. Palmitic acid and stearic acid are important in the manufacture of soaps, cosmetics, pharmaceuticals, candles, and protective coatings. Stearic acid also is used in rubber manufacture. Acrylic acid is employed as an ester in the production of polymers (long-chain molecules) known as acrylates. Methacrylic acid serves as an ester and is polymerized to form Perspex or Plexiglas. Oleic acid is used in the manufacture of soaps and detergents and of textiles.

carbuncle, in medicine, a type of inflammatory staphylococcal infection of the skin. A carbuncle typically consists of two or more interconnected boils called furuncles; these are painful red nodules that form yellowish heads which burst to release pus and dead tissue. Carbuncles, however, are larger than furuncles, generally involve deeper layers of the skin, and have multiple openings for the drainage of pus. They occur most often in hairy skin areas or areas that are subject to friction—*e.g.,* the back of the neck, the armpits, and the buttocks.

While simple boils can be eliminated by the application of hot, moist dressings followed by washing with soap, carbuncles may have to be lanced and drained, a procedure that is often followed by antibiotic treatment. After the treatment, poor hygiene may lead to a recurrence.

carbuncle, in mineralogy, a deep red, cabochon-cut almandine, which is an iron aluminum garnet. *See* almandine.

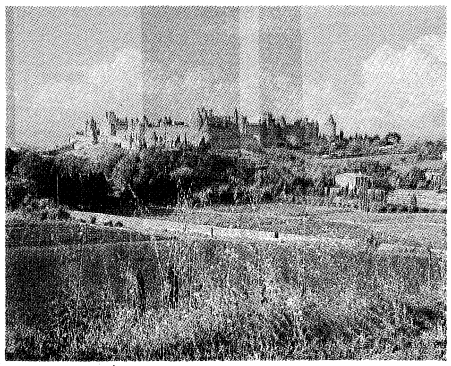
carburetor, also spelled CARBURETTOR, device for supplying a spark-ignition engine with a mixture of fuel and air. Components of carburetors for automobile engines usually include a storage chamber for liquid fuel, a choke, an idling (or slow-running) jet, a main jet, a venturi-shaped air-flow restriction, and an accelerator pump. The quantity of fuel in the storage chamber is controlled by a valve actuated by a float. The choke, a butterfly valve, reduces the intake of air and allows a fuel-rich charge to be drawn into the cylinders when a cold engine is started. As the engine warms up, the choke is gradually opened either by hand or automatically by heat- and engine-speed-responsive controllers. The fuel flows out of the idling jet into the intake air as a result of reduced pressure near the partially closed throttle valve. The main fuel jet comes into action when the throttle valve is further open. Then the venturi-shaped air-flow restriction creates a reduced pressure for drawing fuel from the main jet into the air stream at a rate related to the air flow so that a nearly constant fuel-air ratio is obtained. The accelerator pump injects fuel into the inlet air when the throttle is opened suddenly.

Other components have been added to carburetors to reduce hydrocarbon emissions and improve fuel economy. A miniature electronic device called a microprocessor, as part of the engine system, can provide precise control of the intake air-fuel mixture on the basis of engine temperature, load, and speed.

carburizing, form of surface hardening (*q.v.*) in which the carbon content of the surface of a steel object is increased.

carcajou (mammal): *see* wolverine.

Carcassonne, town, capital of Aude *département,* Languedoc-Roussillon region, southwestern France, southeast of Toulouse, near



Medieval fortifications, the Cité, Carcassonne, Fr.
Club Iris

the eastward bend of the Aude River, which divides the city into two towns, the Ville Basse and the Cité. The Cité has the finest remains of medieval fortifications in Europe.

On the summit of an isolated hill rearing abruptly on the Aude's right bank, the site of the Cité was occupied as early as the 5th century BC by the Iberians, then by Gallo-Romans. The inner rampart was built AD 485 when Euric I was king of the Visigoths. Clovis failed to take it in 508, though Muslim invaders succeeded in 728, as did Pepin the Short in 752.

The viscounts of Carcassonne and Béziers built the Basilique Saint-Nazaire (1096–1150), and about 1125 the Château Comtal was incorporated into the Visigothic rampart. In 1247, as a consequence of the Albigensian Wars, the viscounts' possessions were confiscated by the French crown. Great art works were then undertaken. The cathedral's Romanesque transept and choir were replaced by Gothic structures (the Romanesque nave remains). The stained glass is from the 14th–16th centuries. The outer ramparts, also turretted, towered, and crenellated, were built during the reign of Louis IX and continued by his son Philip III, who also added to the inner walls the beautiful Porte (gate) Narbonnaise. The Porte, the only entry into the Cité by road, is guarded by two towers with projecting beaks and a double barbican that forced assailants to expose an undefended flank.

When Roussillon province was annexed to France in 1659, Carcassonne ceased to be a frontier fortress and was left to decay. In 1844 the architect and medievalist Viollet-le-Duc began reconstruction of the cathedral and the ramparts, work which continued until the 1960s. The Cité has about 1,000 inhabitants in its narrow, winding streets.

The Ville Basse was founded in 1240 when rebellious citizens of the Cité were banished beyond the walls. It was burned by Edward the Black Prince in 1355 when he failed to take the citadel. The church of Saint-Vincent and the cathedral of Saint-Michel, both 13th century, survive. Ville Basse is the business centre of modern Carcassonne. There is some light manufacture, but Carcassonne lives mainly on tourism. Pop. (1982) 38,379.

carcharhinid, any member of the shark family Carcharhinidae, which includes about 13 genera found worldwide, primarily in warm and temperate oceans but also, in some instances, in fresh or brackish water. The majority of living sharks are carcharhinids.

They are typically sharklike in appearance, characterized by two dorsal fins, an elongate upper tail lobe, and single-cusped, blade-shaped teeth. Like other sharks, carcharhinids are carnivorous, preying on fishes and various other animals. The species range in length from about 1.5 to 5.5 metres (4.5 to 18 feet). The classification of many, especially the gray sharks, or whalers (*Carcharhinus*), is uncertain and may be revised after further study.

A number of carcharhinids, such as the blue and tiger shark (*qq.v.*), are well known. Others are described below:

Blacktip shark, any of several species with dark fin tips; two potentially dangerous Atlantic species: the small blacktip (*Carcharhinus limbatus*), growing to about 2.5 metres, and the somewhat larger large blacktip, or spinner shark (*C. maculipinnis*). One small, inoffensive species, *C. melanopterus,* is found in shallow Indo-Pacific waters.

Bull shark (*Carcharhinus leucas*), also called cub, or ground, shark; inshore, western Atlantic; swims as much as 250 kilometres (about 160 miles) up rivers; blunt-snouted; pale to dark gray above, white below; to about 3.5 metres; potentially dangerous.

Lake Nicaragua shark, considered a race of bull shark by some; found in Lake Nicaragua; stout, blunt-nosed, gray; to 2.5 to 3 metres; potentially dangerous.

Bull shark (*Carcharhinus leucas*)
Bob Abrams—Bruce Coleman Inc.

Lemon shark (*Negaprion brevirostris*), common western Atlantic species; inshore, occasionally in fresh or brackish water; yellowish; to about 3.5 metres; potentially dangerous.

Soupfin shark (*Galeorhinus zyopterus*), North American Pacific species once heavily fished for vitamin-rich liver oil; related to the school shark (*G. australis*), a valuable Australian food fish, and tope (*G. galeus*), a British sport fish; all three are gray or brownish, to about two metres long, and often found in schools.

Whitetip shark (*Carcharhinus longimanus*), Atlantic and Mediterranean species, primarily tropical; several similar forms, possibly of same species, in Pacific; long pectoral fins; large, rounded first dorsal fin; to 3.5 metres; gray, brown, or bluish with white fin tips; seldom nears shore; potentially dangerous.

Carchemish, Roman EUROPUS, ancient city-state near modern Jarābulus, in Ḥalab *muḥāfaẓah* (governorate), Syria. It commanded a strategic crossing of the Euphrates River for caravans engaged in Syrian, Mesopotamian, and Anatolian trade. The site, occupying more than 230 acres (93 hectares), was excavated (1911–20) by David G. Hogarth and later by Sir Leonard Woolley. Carchemish was first occupied in the Neolithic Period. Later finds included Uruk-Jamdat Nasr pottery, a product of the southern Euphrates Valley in Sumerian cities of about 3000 BC. The end of the Early Bronze (*c.* 2300 BC) and the Middle and Late Bronze Age (*c.* 2300–1550; *c.* 1550–1200 BC) were represented by tombs.

Written records concerning Carchemish first appear in the Mari letters (royal archives of Mari, *c.* 18th century BC), which include a mention of a king named Aplahanda. At that time the city was a trade centre for wood and appears to have engaged in the shipment of Anatolian timber down the Euphrates.

Later, the Hittite conqueror Suppiluliumas (*c.* 1375–35) established his son as king of the city, which he used as a buffer state against Assyria, Mitanni, and Egypt. With the fall of the Hittite Empire, Carchemish was probably overrun by the Sea Peoples. The district finally capitulated to Sargon II of Assyria in 717. The last important historical event connected with it was the battle fought in 605 BC, at which the Babylonian king Nebuchadrezzar II expelled the Egyptians from Syria.

Excavation showed that the town was defended by thick double walls with strong towered gates. On the citadel, excavators found a rich series of orthostates (stone slabs set at the bottom of mud-brick walls), carved in an eclectic style peculiar to northern Syria. Many traits of Assyrian art, possibly brought by Hurrians from northern Syria, were also discerned at Carchemish.

Carchi, northernmost of the highland provinces of Ecuador, bounded by Colombia on the north. Its area is 1,496 sq mi (3,876 sq km). The population is concentrated around the provincial capital, Tulcán (*q.v.*), in the intermontane basin of Tulcán (altitude 9,800 ft [3,000 m]). The province is chiefly agricultural; in the basin, wheat, barley, and fruits are grown. At lower and medium elevations, corn (maize), sugarcane, and coffee are produced, and dairy cattle are raised. Sheep are pastured on the higher slopes. Sulfur mining is growing in importance, as is the production of pyrethrum for use in insecticides. The Pan-American Highway crosses the province from north to south. Pop. (1983 est.) 155,182.

carcinogen, any of a number of agents that can cause cancer, including chemicals, radiation, and viruses. Exposure to such agents, singly or in combination, can initiate cancer under conditions not wholly understood.

Chemical effluents from industry; environmental pollutants from automobiles, residences, and factories; and tobacco smoke bear carcinogens in varying degrees depending upon geographical location and climate. Physical carcinogens include ultraviolet rays from sunlight and ionizing radiation from X-rays and from radioactive materials in industry and in the general environment. A number of viruses are suspected of causing cancer in animals, including man, and are frequently referred to as oncogenic viruses (*see* oncogenic virus). Repeated local injury or recurring irritation to a part of the body can be carcinogenic.

Some—not all—cancers are heritable in the sense that a predisposition exists, awaiting a convergence of carcinogenic influences for cancer to manifest itself. The identification and timely elimination of carcinogens can reduce the incidence of cancer.

carcinoma, a cancerous growth or tumour of the epithelial tissues (the tissues covering the external surfaces of the body, lining the digestive tract and blood vessels, and making up the tissues or surface tissues of internal organs, including the liver, pancreas, thyroid gland, ovaries, and prostate gland), the malignant cells of which tend to invade surrounding healthy tissues and give rise to secondary growths (metastases) distant from the original tumour. Cancers of the skin, breast, mucous membrane, lung, and many internal organs and glands may be carcinomas; cancers of the nervous system, lymphatic system, blood, bone, and muscle are not.

Adenocarcinomas are carcinomas in which the cancerous cells are arranged in the form of glands. Stomach cancers are usually adenocarcinomas, arising out of the glandular cells of the stomach lining. The most common type of cancer of the pancreas also is the adenocarcinoma. Cancers of the prostate gland in men and of the ovaries in women are most commonly types of adenocarcinomas, as are many lung cancers.

card, playing: *see* playing card.

card game, a game played for pleasure or gambling (or both) with one or more decks of playing cards (*see* playing card). Card games are probably coeval with cards themselves and may have been invented by the Chinese when they began shuffling paper money into various combinations. The Chinese are thought to have played both for and with this money, and in China today the general term for playing cards means paper tickets.

Early playing cards proper were mostly numeral cards. In China they were used for games in which the higher cards captured the lower or in which they were formed into winning combinations. Those two principles are still the basis for the two great families of card games.

Circular cards from India are said to have been used on chess boards in a game of pure skill, from which games of chance evolved, but no book gives any account of them. A Persian game, As Nas, has also been called a link in the development of modern games.

Cards and card games have been popular with all classes, despite sporadic attempts by monarchs, nobles, and governments to discourage their use by stringent laws. Both governments and churches condemned card playing in periods when gaming fever became widespread, bringing with it reckless wagering and a cruelly strict code of honour. Quarrels led to duels and to many causes célèbres, including the Tranby Croft Baccarat Scandal of 1890, a libel suit over charges of cheating, which, because it involved royalty, rocked Victorian England. In modern times the social and intellectual prestige of games such as Bridge and the dwindling of gambling practices led to an abatement of objections to card playing.

The number of possible card games is practically unlimited, and a vast number of them have been devised. All depend either upon the concept of rank or that of cards in combinations. Some are designed for a specified number of players, a popular number being four; others may be played by any reasonable number. In most games a player's cards are known only to himself until exposed in conformity with the rules.

Games based on rank. In these games each card may defeat or be defeated by other cards when played to a trick. A trick consists of a card from each participant, usually played in clockwise rotation, although in games of Spanish origin, such as Ombre, the cards are played and dealt anticlockwise. Each trick is taken by the highest ranking card of the suit led. Often a trump suit, determined by the rules of the game, may predominate; in this case, any card of that suit may capture any card of the other suits. Except for the trump suit, suits have no order of precedence in the capture of tricks but may have relative values in other matters, such as scoring.

One of the earliest games of this type was an English game called Triumph, popular in the 16th and 17th centuries, although it seems likely that similar French and Spanish games preceded it. A three-handed Spanish game, Ombre, then became very fashionable, and this, in turn, was followed by a still-enduring family of games of which Loo in England and Spoil Five in Ireland had by the 18th century become "national" games, while Écarté in France, Napoleon in England, and Euchre in the United States achieved similar status in the 19th century and Whist and the various forms of Bridge did so in the 20th century.

Games based on combinations. In this family, which is of older lineage, the object is to acquire combinations of cards that have a prescribed scoring value, a principle seen in ancient Chinese Domino games. The popular example today is Poker. Poker developed from a long line of European games of which the first may have been Primero, a Spanish game that the antiquary Joseph Strutt in *Sports and Pastimes of the People of England* (1801) believed to be the most ancient of the card games played in England. According to Shakespeare, Primero was played by Henry VIII on the night Queen Elizabeth was born. From Primero came the still popular English game of Brag, which was referred to as Brag or Pocher (Ger. *pochen,* "to knock"). Modern Poker, which first emerged in the United States in the early 19th century, became popular by virtue of its superior opportunities for calculation and psychology.

The other widely popular game based on grouping, or melding, cards in combinations is Rummy and its countless variations. Instead of each deal ranking as a separate event as in Poker, play is continuous. Scoring follows the principle that cards not melded (grouped) into scoring combinations when a critical point is reached are counted as penalty cards. One game of this family, Conquian, or Cooncan, entered the United States from Mexico in the early 1900s. In 1949 Canasta, invented in Latin America, spread rapidly to North America and Europe.

Games of both rank and combination. Trick play and melding have often been combined, notably in Piquet, which has a courtly terminology that derives from a lengthy association with aristocrats and serious gamesters, especially in France. The game Bezique is based on a similar idea but is played with two packs—sometimes more—and is a test of memory. Games of this type include the Pinochle group, highly popular in the United States in its four-handed versions.

The Solitaire or Patience games. At least 350 variations of games for one person are known. They are played with either one or two decks. The game usually begins by releasing certain key cards and trying to build the remaining cards upon them in a prescribed order. Success or failure depends largely on the chance initial arrangement of the cards. Some Solitaire games, however, especially those of the two-deck variety, contain an appreciable element of skill.

Children's and party games. The games for children are necessarily simple, as they must appeal to all age groups, and are seldom played in a serious frame of mind. Children enjoy them because they can compete with adults with a chance of winning. Most can be played by any reasonable number, and many games accentuate the element of suspense by giving each player three lives, after losing which he is out. Popular games include Slapjack, Casino, Concentration, Old Maid, Beggar-My-Neighbour, Go Fish (or Authors), and Spit.

Casino games. The most widely played casino card games in Europe are Baccarat Banque, its more popular variant Chemin de fer or "Chemmy," and Trente et Quarante; in the United States the single most popular casino card game is Blackjack (Twenty-one). All are derived from 15th- and 16th-century European games and have in common extreme simplicity in mechanics of play. The underlying principle is to assemble cards whose value does not exceed a specified number—9 in Baccarat, 21 in Blackjack—and to bet on the probability that the player or the bank will be successful.

For more information, *see* individual card games in the MICROPAEDIA.

cardamom, also spelled CARDAMON, spice consisting of whole or ground dried fruit, or seeds, of *Elettaria cardamomum,* a herbaceous perennial of the ginger family (Zingiberaceae). The seeds have a warm, slightly pungent, and highly aromatic flavour somewhat reminiscent of camphor. They are a popular seasoning in Near and Far Eastern dishes, particularly curries, and in Scandinavian pastries.

Cardamom (*Elettaria cardamomum*)
W.H. Hodge

Native to the moist forests of southern India, cardamom fruit may be collected from wild plants; but most is cultivated in India, Sri Lanka, and Guatemala. Leafy shoots arise 5 to 20 feet (1.5 to 6 metres) from the branching rootstock. Flowering shoots, about 3 ft long, may be upright or sprawling; each bears numerous flowers about 2 inches (5 centimetres) in diameter with greenish petals and a purple-veined white lip.

The whole fruit, 0.3 to 0.6 in., is a green, three-sided oval capsule containing 15 to 20 dark, reddish-brown to brownish-black, hard, angular seeds. They are picked or clipped from the stems just before maturity, cleansed, and dried in the sun or in a heated curing chamber. Cardamom may be bleached to a creamy white colour in the fumes of burning sulfur. After curing and drying, the small stems of the capsules are removed by winnowing. Decorticated cardamom consists of husked dried seeds. The essential oil occurs in large parenchyma cells underlying the epidermis of the seed coat. The essential oil content varies from 2 to 10 percent; its principal components are cineole and α-terpinyl acetate.

The name cardamom is sometimes applied to other similar spices of the ginger family (*Amomum, Aframomum, Alpinia*) used in cuisines of Africa and Asia or as commercial adulterants of true cardamoms.

Cardamom Hills, mountainous area in southeastern Kerala state, southern India, forming part of the Western Ghāts range. Some of their eastern peaks are more than 4,500 ft (1,370 m) high. The Cardamom Hills region produces tea, coffee, teak, and bamboo as well as the cardamom for which it is named. Most of its produce is shipped eastward through Tamil Nādu state down the Kambam River Valley. The name Cardamom Hills is sometimes used for the entire Western Ghāts range south of Pālghāt Gap.

Cardamom Mountains, French CHÂINE DES CARDAMONES (Kampuchea): *see* Krâvanh Mountains.

Cardano, Gerolamo, Gerolamo also spelled GERONIMO, or GIROLAMO, English JEROME CARDAN (b. Sept. 24, 1501, Pavia, Duchy of Milan—d. Sept. 21, 1576, Rome), Italian physician, mathematician, and astrologer who gave the first clinical description of typhus fever and whose book *Ars magna* ("Great

Art") is one of the cornerstones in the history of algebra.

Educated at the universities of Pavia and Padua, Cardano received his medical degree in 1526. In 1534 he moved to Milan, where he lived in great poverty until he became a lecturer in mathematics. Admitted to the college of physicians in 1539, he soon became rector. His fame as a physician grew rapidly, and many of Europe's crowned heads solicited his services; however, he valued his independence too much to become a court physician. In 1543 he accepted a professorship in medicine in Pavia.

Cardano was the most outstanding mathematician of his time. In 1539 he published two books on arithmetic embodying his popular lectures, the more important being *Practica arithmetica et mensurandi singularis* ("Practice of Mathematics and Individual Measurements"). His *Ars magna* (1545) contained the solution of the cubic equation, for which he was indebted to the Venetian mathematician Niccolò Tartaglia, and also the solution of the quartic equation found by Cardano's former servant, Lodovico Ferrari. His *Liber de ludo aleae* ("Book on Games of Chance") presents the first systematic computations of probabilities, a century before Blaise Pascal and Pierre de Fermat. Cardano's popular fame was based largely on books dealing with scientific and philosophical questions, especially *De subtilitate rerum* ("The Subtlety of Things"), a collection of physical experiments and inventions, interspersed with anecdotes.

Cardano's favourite son, having married a disreputable girl, poisoned her and was executed in 1560. Cardano never recovered from the blow. From 1562 he was a professor in Bologna but in 1570 was suddenly arrested on the accusation of heresy. After several months in jail he was permitted to abjure privately, but he lost his position and the right to publish books. Before his death he completed his autobiography, *De propria vita* (*Book of My Life*). Modern biographies include A. Bellini, *Gerolamo Cardano* (1947), and Oystein Ore, *Cardano, the Gambling Scholar* (1953).

Cardenal, Ernesto (b. Jan. 20, 1925, Granada, Nicaragua), revolutionary Nicaraguan poet and Roman Catholic priest who is considered to be the second most important Nicaraguan poet, after Rubén Darío.

He was educated first at Jesuit schools in Nicaragua, then in Mexico and at Columbia University. Having undergone a religious conversion, in 1957 he entered the Trappist monastery at Gethsemane, Ky., transferred to the Benedictine monastery of Cuernavaca, Mex., and, after studying theology in a seminary at La Ceja, Colom., was ordained a priest in 1965 in Nicaragua.

His early poems, collected in *Epigramas* (1961), denounce the senseless violence of the Somoza regime in Nicaragua, while others are love poems written with a fine sense of irony. *La hora 0* (1960; *Zero Hour and Other Documentary Poems*), a long documentary poem denouncing the effects of domestic tyranny and American imperialism in Central American history, is a masterpiece of protest poetry. In subsequent works Cardenal began to use empty phrases and commercial slogans as symbols of an alienating world.

The poems in *Salmos* (1964; *Psalms of Struggle and Liberation*) represent Cardenal's rewriting of the biblical psalms of David and condemn modern-day evils. These poems, like many of his others, express the tension between his revolutionary political fervour and his religious faith. The book culminates in an apocalyptic view of the world, a theme that becomes an obsession in later works.

In *Oración por Marilyn Monroe y otros poemas* (1965; "Prayer for Marilyn Monroe and Other Poems"), the earlier prophetic tone is linked to contemporary events: the death of the film actress Marilyn Monroe serves as an example of what Cardenal sees as the dehumanizing corruption of the capitalist system. Clichés, slogans, newspaper clippings, and advertisements in the poem become symbols of noncommunication.

Among his other volumes of poetry is *El estrecho dudoso* (1966; "The Doubtful Strait"). *Homenaje a los indios americanos* (1969; *Homage to the American Indians*), and *Oráculo sobre Managua* (1973; "Oracles About Managua"). *Vida en el amor* (1970; *To Live Is to Love*), a book of philosophical essays, and *En Cuba* (1973; *In Cuba*), recollections of his visit there in 1970, comprise his prose work. Volumes of his poetry have been translated into all the major European languages.

Cardenal took an active part in the Sandinista revolution that ousted Anastasio Somoza in July 1979, and he became minister of culture in the new government. In this post he sponsored popular workshops in poetry and theatre and promulgated Sandinista political ideals.

Cárdenas, city, northern Matanzas province, west-central Cuba. It is located on the shore of a large bay and is sheltered by the long Hicacos Peninsula. Cárdenas is one of Cuba's chief sugar ports. Founded in 1828, the settlement grew steadily after nearby marshes were drained. The city's industries include sugar refineries, rum distilleries, and factories manufacturing rope from henequen. Playa Varadero, a well-known beach-resort area, lies about 8 miles (12 km) north-northwest. Pop. (1986 est.) 78,300.

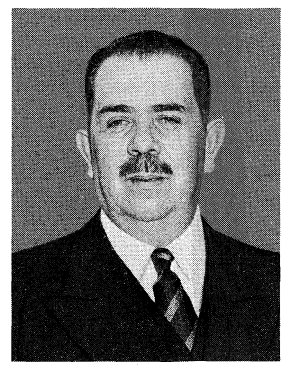
Cárdenas, Bartolomé de: *see* Bermejo, Bartolomé.

Cárdenas (del Río), Lázaro (b. May 21, 1895, Jiquilpan, Mex.—d. Oct. 19, 1970, Mexico City), president of Mexico (1934–40), noted for his efforts to carry out the social and economic aims of the Mexican Revolution. He distributed land, made loans available to peasants, organized workers' and peasants' confederations, and expropriated and nationalized foreign-owned industries.

Cárdenas was largely of Indian descent. After a rudimentary education, he received his first job in a local branch of the Public Revenue Office.

In February 1913 President Francisco Madero, who had led the struggle to overthrow the long dictatorship of Porfirio Díaz, was taken prisoner and assassinated on the orders of the rebellious general Victoriano Huerta, who now seized control of the government. Huerta's repressive military dictatorship provoked civil war almost immediately, and Venustiano Carranza headed the new revolutionary forces. At the age of 18, Cárdenas joined a branch of the revolutionary army led by General Guillermo García Aragón, and within a year he had risen to the rank of captain. When the revolutionary forces split into opposing factions, he remained loyal to Carranza, whose army triumphed in 1920. In that year Cárdenas was appointed general, the highest rank in the Mexican Army, and continued to participate in military campaigns until 1929.

Like most of the revolutionary military leaders, General Lázaro Cárdenas was also active politically, and in 1928, at the age of 33, he was elected governor of his native state of Michoacán. He served in that position for a full term, until 1932. Cárdenas also played an important role in forming a nationwide party to reinforce the revolutionary regime. Under the leadership of former president Plutarco Elías Calles, in office from 1924 to 1928, the Partido Nacional Revolucionario (PNR) was launched in 1929, and in the following year Governor Cárdenas was chosen to be the party's president. Cárdenas worked hard to transform the PNR from a loose federation of state parties, each led by a military-political caudillo (boss), into a truly national party and a major element of stability in the revolutionary regime. Cárdenas was minister of the interior for six weeks in 1931 and minister of war and marine for five months in 1933. It was from the latter job that he retired to become the PNR's candidate for president in the 1934 election.



Lázaro Cárdenas
Archivo Casasola, Mexico City

Cárdenas turned out to be an extraordinary presidential candidate. Although his election was assured, he spent the year between his nomination and polling day carrying out an intensive campaign. He visited virtually every city, town, and village in the country, meeting with local leaders and ordinary citizens and building up an extensive personal following in all parts of the country. During this campaign, he made clear his intention to carry out PNR's six-year plan of social and economic reform.

Once elected president, General Cárdenas moved cautiously at first. The army, the civil administration, and much of the political structure of the regime remained under the control of former president Calles, who had wielded vast influence while in power. During his first year in office, President Cárdenas spent much of his time establishing his own influence in these branches of the administration. Finally, he felt strong enough to have Calles sent into exile in the United States in 1936.

As president, Cárdenas carried out a wide range of reforms. Under the agrarian reform program, he distributed nearly twice as much land to peasants as had all of his predecessors combined, such that by the end of his administration about half of the country's cultivated land was held by previously landless farmers. He also extended the services of government banks so that the peasants who had received land under the reform could borrow money. In an effort to provide a political base for the land-redistribution program, he organized all of its beneficiaries in a new National Peasant Confederation (Confederación Nacional Campesina, CNC). This was but one more step in strengthening the general political structure of his new regime. Another major step in this direction was taken early in 1936 when most of the country's dispersed central labour groups were organized into the Confederación de Trabajadores de Mexico, which, for the next generation, continued to represent at least half of the country's organized workers.

Cárdenas also reorganized the government party. In 1938 a national convention restructured the party and renamed it the Partido de la Revolución Mexicana (PRM). Whereas in the past only government employees and aspiring politicians were members of the party, the new organizational scheme allowed mass groups to join the PRM directly. Four "sectors" of the party were established: labour,

peasant, "popular," and "military." Most national labour groups were affiliated with the first; the CNC constituted the second; a variety of middle-class groups made up the third; and the armed forces were incorporated into the last. In the next administration the military sector was suppressed, and since then the military role in Mexican politics has been reduced considerably.

The Cárdenas administration was most famous abroad for its efforts to expropriate foreign-owned industries and place them under Mexican control. In 1937 the government expropriated the nation's principal railways, and in March 1938 President Cárdenas signed a decree nationalizing the country's oil industry. After short-lived experiments of putting both of these industries under the control of their workers' unions, they were placed under autonomous public corporations, which were to function more or less like any other large private industry.

When his term in office came to an end, President Cárdenas presided over the election of his successor, General Manuel Ávila Camacho. He intended to withdraw from active political life. With the outbreak of World War II, however, in which Mexico became an active participant early in 1942, Cárdenas returned to public office. He served as minister of national defense from 1943 to 1945, and in the last year of his term he was made commander in chief of the Mexican Army. He retired once again late in 1945.

For the following 16 years, he held no public office. In 1961, however, Cárdenas became the executive member of the Comisión de la Cuenca del Río Balsas, which ran one of the country's major regional electrification and development agencies, in the state of Guerrero. His sharply diminished responsibilities notwithstanding, he remained a major figure in national politics. He became the symbol of the left in the government party, which was renamed the Partido Revolucionario Institucional in 1946. He remained the major supporter of the cooperative type of agrarian reform and the chief opponent of the United States' economic and political influence in Mexico. Cárdenas never withdrew from the government party, although he continued to support alternative political organizations. In the early 1960s he sponsored a rival group to the CNC, the Independent National Peasant Confederation (Confederación Nacional Campesina Independiente), and patronized—but never joined—a left-wing political coalition, the National Liberation Movement.

After the victory of the Castro Revolution, Cárdenas became the most forceful ally of the Cuban revolutionaries in Mexico. Basically, however, Cárdenas' political influence had substantially declined during the last years of his life. Nevertheless, he remained a highly controversial figure and a rallying point for those who were critical of the policies of succeeding administrations. (R.J.Al.)

BIBLIOGRAPHY. Several books have been written in English about Lázaro Cárdenas and his administration, during and after his period in power. These include Nathaniel Weyl and Sylvia Weyl, *The Reconquest of Mexico: The Years of Lázaro Cárdenas* (1939); Evelyn Waugh, *Mexico: An Object Lesson* (U.K. title, *Robbery Under Law: The Mexican Object-Lesson,* 1939); William Cameron Townsend, *Lázaro Cárdenas: Mexican Democrat* (1952; 2nd ed. 1979); Henry A. Phillips, *New Designs for Old Mexico* (1939); and J.H. Plenn, *Mexico Marches* (1939). Later relevant works include Joe C. Ashby, *Organized Labor and the Mexican Revolution Under Lázaro Cárdenas* (1967), and Clarke Newlon, *The Men Who Made Mexico* (1973).

cardiac arrhythmia, abnormal rate or regularity of the heartbeat, usually resulting from irregularities within the cardiac conduction system. Arrhythmias occur in both normal and diseased hearts and have no medical significance in and of themselves, though they may endanger heart function when coupled with other cardiac abnormalities.

The most common arrhythmias are sinus arrhythmia, in which heart rate accelerates with the intake of breath and decelerates with expiration; tachycardia (*q.v.*), which is a regular acceleration of the heart rate; bradycardia (*q.v.*), a regular slowing of the heart rate; and premature atrial or ventricular beats, which are extra contractions within otherwise normal heart rhythm. While occasional irregularities are normal, prolonged or chronic arrhythmias associated with some forms of heart disease may reduce cardiac output, lowering blood pressure and affecting the perfusion of vital organs with blood, and can precipitate heart failure. Severe arrhythmias can trigger atrial or ventricular fibrillation, in which the heart beats ineffectively at many times its normal rate (*see* fibrillation).

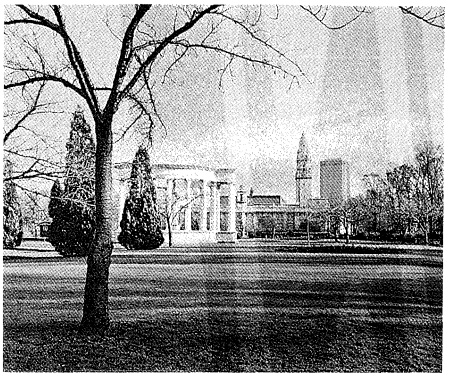
Cardiac arrhythmias reflect the failure of the sinus node, the normal cardiac pacemaker, to maintain a regular heartbeat, usually because of defects in the various pathways by which electrical impulses are carried to different areas of the heart. Anatomical defects or disease can slow down or speed up the propagation of electrical impulses, causing them to arrive out of the normal rhythm, or can turn the impulses back on their path, short-circuiting the pacemaker. Many arrhythmias can be corrected through cardioversion, in which an electric shock is applied to override abnormal impulses, or by drugs such as quinidine or digitalis, which directly affect the sensitivity of the heart muscle and the conduction rate of electrical impulses.

cardiac catheterization, procedure by which a flexible tube (catheter) is inserted into an artery or vein and passed along the course of that vessel into the heart. It is used for injecting drugs directly into the heart, for measuring the blood flow and the pressures in the heart and central blood vessels, in the diagnosis of congenital heart disease, in exploring narrowed passages and abnormal communications between heart chambers, and as a means of passing electrodes into the heart to restore or regulate the heartbeat. The procedure was originated by the German physician Werner Forssmann, who, in 1929, opened a vein in his own arm, inserted the tip of a catheter about ⅛ inch (3.2 mm) in diameter and 2½ feet (76 cm) long, and passed it up his arm vein, along the intrathoracic veins, and on into the right atrium of his heart.

More recently developed is the technique of left-heart catheterization, which involves passing the catheter up an artery, against the direction of blood flow; while somewhat more difficult and hazardous than venous passage, it is an extremely valuable diagnostic procedure. *See also* angiocardiography; diagnostic radiology.

cardiac output, in human physiology, volume of blood expelled by either ventricle of the heart. It is customarily expressed as minute volume, or litres of blood per minute, calculated as the product of stroke volume (output of either ventricle per heartbeat) and the number of beats per minute. Maintaining and regulating cardiac output, which is usually proportional to the tissues' need for oxygen and other nutrients, is one of the circulatory system's most intricate functions. In the healthy human adult, resting (or basal) output is estimated to be slightly over five litres per minute. Normally, it decreases somewhat when a person changes from recumbent to upright position. It may be increased 50 to 100 percent by anxiety and excitement and as much as fivefold by exercise. Measurement of cardiac output, as first described by the German physiologist Adolf E. Fick in 1870, makes possible an evaluation of respiratory exchange, *i.e.,* the delivery of oxygen to the tissues.

Cardiff, Welsh CAERDYDD, city, capital of Wales (since 1956), district, and seat of South Glamorgan and Mid Glamorgan counties. Cardiff city is located on the Bristol Channel



Welsh National War Memorial in Cathays Park, Cardiff, South Glamorgan; civic buildings are in the background

Justin B. Ingram—Bruce Coleman Inc.

at the mouth of the River Taff, and Cardiff district, largely coextensive with the city, covers an area of 46 square miles (119 square km). The district borders those of Newport to the east, Rhymney Valley and Taff-Ely to the north, and Vale of Glamorgan to the west.

The Romans built a small fort (*c.* AD 75) there, where their Gloucester–Carmarthen road crossed the Taff, and strengthened it in the face of seaborne attacks from Ireland. The town began its continuous existence upon the arrival of the Normans in the 11th century. The Norman landowner Robert FitzHamon built a fortification on the site of the Roman fort during his expedition of 1090–93 against the Welsh; and by 1150 a stone keep was erected on the mound—one of the finest surviving examples of its type in the country. Outside the castle a small walled town grew up, enjoying trading privileges from a series of charters granted by either the local lord or the crown (*e.g.,* 1608, from James I). Cardiff acted as a market centre and small port for the coastal plain nearby. The castle and seigniory came into the possession of Richard III and Henry VII and was granted to the Herbert family of South Wales, from whom they passed by marriage, in 1766, to the earl (since 1796, marquess) of Bute. The subsequent development of Cardiff has been closely linked with the Bute family, who greatly improved the castle as a residence and gave land adjoining it for the creation of a Civic Centre in the early 20th century; the castle itself and its attached parkland were given to Cardiff in 1947.

In 1801 the town's population was only 1,018, but during the next 100 years growth was continuous and rapid. Canal (to Merthyr Tydfil, 1794) and rail connections were constructed into the industrial and mining hinterland, and a new system of docks was developed between 1839 and 1907. By 1913, Cardiff had become the largest coal-exporting port in the world. The coal trade fell off dramatically after 1918 and in 1963 ceased altogether, but the city remained the largest in Wales, the most important shopping and service centre in the country, and the headquarters for many national organizations and government departments. It is also an important industrial centre. Steelmaking came to an end in 1978, but food processing, engineering, and other light industries continue.

Cardiff has many notable buildings, though few historic ones, with the main exceptions of the castle, Llandaff Cathedral, and the me-

dieval parish Church of St. John. The Civic Centre in Cathays Park is a fine set of public buildings, built since 1904, mostly in Portland stone, and set among ornamental gardens and broad avenues; among the buildings are the city hall, the law courts, the Welsh National Museum, the University College of South Wales and Monmouthshire, and the Welsh National War Memorial. The Welsh Folk Museum is housed in St. Fagan's Castle, 4½ mi (7 km) west of the city centre. The city airport is at Rhoose, 12 mi west. Pop. (1981 prelim.) city, 260,574; (1982 est.) district, 279,800.

Cardigan, Welsh ABERTEIFI, town, Ceredigion district, Dyfed county, Wales. The town grew up adjacent to a 12th-century Norman castle overlooking the River Teifi. An arched bridge across the river is said to date from 1136. In 1176 the Welsh prince and justiciar Lord Rhys (Rhys ap Gwffudd) sponsored the first recorded national *Eisteddfod* (bardic assembly for poetry and music) of Wales, in the castle precinct; some 30,000 people attended. The town's first charter was granted in 1284. Cardigan served as a local market centre and was also a small Irish Sea port but declined during the 19th century; its historic role as county town of the former Cardiganshire also declined with the growth of Aberystwyth, 40 mi (64 km) northeast. Cardigan is a modest tourist centre, close to attractive coastal and country scenery. Pop. (1981 prelim.) 4,184.

Cardigan, James Thomas Brudenell, 7th earl of (b. Oct. 16, 1797, Hambleden, Buckinghamshire, Eng.—d. March 28, 1868, Deene, Northamptonshire), British general who led the charge of the Light Brigade of British cavalry against the Russians in the Battle of Balaklava, Oct. 25, 1854, during the Crimean War—an incident immortalized in Alfred, Lord Tennyson's poem "The Charge of the Light Brigade" (1855).

Educated at Christ Church, Oxford, he entered the army in 1824, at a later age than was then usual, and quickly purchased promotion, becoming lieutenant colonel of the 15th Hussars by 1832. A martinet of uncertain temper, he quarrelled with his officers, illegally placing one in arrest, and was censured by the ensuing court-martial and forced to give up his command (1834). But in 1836 family influence secured him the command of the 11th Light Dragoons (renamed the 11th Hussars in 1840). He inherited his father's earldom and fortune in 1837. By spending an estimated £10,000 a year from his private purse, he made the regiment the smartest in the service (he introduced what came to be called the cardigan jacket); but again there was trouble because of his severity toward his officers, which led to a duel with one of them, Captain Tuckett, who was wounded. Cardigan faced public anger by demanding trial by his peers and won his case on a technical point of law. He retained command of his regiment until his promotion to major general in 1854.

Cardigan, detail of an engraving by G. Fobel after a portrait by H.W. Phillips

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

On the outbreak of the Crimean War (1854) he was appointed commander of the Light Brigade, under his brother-in-law G.C. Bingham, earl of Lucan, with whom he was on bad terms. His brigade saw little action before Oct. 25, 1854, when the celebrated charge of the Light Brigade took place (*see* Balaklava, Battle of). Although Cardigan queried the ambiguous order from Lord Raglan that originated the charge, he did not hesitate when the order was repeated but led the manoeuvre steadily and gallantly. The charge so struck the imagination of the British public that Cardigan was lionized on his return to England, where he was appointed inspector general of cavalry. Later when Colonel Calthorpe published a book falsely asserting Cardigan had not led the charge, he sued the author for libel but was nonsuited on a technicality. He died from injuries received in a riding accident.

Cardigan Bay, scenic inlet of the Irish Sea indenting the west coast of Wales. It is about 65 mi (105 km) long from south-southwest to north-northeast. Two national parks, Snowdonia and Pembrokeshire Coast, incorporate substantial stretches of beach and cliff along the shoreline. Coastal resort towns include Pwllheli and Criccieth (home of Prime Minister David Lloyd George) on the Lleyn Peninsula,

The Promenade, Aberdovey, on the Dovey Estuary of Cardigan Bay

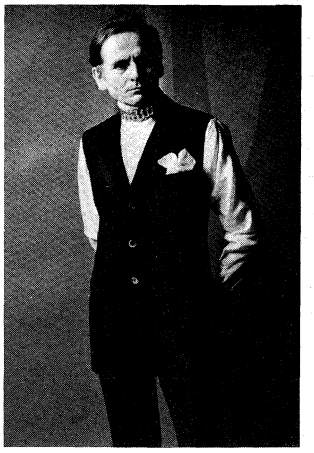
J. Allan Cash—EB Inc.

which bounds the bay to the north; historic Harlech with its castle and dunes; Barmouth by the Mawddach Estuary, a 19th-century resort patronized by William Wordsworth and John Ruskin; Aberdovey by the Dovey Estuary, associated in Welsh folklore ("The Bells of Aberdovey") with the submergence of a land beyond the present coastline; Aberystwyth, the major town of west central Wales; and Fishguard, a base for seaborne trade and ferry service between Wales and Ireland.

Cardin, Pierre (b. July 7, 1922, Venice), French designer of elegantly cut clothes for women and also a pioneer in the design of high fashion for men.

Cardin's father, a wealthy French wine merchant, wished him to study architecture, but from childhood he was interested in dressmaking. At 17 he went to Vichy, Fr., to become a tailor at a men's shop. After World War II he joined the Parisian fashion house of Paquin, where he designed the costumes for Jean Cocteau's film *Beauty and the Beast.* At the designing establishment of Christian Dior (1947–50) he became one of the designers of the "New Look" (1947) and created his famous "Bar" suit with long, black skirt and fitted jacket in natural shantung.

In 1950 he opened a shop to design creations for the popular Parisian costume balls, but he continued to create a limited number of fashions for men and women. He gradually gained a solid reputation as a men's suit maker and branched into whimsical accessories for men. Cardin successfully presented his first designer ready-to-wear complete dress collection in 1957. In 1959 he created the first ready-to-wear collection for women ever presented by a top designer and in 1960 introduced the first designer ready-to-wear col-



Cardin in a sleeveless dinner jacket of his own design

By courtesy of Pierre Cardin, Paris

lection for men. He showed himself a master of the bias cut, soft semifitted lines, and lavish colour. In the late 1960s his stark, short tunics, and his use of vinyl, helmets, and goggles launched the Space Age look. His ready-to-wear line of men's clothing has especially influenced other designers of male attire, such as the American Bill Blass.

cardinal, a member of the Sacred College of Cardinals whose duties include electing the pope, acting as his principal counsellors, and aiding in the government of the Roman Catholic Church throughout the world. Cardinals serve as chief officials of the Roman Curia (the papal bureaucracy), as bishops of major dioceses, and often as papal envoys. They wear distinctive red dress, have been addressed as Eminence, and are known as princes of the church.

Scholars have disagreed about the origin of the title. There is, however, tentative consensus among modern scholars that the Latin word *cardinalis,* from the word *cardo* ("pivot, hinge") was first used during the barbarian invasions of western Europe to designate a bishop who was incorporated into a vacant see after his own see had been overwhelmed. In Rome the first persons to be called cardinals were the deacons of the seven regions of the city, at the beginning of the 6th century, when the word began to mean "principal," "eminent," "superior." The name was also given to the senior priest in each of the "title" churches (the parish churches) of Rome and to the bishops of the seven sees surrounding the city. By the 8th century the Roman cardinals constituted a privileged class among the Roman clergy. They took part in the administration of the church of Rome and in the papal liturgy. By decree of a synod of 769 only a cardinal could become pope. In 1059, during the pontificate of Nicholas II, cardinals were given the right to elect the pope. For a time this power was assigned exclusively to the cardinal bishops, but the third Lateran Council (1179) gave back the right to the whole body of cardinals.

In cities other than Rome the name began to be applied to certain ecclesiastics as a mark of honour. The earliest example of this occurs in a letter sent by Pope Zacharias in 747 to Pepin the Short, king of the Franks, applying the title to the priests of Paris to distinguish them from country clergy. This meaning of the word spread rapidly, and from the 9th century various episcopal cities had a special class among the clergy known as cardinals.

The use of the title was reserved for the cardinals of Rome in 1567 by Pius V.

The College of Cardinals, with its structure of three orders (bishops, priests, and deacons), had its origin in the reform of Urban II (1088–99). These ranks within the College of Cardinals do not necessarily correspond to a cardinal's rank of ordination; *e.g.,* the bishop of a diocese such as New York City or Paris may be a cardinal priest. From the time of the Avignon papacy (1309–77), the question of the internationality of the Sacred College was imposed with great insistence; a reform under Sixtus V (1585–90) attempted to provide for it. The question has continued to be raised at various times, particularly in the second half of the 20th century.

The cardinal bishops are successors of the bishops of the sees just outside Rome. There were seven of these sees in the 8th century, but the number was later reduced to six. Prior to 1962 each of the cardinal bishops had full jurisdiction in his own see; since then, however, they preserve only the title without any of the functions, which passed to a bishop actually resident in the see. In 1965 Paul VI created cardinals from among the Eastern Catholic patriarchs and arranged that they should become cardinal bishops on the title of their patriarchal sees.

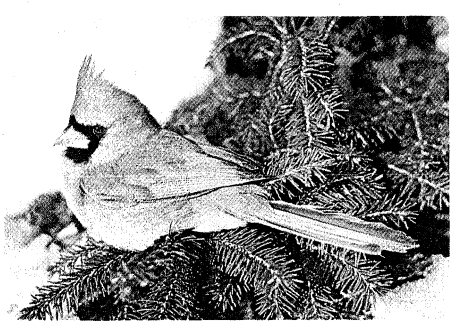
The second and largest order in the Sacred College is that of the cardinal priests, successors of the early body of priests serving the "title" churches of Rome. Since the 11th century this order has been more conspicuously international than the orders of cardinal bishops and deacons, including the bishops of important sees from throughout the world.

The cardinal deacons are successors of the seven regional deacons. By the 10th–11th century there were 18 deaconries in the city, and the reform of Urban II assigned a cardinal deacon to each of them. Originally, the order was limited to those who had advanced no further than the diaconate. Later legislation prescribed that a cardinal deacon be at least a priest. John XXIII and Paul VI, after appointing cardinal deacons who were not bishops, immediately consecrated them bishops.

The total number of cardinals was fixed at 70 by Sixtus V in 1586, of which 6 were cardinal bishops, 50 were cardinal priests, and 14 were cardinal deacons. John XXIII eliminated the restriction of 70, and since then the number has reached more than 100.

New cardinals are appointed only by the pope. He calls a secret consistory (meeting) of the cardinals and announces to them the names of the new cardinals. The newly named cardinals then receive the red biretta and the ring symbolic of the office in a public consistory.

cardinal, also called REDBIRD, or CARDINAL GROSBEAK (*Cardinalis,* formerly *Richmondena, cardinalis*), songbird of North America east of the Rockies, belonging to the family Fringillidae (placed by some authors in the Emberizidae; order Passeriformes). It is 20 cm (8 inches) long, with pointed crest; the male is bright red, the female being a duller reddish or olive brown. Pairs of these birds utter loud, clear whistling notes year-round in gardens and open woodlands. They feed on insects (and thus are beneficial for pest control) and on wild seeds and wild fruits. The cardinal is especially abundant in the southeastern United States and has been introduced into Hawaii, southern California, and Bermuda.



Cardinal (*Cardinalis cardinalis*)
Stephen Collins

cardinal fish, any fish of the family Apogonidae (order Perciformes), a group including about 200 species of small, typically nocturnal fishes found in tropical and subtropical waters. The majority of cardinal fishes are marine and live among reefs in shallow water. Some, such as *Astrapogon* (or *Apogonichthys*) *stellatus* of the Caribbean, take shelter in the shells of living conchs. Cardinal fishes range from 5 to 20 cm (2 to 8 inches) in length and are characterized by two dorsal fins, a large mouth, large eyes, and large scales. Many are red or reddish; others may be silvery, brownish, or black.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

cardinal flower, any of several closely related species of the genus *Lobelia,* perennial plants of the family Lobeliaceae that are native to North and Central America. All bear spikes of scarlet, lipped flowers on leafy stems up to 1.5 m (5 feet) tall. *L. cardinalis* and *L. splendens,* considered to be one species by some authorities, are taller than *L. fulgens,* the Central American parent species of the garden cardinal flower. The blue cardinal (*L. siphilitica*) is smaller than the others and has blue or whitish flowers.

Cardinal flower (*Lobelia cardinalis*)
Grant Heilman—EB Inc.

cardinal sin: *see* deadly sin.

Cardioceras, genus of ammonite cephalopods, extinct animals related to the modern pearly nautilus and characteristic as fossils in Late Jurassic rocks (the Jurassic Period began 190,000,000 years ago and lasted 54,000,000 years). The several species known are excellent index, or guide, fossils for Jurassic rocks, enabling them to be correlated over widely separated areas. The shell of *Cardioceras* is circular in outline and ribbed, with a prominent crest along the outer margin.

Cardioceras cordiforme, collected from the Sundance Formation at Freezeout Mountains, Wyoming
By courtesy of the Buffalo Museum of Science, Buffalo, N.Y.

cardiology, medical specialty dealing with the diagnosis and treatment of diseases and disorders of the heart. Cardiology first became a specialized field of study when Jean Baptiste de Sénac in 1749 published a summary of contemporary knowledge of the heart. This was followed 12 years later by Leopold Auenbrugger's discovery that the condition of the heart can be estimated by the sound returned from tapping on the chest (percussion). Listening to heart sounds became a major part of medical diagnosis after René Laënnec's invention of the stethoscope in 1816 enabled heart specialists for the first time to diagnose aneurysms and other cardiovascular problems before the patient's death.

Much of the development of cardiology during the 19th century consisted of improved diagnostic methods. An important diagnostic advance was Willem Einthoven's invention in 1903 of the electrocardiograph, which measures the heart's electrical activity; by 1915 the basic methods of diagnosis of heart disease, including fluoroscopic studies of the beating heart, were in place. Diagnostic technology was furthered by Werner Forssmann's development in 1929 of cardiac catheterization, in which a narrow tube is threaded through the veins from the arm into the heart, enabling the injection of radiopaque dyes that outline heart structures on fluoroscopy.

By enabling cardiologists and surgeons to observe the coronary arteries, Forssmann's discovery opened up the possibility of surgical correction of many heart problems. Cardiology itself remains a medical, not a surgical, specialty, however, although cardiologists work closely with surgeons in cases of heart surgery. Cardiologists provide the continuing care of heart patients, performing basic studies of heart function and supervising all aspects of therapy, including the administration of drugs to modify heart functions.

Much of the development of cardiac medicine in the second half of the 20th century has been in the field of heart surgery, which to all practical purposes did not exist until the 1950s. Major advances in this field have included the routine repair of coronary artery disease, one of the major causes of heart attacks; the first human heart transplant, performed by Christiaan Barnard of South Africa in 1967; and the development of a permanently functioning, surgically implanted artificial heart by a research team at the University of Utah, first used in 1982.

cardiopulmonary resuscitation (CPR), emergency procedure designed to restore normal breathing and circulation after such traumas as cardiac arrest and drowning. CPR involves clearing the air passages to the lungs and carrying out external heart massage by the exertion of pressure on the chest.

CPR procedures should be performed only on

unconscious individuals who are not breathing and only by those who have training in CPR methods. The first step in CPR is to open the airway by placing the individual on his back on a rigid surface, clearing foreign matter from the mouth or airway, and tilting the head back so that the chin is elevated. The second step involves mouth-to-mouth resuscitation—clamping the victim's nostrils, making an airtight seal over his mouth and breathing into it about 12 times per minute, allowing for natural exhalation. The third step is to check one of the carotid arteries (large blood vessels located on either side of the voice box) for a pulse. Absence of a pulse requires artificial circulation of the blood by means of external chest compressions (at the rate of about 80 per minute for adults). The recommended ratio of chest compressions to breaths administered is 15:2. CPR should continue uninterrupted until normal breathing and circulation are restored or until advanced professional medical assistance can be obtained. The procedure is modified somewhat for infants and children and under special circumstances (such as additional injury).

cardiovascular system, organ system that conveys blood to and from all parts of the body, carrying nutrients and oxygen to the tissues and removing wastes and carbon dioxide.

A brief treatment of cardiovascular systems follows. For full treatment, *see* MACROPAEDIA: Circulation and Circulatory Systems. For a depiction of some of the structures that make up the human cardiovascular system, shown in relation to other parts of the gross anatomy, *see* the colour Trans-Vision in the PROPAEDIA: Part Four, Section 421.

The cardiovascular system is essentially a closed tube through which blood moves in a double loop. Its chief structures are the heart, a muscular pump that propels blood around the circuit; the arteries, thick-walled vessels that carry blood outward from the heart; veins, thinner-walled vessels that return blood to the heart; and the capillaries, minute blood passages connecting the arteries and veins, in which nutrients and wastes are exchanged between the blood and tissues.

The cardiovascular system is necessary only to animals of some size and complexity because in small animals physical diffusion is adequate to transport nutrients to the body. Hence, though the circulatory system is found in the larger and higher invertebrates, it reaches a complex development only in the vertebrates. It is filled with blood, which travels in a circuit passing through respiratory organs for the exchange of gases and close to the excretory organs for the emission of wastes.

The adult human heart is suspended in the chest cavity within a tough, membranous sac, the pericardium, which contains a fluid that cushions the beating organ. The heart muscle (myocardium) is made up of unique muscle fibres that spontaneously contract to squeeze the blood out of the four main cavities, or chambers, of the heart. Blood first enters the right atrium, a relatively thin-walled muscular chamber that accepts blood returning to the heart from most of the body. It then passes into the right ventricle, a more muscular cavity that pumps blood to the lungs to be oxygenated. On returning from the lungs, the blood enters the left atrium and from there flows into the left ventricle, the largest of the heart's four chambers and the chief pump forcing blood to distant tissues. The atria and ventricles are separated by tissue valves that prevent backflow of blood during ventricular contractions; similar valves at the exits from the ventricles prevent blood from surging back into the chamber when it is relaxed.

The heart contracts in two steps. First, the two atria distend to accept the inflow of blood from the veins, then contract to force the blood into the ventricles. A second, stronger contraction by the ventricles closes the atrioventricular valves and squeezes the blood out through the arteries. All heart muscle contracts without any outside stimulation, but an electroconductive tissue (the Purkinje fibres) buried in the myocardium triggers rhythmic beats to provide maximum contractile efficiency.

From the left ventricle, blood enters the aorta, the largest artery in the circulatory system. Two coronary arteries branch off almost immediately to supply blood to the myocardium; farther along, the aorta gives off the innominate, left carotid, and left subclavian arteries, which carry blood to the head, neck, and arms. The aorta then turns downward, sending arterial branches to the chest and abdominal organs as it descends, finally dividing into the iliac arteries supplying the legs.

As arteries branch off, the diameter of the new vessels becomes progressively smaller. The small arteries, called arterioles, feed into the microscopic capillary beds, where the vessel walls are but a few microns thick. The thin capillary walls act as a semipermeable membrane, allowing small molecules such as oxygen, water, carbon dioxide, and glucose to pass in both directions. Nutrients diffuse outward through this membrane while tissue waste products diffuse in, to be carried to the kidneys, liver, and lungs for removal from the body.

Capillaries converge to form small venules, which eventually join to become larger veins, generally following the same path as the arteries. Because most of the pressure of the heart contractions has been attenuated by the time the blood passes through the capillaries, fluid pressure in the veins is fairly low, so the vessels contain a number of valves that help control the direction of flow.

Blood from the venous network eventually reaches the heart through the superior and inferior venae cavae, from the upper and lower body respectively, which empty into the right atrium. That blood is expelled through the right ventricle into the short pulmonary artery leading to the lungs. The capillaries of the lungs are organized around the air pockets or alveoli at the end of the airway passages, so that carbon dioxide is given up by the blood into the air and oxygen is taken up. The oxygenated blood then returns to the left atrium through the pulmonary vein.

Diseases of the heart and blood vessels are a major source of human mortality and morbidity. The single largest cause of death in developed countries is atherosclerotic heart disease, in which the buildup of fatty deposits in the coronary arteries closes off the blood supply to part of the myocardium, destroying vital heart tissue. Atherosclerosis also contributes to strokes by narrowing the arteries supplying the brain, thus making them susceptible to blockage by spasm or blood clots. Other major diseases of the cardiovascular system include congenital heart diseases, rheumatic heart disease, and vascular inflammation.

Cardis, Treaty of (1661), peace settlement between Russia and Sweden, ending the war begun in 1656 and maintaining the territorial accords of the earlier Treaty of Stolbovo. *See* Stolbovo, Treaty of.

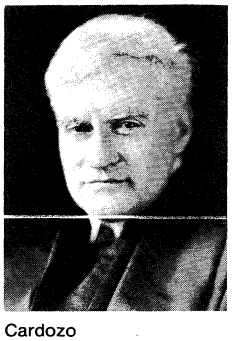
cardoon (*Cynara cardunculus*), thistlelike perennial herb of the family Asteraceae, native to southern Europe and North Africa, where it is used as a vegetable. Its blanched inner leaves and stalk (called the chard, though not to be confused with Swiss chard, or leaf beet) and thick main roots are usually boiled, seasoned, and served chilled in salads.

Besides common and Spanish cardoons, there are also prickly-leaved Tours cardoons, red-stemmed cardoons, and Paris cardoons, these latter being the largest and most tender. The species was introduced into South America and has gradually spread over great areas of the pampas.

Cardoon (*Cynara cardunculus*)
Shunji Watari—EB Inc.

Cardozo, Benjamin Nathan (b. May 24, 1870, New York City—d. July 9, 1938, Port Chester, N.Y., U.S.), American jurist, a creative common-law judge and legal essayist who influenced the trend in U.S. appellate judging toward greater involvement with public policy and consequent modernization of legal principles. Generally a liberal, he was less concerned with ideology than with the nature of the judicial process itself; largely for this reason, his importance, while universally conceded, is difficult to fix precisely. Although he was esteemed for his service as an associate justice of the United States Supreme Court (1932–38), he was probably more significant for his work on the highest state tribunal in New York, the Court of Appeals (1914–32; chief judge from 1926).

A member of a distinguished Sephardic Jewish family, Cardozo enjoyed an unblemished personal reputation, although his father, Albert Jacob Cardozo, a New York Supreme Court justice with Tammany Hall connections, had resigned in 1872 under threat of impeachment. Admitted to the New York bar in 1891, Benjamin Cardozo was highly successful as a courtroom lawyer despite his mild, reserved manner. Elected to the state Supreme Court as a reform candidate in 1913, he was quickly promoted to the Court of Appeals. During his tenure, the quality of this appellate bench was thought by many to exceed that of the U.S. Supreme Court. In *MacPherson* v. *Buick Motor Company* (1916), Cardozo announced



Cardozo
By courtesy of the Library of Congress, Washington, D.C.

a doctrine that was later adopted elsewhere in the United States and in Great Britain: an implied warranty of safety exists between a

manufacturer and a private purchaser, despite intermediate ownership of the product by a retail dealer.

After the resignation (Jan. 12, 1932) of Justice Oliver Wendell Holmes, President Herbert Hoover appointed Cardozo to the U.S. Supreme Court. In the New Deal period under President Franklin D. Roosevelt, Cardozo usually was bracketed with the liberally inclined Justices Louis D. Brandeis and Harlan Fiske Stone. He wrote a majority opinion for *Helvering* v. *Davis,* 301 U.S. 619, and other Social Security cases (1937), upholding the federal Social Security program on the basis of the general welfare provision of the Constitution (Article I, section 8). In *Palko* v. *Connecticut,* 302 U.S. 319 (1937), a criminal case involving a claim of double jeopardy, he held that the Fourteenth Amendment (1868) to the Constitution imposed on the states only those provisions of the Bill of Rights (the first 10 amendments, 1791) that were "of the very essence of a scheme of ordered liberty." Although it offered a minimum of guidance and may have encouraged much more constitutional litigation than would a specific standard, this test was retained by the court through the 1960s. In 1969, however, the *Palko* ruling was reversed by the court (*Benton* v. *Maryland*), which held that the rule against double jeopardy was so fundamental to justice as to be a requirement of due process of law.

Cardston, town, southwestern Alberta, Canada, on Lee Creek, near the U.S. (Montana) border, 42 miles (68 km) southwest of Lethbridge. Founded by Mormons from Utah in 1887, it was named for Charles Ora Card (Brigham Young's son-in-law), who led the wagon train from Utah and who played an important role in the development of irrigation from the nearby St. Mary River (now dammed to form St. Mary Reservoir). Cooperative farming on which the town was built still flourishes, and a cattle-grain economy prevails. The town's white granite Mormon temple (built 1913–23) is the only one of its kind in Canada; octagonal in a double Maltese cross ground plan, it is 110 feet (34 m) high. In 1888 the North West Mounted Police established a post at Cardston, which was incorporated as a village in 1898 and as a town in 1901, with Card (whose cabin on Main Street has been preserved) as its first mayor. Pop. (1982) 3,267.

Carducci, Giosuè (b. July 27, 1835, Val di Castello, near Lucca, Duchy of Lucca [Italy]—d. Feb. 16, 1907, Bologna, Italy), Italian poet, winner of the Nobel Prize for Literature in 1906, and one of the most influential literary figures of his age.

The son of a republican country doctor, he spent his childhood in the wild Maremma region of southern Tuscany. He studied at the University of Pisa and in 1860 became professor of Italian literature at Bologna, where he lectured for more than 40 years. He was made a senator for life in 1890 and was revered by the Italians as a national poet.

Giosuè Carducci

By courtesy of the Biblioteca dell'Archiginnasio, Bologna; photograph, Fotofast

In his youth Carducci was the centre of a group of young men determined to overthrow the prevailing Romanticism and to return to classical models. Giuseppe Parini, Vincenzo Monti, and Ugo Foscolo were his masters, and their influence is evident in his first books of poems (*Rime,* 1857; later collected in *Juvenilia* and *Levia gravia,* 1868 ["Light and Serious Poems"]). He showed both his great power as a poet and the strength of his republican, anticlerical feeling in his hymn to Satan, "Inno a Satana" (1863), and in his *Giambi ed epodi* (1867–69; "Iambics and Epodes"), inspired chiefly by contemporary politics. Its violent, bitter language reflects the virile, rebellious character of the poet. *Rime nuove* (*The New Lyrics*) and *Odi barbare* (*The Barbarian Odes*), which appeared in the 1880s, contain the best of Carducci's poetry: the evocations of the Maremma landscape and the memories of childhood; the lament for the loss of his only son; the representation of great historical events; and the ambitious attempts to recall the glory of Roman history and the pagan happiness of classical civilization. Carducci's enthusiasm for the classical in art led him to adapt Latin prosody to Italian verse, and his *Odi barbare* are written in metres imitative of Horace and Virgil. Carducci's research in Italian literature was warmed by his poetic imagination and style, and his best prose works equal his poetry.

Carducci, Vincenzo, Spanish VICENTE CARDUCHO (b. 1578, Florence—d. 1638, Madrid), Italian-born painter, the brother of artist Bartolommeo Carducci, whom he accompanied to Spain in 1585. Vincenzo succeeded his brother in 1609 as court painter to Philip III. Trained by his brother in the style of Italian Mannerism, he was one of the leading artists in Madrid until the arrival of Velázquez. Vincenzo painted three battle scenes for the Buen Retiro palace (now in the Prado museum), but he was chiefly a religious painter. He wrote the *Diálogos de la Pintura* (1633), an academic treatise on art.

Carduelidae, songbird family, order Passeriformes, consisting of about 112 species of gregarious songbirds found in woodlands and brushlands worldwide, except in the Pacific Islands.

Members range in size from 10 to 25 cm (4 to 10 inches) long. They have pointed bills and rounded wings. Most are small birds with strong, undulating flight, during which they sing. They flit about searching chiefly for seeds, buds, berries, and, occasionally, insects. Among the notable members are: goldfinches and siskins (*Carduelis*), redpolls (*Acanthis*), rosefinches (*Leucosticte*), crossbills (*Loxia*), bullfinches (*Cocothraustes*), and canaries (*Serinus*). This large group of active little birds is sometimes classified as a subfamily (*Carduelinae*) in the family of Old World seedeaters (Ploceidae). It belongs to the songbird suborder (Passeres).

Cardwell (of Ellerbeck), Edward Cardwell, Viscount (b. July 24, 1813, Liverpool—d. Feb. 15, 1886, Torquay, Devon, Eng.), British statesman who, as secretary of state for war (1868–74), was considered to be the greatest British military reformer of the 19th century, modernizing the organization and equipment of the British Army in the face of strenuous opposition at home.

The son of a Liverpool merchant, he was educated at Winchester and at Balliol College, Oxford. A lawyer from 1838 and a member of the House of Commons from 1842, Cardwell served as president of the Board of Trade (1852–55), chief secretary for Ireland (1859–61), chancellor of the duchy of Lancaster (1861–64), and secretary for the colonies (1864–66). In 1868 William Gladstone, on becoming prime minister, gave Cardwell the War Office.

Concerned with improving conditions for the private soldier, Cardwell, in 1868, abolished flogging as a military punishment in peacetime. Two years later, he shortened the army enlistment term from 12 years' active service (it had been 21 years from 1815 to 1847) to six years' active duty and six years' reserve obligation, making possible for the first time in Great Britain a large, well-prepared reserve of reasonably young men. These and other measures so stimulated enlistments that the payment of "bounty money" (recruitment bonuses) was abolished in 1870.

In 1871, over the almost unanimous opposition of senior officers, Cardwell succeeded in abolishing the purchase of military commissions. That system had allowed generations of rich men and their sons to attain high ranks for which they were wholly unfitted and thereby had retarded the progress of competent career officers. On leaving office with Gladstone in 1874, Cardwell was created a viscount. The almost effortless British conquest of Egypt in 1882 is believed to have demonstrated the value of his reforms.

Cardwell died without surviving issue, and his peerage became extinct.

Čardžou (Turkmen S.S.R.): *see* Chardzhou.

CARE, in full COOPERATIVE FOR AMERICAN RELIEF EVERYWHERE, formerly COOPERATIVE FOR AMERICAN REMITTANCES TO EUROPE and COOPERATIVE FOR AMERICAN REMITTANCES EVERYWHERE, international aid and development organization that operates in some 35 countries worldwide.

CARE was formed in 1945 as an umbrella organization for a group of U.S. and Canadian associations working to help rebuild wartorn western Europe. Rather than disband after Europe had recovered, the organization extended its services to the less-developed countries of the world, and many western European countries formed their own branches of CARE.

Working through the host governments, with an emphasis on shared cost and self-help programs, CARE organizes a number of projects, including land management, soil conservation, food distribution, nutrition, and nutrition education. Since 1962, CARE's services also have included the Medical International Cooperation Organization (MEDICO; founded 1958), which gives health care workers training for service to remote rural areas.

Carême, Marie-Antoine, byname ANTONIN (b. June 8, 1784, Paris—d. Jan. 12, 1833, Paris), French chef who served the royalty of Europe and wrote several classics of cuisine.

Antonin was born into a poor family. He began his career at age 15 as a kitchen helper in a Parisian restaurant but soon moved to employment in a fashionable pastry shop, or *pâtisserie,* frequented by Charles-Maurice de Talleyrand. Carême's elaborately sculptured confections reached the table of Napoleon himself. Carême thereafter became the chef of Talleyrand (12 years), of the prince regent (the future George IV) of Great Britain (2 years), and briefly, in succession, of Tsar Alexander I of Russia, the court of Vienna, the British embassy in Paris, the Prince of Württemberg, the Marquess of Londonderry, and the Princess Bagration. He then spent 7 years with the Baron de Rothschild at his Ferrières estate.

His cuisine was famous for its decorative and elaborate display, approaching the grandiose, fitting for the old society of Europe. His chief works include *Le Cuisinier parisien ou l'art de la cuisine française au XIX^e^ siècle* (1828; "The Parisian Cook, or the Art of French Cooking in the 19th Century"), *Le Patissier royal parisien* (1828; "The Royal Parisian Pastry-Chef"), *L'Art de la cuisine française au XIX^e^ siècle* (1833; "The Art of French Cooking in

the 19th Century"), *Le Patissier pittoresque* (1842; "The Picturesque Pastry-Chef"), and *Le Maitre d'hotel français, traité des menus à servir à Paris, à Saint-Pétersbourg, à Londres, à Vienne* (1820; "The French Head Waiter: A Selection of Menus to Serve in Paris, Saint Petersburg, London, and Vienna").

Carew, Sir George: *see* Totnes, George Carew, earl of.

Carew, Richard (b. July 17, 1555, East Antony, Cornwall, Eng.—d. Nov. 6, 1620), English poet and antiquary known for an early history of Cornwall that gives an interesting picture of a country gentleman's life *c.* 1600.

Entering Christ Church, Oxford, at age 11, Carew later spent three years studying law and subsequently traveled abroad. He entered Parliament in 1584, became high sheriff of Cornwall in 1586, and served as treasurer under the lord lieutenant.

In 1589 he began his *Survey of Cornwall* (1602; modern edition, 1953). He translated the first five cantos of Torquato Tasso's *Gerusalemme liberato,* as *Godfrey of Bulloigne or the Recouverie of Hierusalem* (1594). His last work was *The Excellencie of the English Tongue* (1614).

Carew, Rod, byname of RODNEY CLINE CAREW (b. Oct. 1, 1945, Gatun, Panama), professional American League baseball player, who was one of the great hitters of the modern era.

Carew began playing baseball as a schoolboy in Gatun, Panama. He went with his mother to New York City in 1962 and played sandlot ball there. He batted left-handed and threw right-handed. From 1964 through 1967 he played on minor-league teams in the Minnesota Twins organization and joined the parent club in 1967, when his performance earned him the Rookie of the Year award. Carew played second base until 1976 and first base thereafter. He led his league in hitting seven times (1969, 1972–75, and 1977–78), his highest average being .388 in 1977; that same year he was named the Most Valuable Player in the American League. He also stole home seven times in 1969, a league record. In 1979 he was traded to the California Angels. With them he batted more than .300, as he had for his last 10 years with the Twins. He retired in 1986, with a lifetime batting average of .328. He became a national hero in Panama and retained Panamanian citizenship. Carew was also a serious amateur photographer.

Consult the INDEX *first*

Carew, Thomas (b. 1594/95, West Wickham, Kent, Eng.—d. March 22, 1639/40, London), English poet and first of the Cavalier song writers.

Educated at the University of Oxford and at the Middle Temple, London, he served as secretary at embassies in Venice, The Hague, and Paris. In 1630 Carew received a court appointment and became server at table to the king. The Earl of Clarendon considered him as "a person of pleasant and facetious wit" among a brilliant circle of friends that included the playwright Ben Jonson.

Carew's only masque, *Coelum Britannicum,* was performed by the King and his gentlemen in 1634 and published the same year. Music for it was composed by Henry Lawes, who, among others, set some of Carew's songs to music.

Carew's poems, circulated in manuscript, were amatory lyrics or occasional poems addressed to members of the court circle, notable for their ease of language and skillful control of mood and imagery. His longest poem is the sensuous *Rapture.* He was a meticulous workman, and his own verses addressed to Ben Jonson show that he was proud to share Jonson's creed of painstaking perfection. He greatly admired the poems of John Donne, whom he called king of "the universal monarchy of wit" in his elegy on Donne (deemed the outstanding piece of poetic criticism of the age). Carew was also indebted to Italian poets, particularly Giambattista Marino, whose libertine spirit, brilliant wit, and technical facility were much akin to his own, and on whose work he based several of his lyrics. He translated a number of the Psalms and is said to have died with expressions of remorse for a life of libertinism.

His poems were published a few weeks after his death. The definitive edition is that of Rhodes Dunlap, *The Poems of Thomas Carew, with His Masque "Coelum Britannicum"* (1949).

Carey, Henry (b. *c.* 1687, England—d. Oct. 4, 1743, London), English poet, playwright, and musician chiefly remembered for his ballads, especially "Sally in Our Alley," which appeared in a collection of his best poems set to music, called *The Musical Century* (1737). Despite the popularity of his work, Carey suffered great poverty, largely because his plays and poems were widely pirated by unscrupulous printers.

Reputed to be the illegitimate son of George Savile, 1st marquess of Halifax, he came to London (perhaps from Yorkshire) sometime before 1713, when his first book of poems was published. He studied music and began to work for the theatre, often providing both words and music for a number of farces, burlesques, ballad operas, and interludes; of his theatre work, the best is perhaps *The Honest Yorkshire-Man* (1735). Carey committed suicide by hanging. His son later claimed that his father was the author of "God Save the Queen," but this claim is unproved.

Carey, Henry C(harles) (b. Dec. 15, 1793, Philadelphia—d. Oct. 13, 1879, Philadelphia), American economist and sociologist, often called the founder of the American school of economics, widely known in his day as an advocate of protectionism.

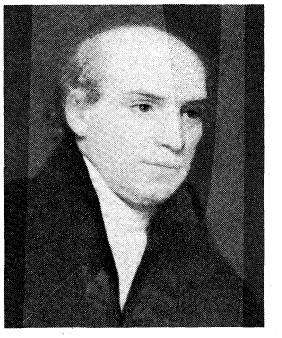
The son of Mathew Carey, Irish-Catholic political refugee, writer, and publisher, Carey became a partner in Carey, Lea & Carey, a leading U.S. publishing house, and later its president. His education, though informal, resulted in a cursory acquaintance with many fields of learning.

After 1835 he devoted himself to writing sociological and economic books and pamphlets. Among his more important works are *Essay on the Rate of Wages* (1835), *Principles of Political Economy* (1837–40), *Principles of Social Science* (1858–60), and *The Unity of Law* (1872). His works were translated into at least eight languages, many persons finding in them a foil to laissez-faire.

He became increasingly critical of English classical political economy. An optimist, he looked upon nature's laws as conducive to steady economic progress and to the harmony of diverse economic interests. Also a Republican and a nationalist, Carey believed protection initially essential to the industrial development of rising nations. His home served as a salon to disciples and visitors, and his reputation was perhaps greater abroad than at home.

Carey, William (b. Aug. 17, 1761, Paulerspury, Northamptonshire, Eng.—d. June 9, 1834, Frederiksnagar [now Shrīrāmpur], India), founder of the English Baptist Missionary Society (1792), lifelong missionary to India, and educator whose mission at Serampur set the pattern for modern missionary work. He has been called the "father of Bengali prose" for his grammars, dictionaries, and translations.

A Baptist from 1783, Carey served for several years as a pastor in Moulton, Northamptonshire, where he also taught school and continued his trade as a shoemaker. In 1789 he



William Carey, detail from an oil painting by Robert Home, 1812
By courtesy of Regent's Park College, Oxford

transferred to the Baptist Church at Leicester and three years later published a pamphlet entitled *An Enquiry into the Obligations of Christians to Use Means for the Conversion of the Heathens,* which led to his formation, with a dozen other ministers, of the English Baptist Missionary Society.

The new society's first missionaries, Carey and John Thomas, a doctor, went to Calcutta in 1793. The following year, Carey removed himself from the society's financial support when he became superintendent at an indigo plant at Mudnabati, Bengal. There he also preached, taught, and began his first Bible translation. Compelled to leave British-Indian territory, he and his family moved to the Danish colony of Frederiksnagar, near Calcutta, in 1800. There he and Joshua Marshman and William Ward, known as the "Serampore trio," founded the mission described by the English philanthropist William Wilberforce as "one of the chief glories" of the British nation.

Appointed in 1801 to teach Bengali, Sanskrit, and Marathi at Fort William College, Carey translated the Bible into Bengali, Oriya, Marathi, Hindi, Assamese, and Sanskrit. Parts of it he also translated into 29 other languages and dialects. He edited, with Marshman, a grammar in Bhotia and prepared six other grammars in different languages. In addition to dictionaries in Bengali, Sanskrit, and Marathi, Carey and Marshman prepared a translation of three volumes of the Hindu epic poem *Rāmāyaṇa.* Having established a press at Serampur, Carey edited and published two works of the horticulturist William Roxburgh, *Hortus Bengalensis* (1814) and *Flora Indica* (1832), and helped distribute prose texts for use in schools. His social work extended beyond education to urge the government to outlaw such practices as infanticide and suttee (in which Hindu widows cremated themselves on their husbands' funeral pyres). He also encouraged the use of Indians as missionaries and led in the formation of the Agricultural Society of India in 1820.

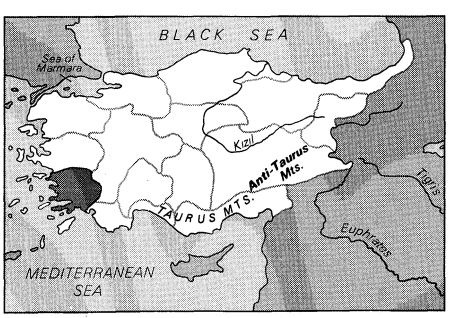
Careysburg, city, western Liberia, West Africa. It was first settled in 1859 by freed North American slaves (mainly from Barbados and the United States); the town, named for the Rev. Lott Carey (an American black who settled in Monrovia), is inhabited mainly by their descendants. The Voice of America (whose receiving station is at Brewerville 15 miles [24 km] west) has operated one of the most powerful radio stations in Africa at Careysburg since 1964, retransmitting programs to Africa, Central Europe, and the Middle East. Rubber and coffee farming are the major economic activities in the area. Pop. (1974) 5,184.

cargo cult, any of the religious movements chiefly, but not solely, in Melanesia that exhibit belief in the imminence of a new age of blessing, to be initiated by the arrival of a special "cargo" of goods from supernatural sources—based on the observation by local residents of the delivery of supplies to colonial officials. Tribal divinities, culture heroes, or ancestors may be expected to return with the cargo, or the goods may be expected to come through foreigners, who are sometimes accused of having intercepted material goods intended for the native peoples. If the cargo is expected by ship or plane, symbolic wharves or landing strips and warehouses are sometimes built in preparation, and traditional material resources are abandoned—gardening ceases, and pigs and foodstocks are destroyed. Former customs may be revived or current practices drastically changed, and new social organizations, sometimes imitative of the colonial police or armed forces, initiated.

These preparations announce the radically new age, thought to be inaugurated probably by cataclysmic events that will destroy the old order and bring a paradisal plenty, together with freedom and justice that may involve the reversal of the positions of white foreigners and indigenous peoples. The political implications and economic losses connected with these mass movements led colonial authorities to repress them. They may, however, be understood as the expression of traditional millennial ideas, often revived by the eschatological teaching of Christian missions and further inspired by the material wealth of the whites, which was interpreted by nonliterate peoples as emanating from supernatural sources overseas.

Cargo cults led by prophets claiming a new revelation appeared in the late 19th century, caught public attention in the Papuan "Vailala Madness" in 1919, and proliferated by the score from the 1930s, especially in marginal and undeveloped areas. In growing towns, cargo cults gave way to more secular movements.

Caria, ancient district of southwestern Anatolia. One of the most thoroughly Hellenized districts, its territory included Greek cities along its Aegean shore and a mountainous interior bounded by Lydia in the north and by Phrygia and Lycia in the east. The non-Greek Carians of the interior considered themselves an indigenous people, and claimed kinship with the Lydians and Mysians, with whom they shared a common worship. Caria passed from Lydian to Persian rule about 546 BC. West Carian dynasts joined in the unsuccessful Ionian revolt against the Persian king Darius I (*c.* 499–493 BC), and the coastal cities were later drawn into the Greek Delian League. Early in the 4th century BC all of Caria was rejoined to the Persian Empire as a separate satrapy under the rule of the native Hecatomid dynasty. One of the rulers, Mausolus (*c.* 377–353 BC), transferred the capital from Mylasa to Halicarnassus, where his tomb came to rank as one of the Seven Wonders of the Ancient World. After Alexander the Great, the history of Caria is one of autonomous cities and communes under the suzerainty of a succession of Hellenistic rulers until the entire region was incorporated into the Roman province of Asia (129 BC).

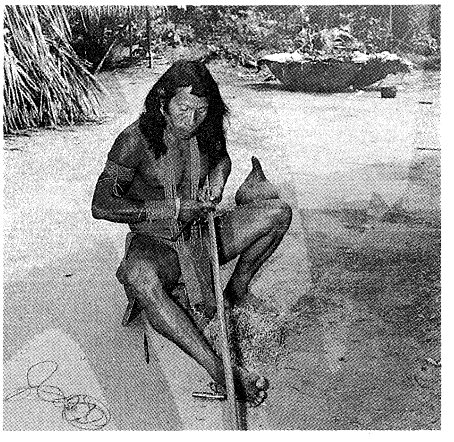


Caria under the Roman Empire

From W. Shepherd, *Historical Atlas*, Harper & Row, Publishers (Barnes & Noble Books), New York: revision copyright © 1964 by Barnes & Noble, Inc.

Carian language, ancient language spoken in the southernmost area of western Asia Minor; known primarily from the more than 100 Carian graffiti that were left by Carian mercenaries who served in Egypt. Clay tablets and monumental inscriptions in the language have also been found in Caria since World War II. Carian appears to be written in an alphabetic script. Not enough is known of the language as yet for it to be definitely classified, although some scholars assume that it belongs to the Anatolian subgroup of the Indo-European language family.

Carib, American Indian people who inhabited the Lesser Antilles and parts of the neighbouring South American coast at the time of the Spanish conquest. Their name was given to the Caribbean Sea, and its Arawakan equivalent is the origin of the English word cannibal. Today the term Cariban is used to designate a linguistic group that includes not only the language of the Antillean Carib but also many related Indian languages spoken in South America.



Guianan Carib making a blowgun to be used for hunting

T. Bertranet—Atlas Photo

The Island Carib, who were warlike (and allegedly cannibalistic), were immigrants from the mainland who, after driving the Arawak (*q.v.*) from the Lesser Antilles, were expanding when the Spanish arrived. Peculiarly, the Carib language was spoken only by the men; women spoke Arawak. Raids upon other peoples provided women who were kept as slave-wives; the male captives were tortured and killed.

The Island Carib were a maritime people, expert navigators who made distant raids in large dugout canoes. Warfare was their major interest and central value. Internal conflicts were common; there was no important chief, military organization, or hierarchical structure. The men strove to be individualistic warriors and boasted of their heroic exploits.

Carib groups of the South American mainland lived in the Guianas, and south to the Amazon River. Some were warlike and were alleged to have practiced cannibalism, but most were less aggressive than their Antillean relatives. They lived in small autonomous settlements, growing cassava and other crops and hunting with blowgun or bow and arrow. Their culture was typical of the peoples of the tropical forest. Other Carib-speaking tribes, apparently much like the Guianan Carib, were found to the west on the wooded slopes of the Andes along the Venezuelan–Colombian border. To the southeast the Guicuru, Bakairi, and other Carib speakers lived at the headwaters of the Xingu River in central Brazil.

Cariban languages, a group of South American Indian languages that were spoken before the Spanish Conquest from what is now the Greater Antilles to the central Mato Grosso in Brazil; most of the languages, however, were spoken north of the Amazon River in what is now northern Brazil, the inland areas of the Guianas and Venezuela, and lowland Colombia. West Indian Cariban is extinct, and the languages of the group have undergone a drastic decline in the other areas.

Caribbean Community and Common Market (Caricom), Caribbean organization established by the Treaty of Chaguaramas of July 4, 1973, to replace the former Caribbean Free Trade Association (Carifta), established in 1967. The member nations are Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Montserrat, St. Christopher and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago. The secretariat is located in Georgetown, Guyana.

The Caribbean Community's main purpose is economic cooperation in the area. Both common external tariffs and common protective policies for trade with countries beyond its membership were established by Caricom. It established fiscal incentives to industry and taxation arrangements to facilitate smooth relations among its members. Among Caricom's activities are coordination of economic policies and development planning. It also devises and institutes special projects for the less-developed countries within its jurisdiction.

Caribbean Current, powerful surface oceanic current passing west through the Caribbean Sea, then north through the Yucatán Channel, and finally east out the Straits of Florida to form the Florida Current. The warm Caribbean Current, derived from the junction of the North Equatorial Current and the Guiana Current, flows at an average rate in the range of 15 to 17 in. (38 to 43 cm) per second and transports about 1,000,000,000 cu ft (27,500,000 cu m) of water per second.

Caribbean literature, literary works of the Caribbean area written in Spanish, French, or English. The literature of the Caribbean has no indigenous tradition. The pre-Columbian American Indians left few rock carvings or inscriptions (petroglyphs), and their oral traditions did not survive 16th-century Spanish colonization. The West Africans who replaced them were also without a written tradition, so that for about 400 years Caribbean literature was an offshoot and imitation of the models of the colonial powers—Spain, France, Great Britain, and The Netherlands. Caribbean writers, however, were not unaware of their environment. The letters and speeches of Toussaint-Louverture, Haitian general and liberator, indicate that from at least the end of the 18th century the Caribbean was conscious of its cultural identity. It was not until the 1920s, however, that the challenge of a distinctive literary form was accepted. Then, as part of Spanish-American Modernism, Spanish and French Caribbean writers began to break away from European ideals and to identify themselves with their mainly Negro masses. For a discussion of Spanish-American Modernism, *see* MACROPAEDIA: Latin American Literature: *Rubén Darío and the Modernists.*

The leaders of this movement, mainly poets, were Luis Palés Matos (Puerto Rico), Jacques Roumain (Haiti), Nicolás Guillén (Cuba), Léon Damas (French Guiana), and Aimé Césaire (Martinique). Jean Price-Mars, a Haitian ethnologist, in *Ainsi parla l'oncle* (1928), declared that his purpose was to "restore to the Haitian people the dignity of their folklore."

The achievement of this Négritude, finely expressed in Césaire's poem *Cahier d'un retour au pays natal* (1939; *Return to My Native Land,* 1968), was the construction into poetic forms of the rhythmic and tonal elements of the islands' rituals and speech patterns, using Symbolist and Surrealist techniques.

The British Caribbean, developing its national literature after 1945, made its own contribution in the folk dialect novel: Vic Reid's *New Day* (1949), Samuel Selvon's *A Brighter Sun* (1952) and *The Lonely Londoners* (1956), George Lamming's *In the Castle of My Skin* (1953), V.S. Naipaul's *Mystic Masseur* (1957) and *House for Mr. Biswas* (1961), among others; and in the poetry of Louise Bennett (*Jamaica Labrish,* 1966). Paradoxically, anglophone Caribbean development was formally conservative, working toward an "open" rather than an autochthonous, or indigenous, expression in the work of C.L.R. James (Trinidad) and the poetry of Derek Walcott (St. Lucia). In the novels of Wilson Harris (Guyana), the Symbolist and Surrealist techniques of the Modernist movement reappear; and the poetry of Edward Brathwaite (*Rights of Passage* [1967], *Masks* [1968], *Islands* [1969]) attempts to reassert the place of Africa in the Caribbean. (E.Be.)

Caribbean Sea, suboceanic basin of the Atlantic Ocean, situated north of the Equator in the Western Hemisphere and washing the northern coast of South America and the eastern coasts of Central America and part of Mexico. It covers an area of approximately 1,020,000 sq mi (2,640,000 sq km).

The following article summarizes information about the Caribbean Sea. For full treatment, *see* MACROPAEDIA: North America; West Indies.

To the south it is bounded by the coasts of Venezuela, Colombia, and Panama; to the west by Costa Rica, Nicaragua, Honduras, Guatemala, Belize, and the Yucatán peninsula of Mexico; to the north by the Greater Antillean islands of Cuba, Hispaniola, Jamaica, and Puerto Rico; and to the east by the Lesser Antillean chain, composed of the island arc that extends from the Virgin Islands in the northeast to Trinidad, off the Venezuelan coast, in the southeast. The Yucatán Channel connects it with the Gulf of Mexico to the north. The Caribbean's greatest known depth is Cayman Trench (Bartlett Deep), between Cuba and Jamaica at approximately 25,216 ft (7,685 m) below sea level.

The Caribbean Sea is divided into five submarine basins that are roughly elliptical in shape and separated from one another by submerged ridges and rises. These are the Yucatán, Cayman, Colombian, Venezuelan, and Grenada basins. Subsurface water enters the Caribbean Sea across two sills. These sills are located below the Anegada Passage, which runs betweeen the Virgin Islands and the Lesser Antilles, and the Windward Passage, which runs between Cuba and Hispaniola. The sill depth of the Anegada Passage is between 6,400 and 7,700 ft; the sill depth of the Windward Passage is from 5,250 to 5,350 ft.

The climate of the Caribbean is generally tropical, but there are great local variations, depending on neighbouring mountain elevations, water currents, and the trade winds. Rainfall varies from 350 in. (8,890 mm) a year in parts of Dominica to only 10 in. annually on the island of Bonaire off the coast of Venezuela.

The geologic age of the Caribbean is not known with certainty. As part of the Central American Sea, it is presumed to have been connected with the Mediterranean during Paleozoic times (from about 570,000,000 to about 225,000,000 years ago) and then gradually to have separated from it as the Atlantic was formed.

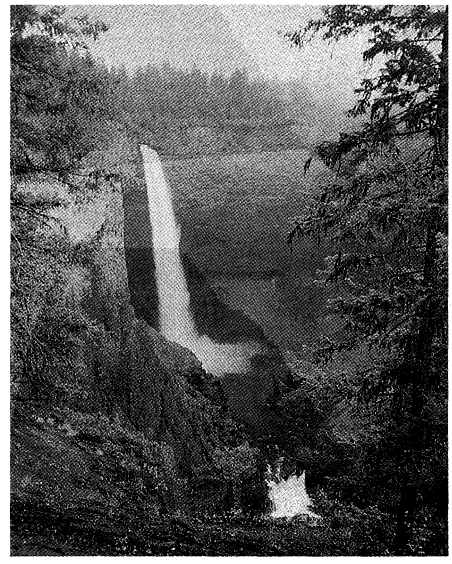
The economies of the Caribbean countries are greatly dependent upon tourism. With its sunny climate and recreational resources, the region has become one of the world's principal winter vacation resort areas, particularly for the peoples of the United States and Canada to the north and Brazil and Argentina to the south.

Caribbees (islands, Caribbean Sea): *see* Lesser Antilles.

caribe (fish): *see* piranha.

Caribert I (Merovingian king): *see* Charibert I.

Cariboo Mountains, range, in eastern British Columbia, Canada, forming the northern subdivision of the Columbia Mountains. Lying within an area enclosed by the great bend of the Fraser River and its tributary the North Thompson, they extend for about 190 mi (305 km), paralleling the Rocky Mountain Trench, which separates them from the Canadian Rockies. From Mt. Sir Wilfrid Laurier (11,299 ft [3,444 m]), the highest peak, the mountains gradually decline northward and westward, merging with the Interior Plateau near Prince George. They are well mineralized, and gold is mined near Barkerville, the centre of the 1860s gold rush. Wells Gray and Bowron Lake provincial parks occupy the western slopes, where there is some lumbering and ranching in addition to mining.



Helmcken Falls in Wells Gray Provincial Park, in the southern part of the Cariboo Mountains, British Columbia

Bob and Ira Spring—EB Inc.

Cariboo Road, wagon trail surveyed by Royal Engineers who aided its construction (1862–65) during the Cariboo gold rush, in the Fraser River Valley, southern British Columbia, Canada. It extended more than 400 mi (644 km) from Yale, at the head of steamboat navigation on the Fraser, through Ashcroft, to Barkerville in the Cariboo Mountains. The project was regarded as an engineering triumph because of the precipitous terrain. The original road, which facilitated settlement of the area, has been replaced by a modern highway that is called Cariboo Highway along part of its extent.

Wagon freighting on the Cariboo Road north of Yale, B.C., during the late 19th century

By courtesy of the Provincial Archives, Victoria, B.C.

Caribou, city, Aroostook County, northeastern Maine, U.S., on the Aroostook River, near the New Brunswick border, 13 mi (21 km) north of Presque Isle. Settled in 1824, it developed as a lumbering centre and was incorporated in 1859 as Lyndon Village. It was renamed Caribou in 1877 for the woodland caribou once plentiful in the region. The city is the shipping point for a large potato-growing region. It serves as the commercial centre of Loring Air Force Base, near Limestone, 11 mi (18 km) northeast, and as a gateway to Maine's Great North Woods and the Allagash outdoor recreation area. Its Nylander Museum houses Indian artifacts, minerals, and geological items collected by Swedish-born naturalist and geologist Olaf Nylander. Inc. city, 1968. Pop. (1980) 9,916.

caribou, in North America, a native species of reindeer (*q.v.*).

caricature, in graphic art, comically distorted drawing or likeness, done with the purpose of satirizing or ridiculing its subject, whether it be a person, type, or action. Plentiful examples of comic distortion may be found in gargoyles, the marginal illuminations of manuscripts, medieval broadsheets, and elsewhere, but the first known portrait caricatures are 18th-century and Italian. The Italian word *caricatura* (from *caricare,* "to load," or "to surcharge") is said to have been coined by the painter Annibale Carracci, who is also credited with inventing the device, put to virulent use by subsequent political caricaturists, of transforming a face into an animal, vegetable, or indeed anything, while retaining a likeness.

A brief treatment of caricature follows. For full treatment, *see* MACROPAEDIA: Caricature, Cartoon, and Comic Strip.

Political caricature appeared first in 18th-century England. Aristocratic English amateurs, having encountered the cunning likenesses done by Pier Leone Ghezzi in Rome, took them and the craze for caricature home. One of the most successful exponents of the fashionable new art form, George Townshend, extended its range of targets from personal acquaintances and artistic celebrities to politicians. Political caricature quickly achieved wide popularity; between 1780 and 1820, in a feverish political atmosphere, huge numbers of satirical prints were produced for sale or hire. In these political squibs, by now included in the widening term caricature, the tradition of "moral pictures" is as strong as that of Carracci and Townshend. Nevertheless, the 18th-century amateurs, whose insouciant draughtsmanship often conveyed an unintentional humour, shaped the characteristic style of caricature. A similar lively crudeness of expression was deliberately cultivated by the following generation of professional caricaturists, and preeminent among them was James Gillray, whose manner of drawing nicely complemented the grossness of his subjects. Many familiar cartoon conventions were established at this time: captions, speech balloons, and, particularly in the prints of Mustard George, the division of the paper into frames to present a series of related or contrasted pictures

(though not a narrative)—the comic strip in embryo. Among the first artists to use these devices specifically for the purpose of narrating a comic story was the Swiss Rodolphe Töpffer, who published his *Adventures of Dr. Festus* as lithographs in 1829.

The invention of lithography in the late 18th century was quickly exploited in France as a means of publishing pictures. Caricature became connected with journalism. Two satirical periodicals in particular, the weekly *La Caricature* and the daily *La Charivari*, both founded by Charles Philipon in the 1830s, exerted a far-reaching influence through the thousands of masterly lithographs they published. The trend in caricature toward a rapid, expressive style was confirmed by the use of lithography, a fast and direct method in which the artist drew directly onto the stone from which the prints were taken. The relentless political campaigns of *La Charivari*, including that against King Louis-Philippe, which transformed his fat face into a pear (*poire*, "dullard"), resulted in its eventual muzzling by official censorship. The journal consequently turned to social satire and established the genre of the *portrait chargé*, or "loaded portrait," in which the subject is allegorized as well as caricatured. Philipon's journals, in both phases, had many imitators: political–satirical in continental Europe and the more purely comic, as in the increasingly respectable *Punch*, in England.

Punch, with its high standards of draughtsmanship and inoffensive caricatures, often no more than illustrated jokes, contrasted strongly with the political aggressiveness of its European counterparts and its own English predecessors. Popular art did not survive long after 1830 in the lower strata of English society, except in the ancient form of woodcut broadsheets. During most of the Victorian age, periodicals like *Punch*, in which the tradition of British caricature was carried on, were available at threepence or sixpence a copy for those who could afford them. In England it was the adoption of wood engraving, rather than lithography, to replace copperplate etching that brought caricature into periodicals such as *Punch* in the 1840s; and wood engraving, a medium in which the artist's original drawing is worked over by craftsmen, produced a more restrained and conventional style than that of continental lithographs, thus reflecting a similar contrast of national attitudes in the caricaturists' approaches.

It was *Punch* that caused the word cartoon to supplant the overworked designation caricature, by parodying, with great popular success, a series of genuine cartoons, or full-size sketches to be used as patterns, for the new House of Commons frescoes in 1843. The meaning of cartoon was then further stretched with the appearance, largely in the 1860s, of "serious" cartoons. Perhaps the most famous was Sir John Tenniel's "Dropping the Pilot" (1890, referring to the dismissal of Otto von Bismarck by Kaiser Wilhelm II of Germany). This sort used analogy, symbols, or allegorical figures, with no distortion or humorous intent, to comment on contemporary events.

The revolution in printing caused by photo-process engraving in the 1880s democratized caricature. The cheapness of the new process made it possible, and so commercially obligatory, to illustrate daily newspapers; in 1888 the *Pall Mall Gazette* employed the first staff cartoonist, F.C.G. (Francis Carruthers Gould). Cheap comic papers, combining photo-process engraving with simple forms of colour printing, proliferated and brought caricature within reach of all classes; in England the comic-strip weekly "Ally Sloper's Half Holiday," at a halfpenny a copy, became "the poor man's *Punch*." American newspapers in the 1890s began to include comic strips as well as political cartoons; "The Katzenjammer Kids," a continuing story, appeared in 1897. Process engraving also brought about a relaxation of style; it faithfully reproduced the artist's drawing, whether in broad brushstrokes or, like Phil May's, in swift pen scribbles. Cartoonists began to take advantage of this to develop a line as individual as possible; Caran d'Ache, Albert Hirschfeld, David Low, Max Beerbohm, Jean Cocteau, Miguel Covarrubias, and Vicky became household words, each indicating not merely a cartoonist but a type of drawing. Simultaneously a number of painters—such as Henri Toulouse-Lautrec, James Abbott McNeill Whistler, Lyonel Feininger, George Grosz, Paul Klee, William Gropper, and Ben Shahn—advanced caricature in the fine arts.

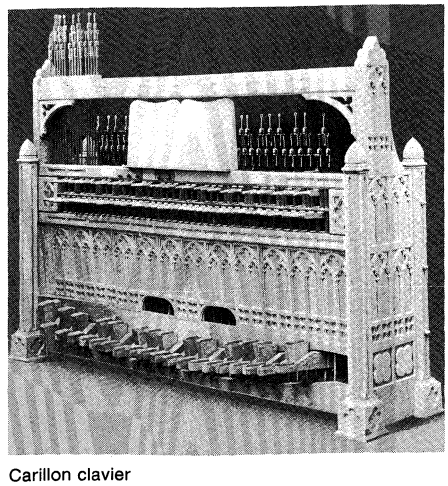
As single-panel gag cartoons, comic strips, and comic books grew in popularity during the mid-20th century, caricature was not so much in evidence. A number of cartoonists, however, invigorated and gave new life to the medium—including England's Cecil Beaton, Gerard Hoffnung, Ronald Searle, and Gerald Scarfe and the United States' Robert Osborn, David Levine, Edward Sorel, and Patrick Bruce Oliphant.

Consult the INDEX *first*

caries, plural CARIES, also called TOOTH DECAY, cavity or decay of a tooth, a localized disease that begins at the surface of the tooth and may progress through the dentine into the pulp cavity. It is believed that the action of microorganisms in the mouth on ingested sugars and carbohydrates produces acids that eat away the enamel. The protein structure of the dentine is then destroyed by enzymatic action.

Diet, general health, structural defects of the teeth, and heredity affect one's chances of developing caries. Treatment includes attention to diet, often entailing the avoidance of sweets, and care of the teeth by cleansing and by restoring teeth that have cavities. The addition of sodium fluoride to fluoride-deficient municipal water supplies has been observed to reduce the incidence of caries by as much as 65 percent.

carillon, musical instrument consisting of at least 23 cast bronze bells in fixed suspension, tuned in chromatic order (*i.e.,* in half steps) and capable of concordant harmony when sounded together. Customarily located in a tower, it is played from a clavier, or keyboard, containing wooden levers and pedals wired to clappers or, less commonly, from an ivory keyboard with electric action operating the clappers; but only the first method permits expression through variation of touch. On some instruments a part of the range is capable of automatic play by use of perforated rolls.



Carillon clavier
Gillett & Johnston (Croydon) Limited

Most carillons encompass three to four octaves, a few five and even six. Although the bourdon, or lowest note, can be any pitch, it often sounds around middle C. In heavy instruments the bell to produce this note may weigh 6 to 8 tons, occasionally 10 or 12; the world's heaviest, at the Riverside Church, New York City, weighs 20 tons. Carillon bells diminish in size and weight with the upward scale to extreme trebles of about 20 pounds (9 kilograms). Playing large instruments—using fists and feet—takes considerable physical exertion, as clappers weighing as much as several hundred pounds must be swung. (The heaviest clappers are counterbalanced.)

Most carillon music has been arranged for a specific instrument by its player. Baroque music of the 17th and 18th centuries adapts to bells; much of Vivaldi, Couperin, Corelli, Handel, Bach, and Mozart is admirably suited to carillon transcription. Nineteenth-century Romantic music must be chosen selectively, and contemporary music even more so. Improvisation is extensively employed, particularly on folk songs and other familiar themes.

The word carillon was originally applied in France to four stationary clock bells (hence the medieval Latin name *quadrilionem*) and later referred to any group of fixed bells. During the 14th century a weight-driven revolving pegged drum was invented that could be connected to clockworks; the pegs tripped levers wired to hammers, which in turn struck the bells. For the next 150 years, clock chimes struck by this method produced simple note sequences or melodies preceding the hour strike in church and town-hall towers. Interest in the musical potential of bells was greatest in Belgium and the Netherlands, where bell founding had reached an advanced stage and a bell profile had been developed that produced a more musical sound than those of foreign founders. The set of bells now known as a carillon originated in Flanders, possibly at Aalst or Antwerp, in about 1480. The Flemish devised a wooden keyboard for use alongside the chiming cylinder. This innovation became popular throughout Belgium and the Netherlands and northern France but was widely adopted elsewhere only in modern times.

Carillon art reached a pinnacle in the latter half of the 17th century with the founders François and Pierre Hémony of the Netherlands. They were the first to tune the bells with precision, especially with regard to a bell's inner tuning (*i.e.,* of the partial tones that make up a bell's complex sound), and thus to put fully into practice the results of research completed 200 years earlier. During the 19th century, tuning techniques (but not the underlying theory) were forgotten as orders for bells slackened; the bells that were made were generally inferior, and carillons fell into disrepair. The rediscovery of the tuning process at the John Taylor and Company foundry in Loughborough, Leicestershire, Eng., in the 1890s initiated a revival of carillon art.

Mechelen, Belg., has been the focal point of the carillon since the 16th century, the first post of municipal carillonneur being established there in 1557, at St. Rombold's Cathedral. Its carillon remains the world's best known. Jef Denyn, who played there from 1881 to 1941, led in the restoration of the art, establishing in 1922 the first carillon school and a publishing enterprise. In the same year, the carillon was introduced to the United States, where later the world's two largest, each with 72 bells, were built for the Riverside Church in New York City and for Rockefeller Chapel at the University of Chicago.

carillon, electronic (musical instrument), also called ELECTROACOUSTICAL CARILLON, or ELECTROPHONIC CARILLON: *see* electronic carillon.

Carinthia (Austria): *see* Kärnten.

Carinus, in full MARCUS AURELIUS CARINUS (d. 285, on the Margus River, Moesia Superior), Roman emperor 283–285.

With the title of Caesar, he was sent by his father, the emperor Carus, to the army of the Rhine in 282. On his father's death in the summer of 283, Carinus became emperor in the West, his brother Numerian becoming emperor in the East. After a campaign on the

Carinus, marble bust; in the Capitoline Museum, Rome
Alinari—Art Resource/EB Inc.

Rhine, Carinus returned to Rome where, in September 284, he celebrated games in honour of Carus' victories in Persia the year before.

Near Verona in the spring of 285, Carinus defeated Aurelius Julianus, the governor of Venetia, who had proclaimed himself emperor. Shortly afterward Carinus was killed by his own troops during a battle against Diocletian (who had succeeded Numerian as emperor in the East) on the banks of the Margus River.

Carisbrooke, locality, Medina district, Isle of Wight, England, southwest of Newport. The great castle shows three main periods of building—Roman, Norman, and Elizabethan. The early Norman motte and bailey (defensive mound and associated castle) were built on the site of a Roman fort of the 3rd century. Its extended fortifications were enclosed by an elaborate outer curtain in the 16th century under threat of Spanish invasion. Charles I was imprisoned there in 1647–48. Pop. (1971) 3,195.

Carissimi, Giacomo (baptized April 18, 1605, Marino, near Rome—d. Jan. 12, 1674, Rome), one of the greatest Italian composers of the 17th century, chiefly notable for his oratorios and secular cantatas. Following brief appointments at Tivoli and Assisi, he settled in Rome in the late 1620s as director of music at the church of S. Apollinare and retained this post until he died.

Although not an operatic composer, Carissimi helped to satisfy the Italians' enthusiasm for opera by making its pastoral or dramatic content available in the home and in the church through his numerous oratorios and cantatas. His 16 oratorios on Old Testament subjects were "substitute operas" that could be performed during Lent, when operas were forbidden. Those episodes in which the narrative is interrupted and the characters express emotions, as in opera, show Carissimi's basic interest and talents. In his cantatas he consolidated the pioneer work of Luigi Rossi, but in oratorio he was himself a pioneer.

Carissimi's works are marked by emotional balance and an ideal fusion of the lyrical and the dramatic, and when working on a large scale his pronounced feeling for tonality prevents any tendency to diffuseness. His genius is well displayed in his oratorio *Jephtha*, lasting about 20 minutes, where both solo narrator and chorus act as commentators and the latter also take the roles of opposing groups in the story. Handel expanded this basic scheme in his oratorios. Carissimi greatly influenced later music not only through his compositions but also through his numerous pupils. A renewed interest in the music of Carissimi has resulted in performances of some of his oratorios, including *The Judgment of Solomon, Baltazar,* and *Judicium Extremum.*

Carl (personal name): *see under* Charles, except as below.

Carl XVI Gustaf, in full CARL GUSTAF FOLKE HUBERTUS (b. April 30, 1946, Stockholm), king of Sweden from 1973. The only son of King Gustav VI Adolf's eldest son, Prince Gustav Adolf (who died in an air crash in 1947), Carl Gustaf became crown prince in 1950, when his grandfather acceded to the throne. He studied at military cadet schools, at the University of Uppsala, and in France and was commissioned as a naval officer in 1968. He married Silvia Sommerlath in 1976, three years after his accession.

Carl Gustaf's accession occurred when the role of the Swedish monarchy was being radically altered. Under the constitution prior to 1975, the king played a formal role in the administration of the country; for example, he presided over councils of state, signed government decisions, commanded the armed forces, and appointed someone to form a new government upon the resignation of the current administration. The new constitutional laws, enacted in 1973 and made effective on Jan. 1, 1975, relieved the king of all these duties, leaving him with a solely symbolic function.

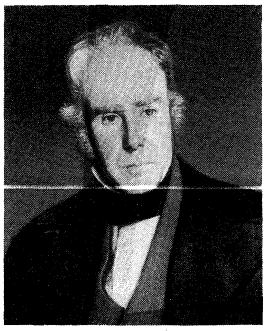
Carl Hagenbeck Tierpark: *see* Hamburg Zoo.

Carleton, Guy: *see* Dorchester, Guy Carleton, 1st Baron.

Carleton, Mount, highest point (2,690 ft [820 m]) in the Maritime Provinces (New Brunswick, Nova Scotia, and Prince Edward Island) of Canada, 70 mi (110 km) east of Edmundston, N.B., near Nictau and Nepisiguit lakes. Structurally it is a monadnock, or erosional remnant, rising above the 1,000-ft level of the surrounding highlands, which are an extension of the Appalachian region. The mountain, focus of a provincial park in Restigouche County, was named in 1899 after Gen. Thomas Carleton, New Brunswick's first governor.

Carleton, William (b. Feb. 20, 1794, Prillisk, County Tyrone, Ire.—d. Jan. 30, 1869, Dublin), prolific writer who realistically portrayed the life of the rural Irish.

Born the youngest of 14 children on a small farm, Carleton learned to appreciate the Irish heritage from his father, a man well-versed in



William Carleton, detail of a portrait by John J. Slattery, c. 1855; in the National Gallery of Ireland, Dublin
By courtesy of the National Gallery of Ireland, Dublin

the rich folklore of the area. At first a village tutor, he published a two-volume collection of sketches, *Traits and Stories of the Irish Peasantry* (1830), which describes the Ireland of the 19th-century tenant farmer. The writings that followed—*e.g., Tales of Ireland* (1834) and *Fardorougha the Miser* (1839)—deal with such rural problems as the land question, secret patriotic societies, and the Irish potato famine of the 1840s. Although filled with local colour, his powerful stories had wide appeal and were translated into French, German, and Italian.

Carletonville, town, principal mining centre of the Far West Witwatersrand goldfields, Transvaal, South Africa, west of Johannesburg. Carletonville was originally an unplanned settlement established between 1937 and 1957 as the Blyvooruitzicht, West Driefontein, Doornfontein, and Western Deep Levels companies developed their gold mining claims. In 1959 it was officially designated a town, being named for Guy Carleton Jones, a local mining director. Carletonville's prosperity is heavily dependent on the continued production of gold. Uranium is often recovered as a by-product of gold production and the town contains some light industrial development. Situated in a dolomite area, the environs of the town have suffered from sinkhole destruction.

By 1979 Western Deep Levels Ltd. operated the world's deepest gold mine (extending to 11,837 ft [3,608 m] below the Earth's surface). Pop. (1978 est.) mun., 108,040.

Carlile, Richard (b. Dec. 8, 1790, Ashburton, Devonshire, Eng.—d. Feb. 10, 1843, London), Radical English journalist who was a notable champion of the freedom of the press.

Carlile, detail of an oil painting by an unknown artist; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

Although convinced that the free propagation of ideas was more important than specific reforms, he was an early advocate of almost all the Radical causes of his time, including the abolition of monarchy, completely secular education, and the emancipation of women.

A shoemaker's son, Carlile became a journeyman tinsmith in London in 1813. Influenced by the humanitarian Thomas Paine's *Rights of Man* and dismayed by the economic depression of 1817, he began a new career as a salesman of two Radical weeklies, *The Black Dwarf* and (William) *Sherwin's Weekly Political Register.* Given control of Sherwin's printing press, Carlile immediately published several radical and deistic writings, among them his own *Political Litany.* For publishing Paine's works he was tried in 1819, heavily fined, and sentenced to a three-year term of imprisonment, which was extended to six years for nonpayment of the fine.

He had become sole proprietor of Sherwin's weekly journal that same year (1819) and, changing its name to *The Republican,* he edited 12 volumes in prison. Curiously, the

government made no attempt to stop his editorial work in jail, although his wife and other persons who operated his printing shop were harassed by police and occasionally imprisoned.

Carlile was released from prison in 1825, and the government decided against further legal action. He then edited two more volumes of *The Republican* and two new weeklies, *The Gorgon* and *The Lion.* From 1829 to 1831 he led discussions in the London Rotunda, which became the centre of Radical and freethinking activities.

Carlini, Armando (b. Aug. 9, 1878, Naples—d. Sept. 30, 1959, Pisa), Italian philosopher whose Christian spiritualism synthesized contemporary theories espoused by Giovanni Gentile and Benedetto Croce about the nature of phenomena. Basing his theory on the dichotomy of God and worldliness, he defined existence as dependent upon self-awareness and the identification of an "exterior world."

Educated at the universities of Bologna and Athens, Carlini succeeded Gentile as professor of theoretical philosophy at the University of Pisa (1922–59). His major works include *La vita dello spirito* (1921; "The Life of the Spirit"), *La metafisica di Aristotele* (1928; "The Metaphysics of Aristotle"), *La religiosita dell' arte e della filosofia* (1934; "The Religiousness of Art and Philosophy"), and *Lineamenti di una concezione realistica dello spirito umano* (1942; "Outline of a Realistic Conception of the Human Spirit"). *Alla ricerca di me stesso* (1951; "On the Research of Myself") is his moving autobiography.

Carlino (Florentine painter): *see* Dolci, Carlo.

Carlinville, city, seat (1829) of Macoupin County, southwestern Illinois, U.S. The first white settlement on the site, in an area known as Black Hawk hunting ground (frequented by Sauk, Fox, and Kickapoo Indians), was made in about 1815. The community was named for Gov. Thomas Carlin. A notable feature is the "million-dollar" county courthouse (1870), an imposing domed limestone structure, the construction of which was attended by fraud and scandal. Agriculture, including livestock raising, is important to the local economy. The chief crops are corn, soybeans, and apples. A large creamery is in the city. Industrial activities include coal mining and the manufacture of pipe, fittings, and cotton work gloves. Blackburn College, which in 1912, under the leadership of William M. Hudson, became internationally known for its self-help plan and student management, was established in 1857.

The first Civil War regiment in Illinois was organized at Carlinville, and four U.S. Civil War generals—John M. Palmer, John Logan, Richard Rowett, and John I. Rinaker—lived there. The first three are buried in the city's cemetery. A plaque on the Methodist Church lawn commemorates a speech Abraham Lincoln made there in 1858 in the campaign against Stephen A. Douglas for the U.S. Senate. Inc. 1829. Pop. (1980) 5,439.

Carlisle, district (city), county of Cumbria, England, on the Scottish border. It has an area of 398 sq mi (1,032 sq km).

In the Roman period, a civilian settlement, Luguvallium (later Carlisle), grew up on the south bank of the Eden, opposite Petriana (later Stanwix), a fortified camp on the line of Hadrian's Wall. The town dominated the surrounding area and in 685 became part of the see of Lindisfarne. It was destroyed by Norse invaders about 875 and was restored when claimed from the Scots by the Norman-English king William II Rufus in 1092. He initiated the building of a castle and walls.

Carlisle's role as a fortress town dates from the reign of Henry I (1100–35). Its position commanding the narrow lowland entry into England from the northwest gave it strategic importance. Augustinian canons built a church behind the castle, and their prior was created the first bishop in 1133. The first charter was granted in 1158, and in 1353 the city was given the right to a "free guild and a free election of their mayors and bailiffs." During the English Civil War, the town was besieged from October 1644 until June 1645, when its Royalist defenders finally surrendered to Parliamentary forces.

Considerable growth of the cotton-textile industry occurred in the late 18th and 19th centuries, and the community has remained the principal centre of the northern English cotton industry outside Lancashire, specializing in calico printing. New growth followed the advent of the railways after the 1830s, and Carlisle has become a major railway centre. Principal industries, besides textiles, are food and confectionery and engineering.

The cathedral was originally the church of the Augustinian priory (founded 1093), but much of this building was destroyed by fire in 1292 and 1392. Only part of the Norman nave remains. The Decorated-style east window contains mid-14th-century glass, and the tower was added in 1401. Other notable buildings include the town hall (1717) and 14th-century guildhall. Of the castle remains, the most important are the central Norman keep, the 14th-century main gate, and Queen Mary's Tower.

There are colleges of art and technology, and Tullie House (1689) houses the city's museum and art gallery. The racecourse is one of the oldest in England.

The rural area of the district has large stretches of unspoiled countryside, reaching a high point at Cold Fell (2,041 ft [622 m]), and includes the towns and villages of Brampton, Longtown, Dalston, and Wetheral. Pop. (1981 prelim.) city, 71,503; (1982 est.) district, 100,900.

Carlisle, borough, seat (1751) of Cumberland County, southern Pennsylvania, U.S., in the Cumberland Valley, 18 mi (29 km) southwest of Harrisburg. James le Tort, a French-Swiss Indian trader, settled with an Indian tribe near the site about 1720. The town, laid out in 1751, was named for Carlisle, Cumberland, Eng. It witnessed continuous conflict with the Indians until Benjamin Franklin negotiated a treaty in 1753. A provincial fort was built in 1756 during the French and Indian Wars, and Carlisle was the starting point for many military expeditions.

Carlisle became a munitions supply point during the American Revolution. Molly Pitcher, Revolutionary War heroine, and other colonial notables are buried in the Old Graveyard. In 1794 Carlisle served as Washington's headquarters during the Whiskey Rebellion. It was linked (1837) with Chambersburg by the Cumberland Valley Railroad. During the Civil War it was briefly occupied (June 27–30, 1863) by Confederate troops who bombarded it (July 1) when they retreated. Carlisle was an active station on the Underground Railroad, harbouring runaway slaves.

Light manufacturing (carpets, shoes, electronic equipment, quartz crystals, and rubber products) dominates its economy. Dickinson College was founded there as a grammar school by Thomas Penn in 1773, and Dickinson School of Law opened in 1834. Carlisle Barracks, seat of the U.S. Army War College, formerly housed the Carlisle Indian Industrial School (1879–1918), where Olympic champion Jim Thorpe began his athletic training. Pop. (1980) 18,314.

Carlisle, Charles Howard, 3rd earl of (b. 1674—d. May 1, 1738, Bath, Somerset, Eng.), chief minister of Great Britain from Dec. 30, 1701, to May 6, 1702, and from May 23 to Oct. 11, 1715.

The eldest son of Edward Howard, the 2nd earl (1646?–92), he was a member of Parliament from 1690 until he succeeded his father as earl in 1692. Throughout his life he held a variety of crown-appointed posts, most notably as first lord of the Treasury (then the chief, or "prime," ministry) under Queen Anne and King George I.

Carlisle, John G(riffin) (b. Sept. 5, 1835, Campbell Co., Ky., U.S.—d. July 31, 1910, New York City), lawyer, legislator, and government official. He served as speaker of the U.S. House of Representatives (1883–89) and secretary of the Treasury (1893–97).

Carlisle was admitted to the Kentucky bar in 1858 and practiced law in Covington before his election to a term in the state legislature (1859–61); he also served in the Kentucky state senate (1866–71) and as lieutenant governor (1871–75). Carlisle, a Democrat, was elected to the U.S. House of Representatives in 1876; he championed tariff reduction and rose to the post of speaker (1883). In 1890 he resigned from the House to fill an unexpired term in the Senate.

In 1893 Pres. Grover Cleveland appointed him secretary of the treasury. Carlisle's hard-money policy during the depression that followed the Panic of 1893 was extremely unpopular in the growing free-silver wing of the Democratic Party. In 1896 he abandoned the party's nominee for president, William Jennings Bryan, champion of the free-silver movement, to support John M. Palmer, candidate of the National Democratic Party (Gold Democrats). As a result of this switch of allegiance, Carlisle lost popular support in his native Kentucky; from 1897 he practiced law in New York City.

Carlisle, Lucy Hay, countess of, *née* PERCY (b. 1599—d. Nov. 5, 1660), intriguer and conspirator during the English Civil Wars, celebrated by many poets of the day, including Thomas Carew, William Cartwright, Robert Herrick, and Sir John Suckling.

The second daughter of Henry Percy, 9th earl of Northumberland, she married James Hay (the earl of Carlisle from 1622) and became a conspicuous figure at the court of Charles I. The King's adviser, the Earl of Strafford, valued highly her sincerity and services; but after his execution (1641), possibly in consequence of a revulsion of feeling at his abandonment by the court, she devoted herself to the interests of the Parliamentary leaders, to whom she communicated the King's most secret plans and counsels. Her greatest achievement was the timely disclosure to Lord Essex of the King's intended arrest of the five members of Parliament, which enabled them to escape. But she appears to have served both parties simultaneously, betraying communications on both sides, and doing considerable mischief in inflaming political animosities.

In 1647 she attached herself to the interests of the moderate Presbyterian party, which assembled at her house, and in the second Civil War showed great zeal and activity in the royal cause, pawned her pearl necklace for £1,500 to raise money for Lord Holland's troops, established communications with Prince Charles during his blockade of the Thames, and made herself the intermediary between the scattered bands of Royalists and the Queen. In consequence, her arrest was ordered on March 21, 1649, and she was imprisoned in the Tower, whence she maintained a correspondence in cipher with Charles through her brother, Lord Percy, until Charles went to Scotland. According to a Royalist newsletter, while in the Tower she was threatened with the rack to extort information. She was released on bail on September 25, 1650, but appears never to have regained her former influence in the Royalist counsels, and died, soon after the Restoration, of apoplexy.

Carlisle Commission, also called PEACE COMMISSION OF 1778, during U.S. War of Independence, group of British negotiators sent in 1778, to effect a reconciliation with the 13 insurgent colonies by a belated offer of self-rule within the empire. Shocked by the British defeat at Saratoga (concluded Oct. 17, 1777) and fearful of French recognition of American independence, Prime Minister Lord North induced Parliament to repeal (February 1778) such offensive measures as the Tea Act and the Massachusetts Government Act and to establish a commission to seek a negotiated settlement with the Americans. Headed by Frederick Howard, 5th earl of Carlisle, the commissioners set out in April, although they knew that the Franco-American Alliance had already been formed. Meanwhile, withdrawal of the main British army from Philadelphia to New York further stiffened American resolve to accept nothing short of independence, which the commission was not authorized to grant. Despite persistent propaganda and bribery attempts, the commission was unable to plead its case successfully.

Where the same name may denote a person, place, or thing, the articles will be found in that order

Carlism, Spanish CARLISMO, a Spanish political movement of traditionalist character, originating in the 1820s in the *apostólico* or extreme clerical party and mobilized in 1827 in the form of paramilitary Royalist Volunteers. This opposition to liberalism crystallized in the 1830s around the person of Don Carlos (*see* Carlos María Isidro de Borbón), younger brother of King Ferdinand VII, and afterward conde (count) de Molina. In claiming the right to succeed his brother, Don Carlos denied the validity of Charles IV's pragmatic sanction of 1789, then being used by Ferdinand to ensure the succession of his infant daughter Isabella (born on Oct. 10, 1830). Instead, the Carlists invoked the Salic Law, introduced into Spain by Philip V in 1713, which excluded females from the royal succession.

The disputed succession and its ideological overtones provoked the Carlist War of 1833–39. The Carlists, though defeated, thereafter upheld their cause despite the conservatism of the Isabelline monarchy and unsuccessful attempts to effect a dynastic reconciliation through a marriage between Isabella II (*q.v.*) and Don Carlos' heir, Don Carlos, conde de Montemolín. The Carlist claim passed to the latter upon the "abdication" of "King Charles V" in 1845. On the death of "King Charles VI" (Montemolín) in 1861, the leadership of the cause was assumed by his brother Don Juan; his alleged liberalism brought about his "abdication" in 1868 in favour of his son, Don Carlos, duque de Madrid, "King Charles VII," who then led the movement until his death in 1909. During the 19th century the Carlists frequently resorted to armed rebellion: a second Carlist War was unsuccessfully waged in the late 1840s, an abortive attempt made at a military coup d'etat in 1860, and full-scale war resumed between 1872 and 1876 during the political upheavals following the deposition (1868) of Isabella II. Yet another defeat, and the restoration (1874) of Isabella's son Alfonso XII, brought decline to Carlism, until Spain's humiliation in the Spanish-American War stimulated new growth and a brief return to insurgency during the years 1900–02.

Since the 1880s the party's history has been characterized by a series of conflicts between those who argued for understandings with other Catholic parties that accept the framework of parliamentary liberalism (or with parties resisting the encroachment of centralized state power) and those for whom the tactical alliance implied a watering down of principle. The latter point of view found expression in the creation (1918) by Juan Vázquez de Mella of the Traditionalist Party, which subsequently became the principal exponent of Carlism. It was merged in 1937 with the Falange by Gen. Francisco Franco, a party with which it had little in common.

The third Don Carlos, duque de Madrid, was succeeded as pretender in 1909 by his only son Don Jaime, duque de Madrid, on whose death without issue in 1931 the succession passed to his uncle Don Alfonso Carlos, duque de San Jaime. With Alfonso's death in Vienna on Sept. 29, 1936, the Carlist line became extinct. Alfonso, however, had nominated his successor, Francis Xavier of Bourbon-Parma (styled Charles IX by his adherents in Spain). By 1960, however, most Carlists had accepted the recognition given in 1958 by prominent members of their party to the son of King Alfonso XIII, Don Juan, conde de Barcelona, an outspoken critic of Franco, as rightful pretender to the throne. In July 1969, Franco named his close supporter Juan Carlos, prince of Asturias and son of Don Juan, his legal heir; on Franco's death in 1975 Juan Carlos became king.

Carlo (Italian personal name): *see under* Charles.

Carloforte, only town on the small Isola di San Pietro (area 20 sq mi [52 sq km]), just off the southwest coast of Sardinia, Italy. The island is administratively part of Cagliari province. The town was named after Charles Emmanuel III of Savoy, who resettled the island in 1738, after centuries of desertion, with Genoese fugitives from the North African island of Tabarka. It has an observatory, set up in 1899 by the International Geodetic Survey as one of the six special latitude observatories on the parallel 39°08′ N. Steamers ply between Porto Vesme (on Sardinia) and the island of Sant'Antioco. The main industry is tunny fishing; salt extraction and manganese mining are also carried on. Pop. (1981 prelim.) mun., 6,637.

Carloman, German KARLMANN, name of rulers grouped below by country or nation and indicated by the symbol •.

BAVARIA/CARINTHIA

• **Carloman** (b. 828—d. March or September 880, Öttingen, Ger.), eldest son of Louis II the German and father of the emperor Arnulf. Carloman rebelled against his father in 861 and 863 but in 865 was entrusted by Louis with a share in his authority, being granted jurisdiction over Bavaria and Carinthia. After this he remained loyal to his father, even helping to suppress the rebellion of his two younger brothers (866) and taking part in a campaign against the Moravians (869). The latter by 874 were forced to admit Frankish supremacy. After the death of the emperor Louis II (875), a faction in northern Italy favoured Carloman as candidate for the imperial crown; but Pope John VIII preferred Charles II the Bald. When Louis the German died (876), Carloman succeeded him as king of some of the German territories. In undisputed control of Bavaria, he promptly crossed the Alps on the death of Charles the Bald (877) and was recognized as king in northern Italy. The Pope, however, still refused him the imperial crown. Falling ill, Carloman had to renounce his lands and titles to his brother Louis III the Younger. His illegitimate son Arnulf became emperor in 896.

FRANCE

• **Carloman** (d. Dec. 12, 884), second son of Louis II and king of France or the West Franks (882–884). On Louis II's death (879) Carloman was associated with his brother Louis III as king of the West Franks, but both, as the children of a first marriage that had been unacceptable to their grandfather Charles the Bald, had difficulty in obtaining recognition. On Louis's death (882) Carloman became sole ruler. He died while hunting.

FRANKISH KINGDOMS

• **Carloman** (b. *c.* 715—d. Aug. 17, 754), Frankish prince, son of Charles Martel and brother of Pepin III the Short.

After inheriting Austrasia, Alemannia, Thuringia, and the suzerainty of Bavaria from his father, Carloman fought alone and with his brother to suppress external enemies and rebellious subjects. Concerned with reform of the church, he called on St. Boniface for help and in 742 summoned the first Frankish council in nearly 50 years; in 743 the Synod of Estinnes regulated the problem of church lands seized by Charles Martel and granted out to his vassals.

Carloman abandoned the secular life, becoming a monk first at Monte Soratte, later at Monte Cassino, in Italy.

• **Carloman** (b. 751—d. Dec. 4, 771, Samoussy, Fr.), the younger brother of Charlemagne, with whom, at the instance of their father, Pepin III the Short, he was anointed king of the Franks in 754 by Pope Stephen II (III) in the abbey of Saint-Denis. Carloman inherited the eastern part of Pepin's lands (768). He favoured alliance with the Lombards and married Gerberga, a daughter of their king, Desiderius. When Carloman died, Charlemagne annexed his territory and became sole ruler of the Frankish empire.

Carlos (Portuguese, Spanish personal name): *see under* Charles, except as below.

Carlos DE AUSTRIA, byname DON CARLOS (b. July 8, 1545, Valladolid, Spain—d. July 25, 1568, Madrid), prince of Asturias, son of King Philip II of Spain and Maria of Portugal, heir to the Spanish throne, whose hatred for his father led him to conspire with the King's enemies in the Low Countries, thus provoking his arrest. His death contributed to the black legend of Philip II.

Don Carlos spent his first years at Alcalá de Henares with his aunts, the infantas Doña María and Doña Juana. Except for a short period, the Prince did not see his father until he was 14 years of age. In 1554 Philip II entrusted his son's education to Honorato Juan, but the humanist accomplished very little. Don Carlos was sickly and soon showed signs of mental instability, being given to outbursts of violence. The Cortes of Castile recognized him as heir to the throne in 1560, but Philip subsequently decided he was incapable of ruling and barred him from succession to the throne. In 1565 Don Carlos attempted to escape to Flanders and, two years later, to Germany. Finally, Philip II ordered his arrest (January 1568) when he learned of the intrigues of the Prince with the Marquis of Berghes and the Baron of Montigny, nobles involved in the rebellion of the Low Countries. Don Carlos died in prison a few months later. Although his death occurred under mysterious circumstances, there is no evidence that he was executed by order of his father. The accounts that the Prince was subject to a judicial process or that his death was caused by his love for Queen Isabella of Valois, Philip's wife, or by his Protestant inclinations lack historical foundation. Don Carlos is probably best known as the hero of a tragedy by Schiller and of Verdi's opera *Don Carlo*.

Carlos, DON: *see* Carlos de Austria; Carlos Luis de Borbón; Carlos María de los Dolores de Borbón y Austria-Este; Carlos María Isidro de Borbón.

Carlos Luis DE BORBÓN, CONDE (count) DE MONTEMOLÍN, byname DON CARLOS (b. Jan. 31, 1818, Madrid—d. Jan. 13, 1861, Trieste, Austrian Empire), the second Carlist, or Bourbon traditionalist, Spanish pretender (as Charles VI) who twice attempted unsuccessfully to seize the throne and who by perpetuating the breach within the Bourbon royal family helped weaken support for the monarchy.

Montemolín, grandson of Charles IV (ruled 1788–1808), was given the Carlist mantle by his father, Don Carlos, conde de Molina, in 1845. In 1846–48 Montemolín's Carlist partisans fought a hopeless war in Catalonia against his Bourbon cousin Queen Isabella II. In 1860 he again tried to wrest the throne from Isabella, but a rising on his behalf failed to occur. He was captured and signed an abject renunciation of his claims, which he repudiated once safely in exile. When he died childless shortly thereafter, Carlist leadership passed to his brother Don Juan.

Carlos María DE LOS DOLORES DE BORBÓN Y AUSTRIA-ESTE, DUQUE (duke) DE MADRID, byname DON CARLOS (b. March 30, 1848, Laibach [Ljubljana], Austrian Empire—d. July 18, 1909, Varese, Italy), the fourth Carlist, or Bourbon traditionalist, pretender to the Spanish throne (as Charles VII) whose lack of leadership and military incompetence led to the final decline of the Carlist cause.

Don Carlos was the great-grandson of Charles IV (ruled 1788–1808) and the eldest son of the third Carlist pretender, Don Juan de Borbón, who abdicated on his behalf during the Revolution of 1868, which deposed Isabella II. Taking advantage of the resulting political instability, Don Carlos rallied his forces and provoked a bloody civil war, the Second Carlist War (1872–76). Although the Carlists scored some notable successes, their cause was doomed by the accession of Isabella's son Alfonso XII to the throne in 1874.

Don Carlos fled and became a wandering exile. He failed to exercise leadership to implement his claim either at the death of Alfonso (1885) or at the time of national discontent following defeat in the Spanish–American War (1898). At his death the Carlist party, divided by the development of regionalist parties and the advent of liberal Catholicism, was disillusioned and fragmented.

Carlos María Isidro DE BORBÓN, CONDE (count) DE MOLINA, byname DON CARLOS (b. March 29, 1788, Madrid—d. March 10, 1855, Trieste, Austrian Empire), the first Carlist pretender to the Spanish throne (as Charles V) and the second surviving son of King Charles IV.

He was imprisoned in France from 1808 to 1814 and led an uneventful life until he incurred the hostility of the Spanish radicals during the constitutional period (1820–23). Although pious and rigidly orthodox, he was unwilling to pay attention to the overtures of the *apostólicos* (extreme clericals) until his brother Ferdinand VII tried to make him recognize his daughter Isabella as heir to the throne. Don Carlos refused, maintaining that by the form of Salic law established by Philip V in 1713 (subsequent revocations of which he considered invalid) he was Ferdinand's rightful successor. Since the Spanish liberals supported Isabella's claim, Don Carlos became the candidate of the clericals, asserting that he represented the true traditions of the monarchy, the church, and regional liberties against the foreign innovations of liberal constitutionalism and centralization.

He went to Portugal in March 1833 to meet his brother-in-law Dom Miguel, the Portuguese pretender, and, in consequence of the civil war there, was cut off from Spain when Ferdinand VII died in September 1833. Don Carlos could return to Spain, where his supporters proclaimed him king as Charles V, only via England, and it was not until July 1834 that he put himself at the head of his partisans in the Basque provinces. Tomás de Zumalacárregui, his commander in chief, was a general of genius, but Don Carlos' lack of judgment prevented any early solution to the first Carlist War. After Zumalacárregui's death (1835) and the Carlists' failure to take Bilbao, the intitiative passed increasingly to the liberals. When, in August 1839, the Carlist general Rafael Maroto signed the Convention of Vergara, by which the liberals recognized Basque legal privileges, most of the fighting ceased and Don Carlos went into exile. He abdicated his pretensions in 1845, taking the title conde de Molina, in the vain hope that his son Carlos Luis de Borbón (*q.v.*) might heal the breach within the Bourbon family by marrying Isabella II.

Carlota, French in full MARIE-CHARLOTTE-AMÉLIE-AUGUSTINE-VICTOIRE-CLÉMENTINE-LÉOPOLDINE (b. June 7, 1840, Laeken, Belg.—d. Jan. 19, 1927, near Brussels), wife of the emperor Maximilian of Mexico.

At the age of 17, the only daughter of Leopold I, king of the Belgians, and Princess Louise of Orléans, she married the archduke Maximilian, brother of the emperor Francis Joseph I

Carlota

By courtesy of the Library of Congress, Washington, D.C.

of Austria. They lived as the Austrian regents in Milan until 1859, when Austria lost control of Lombardy. In 1864 she accompanied Maximilian to Mexico to accept the Mexican crown offered him by Napoleon III of France. The ambitious Carlota welcomed her authority in Mexico, but she also became genuinely interested in Mexican history, art, and culture. When in 1866 Napoleon withdrew his troops in the face of Mexican revolutionary resistance and United States opposition, she left for Europe to seek assistance in Paris and Vienna and finally in Rome from the Pope. Upon the failure of her efforts, she suffered a profound emotional collapse and never went back to Mexico. After the Mexicans executed her husband the following year, she spent the rest of her life in seclusion in castles at Laeken, Belg., and near Trieste, Italy.

Carlota, La, chartered city, Negros Occidental province, western Negros Island, Philippines. A company town serving a large modern sugar mill and plantation, it is linked by road and rail to Bacolod, the provincial capital, 18 mi (29 km) north, and by road to the west coastal highway. La Carlota is located 20 mi west of Canlaon Volcano (8,071 ft [2,360 m]), and there are hill resorts in the surrounding area near the city. It was organized as a city in 1966. Pop. (1980) 45,812.

Carlow, Irish CEATHARLACH (The Four Lakes), county in the province of Leinster, Ireland. The second smallest Irish county (346 sq mi [896 sq km]), it is bounded by County Kildare (north), Counties Wicklow and Wexford (east), and Counties Kilkenny and Leix (west). In the east are the granitic mountains of the Leinster Chain, notably Mt. Leinster (2,610 ft [796 m]) and Knockroe (1,777 ft [542 m]), crossed by the River Slaney and flanked to the west by the River Barrow Valley; in the west is the ridge of Old Loughlin bog. The intensively cultivated county is particularly suited for barley; wheat and sugar beets are other major crops. Game birds and fish are abundant. The railway from Dublin to Kilkenny and Waterford crosses the county.

Ceatharlach formed part of the medieval lordship of Leinster. Historic relics include megalithic tombs, Norman castles, and monastic settlements. Carlow is the county town (seat), and a county manager administers Counties Carlow and Kildare. There is a regional technical college. Pop. (1981) 39,820.

Carlow, Irish CEATHARLACH, urban district and county town (seat), County Carlow, Ireland, on the River Barrow. An Anglo-Norman stronghold, the town received charters of incorporation in the 13th and 17th centuries. The keep (innermost citadel) of a 13th-century stronghold remains at the confluence of the Barrow and Burren rivers. The Roman Catholic cathedral in Carlow was built in 1833 in Gothic Revival style. Local industries include sugar-beet and flour processing and the manufacture of footwear and machinery. Pop. (1981) 11,722.

Carlowitz, Treaty of, Carlowitz also spelled KARLOWITZ (Jan. 26, 1699), peace settlement ending hostilities (1683–99) between the Ottoman Empire and the Holy League (Austria, Poland, Venice, and Russia), which transferred Transylvania and much of Hungary from Turkish control to Austrian, thereby significantly diminishing Turkish influence in east central Europe and making Austria the dominant power there.

In the late summer of 1697, Sultan Mustafa II led one last large expedition northward but was defeated decisively by Prince Eugene of Savoy at the Battle of Zenta (September 11). Thus defeated by the Austrians, threatened by the Russians, and diplomatically pressured by the nonbelligerents England and Holland, the Sultan agreed to negotiate. A peace congress met in 1698 at the village of Carlowitz (spelling used in the treaty) or Karlowitz (modern Sremski Karlovci, Yugos.) near Belgrade for 72 days. For the first time the Turks agreed to negotiate with a coalition of European nations, to accept mediation by neutral powers, and to admit defeat. On Jan. 26, 1699, the Ottoman Empire signed peace treaties with Austria, Poland, and Venice. Austria received all of Hungary (except the Banat of Temesvár, bounded by the Theiss [Tisza], Maros [Mureşul], and Danube rivers), Transylvania, Croatia, and Slovenia; the Austro-Turkish treaty was to last for 25 years. Venice acquired the Peloponnese (which the Turks regained in 1715) and most of Dalmatia, including the harbour of Cattaro (Kotor). Poland returned its conquests in Moldavia but regained Podolia as well as part of the Ukraine west of the Dnepr River, which the Turks had conquered in 1672. The Turks and the Russians concluded only a two-year armistice at Carlowitz; but in 1700 they signed the Treaty of Constantinople, which gave Azov to Russia (Azov was returned to the Turks in 1711 and restored to Russia only in 1783) and also allowed the tsar to establish a permanent diplomatic mission in Constantinople.

Carlsbad (Czechoslovakia): *see* Karlovy Vary.

Carlsbad, city, San Diego County, southern California, U.S., on the Pacific Ocean just south of Oceanside, in a winter-vegetable and flower-growing district. Settled in the 1870s, it was first called Frazier's Station but was renamed (1883) when its mineral waters were found to be similar to those of Carlsbad, Bohemia (now Karlovy Vary, Czech.). After the

arrival (1885) of the Santa Fe Railway, the city with its fine beaches became a popular health resort. Light industry includes helicopter assembly. Inc. 1952. Pop. (1980) 35,490.

Carlsbad, city, seat (1889) of Eddy County, southeastern New Mexico, U.S., on the Pecos River. Founded in 1887 and first known as Eddy (for its founder Charles B. Eddy), it was renamed in 1899 for the European spa of Karlsbad (now Karlovy Vary, Czech.), because of nearby mineral springs. The centre (since 1888) of a large irrigation district, it is a shipping point for cotton, alfalfa, wool, oil, and livestock. Potash, discovered in 1926, is mined extensively. A branch of New Mexico State University is in the city. Carlsbad is the gateway to Carlsbad Caverns National Park (19 mi [31 km] south), and Living Desert State Park is nearby. The city has resort facilities along lakes created by dams on the Pecos. Inc. 1918. Pop. (1982 est.) 26,559.

Carlsbad Caverns National Park, national park in southeastern New Mexico, U.S., established in 1923 as a national monument and designated a national park in 1930. Beneath the park, which is 46,755 ac (18,921 ha) in area, winds a labyrinth of the largest underground chambers ever discovered. The total length of the rooms and passages is still unknown, but the explored part of the main cavern is 21 mi (33 km) long, of which 3 mi are open to visitors. Of the three major levels, the deepest is 1,037 ft below the ground. Elevators take visitors to the 750-ft level. The second level is at 900 ft.

The caverns have been formed by the dissolving of limestone by water. Many of the rooms so created have stalactites and stalagmites of calcite. The roof of the Papoose Room supports gleaming draperylike formations. The Big Room is about 1,300 ft long and 650 ft wide. Its ceiling arches 285 ft above the floor. Here are the Giant Dome, a stalagmite 62 ft tall, and the Twin Domes, only slightly smaller, superbly proportioned, and delicately fluted. A colony of several million bats inhabits a part of the caverns known as Bat Cave during the summer. These bats led to the exploration of the caverns in 1901, when a local cowboy, Jim White, saw them pouring from the cave's mouth at sundown to forage for insects. Carlsbad Caverns' surface area is a sanctuary for its native plants and wildlife.

Carlsbad Decrees, Carlsbad also spelled KARLSBAD, series of resolutions (*Beschlüsse*) issued by a conference of ministers from the major German states, meeting at the Bohemian spa of Carlsbad (now Karlovy Vary), Aug. 6–31, 1819. The states represented were Austria, Prussia, Bavaria, Saxony, Mecklenburg, Hanover, Württemberg, Nassau, Baden, Saxe-Weimar-Eisenach, and electoral Hesse.

The occasion of the meeting was the desire of the Austrian foreign minister, Metternich, to take advantage of the consternation caused by recent revolutionary outrages—especially the murder of the dramatist August Kotzebue by Karl Sand, a member of a radical student organization—to persuade the German governments to combine for the suppression of the liberal and nationalistic tendencies within their states. The conference agreed to Metternich's urgent disciplinary measures. He proposed that (1) the Diet of the German Confederation (*Bund*) should be asked to institute uniform censorship of all periodical publications; (2) the recently formed Burschenschaften (nationalist student clubs) should be disbanded and the faculties of schools and universities be placed under supervisory curators; and (3) a central investigating commission, armed with inquisitional powers, should be set up at Mainz with powers to ferret out conspiratorial organizations. These decrees were agreed upon by the representatives of the German states on Sept. 20, 1819.

The repressive and reactionary Carlsbad Decrees were enforced with varying severity in the German states over the next decade. Although they were temporarily successful in suppressing liberal political activities, they failed in the long run to stifle German nationalism or to curtail liberal developments in the states. The deliberations and acts of the congress are to be found in M. de Martens, ed., *Nouveau recueil général de traités,* vol. 4 (1846).

Carlsberg Ridge, submarine ridge of the Arabian Sea and the Indian Ocean. The ridge is a portion of the Mid-Indian Ridge and extends from near Rodrigues Island to the Gulf of Aden, trending basically northwest to southeast. The ridge separates the Arabian Sea to the northeast from the Somali Basin to the southwest. The mean depth of the Carlsberg Ridge is about 9,600 ft (3,300 m) below sea level, and it rises to a mean elevation of about 7,000 ft above the seafloor. The ridge turns westward around the island of Socotra and eventually connects with the East African Rift system by way of the Gulf of Aden. The Carlsberg Ridge coincides with the belt of seismic activity in the Indian Ocean.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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Carlson, Chester F. (b. Feb. 8, 1906, Seattle, Wash., U.S.—d. Sept. 19, 1968, New York City), American physicist who was the inventor of xerography, an electrostatic dry-copying process that found applications ranging from office copying to reproducing out-of-print books.

By the age of 14, Carlson was supporting his invalid parents, yet he managed to earn a college degree from the California Institute of Technology, Pasadena, in 1930. After a short time spent with the Bell Telephone Company, he obtained a position with the patent department of P.R. Mallory Company, a New York electronics firm.

Plagued by the difficulty of getting copies of patent drawings and specifications, Carlson began in 1934 to look for a quick, convenient way to copy line drawings and text. Since numerous large corporations were already working on photographic or chemical copying processes, he turned to electrostatics for a solution to the problem. Four years later he succeeded in making the first xerographic copy. Carlson obtained the first of many patents for the xerographic process in 1940 and for the next four years tried unsuccessfully to interest someone in developing and marketing his invention. More than 20 companies turned him down. Finally, in 1944, he persuaded Battelle Memorial Institute, Columbus, Ohio, a nonprofit industrial research organization, to undertake developmental work. In 1947 a small firm in Rochester, N.Y., the Haloid Company (later the Xerox Corporation), obtained the commercial rights to xerography, and 11 years later Xerox introduced its first office copier. Carlson's royalty rights and stock in Xerox Corporation made him a multi-millionaire.

Carlson, Evans (Fordyce) (b. Feb. 26, 1896, Sidney, N.Y., U.S.—d. May 27, 1947, Plymouth, Conn.), U.S. Marine officer during World War II who led guerrilla fighters (Carlson's Raiders) on daring military incursions in the Pacific area.

Carlson ran away from home to enlist in the U.S. Army at age 16. During World War I he was made a captain and served as assistant adjutant general on the staff of Gen. John J. Pershing in France and Germany and in the army of occupation (1917–19). He returned to civilian life in 1920 but enlisted as a private in the Marines in 1922, being commissioned a second lieutenant the following year. Carlson first served in China from 1927 to 1929 and returned in 1937 to spend nearly two years as an observer of the Chinese armies, including nearly a year with guerrillas behind Japanese lines. Returning to the United States, he wrote and lectured extensively on the peril of Japanese expansionism in the Far East. He warned against sending such war materials as scrap steel to a potential enemy and described the Chinese potential for resisting Japanese attack.

In 1941 Carlson became commander of the 2nd Marine Raider Battalion (Carlson's Raiders) and, using his experience in China to train the group, led it in a surprise attack on Makin Island in the Gilberts (August 1942) as well as in a month-long raid beyond Japanese lines on Guadalcanal (November). His leadership was characterized by extraordinary personal courage and endurance and unusual democratic discussion within the ranks. The morale of his men was among the highest in the armed forces; to friends he referred to his group as the Kung-Ho (Work Together), or Gung-Ho, Battalion. Malaria and wounds forced his retirement from active service in 1946, at which time he held the rank of brigadier general.

Carlstadt, Andreas Rudolf Bodenstein von: *see* Karlstadt, Andreas Rudolf Bodenstein von.

Carlton, Steve, byname of STEVEN NORMAN CARLTON (b. Dec. 22, 1944, Miami, Fla., U.S.), professional National League left-handed baseball pitcher who in 1983 became the second pitcher to surpass Walter Johnson's career record of 3,508 strikeouts (Nolan Ryan was the first).

Carlton pitched for Miami-Dade (Fla.) Junior College before he signed a contract with the St. Louis Cardinals in 1965. After pitching on their minor league clubs, he came up to the Cardinals in 1966 and remained with them until he was traded to the Philadelphia Phillies after the 1971 season. He came into his own in pitching with the Phillies, winning 20 or more games six times (1971–72, 1976–77, 1980, and 1982). He won his 300th game on Sept. 23, 1983, becoming the 16th pitcher to do so. In 1972, 1977, 1980, and 1982 he won the Cy Young award for the best pitcher in the National League. He was a good left-handed hitting pitcher. His best pitches were a fast ball and a hard slider that both broke and dropped. His unusual strength and stamina resulted from martial arts exercises.

Carlton House table, elegant writing table, normally in mahogany or satinwood, and characterized by a superstructure of drawers and pigeonholes running along the back and curving around the sides of the top, leaving clear only the side nearest the sitter. The curve of the superstructure is emphasized by small concave cupboard doors, but the sides are commonly stepped or curved down toward the front. A brass gallery runs around the outer edge of the superstructure. Introduced in the 1780s, the Carlton House table has been made in various forms ever since. It was named after the London home of the Prince of Wales, for whom the first one was made.

Carlyle, Thomas (b. Dec. 4, 1795, Ecclefechan, Dumfriesshire, Scot.—d. Feb. 5, 1881, London), British historian and essayist, whose major works include *The French Revolution,* 3 vol. (1837), *On Heroes, Hero-Worship, and the Heroic in History* (1841), and *The History of Friedrich II of Prussia, Called Frederick the Great,* 6 vol. (1858–65).

Early life. Carlyle was the second son of James Carlyle, the eldest child of his second marriage. James Carlyle was a mason by trade and, later, a small farmer, a man of profound Calvinist convictions whose character and way

of life had a profound and lasting influence on his son. Carlyle was equally devoted to his mother as well as to his eight brothers and sisters, and his strong affection for his family never diminished.

Carlyle, detail of an oil painting by G.F. Watts, 1877; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

After attending the village school at Ecclefechan, Thomas was sent in 1805 to Annan Academy, where he apparently suffered from bullying, and later to the University of Edinburgh (1809), where he read widely but followed no precise line of study. His father had intended him to enter the ministry, but Thomas became increasingly doubtful of his vocation. He had an aptitude for mathematics, and in 1814 he obtained a mathematical teaching post at Annan. In 1816 he went to another school, at Kirkcaldy, where the Scottish preacher and mystic Edward Irving was teaching. He became one of the few men to whom Carlyle gave complete admiration and affection. "But for Irving," Carlyle commented sometime later, "I had never known what communion of man with man means." Their friendship continued even after Irving moved in 1822 to London, where he became famous as a preacher.

The next years were hard for Carlyle. Teaching did not suit him and he abandoned it. In December 1819 he returned to Edinburgh University to study law, and there he spent three miserable years, lonely, unable to feel certain of any meaning in life, and eventually abandoning the idea of entering the ministry. He did a little coaching (tutoring) and journalism, was poor and isolated, and was conscious of intense spiritual struggles. About 1821 he experienced a kind of conversion, which he described some years later in fictionalized account in *Sartor Resartus,* whose salient feature was that it was negative—hatred of the devil, not love of God, being the dominating idea. Though it may be doubted whether everything was really experienced as he described it, this violence is certainly characteristic of Carlyle's tortured and defiant spirit. In those lean years he began his serious study of German, which always remained the literature he most admired and enjoyed. For Goethe, especially, he had the greatest reverence, and he published a translation, *Wilhelm Meister's Apprenticeship,* in 1824. Meanwhile, he led a nomadic life, holding several brief tutorships at Edinburgh, Dunkeld, and elsewhere.

Marriage. On Oct. 17, 1826, Carlyle married Jane Welsh, an intelligent, attractive, and somewhat temperamental daughter of a well-to-do doctor in Haddington. Welsh had been one of Irving's pupils, and she and Carlyle had known one another for five years. The hesitations and financial worries that beset them are recorded in their letters. It is interesting that Carlyle, usually so imperious, often adopted a weak, pleading tone to his future wife during the time of courtship, though this did not prevent him from being a masterful, difficult, and irritable husband; and, in spite of their strong mutual affection, their marriage was full of quarrels and misunderstandings. Those who knew him best believed Carlyle to be impotent.

In the early years of their marriage the Carlyles lived mostly at Craigenputtock, Dumfriesshire, and Carlyle contributed to the *Edinburgh Review* and worked on *Sartor Resartus.* Though this book eventually achieved great popular success, he had at first much difficulty in finding a publisher for it. Written with mingled bitterness and humour, it is a fantastic hodgepodge of autobiography and German philosophy. Its main theme is that the intellectual forms in which men's deepest convictions have been cast are dead and that new ones must be found to fit the time but that the intellectual content of this new religious system is elusive. Its author speaks of "embodying the Divine Spirit of religion in a new Mythus, in a new vehicle and vesture," but he never says very clearly what the new vesture is to be.

London. In 1834, after failing to obtain several posts he had desired, Carlyle moved to London with his wife and settled in Cheyne Row. Though he had not earned anything by his writings for more than a year and was fearful of the day when his savings would be exhausted, he refused to compromise but began an ambitious historical work, *The French Revolution.* The story of how the partially completed manuscript was lent to J.S. Mill and accidentally burned is well known. After the accident Carlyle wrote to Mill in a generous, almost gay, tone, which is truly remarkable when Carlyle's ambition, his complete dependence upon a successful literary career, his poverty, the months of wasted work, and his habitual melancholy and irritability are considered. The truth seems to be that he could bear grand and terrible trials more easily than petty annoyances. His habitual, frustrated melancholy arose, in part, from the fact that his misfortunes were not serious enough to match his tragic view of life; and he sought relief in intensive historical research, choosing subjects in which divine drama, lacking in his own life, seemed most evident. His book on the French Revolution is perhaps his greatest achievement. After the loss of the manuscript he worked furiously at rewriting it. It was finished early in 1837 and soon won both serious acclaim and popular success, besides bringing him many invitations to lecture, thus solving his financial difficulties.

True to his idea of history as a "Divine Scripture," Carlyle saw the French Revolution as an inevitable judgment upon the folly and selfishness of the monarchy and nobility. This simple idea was backed with an immense mass of well-documented detail and, at times, a memorable skill in sketching character. The following extract is characteristic of the contorted, fiery, and doom-laden prose, which is alternately colloquial, humorous, and grim:

> . . . an august Assembly spread its pavilion; curtained by the dark infinite of discords; founded on the wavering bottomless of the Abyss; and keeps continual hubbub. Time is around it, and Eternity, and the Inane; and it does what it can, what is given it to do (part 2, book 3, ch. 3).

Though many readers were thrilled by the drama of the narrative, it is not surprising that they were puzzled by Carlyle's prophetic harangues and their relevance to the contemporary situation.

In *Chartism* (1840) he appeared as a bitter opponent of conventional economic theory, but the radical-progressive and the reactionary elements were curiously blurred and mingled. With the publication of *On Heroes, Hero-Worship, and the Heroic in History* (1841) his reverence for strength, particularly when combined with the conviction of a God-given mission, began to emerge. He discussed the hero as divinity (pagan myths), as prophet (Muḥammad), as poet (Dante and Shakespeare), as priest (Luther and Knox), as man of letters (Johnson and Burns), and as king (Cromwell and Napoleon). It is perhaps in his treatment of poets that Carlyle shows to the best advantage. Perverse though he could be, he was never at the mercy of fashion; and he saw much more, particularly in Dante, than others did. Two years later this idea of the hero was elaborated in *Past and Present,* which strove "to penetrate . . . into a somewhat remote century . . . in hope of perhaps illustrating our own poor century thereby." He contrasts the wise and strong rule of a medieval abbot with the muddled softness and chaos of the 19th century, pronouncing in favour of the former, in spite of the fact that he had rejected dogmatic Christianity and had a special aversion to the Roman Catholic Church.

It was natural that Carlyle should turn to Cromwell as the greatest English example of his ideal man and should produce the bulky *Oliver Cromwell's Letters and Speeches. With Elucidations* in 1845. His next important work was *Latter-Day Pamphlets* (1850), in which the savage side of his nature was particularly prominent. In the essay on model prisons, for instance, he tried to persuade the public that the most brutal and useless sections of the population were being coddled in the new prisons of the 19th century. Though incapable of lying, Carlyle was completely unreliable as an observer, since he invariably saw what he had decided in advance that he ought to see.

In 1857 he embarked on a massive study of another of his heroes, Frederick the Great, and *The History of Friedrich II of Prussia, Called Frederick the Great* appeared between 1858 and 1865. Something of his political attitude at this time can be gathered from a letter written in April 1855 to the exiled Russian revolutionary A.I. Herzen, in which he says "I never had, and have now (if it were possible) less than ever, the least hope in 'Universal Suffrage' under any of its modifications" and refers to "the sheer Anarchy (as I reckon it sadly to be) which is got by 'Parliamentary eloquence,' Free Press, and counting of heads" (quoted from E.H. Carr, *The Romantic Exiles*).

Unfortunately, Carlyle was never able to respect ordinary men. Here, perhaps, rather than in any historical doubts about the veracity of the gospels, was the core of his quarrel with Christianity—it set too much value on the weak and sinful. His fierceness of spirit was composed of two elements, a serious Calvinistic desire to denounce evil and a habitual nervous ill temper, for which he often reproached himself but which he never managed to defeat.

Last years. In 1865 he was offered the rectorship of Edinburgh University. The speech that he delivered at his installation in April 1866 was not very remarkable in itself but its tone of high moral exhortation made it an immediate success. It was published in 1866 under the title *On the Choice of Books.* Soon after his triumph in Edinburgh, Jane Carlyle died suddenly in London. She was buried in Haddington, and an epitaph by her husband was placed in the church. Carlyle never completely recovered from her death. He lived another 15 years, weary, bored, and a partial recluse. A few public causes gained his support: he was active in the defense of Gov. E.J. Eyre of Jamaica, who was dismissed for his severity in putting down a Negro uprising in 1865. Carlyle commended him for "saving

the West Indies and hanging one incendiary mulatto, well worth gallows, if I can judge." He was excited by the Franco-German War (1870–71), saying "Germany ought to be President of Europe," but such enthusiastic moments soon faded. In these last years he wrote little. His history *The Early Kings of Norway: Also an Essay on the Portraits of John Knox* came out in 1875, and *Reminiscences* was published in 1881. Later he edited his wife's letters, which appeared in 1883 under the title *Letters and Memorials of Jane Welsh Carlyle, Prepared for Publication by Thomas Carlyle.* Although Westminster Abbey was offered for his burial, he was buried, according to his wish, beside his parents at Ecclefechan.

Carlyle's contribution. It is perhaps difficult to be fair to Carlyle. Those who do not accept him as an inspired prophet find he makes intolerable claims on his readers' patience and on their emotional energy. A sentence, a paragraph can be pithy, but a whole book, on the other hand, is always repetitive and diffuse, and he was invariably biassed.

Though he was a man of many words and wide learning, his religious sense, intense in its way, played always around two grand and simple ideas that many religions have in common: the terror of God's glory and the immortality of the soul. The whole of his life and writings can be seen as an attempt to secularize, to reclothe the Calvinist insights without mitigating them. In the effort to preserve religion while discarding its doctrines, he has affinities with several famous Victorians, particularly Matthew Arnold. But whereas Arnold, working from a moderate Anglican basis, attempted to turn Christianity into sweetness and light, Carlyle preserved to the full and even increased the fierceness, the momentous drama, the seriousness of Calvinism. The idea of the elect and the reprobate, even though transferred into moral and secular terms, was an ever-present reality to him. For an infallible Bible he substituted an infallible History, what he called "the true epic poem and universal Divine Scripture, whose plenary inspiration no man out of Bedlam or in it shall bring in question." He stirred the conscience of his century; he helped thousands to see their experience in a historical and spiritual context and thus to find new meaning in a monotonous existence; and in an age of prolonged physical toil, he inspired thousands with belief in the dignity of their work.

(A.O.J.C.)

MAJOR WORKS. *History. The French Revolution,* 3 vol. (1837); *On Heroes, Hero-Worship, and the Heroic in History* (1841); *Oliver Cromwell's Letters and Speeches. With Elucidations,* 2 vol. (1845); *The History of Friedrich II of Prussia, Called Frederick the Great,* 6 vol. (1858–65); *The Early Kings of Norway: Also an Essay on the Portraits of John Knox* (1875).

Biography and criticism. The Life of Friedrich Schiller (1825); *Critical and Miscellaneous Essays,* 4 vol. (1838); *The Life of John Sterling* (1851); *On the Choice of Books* (1866, inaugural address at his installation as rector of Edinburgh University).

Miscellaneous. Sartor Resartus: The Life and Opinions of Herr Teufelsdröckh (1836); *Chartism* (1840); *Past and Present* (1843); *Latter-Day Pamphlets* (1850); *Last Words of Thomas Carlyle on Trades-Unions, Promoterism and the Signs of the Times* (1882).

BIBLIOGRAPHY. *Bibliographies.* I.W. Dyer, *A Bibliography of Thomas Carlyle's Writings and Ana* (1928, reprinted 1968); C. Moore, "Thomas Carlyle: A Critical Bibliography" in C.W. and L.H. Houtchens (eds.), *English Romantic Poets and Essayists,* rev. ed. (1966); the *New Cambridge Bibliography of English Literature,* vol. 3 ed. by G. Watson (1969).

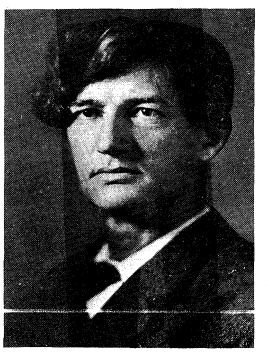
Major collected editions and selections. The fullest collected works is the Centenary Edition by H.D. Traill, 30 vol. (1896–99, reprinted 1974). Selections include: *Carlyle: An Anthology,* ed. by G. M. Trevelyan (1953); *Selected Works, Reminiscences and Letters of Carlyle,* ed. by J. Symons (1955); and *Selections from Carlyle,* ed. by A.M.D. Hughes (1957).

Biographies. J.A. Froude, *Thomas Carlyle,* 4 vol. (1882–84, reissued 1970), is not only the best life of Carlyle but one of the greatest of English biographies, combining the attitude of an intelligent disciple with penetrating observation and remorseless moral criticism. See also Froude's *My Relations with Carlyle* (1903, reprinted 1971), his private account of the writing of the biography, voicing his suspicions that sexual impotence may have been responsible for troubles in Carlyle's marriage. Froude also edited two autobiographical pieces, *T. Carlyle: Reminiscences* (1881), which gives a vivid picture of Carlyle's father and wife, among others; and *Letters and Memorials of Jane Welsh Carlyle: Prepared by T. Carlyle,* 2 vol. (1883), which gives full documentary evidence about Jane's life and character and conveys in notes and comments Carlyle's intense remorse for his shortcomings as a husband. John Clubbe (ed.), *Froude's Life of Carlyle, Abridged* . . . (1979), essentially removes the primary material, *i.e.*, Carlyle's letters. Charles R. Sanders and Kenneth J. Fielding (eds.), *The Collected Letters of Thomas and Jane Welsh Carlyle,* 9 vol (1970–81), includes all known letters and is the definitive edition.

Criticism. Principal critical works include Basil Willey, *Nineteenth Century Studies* (1949), which places Carlyle judiciously in relation to Samuel Taylor Coleridge, Matthew Arnold, and other leading thinkers; John Holloway, *The Victorian Sage* (1953), which provides an admirable account of the philosophical and rhetorical aspects of Carlyle's persuasive methods; Phillip Rosenberg, *The Seventh Hero: Thomas Carlyle and the Theory of Radical Activism* (1974), which studies Carlyle and political theory; Sanders, *Carlyle's Friendships,* throws light on Carlyle's personal relationships; Kenneth M. Harris, *Carlyle and Emerson: Their Long Debate* (1978), which is the first study of the two writers; and Rodger L. Tarr, *A Bibliography of English-Language Criticism, 1824–1974* (1976), which surveys the critical field.

carmagnole, originally, a Piedmontese peasant costume (from Carmagnola, a town in Italy) that was well known in the south of France and brought to Paris by the revolutionaries of Marseille in 1792. The costume, later the popular dress of the Jacobins, consisted of a short-skirted coat with rows of metal buttons, a tricoloured waistcoat, and red cap. The name carmagnole was also applied to a famous Revolutionary song widely sung during the Reign of Terror.

Carman, (William) Bliss (b. April 15, 1861, Fredericton, N.B.—d. June 8, 1929, New Canaan, Conn., U.S.), Canadian regional poet of the Maritime Provinces and the New England region of the United States who is remembered chiefly for poignant love poems and one or two rhapsodies in celebration of nature.



Carman

By courtesy of the Harriet Irving Library, University of New Brunswick, Fredericton

Educated at Fredericton Collegiate and at the University of New Brunswick, in Fredericton, he also attended lectures at the universities of Oxford and Edinburgh and at Harvard.

In 1890 he went to New York City and for two decades earned a living doing editorial work on various journals. Between 1893 and 1905 he published nearly 20 volumes of verse, including *Low Tide on Grand Pré* (1893); three series of *Songs from Vagabondia* (1894, 1896, 1901), written in collaboration with Richard Hovey, a poet whom he had met at Harvard; and *Sappho* (1904), improvisations based on the Greek fragments of Sappho. He also wrote several prose works on nature, art, and the human personality.

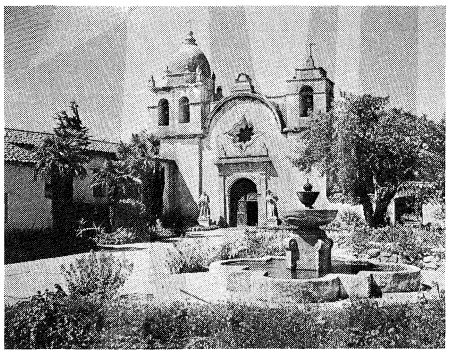
Carmarthen, Welsh CAERFYRDDIN, town, district, district seat, and seat of Dyfed (*q.v.*) county, Wales. The town of Carmarthen is located on the River Towy 8 mi (13 km) above its Bristol Channel mouth. Both Romans and Normans built strongholds there in recognition of its strategic importance, commanding a major river crossing on the coastal route across South Wales at the point where the Towy Valley offers an easy penetration northward into central Wales. During the medieval period Carmarthen became one of the most important boroughs in Wales, receiving many charters, notably from Henry III in 1227, while Edward III in 1353 made the town the sole wool staple (mart) for Wales. It had an Augustinian priory, dating from the Norman period, which housed the oldest extant Welsh manuscript, the *Black Book of Carmarthen* (*c.* 1170–1230). A market centre for a prosperous agricultural hinterland, Carmarthen was formerly also a busy river port. After 1747 some iron smelting was carried on in the town, to which was added tinplate manufacture until 1900. Although some industry—notably milk processing—exists today, Carmarthen gives little impression of an industrial town: rather it is an agricultural market town and a busy shopping centre. Its guildhall was built *c.* 1770 on the site of an earlier one dating from 1583, and St. Peter's Church is largely of 14th-century construction. The Norman castle is now in ruins. Associated with the town have been the Welsh national heroes Llywelyn the Great (Llewelyn ap Iowerth) and Owen Glendower (Owain Glyndwr); the writer Sir Richard Steele (buried in St. Peter's Church); and the Georgian architect John Nash.

Created in 1974, Carmarthen district covers an area of 455 sq mi (1,178 sq km), extending from a 20 mi (32 km) coastline fronting Carmarthen Bay in the south to the River Teify in the north. Bordered by the districts of Preseli and South Pembrokeshire to the west, Ceredigion to the north, Dinefwr to the east, and Llanelli to the south, the district is a prosperous agricultural region, with a pattern of scattered farms producing mainly grass and hay, and having dairy farming as the principal economic activity. Industry ranges from various engineering projects to woollen mills and milk-processing plants, with an increasing emphasis on tourism. Both a highway and a railroad traverse Carmarthen district from east to west. Pop. (1981 prelim.) town, 12,302; (1982 est.) district 52,100.

Carmarthen, Thomas Osborne, marquess of: *see* Leeds, Thomas Osborne, 1st duke of.

Carmel, also called CARMEL-BY-THE-SEA, city, Monterey County, western California, U.S., on the Carmel River and Carmel Bay, adjacent to Monterey. The river was named by the Spanish explorer Sebastián Vizcaíno and a group of Carmelite friars in 1602. The nearby Mission San Carlos Borroméo del Río Carmelo was founded in 1770 at Monterey by the Spanish Franciscan missionary Junípero Serra; it was moved to the Carmel area in 1771, and Serra is buried in the sanctuary. The city, which was founded in 1904 as an art colony, has few sidewalks or street signs and has a wide mixture of architectural styles. Tourism is the economic mainstay. In addition to many art

galleries and the Carmel Mission, attractions include the Biblical Garden, Point Lobos State Reserve, 3 mi (5 km) south, and the scenic



Mission San Carlos Borroméo del Río Carmelo, Carmel, Calif.
Winston Pote—Shostal/EB Inc.

Seventeen-Mile Drive to Pacific Grove. Inc. 1916. Pop. (1980) 4,707.

Carmel, Mount, Hebrew HAR HA-KARMEL, mountain range, northwestern Israel; the city of Haifa is on its northeastern slope. It divides the Plain of Esdraelon ('Emeq Yizre'el) and the Galilee (east and north) from the coastal Plain of Sharon (south). A northwest–southeast-trending limestone ridge, about 16 mi (26 km) long, it covers an area of about 95 sq mi (245 sq km). Its seaward point, Rosh ha-Karmel (Cape Carmel), almost reaches the Mediterranean; there the coastal plain is only 600 ft (180 m) wide. The mountain's highest point, 1,791 ft above sea level, is northwest of the village of 'Isfiyā. The name, dating back to biblical times, is derived from the Hebrew *kerem* ("vineyard" or "orchard") and attests to the mountain's fertility even in ancient times.

Sanctified since early times, Mt. Carmel is mentioned as a "holy mountain" in Egyptian records of the 16th century BC. As a "high place," it was long a centre of idol worship, and its outstanding reference in the Bible is as the scene of Elijah's confrontation with the false prophets of Baal (I Kings 18). Mt. Carmel was also sacred to the early Christians; individual hermits settled there as early as the 6th century AD. The Carmelites, a Roman Catholic monastic order, were founded in 1150; they received their first rule, or laws and regulations governing the conduct of their order, in 1206–14. Their monastery (rebuilt 1828) is near the traditional site of Elijah's miracle.

There are many fine parks and woods on the slopes of the mountain, both within the city of Haifa (*q.v.*) and outside it. Much of the wooded area is included in the Carmel Nature Reserve. On the southwest slopes are caves where archaeologists found (1931–32) Stone Age human skeletons of a type previously unknown.

Carmelite, member of one of the four great mendicant orders (those orders whose corporate as well as personal poverty made it necessary for them to beg for alms) of the Middle Ages. The origin of the order can be traced to Mt. Carmel in Palestine, where a number of devout men, apparently former pilgrims and crusaders, established themselves near the traditional fountain of Elijah, an Old Testament prophet, about 1155. Their rule was written between 1206 and 1214 by St. Albert, Latin patriarch of Jerusalem, and approved in 1226 by Pope Honorius III. The monks hoped to continue on Mt. Carmel the way of life of the prophet Elijah, whom early Christian writers depict as the founder of monasticism.

The early Carmelites were hermits: they lived in separate cells or huts and observed vows of silence, seclusion, abstinence, and austerity. Soon, however, the losses of the crusading armies in Palestine made Mt. Carmel unsafe for the Western hermits, and they set out, in about 1240, for Cyprus, Sicily, France, and England. The first general chapter (legislative meeting) of the Carmelites was held in England in 1247 under St. Simon Stock, and the order was adapted to the conditions of the Western lands to which it had been transplanted: the order transformed itself from one of hermits into one of mendicant friars. In this form the Carmelites established themselves throughout western Europe, becoming popular as an order closely analogous to the Dominicans and Franciscans. The first institution of Carmelite nuns was founded in 1452.

Of all the movements in the Carmelite order, by far the most important and far-reaching in its results was the reform initiated by St. Teresa of Ávila. After nearly 30 years in a Carmelite convent, she founded (1562) in Ávila a small convent wherein a stricter way of life was to be observed; it became the order of Discalced Carmelite Nuns (O.D.C.). In spite of opposition and difficulties of many kinds, St. Teresa succeeded in establishing not only nunneries but also, with the cooperation of Juan de Yepes (later St. John of the Cross), a number of friaries of this stricter observance. The aim of the reform was to restore and emphasize the austerity and contemplative character of primitive Carmelite life. Because Reformed Carmelites wore sandals in place of shoes and stockings, they came to be called the Discalced, or barefooted, Carmelites, to distinguish them from the older branch of the order. In 1580 the reformed monasteries were made a separate province under the prior general of the order, and in 1593 this province became by papal act an independent order.

Both orders suffered severely from the French Revolution and from suppression both by Napoleon and the liberal governments of the 19th century, but they have since been restored in most countries of western Europe, in the Middle East, Latin America, and the United States. The original order (Order of Brothers of the Blessed Virgin Mary of Mt. Carmel; White Friars; O.Carm.) is engaged primarily in preaching and teaching. The Discalced Carmelite Fathers (Order of Discalced Brothers of the Blessed Virgin Mary of Mt. Carmel; O.C.D.) is active in parishes and in foreign missions, having become primarily a pastoral and devotional order. Both branches have been important promoters of Marian devotion. Besides the cloistered nuns, in recent times, numerous congregations of active sisterhoods, Third Order Carmelites, have been formed, devoted to teaching, care of the sick, and other charitable works.

Carmichael, Hoagy, byname of HOAGLAND HOWARD CARMICHAEL (b. Nov. 22, 1899, Bloomington, Ind., U.S.—d. Dec. 27, 1981, Rancho Mirage, Calif.), U.S. self-taught pianist, composer, singer, and actor who composed many of the most popular songs of the big-band era.

Hoagy Carmichael
EB Inc.

While studying at Indiana University, Bloomington (LL.B., 1926), he came to know jazz musicians, including the cornettist Bix Beiderbecke, for whom he named one of his sons. His first composition, "Riverboat Shuffle," which became a jazz classic, was recorded by Beiderbecke and the Wolverines, a jazz group based in Chicago, in 1924. Carmichael went on to compose a series of popular songs whose melodic structure and harmonic interest made them attractive to many musicians, including Louis Armstrong and Jack Teagarden. These songs included "Georgia on My Mind" (1930), "Rockin' Chair" (1930), and "Lazy River" (1931). Working in Hollywood, first as a writer and then as a character actor, he produced other hit songs, including "Thanks for the Memory" (1938), "Two Sleepy People" (1939), and "In The Cool Cool Cool of the Evening," for which he won an Academy Award in 1951. But probably his most successful song and one reputed to be the most frequently recorded popular composition of all time was "Stardust," the first version of which was written in 1927.

Carmichael continued to write songs, and he performed as an actor into the 1970s; his motion-picture credits include *To Have and Have Not* (1944), *Canyon Passage* (1946), and *Young Man with a Horn* (1950). He also wrote two volumes of memoirs: *The Stardust Road* (1946) and *Sometimes I Wonder* (1965).

Carmichael, Leonard (b. Nov. 9, 1898, Philadelphia—d. Sept. 16, 1973, Washington, D.C.), U.S. psychologist and educator who, as secretary of the Smithsonian Institution from 1953 to 1964, was responsible for the modernization of the "nation's attic."

Carmichael received his Ph.D. from Harvard University (1924) and was teacher of psychology at Princeton, Brown, and Rochester successively. He became president of Tufts in 1938, leaving it to go to the Smithsonian. On his retirement there he became (1964) vice president for research and exploration at the National Geographic Society, where he sponsored the work of, among others, L.S.B. Leakey and Jacques-Yves Cousteau. Author or editor of several books on psychology, he also served terms as president of the American Psychological Association and of the American Philosophical Society.

Carmiel (Israel): *see* Karmi'el.

Carmina Burana, German LIEDER AUS BEUERN, 13th-century manuscript that contains songs (the *Carmina Burana* proper) and six religious plays. The contents of the manuscript are attributed to the goliards (*q.v.*), wandering scholars and students in western Europe during the 10th to the 13th century who were known for their songs and poems in praise of revelry. The collection is also called the Benediktbeuern manuscript, because it was found (in 1803) at the Benedictine monastery in Benediktbeuern (from which *burana* is derived), Bavaria. The two parts of the manuscript, though written at the same time, have been separated. The songs, rhymed lyrics mainly in Latin with a few in German, vary in subject and style: there are drinking songs, serious and licentious love songs, religious poems, pastoral lyrics, and satires of church and government. Some of the poems were set to music by Carl Orff in his cantata *Carmina Burana* (1937).

The plays, in Latin, include the only known two surviving complete texts of medieval Passion dramas. These are the *Ludus breviter de Passione* ("Play in Brief of the Passion"), a prologue to a Resurrection play, and a longer text, probably amplified from a play on St. Mary Magdalene's life and the raising of

Lazarus. The other plays are an Easter play; an unusually comprehensive Christmas play; an enlarged *Peregrinus*, which treats Christ's first two appearances to the disciples; and *Ludus de rege Aegypti* ("Play of the King of Egypt"), formerly regarded as part of the Christmas play. *See also* goliard song.

carmina Fescennina (poetry): *see* Fescennine verse.

carmine, red or purplish-red pigment obtained from cochineal (*q.v.*), a red dyestuff extracted from the dried bodies of certain female scale insects native to tropical and subtropical America. Carmine was used extensively for watercolours and fine coach-body colours before the advent of synthetic colouring materials. Since then it has been used only when a natural pigment is required: for pastries, confections, cosmetics, water-soluble drug preparations, and histologic stains.

To prepare carmine, the powdered insect bodies are boiled in ammonia or sodium carbonate solution, the insoluble matter is removed by filtering, and alum is added to the clear salt solution of carminic acid to precipitate the red aluminum salt. Purity of colour is ensured by the absence of iron. Stannous chloride, citric acid, borax, or gelatin may be added to regulate the formation of the precipitate. For purple shades, lime is added to the alum. Chemically, carminic acid is a complex anthraquinone derivative.

Carmona (Angola): *see* Uíge.

Carmona, town, Sevilla province, in the autonomous community (region) of Andalusia, southern Spain; it overlooks the Andalusian Plain from its site on a ridge of the Sierra de los Alcores. It originated as Carmo, the strongest town of the Roman province of Hispania Ulterior under Julius Caesar, and was captured from the Moors (who called it Karmuna) in 1247 by Ferdinand III of Castile. Historic landmarks include the Roman walls and towers of the old city, the Gothic Santa María church (1424–1518), the San Pedro church (begun 1466), in the Churrigueresque style, and the ruins of the Alcázar de Arriba, which was the citadel of Peter the Cruel (1350–69). A large Roman necropolis, discovered nearby in 1881, has been excavated.

The modern town is a processing and agricultural centre (livestock, fruits, grapes, cereals, olives, and olive oil). Pop. (1981) 22,779.

Carmona, António Oscar de Fragoso (b. Nov. 24, 1869, Lisbon—d. April 18, 1951, Lisbon), general and statesman who rose to political prominence in the wake of the successful military revolt of 1926 and who as president of Portugal from 1928 to 1951 served as a symbol of continuity during the regime (1932–68) of António de Oliveira Salazar.

Carmona, a graduate (1888) of the Royal Military College, had risen to the rank of general by 1922. He took part in the successful army coup of May 1926 and, after serving briefly as foreign minister, became premier in July. He named as finance minister Salazar, who soon came to overshadow Carmona himself. After a bloody rebellion had been put down in February 1927, Carmona called a plebiscite and was elected president. He named Salazar as premier in 1932. In the following year a constitution for the "New State" was adopted, under which Carmona was elected president three times: in 1935, 1942, and 1949.

Carnac, village, Morbihan *département,* Bretagne region, western France, near the Atlantic coast, just southwest of Auray. It is the site of more than 3,000 prehistoric stone monuments. The single stone menhirs and multistone dolmens were hewn from local granite, now worn by time and weather and sheathed in white lichen. Venerated by the Bretons until fairly recent times, the stones were adopted by the Romans for religious purposes, and

The Ménec System of menhirs, or standing stones, near Carnac, Fr., Late Neolithic Period (c. 1800 BC)
Photo Ciccione—Rapho/Photo Researchers

Roman deities were carved on some. When Christianity came, the local attachment to the megaliths was diverted to the new faith by the addition of crosses and other symbols.

Dating of the monuments is complicated because they were erected at differing periods, including early, middle, and late Neolithic. Most remarkable of the monuments are the long avenues of menhirs, or standing stones: about 0.5 mi (0.8 km) northwest of the village, the Ménec System traces 11 lines over a distance of 3,376 ft (1,029 m), its terminal circle being broken by a small hamlet; east-northeast the Kermario System of 10 lines stretches for about 4,000 ft, and farther along the same road are the 13 Kerlescan Lines, terminating in an irregular circle after 0.5 mi. The alignment of Kermario points to the passage grave of Kercado, covered by a barrow, explored in 1863. A year earlier René Galles had explored the great tumulus of Mont-Saint-Michel, 65 ft high, 377 ft long. In 1874 James Miln, a Scottish antiquary, uncovered the remains of a Gallo-Roman villa in the mound-covered moorland 1 mi east of the village. The Musée Miln-Le Rouzic in Carnac has an important collection of artifacts. Pop. (1982) 2,559.

carnallite, a soft, white halide mineral, hydrated potassium and magnesium chloride ($KMgCl_3 \cdot 6H_2O$), that is a source of potassium for fertilizers. It occurs with other chloride minerals in the upper layers of marine salt deposits, where it appears to be an alteration product of pre-existing salts. It is found principally in the northern East German salt deposits; and also in Spain, the Soviet Union, Tunisia, and the southwestern United States. For detailed physical properties, *see* halide mineral (table).

Carnap, Rudolf (b. May 18, 1891, Ronsdorf, Ger.—d. Sept. 14, 1970, Santa Monica, Calif., U.S.), German-born U.S. philosopher of Logical Positivism. He made important contributions to logic, the analysis of language, the theory of probability, and the philosophy of science.

Carnap, 1960
By courtesy of the University of California, Los Angeles

Education. From 1910 to 1914 Carnap studied mathematics, physics, and philosophy at the universities of Jena and Freiburg im Breisgau. At Jena he attended the lectures of Gottlob Frege, now widely acknowledged as the greatest logician of the 19th century, whose ideas exerted a deep influence on Carnap.

After serving in World War I, Carnap earned his doctorate in 1921 at Jena with a dissertation on the concept of space. He argued that the conflicts among the various theories of space then held by scholars resulted from the fact that those theories actually dealt with quite different subjects; he called them, respectively, formal space, physical space, and intuitive space and exhibited their principal characteristics and fundamental differences.

For several years afterward Carnap was engaged in private research in logic and the foundations of physics and wrote a number of essays on problems of space, time, and causality, as well as a textbook in symbolic, or mathematical, logic (*Abriss der Logistik,* 1929; a considerably different later German version appeared in English translation: *Introduction to Symbolic Logic and Its Applications,* 1958).

Career in Vienna and Prague. In 1926 Moritz Schlick, the founder of the Vienna Circle—a small group of philosophers, mathematicians, and other scholars who met regularly to discuss philosophical issues—invited Carnap to join the faculty of the University of Vienna, where he soon became an influential member of the Circle. Out of their discussions developed the initial ideas of Logical Positivism, or Logical Empiricism. This school of thought shared its basic Empiricist orientation with David Hume, a Scottish Empiricist, and Ernst Mach, an Austrian physicist and philosopher. Its leading members, informed and inspired by the methods and theories of contemporary mathematics and science, sought to develop a "scientific world view" by bringing to philosophical inquiry the precision and rigour of the exact sciences. As one means to this end, Carnap made extensive use of the concepts and techniques of symbolic logic in preference to the often inadequate analytic devices of traditional logic.

Carnap and his associates established close connections with like-minded scholars in other countries, among them a group of Empiricists that had formed in Berlin under the leadership of Hans Reichenbach, an eminent philosopher of science. With Reichenbach, Carnap founded a periodical, *Erkenntnis* (1930–40), as a forum for the new "scientific philosophy."

The basic thesis of Empiricism, in a familiar but quite vague formulation, is that all of man's concepts and beliefs concerning the world ultimately derive from his immediate experience. In some of his most important writings, Carnap sought, in effect, to give this idea a clear and precise interpretation. Setting aside, as a psychological rather than a philosophical problem, the question of how human beings arrive at their ideas about the world, he proceeded to construe Empiricism as a systematic-logical thesis about the evidential grounding of empirical knowledge. To this end, he gave the issue a characteristically linguistic turn by asking how the terms and sentences that, in scientific or in everyday language, serve to express assertions about the world are related to those terms and sentences by which the data of immediate experience can be described. The Empiricist thesis, as construed and defended by Carnap, then asserts that the terms and sentences of the first kind are "reducible" to those of the second kind in a clearly specifiable sense. Carnap's conception of the relevant sense of reducibility, which he always stated in precise logical terms, was initially rather narrow but gradually became more liberal.

In his first great work, *Der logische Aufbau der Welt* (1928; Eng. trans.—with a smaller work—*The Logical Structure of the World: Pseudoproblems in Philosophy*), Carnap developed, with unprecedented rigour, a version of the Empiricist reducibility thesis according to which all terms suited to describe actual or possible empirical facts are fully definable by terms referring exclusively to aspects of immediate experience, so that all empirical statements are fully translatable into statements about immediate experiences.

Prompted by discussions with his associates in Vienna, Carnap soon began to develop a more liberal version of Empiricism, which he elaborated while he was professor of natural philosophy at the German University in Prague (1931–35); he eventually presented it in full detail in his essay "Testability and Meaning" (*Philosophy of Science,* vol. 3 [1936] and 4 [1937]). Carnap argued that the terms of empirical science are not fully definable in purely experiential terms but can at least be partly defined by means of "reduction sentences," which are logically much-refined versions of operational definitions, and "observation sentences," whose truth can be checked by direct observation. Carnap stressed that usually such tests cannot provide strict proof or disproof but only more or less strong "confirmation" for an empirical statement.

Sentences that do not thus yield observational implications and therefore cannot possibly be tested and confirmed by observational findings were said to be empirically meaningless. By reference to this testability criterion of empirical significance, Carnap and other Logical Empiricists rejected various doctrines of speculative metaphysics and of theology, not as being false but as making no significant assertions at all.

Carnap argued that the observational statements by reference to which empirical statements can be tested may be construed as sentences describing directly and publicly observable aspects of physical objects, such as the needle of a measuring instrument turning to a particular point on the scale or a subject in a psychological test showing a change in pulse rate. All such sentences, he noted, can be formulated in terms that are part of the vocabulary of physics. This was the basic idea of his "physicalism," according to which all terms and statements of empirical science—from the physical to the social and historical disciplines—can be reduced to terms and statements in the language of physics.

In later writings, Carnap liberalized his conception of reducibility and of empirical significance even further so as to give a more adequate account of the relation between scientific theories and scientific evidence.

Career in the United States. By the time "Testability and Meaning" appeared in print, Carnap had moved to the United States, mainly because of the growing threat of German National Socialism. From 1936 to 1952 he served on the faculty of the University of Chicago. During the 1940–41 school year, Carnap was a visiting professor at Harvard University and was an active participant in a discussion group that included Bertrand Russell, Alfred Tarski, and W.V.O. Quine.

Soon after going to Chicago, Carnap joined with the sociologist Otto Neurath, a former fellow member of the Vienna Circle, and with an academic colleague, the Pragmatist philosopher Charles W. Morris, in founding the *International Encyclopedia of Unified Science,* which was published, beginning in 1938, as a series of monographs on general problems in the philosophy of science and on philosophical issues concerning mathematics or particular branches of empirical science.

Since his Vienna years, Carnap had been much concerned also with problems in logic and in the philosophy of language. He held that philosophical perplexities often arise from a misunderstanding or misuse of language and that the way to resolve them is by "logical analysis of language." On this point, he agreed with the "ordinary language" school of Analytic Philosophy, which had its origins in England. He differed from it, however, in insisting that more technical issues—*e.g.,* those in the philosophy of science or of mathematics—cannot be adequately dealt with by considerations of ordinary linguistic usage but require clarification by reference to artificially constructed languages that are formulated in logical symbolism and that have their structure and interpretation precisely specified by so-called syntactic and semantic rules. Carnap developed these ideas and the theoretical apparatus for their implementation in a series of works, including *Logische Syntax der Sprache* (1934; *The Logical Syntax of Language*) and *Meaning and Necessity* (1947; 2nd enlarged ed., 1956).

Carnap's interest in artificial languages included advocacy of international auxiliary languages such as Esperanto and Interlingua to facilitate scholarly communication and to further international understanding.

One idea in logic and the theory of knowledge that occupied much of Carnap's attention was that of analyticity. In contrast to the 19th-century radical Empiricism of John Stuart Mill, Carnap and other Logical Empiricists held that the statements of logic and mathematics, unlike those of empirical science, are analytic—*i.e.,* true solely by virtue of the meanings of their constituent terms—and that they can therefore be established a priori (without any empirical test). Carnap repeatedly returned to the task of formulating a precise characterization and theory of analyticity. His ideas were met with skepticism by some, however—among them Quine, who argued that the notion of analytic truth is inherently obscure and the attempt to delimit a class of statements that are true a priori should be abandoned as misguided.

From about 1945 onward, Carnap turned his efforts increasingly to problems of inductive reasoning and of rational belief and decision. His principal aim was to construct a formal system of inductive logic; its central concept, corresponding to that of deductive implication, would be that of probabilistic implication—or, more precisely, a concept representing the degree of rational credibility or of probability that a given body of evidence may be said to confer upon a proposed hypothesis. Carnap presented a rigorous theory of this kind in his *Logical Foundations of Probability* (1950).

Carnap spent the years from 1952 to 1954 at the Institute for Advanced Study in Princeton, where he continued his work in probability theory. Subsequently, he accepted a professorship at the University of California at Los Angeles. During those years and indeed until his death, Carnap was occupied principally with modifications and considerable extensions of his inductive logic. (C.G.H.)

BIBLIOGRAPHY. Norman M. Martin's article on Carnap in *The Encyclopedia of Philosophy,* ed. by Paul Edwards, vol. 2 (1967), pp. 25–33, gives a lucid survey of Carnap's work and the development of his ideas with extensive bibliography. An especially valuable source is *The Philosophy of Rudolf Carnap,* ed. by P.A. Schilpp (1963). Roger C. Buck and Robert S. Cohen (eds.), *PSA 1970: In Memory of Rudolf Carnap* (1971), is a large collection of essays on his qualities as a man, a teacher, and a thinker.

Carnarvon (Wales): *see* Caernarvon.

Carnarvon, George Edward Stanhope Molyneux Herbert, 5th earl of, BARON PORCHESTER OF HIGHCLERE (b. June 26, 1866, Highclere Castle, Berkshire, Eng.—d. April 5, 1923, Cairo), British Egyptologist who was the patron and associate of archaeologist Howard Carter in the discovery of the tomb of King Tutankhamen.

Carnarvon was educated at Eton and at Trinity College, Cambridge. He began excavations in Thebes in 1906, but, as an amateur, he soon felt the need of expert advice and sought the help of Carter, a former official of the Egyptian government's antiquities department. Their collaboration began in 1907, when Carter agreed to supervise excavations for Carnarvon. They published an account of their work, which included discoveries of tombs of the 12th and 18th dynasties, in 1912: *Five Years' Exploration at Thebes.*

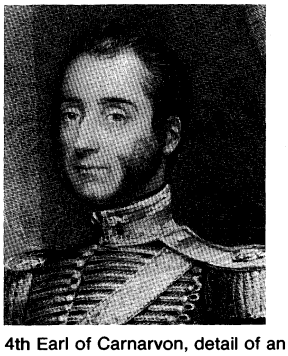
Excavations resumed after World War I, and on Nov. 4, 1922, Carter unearthed the tomb of Tutankhamen in the Valley of the Tombs of Kings. On Feb. 16–17, 1923, the sepulchral chamber was opened, the actual sarcophagus being discovered on Jan. 3, 1924. Carnarvon died in a Cairo hospital from infections and complications that arose after he was bitten by a mosquito while in Thebes to visit the just-opened burial chamber of the tomb.

5th Earl of Carnarvon, engraving after a photograph, 1899

By courtesy of the trustees of the British Museum; photograph, R.B. Fleming

Carnarvon, Henry Howard Molyneux Herbert, 4th earl of, BARON PORCHESTER OF HIGHCLERE (b. June 24, 1831, London—d. June 28, 1890, London), British statesman, a liberally inclined member of Conservative Party governments, who tried, with varying success, to establish federal self-government in British overseas possessions.

He was educated at Eton and Christ Church, Oxford, inheriting his father's earldom in 1849. He was undersecretary for the colonies in 1858–59 and served two terms as colonial secretary (1866–67 and 1874–78). In his first term he realized his greatest achievement—passage of the British North America Act (1867), which gave Canada its federal system and dominion status. In his second term of office, however, his 1875 proposal for a South African federation on the Canadian pattern failed. In 1878 he proposed the so-called Carnarvon Terms, which a few years later provided the settlement of a major dis-



4th Earl of Carnarvon, detail of an engraving by J.H. Robinson after a portrait by F. Walker

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

pute between Canada and the British that was delaying the construction of the Canadian Pacific Railway.

In the 3rd Marquess of Salisbury's first ministry (1885–86) Carnarvon served as lord lieutenant (viceroy) of Ireland, despite his having voted for Liberal Party legislation intended to conciliate Irish nationalists. On Aug. 1, 1885, he and the Irish leader Charles Stewart Parnell held a secret and futile discussion of the possibility of Irish Home Rule. Parnell had been misled into believing that Ireland might be conceded the status of a self-governing province within a federal United Kingdom. In the end, Carnarvon could not find a settlement acceptable to both Salisbury and Parnell.

Carnarvon Gorge, gorge in southeastern Queensland, Australia, on the eastern slopes of the Eastern Highlands. The gorge, sometimes called "The Grand Canyon of Queensland," is about 20 miles (32 km) long and 150 to 1,200 feet (45 to 370 m) wide, with vertical sandstone walls rising 600 feet (180 m). In some sections the sandstone has been so undercut by erosion that hikers at the bottom cannot see the top directly upward. The gorge is the central feature of a 104-square-mile (269-square-kilometre) national park, which also offers caves containing Aboriginal art and highly diverse plant and wildlife, including platypus in the deeper pools.

Carnarvon Range, plateau section of the Eastern Highlands, southeast-central Queensland, Australia. Lying 230 to 280 miles (370 to 450 km) inland from the coast west of Bundaberg, it extends 100 miles (160 km) south and averages 3,000 feet (900 m) in elevation. Explored by Ludwig Leichhardt (1813–48), the range is the source of the Dawson River and is accessible by the Carnarvon Highway and a rail line, both of which lead to Injune. Lying within a 250,000-square-mile (647,500-square-kilometre) natural reserve, the range has been developed as a resort area offering spectacular terrain, Aboriginal cave art, and a wide variety of plant and wildlife. Brisbane is 350 miles (560 km) southeast by air.

Carnatic (India): *see* Karnātaka.

Carnatic music, also spelled KARNATIC MUSIC, music of southern India (generally south of the city of Hyderābād in Andhra Pradesh state) that evolved from ancient Hindu traditions and was relatively unaffected by the Arabic and Iranian influences that, since the late 12th and early 13th centuries, as a result of the Islāmic conquest of the north, characterized the Hindustani music of northern India. In contrast to northern styles, Carnatic music is more thoroughly oriented to the voice. Even when instruments are used alone, they are played somewhat in imitation of singing, generally within a vocal range, and with embellishments that are characteristic of vocal music. Fewer instruments are used in Carnatic than in northern Indian music, and there are no exclusively instrumental forms.

The basic principles of raga (*q.v.*; melody type, or framework for improvisation) and *tāla* (*q.v.*; cyclical rhythmic pattern) are the same in the south and north, but each musical tradition has its own repertoire of actual ragas and *tāla*s, and there are many stylistic differences as well. Carnatic music, with its more homogeneous Indian tradition, has evolved far more orderly and uniform systems for the classification of ragas and *tāla*s.

To many listeners, the music of the south has a restrained and intellectual character as compared with the music of the more secular Hindustani traditions. Centres for present-day Carnatic music include Tamil Nadu (formerly Madras), Karnātaka (formerly Mysore), Andhra Pradesh, and Kerala states.

Carnatic Wars, also spelled KARNATIC WARS, series of military contests during the 18th century between the British, the French, the Marāthās, and Mysore for control of the coastal strip of eastern India from Nellore (north of Madras) southward (the Tamil country). The name Carnatic properly refers to the region occupied by the Kannada-speaking people, which roughly corresponds to the modern Indian state of Karnātaka (formerly Mysore). In the 18th century the coastal Carnatic was a dependency of Hyderābād, within the Mughal Empire.

Succession disputes in both the Carnatic and Hyderābād opened the door for European intervention as supporters of various rival Indian claimants. At first the French, under Joseph Dupleix, governor of Pondicherry (1742–54), were successful both in the Carnatic and in Hyderābād, which the French officer Charles-Joseph Patissier, marquis de Bussy-Castelnau, controlled for seven years. Dupleix was checked by forces of the English East India Company under Robert Clive in 1751, however, and the French claimant was defeated the next year. In the Seven Years' War (1756–63), both the French and British sent armies to South India; the French were defeated at Wandiwash (1760), and the British captured Pondicherry (1761). Thenceforth the British controlled the Carnatic through its nawab, who became deeply indebted both to the English East India Company and to its individual officers. For later events, *see* Mysore Wars.

carnation, also called GRENADINE, or CLOVE PINK (*Dianthus caryophyllus*), herbaceous plant of the pink family (Caryophyllaceae), native to the Mediterranean area. It is widely cultivated for its fringe-petaled flowers, which often have a spicy fragrance.

There are two general groups, the border, or garden, carnations and the perpetual flowering carnations. Border carnations include a range of varieties and hybrids, 30 to 75 cm (1 to 2½ feet) tall; the flowers, in a wide range of colours, are usually less than 5 cm (2 inches) in diameter and are borne on wiry, stiffly erect stems. The bluish-green leaves are narrow, sheathing the stems; swellings appear at leaf and stem joints.

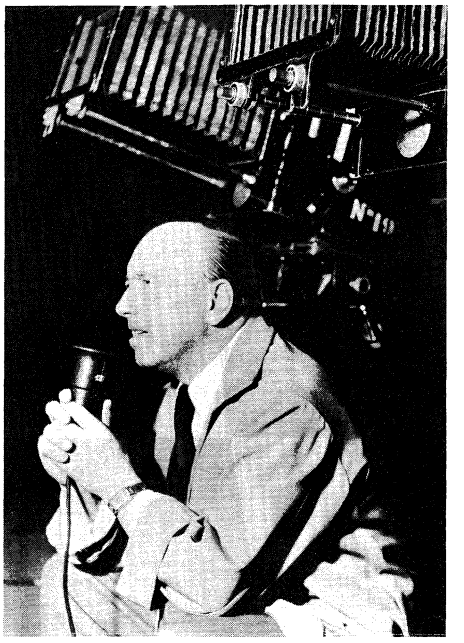
The perpetual flowering carnation, perhaps derived from crosses between the border carnations and the China pink (*D. sinensis*), is taller, up to 1 m (3 feet) in height, is stouter, and produces larger flowers; it blooms almost continuously in the greenhouse. Miniature (baby) and spray varieties of the perpetual carnation are also grown for the florist trade.

Carnations are among the most popular cut flowers, used in floral arrangements, corsages, and boutonnieres. In 1907 Anna Jarvis of Philadelphia selected the pink carnation as the symbol for Mother's Day. In Europe the carnation was formerly used as a treatment for fevers. It was also used to spice wine and ale during Elizabethan times, as a substitute for the more expensive clove.

carnauba wax, very hard wax obtained from the fronds of the carnauba tree, *Copernecia cerifera,* a fan palm of Brazil. During the regular dry seasons in Brazil, where it is called the tree of life, the carnauba palm protects its fanlike fronds from loss of moisture by secreting a coat of carnauba wax. Carnauba has been used in high-gloss polishes, phonograph records, and explosives. Synthetics have replaced it for many applications.

Carné, Marcel (b. Aug. 18, 1909, Paris), motion-picture director noted for his pessimistic dramas. He led the French cinema revival of the late 1930s.

Carné worked for an insurance company and as a journalist before joining the director Jacques Feyder as an assistant on such famous films as *Les Nouveaux Messieurs* (1928; "The New Gentlemen"), *Le Grand Jeu* (1934; "The Great Game"), and *La Kermesse héroïque* (1935; *Carnival in Flanders*). He assisted the director René Clair on the popular comedy *Sous les toits de Paris* (1930; "Under the Roofs of Paris") and was a critic for the film journal *Cinémagazine.* His first picture was a documentary, *Nogent, Eldorado du dimanche* (1924; *Nogent, Sunday's Eldorado*). Six years later the success of *Jenny* (1936) ensured his position as a leading director. Written by Jacques Prévert, as were all but one of his films, it was followed by the comedy *Drôle de drame* (1937; *Bizarre, Bizarre*). *Quai des brumes* (1938; *Port of Shadows*) and *Le Jour se lève* (1939; *Daybreak*) established him as the preeminent director of the revival. In these films, whose fatalism was typical of the French cinema of the late 1930s, the protagonist exists in a hopeless world of violence and poverty in which happiness is impossible. The actor Jean Gabin became famous for his roles as the doomed hero.



Carné
Tele 7 Jours

During World War II Carné released mainly period dramas, such as *Les Visiteurs du soir* (1942; *The Devil's Envoys*) and *Les Enfants du paradis* (1945; *Children of Paradise*), masterpieces of the melodramatic style in which richly drawn characters were photographed with the lyricism and flowing smoothness characteristic of all his films. *Les Portes de la nuit* (1946; *Gates of Night*), in which Carné concentrated particularly on the creation of atmosphere, and *Les Tricheurs* (1958; *The Cheaters*) were outstanding postwar films.

Carneades (b. 214? BC—d. 129?), Greek philosopher who headed the New Academy at Athens when antidogmatic Skepticism reached its greatest strength.

A native of Cyrene, Carneades went in 155 BC on a diplomatic mission to Rome, where he delivered two public orations, in which he argued in favour of justice in one speech and argued against it in the other. This arguing on both sides of a question expressed Carneades' attitude of suspending judgment, an attitude characteristic of Academic, or antidogmatic, Skepticism. The facility Carneades displayed in this regard helped arouse the first Roman interest in Greek philosophy, while also arousing the distrust of the Roman authorities.

Ultimately, Carneades' noncommittal attitude was rooted in his denial that there exists any certain knowledge, either of the senses or of the intellect. In this spirit, he criticized

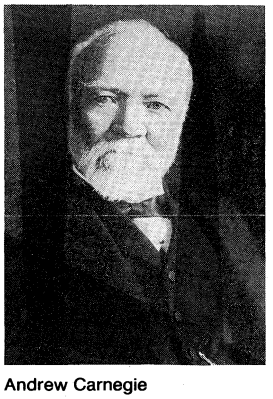
both Epicurean and Stoic beliefs as inconclusive. Many of his arguments on this point later attained classic status. Carneades also defended the philosopher Arcesilaus against the Stoics and Epicureans in the controversy over knowledge. Since no reliable criterion of truth exists, Carneades argued, Arcesilaus was right to urge the withholding of assent from any experience that claimed to be knowledge. Though Carneades left no writings, his teachings were preserved by Cleitomachus.

Carnegie, Andrew (b. Nov. 25, 1835, Dunfermline, Fife, Scot.—d. Aug. 11, 1919, Lenox, Mass., U.S.), Scottish-born American industrialist who led the enormous expansion of the American steel industry in the late 19th century. He was also one of the most important philanthropists of his era.

The son of an impoverished handloom weaver, Carnegie in 1848 emigrated to the United States with his family and settled in Allegheny, Pa. (now part of Pittsburgh). He worked in a cotton factory and later was a telegraph messenger and operator. In the latter post he caught the notice of Thomas Scott, a superintendent of the Pennsylvania Railroad Company, who made Carnegie his personal secretary in 1853. Carnegie's subsequent rise was rapid, and in 1859 he became superintendent of the railroad's western division, in which post he introduced sleeping cars. He had meanwhile begun making shrewd investments in various industrial and financial concerns, and by the age of 30 he had an annual income of $50,000.

Foreseeing the future demand for iron and steel, Carnegie left the Pennsylvania Railroad in 1865 and started managing the Keystone Bridge Company; from 1872 onward he concentrated on steel, founding in that year what would eventually become the Carnegie Steel Company. In the 1870s Carnegie's new company built the first steel plants in the United States to use the new Bessemer steelmaking process. Other innovations followed, including detailed cost- and production-accounting procedures that enabled the company to achieve greater efficiencies than any other manufacturing industry of the time. Any technological innovation that could reduce the cost of making steel was speedily adopted, and in the 1890s Carnegie's mills introduced the basic open-hearth furnace into American steelmaking. Carnegie also obtained greater efficiency by purchasing the coke fields and iron-ore deposits that furnished the raw materials for steelmaking, as well as the ships and railroads that transported these supplies to his mills. The vertical integration thus achieved was another milestone in American manufacturing. Carnegie also recruited extremely capable subordinates to work for him, including Henry Clay Frick.

In 1889 Carnegie's vast holdings were consolidated into the Carnegie Steel Company, which henceforth dominated the American steel industry. In 1890 the American steel industry's output surpassed that of Great Britain's for the first time, largely owing to Carnegie's successes. The Carnegie Steel Company continued to prosper even during the depression of 1892, which was marked by the bloody Homestead strike. Carnegie sold his company to J.P. Morgan's United States Steel Corporation for $250,000,000 in 1901. He subsequently retired and devoted himself to his philanthropic activities, which were themselves vast.



Andrew Carnegie
Brown Brothers

Carnegie provided money for the creation of a great number of public libraries in the United States, Great Britain, and other English-speaking countries. He founded the Carnegie Institute of Technology of Carnegie–Mellon University at Pittsburgh (1900) and the Carnegie Institution of Washington, Washington, D.C. (1902). He was also a large benefactor of Tuskegee Institute, Tuskegee, Ala., founded by Booker T. Washington. He established large pension funds for Homestead workers (1901) and for American college professors through the Carnegie Foundation for the Advancement of Teaching, New York City (1905). The Carnegie Corporation of New York, New York City (1911), was liberally endowed for the furtherance of civilization. His autobiography was edited by J.C. Van Dyke (1920).

Carnegie, Dale, original name DALE CARNEGEY (b. Nov. 24, 1888, Maryville, Mo., U.S.—d. Nov. 1, 1955, Forest Hills, N.Y.), American lecturer, author, and teacher who was a pioneer in the field of public speaking and the psychology of the successful personality.

Carnegie was born to poverty on a farm in Missouri. In high school and college he was active in debating clubs. Upon graduating, he was a salesman in Nebraska, an actor in New York City, and finally taught public speaking at the YMCA. His classes became extremely successful, and Carnegie began lecturing to packed houses. To standardize his teaching methods he began publishing pamphlets which he collected into book form: *Public Speaking: A Practical Course for Business Men* (1926; later titled *Public Speaking and Influencing Men in Business,* 1932). At this time he also served as manager for a lecture tour with Lowell Thomas and compiled *Little Known Facts About Well Known People* (1934).

Carnegie became an instant success with the hugely popular *How To Win Friends and Influence People* (1936). Like most of his books, it reveals little that was unknown about human psychology but stresses that an individual's attitude is crucial. He taught that anyone could benefit from a handicap if it was advantageously presented. Carnegie capitalized on the American longing for success by selling advice that helped readers feel, and perhaps become, successful. Other books include *How to Stop Worrying and Start Living* (1948), which is primarily a collection of commonsense tricks to prevent stress.

Carnegie Hall, historic concert hall at Seventh Avenue and 57th Street in New York City. Designed in a Neo-Italian Renaissance style by William B. Tuthill, the building opened in May 1891 and was eventually named for the industrialist Andrew Carnegie, its builder and original owner. Peter Ilich Tchaikovsky served as guest conductor during the hall's opening week, and since then virtually every important American and visiting musician has performed there. The hall was the longtime home of the New York Philharmonic until that orchestra moved to Lincoln Center in the 1960s.

In 1959 Carnegie Hall came close to being demolished, because the New York Philharmonic's planned move to Lincoln Center left the hall only marginally profitable. At this point the violinist Isaac Stern and the music patrons Jacob and Alice Kaplan mounted a successful campaign to save the old building, and in 1960 New York City bought the building, the money to be repaid to the city by the new nonprofit Carnegie Hall Corporation. Carnegie Hall thus continued to host concerts and other musical events, and in 1986 it underwent a major restoration.

Carnegie Museum of Natural History, in Pittsburgh, Pa., one of the United States' largest research museums. Containing two major museums, that on natural history and the Museum of Art (Carnegie Institute), as well as the 1,982-seat Carnegie Music Hall, the cultural centre there also includes the Carnegie Library of Pittsburgh.

Construction of the library and music hall was completed in 1895. The Carnegie Institute building was completed in 1907. The Carnegie Museum of Natural History sponsors fieldwork that contributes to the Museum's collections: botany, man, amphibians and reptiles, invertebrate fossils, vertebrate fossils, birds, insects and spiders, invertebrate zoology, mammals, and minerals. Its field research is focused on Africa, South America, and the Arctic as well as the United States. The world's most complete dinosaur skeleton is housed in the museum.

Painters represented in the permanent collection of the Museum of Art include Claude Monet, Paul Cézanne, and Winslow Homer. Prints by Rembrandt and Dürer, medieval paintings, and many other art classics make up other parts of the collection.

Carneia, important religious festival among ancient Dorian-speaking Greeks, held in Karneios (roughly August). The name is connected with Karnos, or Karneios (probably meaning "ram"), said to have been a favourite of the god Apollo, unjustly killed by the descendants of Heracles, and therefore commemorated to appease the god's anger; perhaps he was an old god of fertility displaced by Apollo. Five young men called Karneatai were chosen out of each tribe; one man, decked with garlands, ran away and the rest followed him. The person they chased was probably the temporary incarnation of some spirit of vegetation; to catch him perhaps signified that fertility was not allowed to go away but was secured, to be used for the next year's crops.

carnelian, also called CORNELIAN, a translucent, semiprecious variety of the silica mineral chalcedony (*q.v.*) that owes its red to reddish brown or flesh-red colour to colloidally dispersed hematite (iron oxide). It is a close relative of sard, differing only in the shade of red. Carnelian was highly valued and used in rings and signets by the Greeks and Romans, some of whose intaglios have retained their high polish better than many harder stones. Carnelian's colour is enhanced by baking and dyeing with iron salts. Chief localities are Ratnapura, India; Campo de Maia, Brazil; and Warwick, Queensland, Australia. Its physical properties are those of quartz. *See* silica mineral (table).

Carnera, Primo (b. Oct. 26, 1906, Sequals, Udine, Italy—d. June 29, 1967, Sequals), Italian heavyweight-boxing champion of the world from June 29, 1933, when he knocked out Jack Sharkey in six rounds in New York City, until June 14, 1934, when he was knocked out by Max Baer in 11 rounds, also in New York City.

Carnera began his professional boxing career in Paris in 1928 and went to the United States in 1930, compiling an impressive total of knockout victories, which many observers believed were prearranged. After two successive knockouts by Leroy Haynes in 1936, he returned to Europe practically penniless, having seen little of the purses he won in the United States. From 1928 to 1945 he had 99 bouts, winning 86, 66 by knockouts. Weighing about

260 pounds, he was the heaviest of all world champions; his height was 6 feet 5¾ inches.

In World War II he was a member of the Italian Sniper Brigade, had a losing fight in 1945, and returned to the United States as a wrestler. He won a small fortune, became a U.S. citizen, and after retiring from wrestling, he refereed and had a small business. He appeared in several films, for example, in *On the Waterfront* (1954) as a dockside hoodlum.

Carnesecchi, Pietro (b. Dec. 24, 1508, Florence—d. Oct. 1, 1567, Rome), controversial

Carnesecchi, detail of an oil painting by Domenico Puligo; in the Pitti Palace, Florence

Alinari—Art Resource/EB Inc.

Italian Humanist and religious Reformer executed because of his sympathy for and affiliation with the Reformation. He was patronized by the Medici, particularly Pope Clement VII, to whom he became principal secretary. At Naples in 1540 he joined the circle of the influential Spanish religious writer Juan de Valdés, whose distinctive Christianity was a nonsacramental, undogmatic religion that stressed the immediacy of Inner Light (*i.e.,* a divine presence to enlighten and guide the soul) yet was taught and practiced within the context of Catholicism. This doctrine annoyed the Roman inquisitors. Worsening his position, Carnesecchi accepted Martin Luther's doctrine of justification by faith, though repudiating any schismatic policy.

When a movement of suppression began in 1546, Carnesecchi fled to Paris to Catherine de Médicis, queen consort of France from 1547. Refusing to appear in Rome under command of Pope Paul IV, he was condemned in 1558. He was absolved, after Paul's death, and in 1559 returned to Rome. Under Pope Pius V, however, the Inquisition renewed its activities in 1566. Carnesecchi went to Florence, only to be betrayed by his patron, Cosimo I de' Medici. He was beheaded and burned.

Carney, Harry Howell (b. April 1, 1910, Boston—d. Oct. 8, 1974, New York City), featured U.S. soloist in Duke Ellington's band and the first baritone saxophone soloist in jazz.

Carney learned to play the clarinet and alto saxophone from private teachers and worked with local Boston bands until Ellington heard and hired him in 1926. He became Ellington's companion and driver on cross-country tours, as well as providing a clear tone and big sound that added to the unique blend of Ellington's saxophone section. Carney's specialty arrangements included "La Plus Belle Africaine," "A Chromatic Love Affair," and "Sophisticated Lady." Besides recording extensively with Ellington for more than 40 years, Carney recorded with bands led by Benny Goodman, Lionel Hampton, Harry James, and Teddy Wilson. He also recorded with Gerry Mulligan, 17 years his junior and his successor in championing the baritone sax as a jazz instrument.

Carnic Alps, Italian ALPI CARNICHE, German KARNISCHE ALPEN, range of the Eastern Alps, extending along the Austrian–Italian border for 60 mi (100 km) from the Pustertal (valley) and the Piave River (west) to the Gailitz (Italian Silizza) River (east). The mountains are bounded by the Dolomites (*q.v.*; southwest), the Gail River and the Gailtaler Alpen (north), the Karawanken (east), and the Julian Alps (southeast). The mountains rise to Kellerwand (9,121 ft [2,780 m]) and are crossed by road at Plöcken Pass (Italian Passo di Monte Croce, 4,462 ft). Summer resorts and winter sports centres lie within the scenic range.

Carniola, German KRAIN, Slovenian KRANJSKA, western region of the Yugoslav republic of Slovenia, which in the 19th century was a centre of Slovenian nationalist and independence activities within the Austrian Empire. It was part of the Roman province of Pannonia in ancient times, and was occupied by the Slovenes in the 6th century AD. Emerging as a distinct district in the 10th century, Carniola belonged to a series of ecclesiastical and lay princely houses until 1335 when it became a possession of the Austrian Habsburgs, who held it with only brief interruption until 1918.

The scene of Turkish raids and peasant revolts (15th–17th centuries) and of religious repression during the Counter-Reformation, Carniola underwent significant economic advance in the 18th and 19th centuries, particularly while it was ruled by the French as part of the Illyrian Provinces (1809–14). Slovene nationalism also developed in Carniola in the 19th century, and during the 1848 revolutions against the Habsburgs, the inhabitants of the region tried unsuccessfully to create an autonomous Slovene kingdom within the Austrian Empire. In 1849 Carniola was reorganized as an Austrian crown land, which was dominated by Austrian bureaucrats. Under that administration the Slovene nationalist

Carniola in the mid-19th century

movement grew stronger, and in 1918 most of Carniola was attached to the new Kingdom of Serbs, Croats, and Slovenes (later called Yugoslavia). After 1947 Carniola was located entirely within Slovenia.

carnitine, a water-soluble, vitamin-like compound related to the amino acids. It is an essential growth factor for mealworms and is present in striated (striped) muscle and liver tissue of higher animals. Carnitine, which can be synthesized by the higher animals, is associated with the transfer of fatty substances from the bloodstream to active sites of fatty-acid oxidation within muscle cells. It regulates the rate of oxidation of fatty acids and may afford the means by which a cell can rapidly shift its metabolic patterns (*e.g.,* from fat synthesis to fat breakdown).

Consult the INDEX *first*

carnival, the merrymaking and festivity that takes place in many Roman Catholic countries in the last days and hours of the pre-Lenten season. The derivation of the word is uncertain, though it possibly can be traced to the Medieval Latin *carnem levare* or *carnelevarium,* which means to take away or remove meat. This coincides with the fact that carnival is the final festivity before the commencement of the austere 40 days of Lent, during which Catholics, in earlier times, abstained from eating meat. The historical origin of carnival is also obscure. It possibly has its roots in a primitive festival honouring the beginning of the new year and the rebirth of nature, though it is also possible that the beginnings of carnival in Italy may be linked to the pagan Saturnalian festival of ancient Rome.

The first day of the carnival season varies with both national and local traditions. Thus in Munich and Bavaria the carnival, or Fasching (*q.v.*), begins on the feast of the Epiphany (January 6), while in Cologne or the Rhineland it begins on November 11 at 11:11 AM (11th month, day, hour, and minute). In France the celebration is restricted to Tuesday before Ash Wednesday (Shrove Tuesday) and to *mi-carème,* or the Thursday of the third week of Lent. More generally the commencement date is Quinquagesima Sunday, and the termination is Shrove Tuesday; though, in some parts of Spain, Ash Wednesday also is included in the carnival celebrations, an observance that stems from a time when Ash Wednesday was not an integral part of Lent.

In earlier times, Rome was most conspicuous as the centre of carnival activity, and the splendour and richness of the festivity that marked its observance there were scarcely surpassed elsewhere. In its long history, the carnival played a significant role in the development of the popular theatre, vernacular song, and folk dances.

In the United States the principal carnival celebration is in New Orleans, where the carnival season opens on Twelfth Night (January 6) and climaxes with the Mardi Gras season commencing 10 days before Shrove Tuesday. The French name *Mardi Gras* means Fat Tuesday, from the custom of using all the fats in the home before Lent. Masked balls, parades, and various other festivities mark the celebration.

carnival, a travelling entertainment combining the features of both circus and amusement park. Developing out of the same roots as the early 19th-century circus—the "mud shows," so called because they operated mainly in the open—carnivals travelled from town to town, bringing with them a few days of high excitement. In addition to mechanized rides such as the early merry-go-round, carnivals featured live animal acts, pony rides, sideshow curiosities, and games of skill and chance. The carnival barker announced the offerings to the crowd, sometimes promising more than could be presented. Carnivals soon developed a reputation for less than perfect honesty with the customers.

Small travelling carnivals persist in the second half of the 20th century, but they have largely been replaced by permanent amusement and theme parks.

carnival song, Italian CANTO CARNASCIALESCO, plural CANTI CARNASCIALESCHI, late 15th-

and early 16th-century part song performed in Florence during the carnival season. The Florentines celebrated not only the pre-Lenten revelry but also the Calendimaggio, which began on May 1 and ended with the Feast of St. John on June 24. An essential part of the festivities was the singing and dancing of secular songs by masked merrymakers. Under Lorenzo de' Medici (ruled 1469–92) the carnival celebrations became more intense and elaborate, and, as a result of his leadership and encouragement, the court also took a more active part. Lorenzo himself wrote poems to be sung by his courtiers as well as by guild members, the former performing songs based on stories taken from mythology and the latter basing their repertoire on subjects of a more current and popular appeal.

Textually, the *canti carnascialeschi* descend from the old *cacce,* which were also topical, descriptive, and full of double meanings. Often, these are satirical or obscene in character, and the titles of the songs themselves effectively portray the vigour and excitement of life in 15th-century Florence. Musically, the pieces are chordal and strophic, in a style similar to the Mantuan *frottole,* this form probably emanating from the outdoor and public nature of the performances. (They included serenades, chariot songs, and processionals, for example.) In many instances, the music is in an ABBC form, with the $\frac{4}{4}$ metre changing to $\frac{3}{4}$ on the C section; this is then repeated for a number of stanzas. A number of carnival songs were written by Heinrich Isaac during his stay at Lorenzo's court (*c.* 1480), but, unfortunately, they have been lost.

The fall of the Medici (1494) and the rule of Savonarola strongly affected the carnival songs, many of which disappeared along with art treasures and musical instruments. Some of the better known melodies survived, however, newly adorned with sacred and penitential texts. After the fall of Savonarola in 1498, the carnival was reinstated, but it never regained its original colourfulness and air of joyful gaiety. Instead, it became a sombre and dignified court ceremonial, and, as a result, the *canti carnascialeschi* lost their popular spontaneity and grew more literary in nature.

carnivore, a member of the mammalian order Carnivora, literally "meat eaters." The order Carnivora is composed of 10 families of primarily predatory mammals: the dogs, foxes, wolves, and jackals (Canidae); bears (Ursidae); raccoons and pandas (Procyonidae); weasels, skunks, otters, and badgers (Mustelidae); genets, civets, and mongooses (Viverridae); hyenas (Hyaenidae); cats (Felidae); sea lions, or eared seals (Otariidae); earless seals (Phocidae); and the walrus (Odobenidae). Although the term carnivore can be applied broadly to any meat-eating animal, including mammals in other orders such as the otter shrews (Insectivora) and the Tasmanian devil (Marsupialia), mammalogists generally use the term in this more restricted sense. Most members of the order are in fact meat eaters, although some ursids, procyonids, and canids rely heavily on vegetation, and the giant panda (*Ailuropoda melanoleuca*) lives almost entirely on bamboo shoots.

A brief treatment of carnivores follows. For full treatment, *see* MACROPAEDIA: Mammals.

Marine carnivores (the three families of pinnipeds, or seal-like forms) are found in all oceanic waters and along the coasts of all the continents. Terrestrial carnivores are native to all continents but Antarctica and Australia, although the dingo (*Canis dingo*) was introduced to the latter during the early Aboriginal invasion. The smallest carnivore, the least weasel (*Mustela nivalis*), weighs only 30 to 70 grams (1 to 2.5 ounces), while the largest terrestrial species, the Alaskan brown bear (*Ursus arctos*), can reach 780 kilograms (1,700 pounds). The largest member of the order is the elephant seal (*Mirounga leonina*) at 3,600 kilograms (4 tons). Carnivores exhibit a wide variety of forms. The pinnipeds have evolved paddle-like extremities; the limbs are enclosed within the streamlined torso down to at least the elbows or knees, and the remaining portion of the limb is flattened as a flipper that provides efficient aquatic propulsion. Among the terrestrial carnivores, body forms may be adapted for running (many canids), stalking (felids), climbing (many viverrids), and swimming (otters).

Most carnivores have a fairly complex dentition; incisors, canines, premolars, and molars occur in that order. In those members of the order that live mainly on meat, some of the side teeth have evolved into the scissor-like carnassials, or shearing teeth. The teeth behind the carnassials are usually absent. In carnivores the incisor teeth usually function for nipping, and the large sharp canines are used to grab and hold the prey. The more omnivorous ursids and procyonids lack carnassials and have retained more of their molar teeth for grinding their food. Pinnipeds show less variety in tooth structure than other carnivores, their premolars and molars all being essentially conical structures that are efficient for grabbing and holding fish.

The lower jaw of carnivores is hinged in such a way that it can move only vertically, but it can exert great power. Collarbones are absent or reduced, which allows great flexibility in the shoulder area. The brains of carnivores are relatively large for their body weights and, characteristic of the more intelligent animals, are highly convoluted. The stomach is simple and the intestine short, both typical features of carnivorous animals, as animal tissue is easier to digest than vegetable tissue.

The earliest carnivores, the Miacidae, appeared during Paleocene times (about 60,000,000 years ago). The group probably evolved from an insectivorous ancestor. By late Eocene times two distinct lines were apparent within the Carnivora; the Feloidea (which led to the cats, viverrids, and hyenas) and the Canoidea (dogs, mustelids, bears, and procyonids). Among the feloids, the viverrids are so similar to the ancestral miacids that some mammalogists place both in the family Viverridae. The two main characteristics distinguishing these lines are the presence of retractile or semi-retractile claws in most feloids and a difference in the structure of the tympanic bulla, which in feloids is composed of an external tympanic bone and an internal endotympanic bone and in canoids is composed of only the tympanic bone.

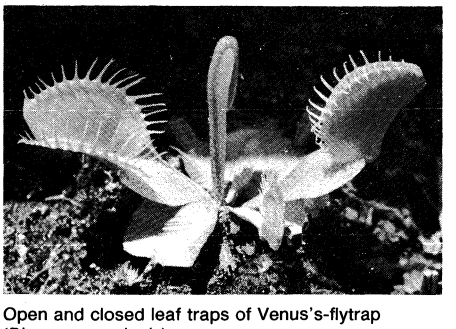
The populations of various carnivores are limited by the availability of prey. Most carnivores space themselves out by establishing and maintaining territories. The size of these territories depends on the size of the predator and the carrying capacity of the prey population; a mountain lion (*Felis concolor*) needs a large territory to support the deer herds it preys on, while a bobcat (*F. rufus*) can usually support itself on the rabbit population of a much smaller area.

Hunting patterns differ throughout the Carnivora. Most canids have great endurance and are built to run down their prey. The cats, on the other hand, tire quickly and are adapted to stalking and leaping upon their prey. When their hooked claws are extended the foot also expands; this gives them a large surface with which to grasp and hold the prey. Although they are the largest land carnivores, the bears live mainly on insects, seeds, nuts, plant matter, and berries; some species also fish. Only the polar bear (*Thalarctos maritimus*) is mostly predatory; its Arctic environment has little vegetation, and this highly aquatic bear lives mainly on seals. The sea otter (*Enhydra*) is among the tool-using mammals. Its diet consists of abalone and other shellfish, which it opens by cracking them on a rock held on its chest as it floats on its back.

Some carnivores are quite solitary (most of the cats, civets, bears, and weasels); others live and hunt in pairs or with the young of the year (foxes and the kinkajou, *Potos flavus*). Some, including the wolves, Cape hunting dogs (*Lycaon pictus*), lions (*Panthera leo*), coatimundi (*Nasua*), and some mongooses, live and hunt in larger social groups. Pinnipeds live in huge rookeries during the breeding season; in many species the males establish breeding territories and maintain harems.

Mating patterns vary from the temporary liaisons seen in the bears and most cats to the monogamous pairs found in many species of canids. Delayed implantation (in which the embryo floats freely in the womb for up to several months before embedding in the uterine wall and commencing development) is found in many mustelids and the bears. Litter size is generally between 3 and 6; bears usually have only 2 cubs, while the Asiatic polecat (*Mustela eversmanni*) may produce up to 18 young. Young carnivores are cared for by one or both parents, depending on the species, and in some, such as the Cape hunting dog, the entire pack feeds and guards the pups once they stop nursing. Young carnivores remain with the adults until they have learned basic hunting skills. Many carnivores will bring wounded game back to their young so they can practice catching and killing. Small carnivores, such as mustelids, may be mature and breeding at one year of age, but the larger ones, such as bears, do not mature until three or four. Male pinnipeds may be much older than that before they can compete with the dominant males for a chance to breed.

carnivorous plant, also called INSECTIVOROUS PLANT, any plant especially adapted for capturing insects and other tiny animals by means of ingenious pitfalls and traps and then subjecting them to the decomposing action of digestive enzymes, bacteria, or both. The approximately 400 known species of carnivorous



Open and closed leaf traps of Venus's-flytrap (*Dionaea muscipula*)
Rutherford Platt

plants constitute a very diverse group, in some cases having little more in common than their carnivorous habit. Although the carnivorous adaptation is most widespread and conspicuous among green plants, some microscopic species of fungi also catch and digest animal prey.

Carnivorous plants digest their prey through a process of chemical breakdown analogous to digestion in animals. The end products, particularly nitrogenous compounds and salts, are absorbed by the plants. Their adaptations for digesting nitrogen-rich animal proteins are thought to enable these plants to survive under otherwise marginal or hostile environmental conditions. Most carnivorous species are green plants that manufacture food by photosynthesis from the raw materials of sunlight, water, and carbon dioxide in the presence of chlorophyll. The carnivorous habit augments the diet derived from their environment.

The conspicuous trapping mechanism, always a leaf modification, draws special attention to these plants. Classification is based primarily on the floral characteristics, as among flowering plants in general. More than half of the species belong to the family Lentibulariaceae (order Scrophulariales), marked by bilaterally symmetrical flowers with fused petals. The remainder of the species belong to several families characterized by radially symmetrical flowers formed of separate petals. The families of the latter group are the Droseraceae and Nepenthaceae, which constitute the order Nepenthales; and the family Sarraceniaceae (order Sarraceniales). The species of Nepenthaceae and Sarraceniaceae, known collectively as pitcher plants, capture prey by means of pitfalls; members of the Droseraceae (sundews, flytraps) have active trapping devices.

The family Droseraceae comprises four genera (*Aldrovanda, Dionaea, Drosera,* and *Drosophyllum*) and about 100 species, nearly all of which belong to the genus *Drosera*, the worldwide genus of sundew (*q.v.*) *Aldrovanda* are floating aquatics sometimes grown in aquaria as curiosities. *Dionaea*, represented by a single species, *D. muscipula*, is the well-known, quick-acting flytrap (*see* Venus's-flytrap). *Drosophyllum*, also with a single species, *D. lusitanicum*, is the Portuguese sundew.

The species of New World pitcher plants are placed in the family Sarraceniaceae. Eight of the 15 species belong to the widely known and much studied genus *Sarracenia*, of eastern North and South America. The approximately 70 species of Old World pitcher plants constitute the only genus of the family Nepenthaceae, *Nepenthes. Cephalotus follicularis*, of southwestern Australia, looks like a saxifrage with small *Sarracenia* leaves; it constitutes a pitcher-plant family of its own, Cephalotaceae (order Saxifragales). (*See* pitcher plant.)

The family Lentibulariaceae includes about five carnivorous genera and more than 250 species. The majority of them belong to the genus *Utricularia,* the bladderworts, the most cosmopolitan of all the carnivorous genera. The two small genera *Biovularia* (two species; Cuba, South America) and *Polypompholyx* (two species; Australia) are very similar to *Utricularia* and also trap their prey by means of highly specialized bladders. *Genlisea* is a small tropical genus of 15 species of tiny aquatic plants that trap their prey by means of tiny pitcher-like structures. The butterworts, 45 species in the genus *Pinguicula*, differ from the bladderworts and other genera, trapping their prey by a third method—on sticky flypaper-like leaves. (*See* bladderwort.)

Whether aquatic, terrestrial, or amphibious, carnivorous plants have a basically similar ecology. Species of two or three genera (*e.g., Sarracenia, Drosera, Pinguicula*) are often found growing almost side by side. The majority are most likely to be found in damp heaths, bogs, swamps, and muddy or sandy shores where water is abundant and where nitrogenous materials are often scarce or unavailable because of acid or other unfavourable soil conditions. *Drosophyllum lusitanicum* seems to be the one exception; this coarse, wiry sundew grows on dry gravelly hills of Portugal and nearby Morocco.

On the whole, carnivorous plants are relatively small, but size variation is enormous even within the same genus. The majority are herbaceous perennials less than 30 centimetres (1 foot) high, often only 4–6 inches. Some species of *Nepenthes,* however, become large shrubby vines. *Drosera* species vary from a few inches to three feet or more in height (*D. gigantea*); the smallest are often hidden among the moss of a sphagnum bog.

Carnot, Lazare(-Nicolas-Marguerite), byname ORGANIZER OF VICTORY, OF THE GREAT CARNOT, French ORGANISATEUR DE LA VICTOIRE, OR LE GRAND CARNOT (b. May 13, 1753, Nolay, Burgundy, Fr.—d. Aug. 2, 1823, Magdeburg, Prussian Saxony), French statesman, general, military engineer, and administrator in successive governments of the French Revolution. As a leading member of the committees of General Defense and Public Safety and of the Directory (1793–97), he helped mobilize the Revolutionary armed forces and matériel.

Lazare Carnot, lithograph by Ambroise Tardieu, after an engraving by C.A. Forestier

By courtesy of the Bibliotheque Nationale, Paris

Education and training. The son of a lawyer, Carnot studied at the Collège d'Autun and subsequently at the small seminary in the same town. After attending the artillery and engineering preparatory school in Paris from 1769 to 1771, he was graduated from the Mézières school of engineering, in January 1773, with the rank of lieutenant. Thus he began the life of a garrison officer, going from one provincial town to another, moving in literary circles wherever he was stationed. In 1780 he was admitted to a distinguished literary society and in 1784 became known for a eulogy of Sébastian Le Prestre de Vauban, the French military engineer, which received an award from the Dijon Academy. In 1787 he was elected a member of the Arras Academy, the director of which at that time was Robespierre, who was to be a leading figure in the Revolution.

When the Revolution broke out in 1789, Carnot was still a captain, a rank he had received in 1784. In 1791 he was elected deputy from Pas-de-Calais to the Legislative Assembly. As a member of the diplomatic and public education committees, Carnot did not distinguish himself; but on Aug. 11, 1792, the day after the attack on the royal palace of the Tuileries in Paris, he was sent to the Army of the Rhine to report what had occurred.

In September 1792 Carnot was elected representative from Pas-de-Calais to the National Convention—the assembly elected under the influence of the fall of the monarchy—and at the end of the month was sent, with two other representatives, on a mission to Bayonne to organize the defense against a possible attack from Spain.

Since he was absent from Paris until the beginning of January 1793, Carnot did not take part in debates accompanying Louis XVI's trial. He did, however, take part in the decisive votes, in which he voted against an appeal to the people and in favour of the King's death. He thus indicated that he had been won over to the position of the Jacobins—the radicals—even though by temperament and inclination he was a man of the independents of the centre.

As a member of the Committee of War, Carnot was assigned to the Committee for General Defense, a predecessor of the Committee of Public Safety, which was to act as the executive branch throughout the republic. In this capacity Carnot presented various reports to the Convention, particularly one on March 9, 1793, which resulted in the dispatch of 82 representatives into the provincial *départements* to expedite the conscription of 300,000 men. Carnot himself was sent into the *départements* of the Nord and of Pas-de-Calais and at the end of March to the Army of the North. He remained with the Army of the North until August 1793, establishing his mastery in military operations as well as in the command of men. He reorganized the army, reestablished discipline, and took part, musket in hand, in the attack and capture of Furnes.

Political rise and fall. On Aug. 14, 1793, the Convention appointed Carnot a member of the Committee of Public Safety. Shortly after, he set out again for the Army of the North, while the enemy besieged Maubeuge. This mission ended in the victory of Wattignies on Oct. 16, 1793, and in the raising of the siege of Maubeuge. Once again Carnot, at the side of the generals, led the attack and entered the recaptured town alongside them. At the end of the month, he resumed his seat on the Committee of Public Safety.

From then on, Carnot devoted himself to the immense task of the Committee, concentrating on the conduct of military operations, although he did not entirely divorce himself from general policy. From the very start Carnot demanded that the ancient tactic of line combat be abandoned, advocating instead attack by masses concentrated at decisive points; eventually his views were adopted by the entire Committee. Carnot took a dominant part in the development of campaign plans, which were discussed by the entire Committee; Robespierre and Saint-Just, one of Robespierre's chief aides, concerned themselves particularly with strategy.

Beginning in May 1794, dissensions arose within the Committee of Public Safety between Carnot and Robespierre and Saint-Just, all of whom were of equally authoritarian and unyielding temperament. Carnot, basically a conservative, did not approve of the egalitarian aims of the social policy of Robespierre and his followers. If he did not play a decisive role during the coup of 9 Thermidor, year II (July 27, 1794), which overthrew Robespierre and marked the end of the Reign of Terror, Carnot must at least have approved of the fall of Robespierre.

Subsequently, however, Carnot's role began to diminish. He continued to occupy himself with directing military operations for another few months, but he soon had to defend himself against attacks by the executors of the Thermidorian coup, aimed without distinction against all former members of the Committee of Public Safety. Thus, in March 1795, in an attempt to dissociate himself from his former colleagues, he claimed that each of them was responsible only for the duty with which he was charged and that the signatures to decrees regarded as reprehensible were only a formality. Yet Carnot did not succeed in silencing the charges. In May 1795, when an obscure deputy demanded the arrest of all the members of the former committees and named Carnot, he was saved by another deputy who shouted "He organized the victory."

Carnot was elected to the Directory, the French government from 1795 to 1799, the executive branch of which consisted of five directors; and he became even more conservative than before. When the elections of the spring of 1797 brought in a royalist majority, Carnot bowed to the results, so that during the coup d'etat of 18 Fructidor, year V (Sept. 4, 1797), which quashed the elections, he had to flee in order to escape arrest. He crossed into Germany and settled in Nürnberg.

After the coup d'etat of 18 Brumaire, year VII (Nov. 9, 1799), which brought Napoleon Bonaparte to power as first consul of France, Carnot returned. He was minister of war for a few months in 1800 but resigned. Appointed in 1802 a member of the Tribunat, a body chosen by the Senate to debate legislation, he fought the authoritarian development of the consular regime, opposed the institution of the Legion of Honour, voted against bestowing on Napoleon the consulate for life, and courageously opposed the establishment of the empire under Napoleon. He continued, however, to hold a seat on the Tribunat until that assembly was suppressed in 1807, when he withdrew from public life.

The allied invasion of 1814 forced him out of retirement. Napoleon appointed him governor of the town of Antwerp, where he remained until after the fall of the empire. Carnot sided with the Restoration under Louis XVIII, but in July 1814 he published his *Mémoire au roi en juillet 1814,* in which he denounced the excesses of the reaction under the Bourbon king. During the Hundred Days, when Napoleon attempted to reestablish his power, Carnot served as minister of the interior, and, after Napoleon's defeat at Waterloo, Carnot encouraged him to resist, but in vain. The Second Restoration marked the end of Carnot's political career.

In July 1815 Carnot was exiled from France. He left Paris in October and settled at Warsaw in January 1816. In August 1816 Carnot left Warsaw for Magdeburg, where he died seven years later.

The Third Republic, eager to acquire ancestors, exalted Carnot's memory, consecrating him as "the Organizer of Victory." When his grandson, Sadi Carnot, nephew of the scientist Sadi Carnot, was president of the republic, the ashes of Lazare Carnot were placed in the Panthéon in Paris. Carnot was indeed "the Organizer of Victory" but only in collaboration with the other members of the Committee of Public Safety, with whom he shared responsibility for the Terror as well. For although the Committee of Public Safety was able to raise, equip, arm, and feed 14 armies and lead them to victory, it succeeded only by means of a mass levy, mass requisitions, and nationalization of military production—measures based on the revolutionary government's use of force, that is, an authority relying on the Terror. The characterization of Carnot as "the Organizer of Victory" is a legend created by the victors of the Thermidor coup, who, holding those vanquished in the coup responsible for the Terror, surrounded the survivors with all the brilliance of the victory.

(Al.S.)

BIBLIOGRAPHY. P.F. Tissot, *Mémoires historiques et militaires sur Carnot, rédigés d'après ses manuscrits, sa correspondance inédite et ses écrits* (1824). The greater part of these *Mémoires* were drafted by Carnot himself; the rest were collected from his notes, writings, and papers. Marcel Reinhard, *Le Grand Carnot,* vol. 1, *De l'Ingénieur au Conventionnel, 1753–1792* (1950), vol. 2, *L'Organisateur de la victoire, 1792–1823* (1952), the best biography of Carnot currently available, gives a favourable interpretation of its subject. An English-language treatment may be found in R.R. Palmer, *Twelve Who Ruled* (1958).

Carnot, (Nicolas-Léonard-) Sadi (b. June 1, 1796, Paris—d. Aug. 24, 1832, Paris), French scientist who described the Carnot cycle, relating to the theory of heat engines.

Carnot was the eldest son of the French Revolutionary figure Lazare Carnot and was named for a medieval Persian poet and philosopher, Sa'dī of Shīrāz, whose writings were enjoying a minor vogue in Paris at the time of his birth. His early years were a period of unrest, and the family suffered many changes of fortune. His father fled into exile soon after Sadi's birth; in 1799 he returned to be appointed Napoleon's minister of war but was soon forced to resign. A writer on mathematics and mechanics as well as military and political matters, the elder Carnot now had the leisure to direct his son's early education.

Sadi Carnot, engraving after a painting by A. Bailly, 1813

By courtesy of the Bibliotheque Nationale, Paris

Sadi entered the École Polytechnique in 1812, an institution providing an exceptionally fine education, with a faculty of famous scientists aware of the latest developments in physics and chemistry, which they based on a rigorous mathematics. By the time Sadi graduated in 1814, Napoleon's empire was being rolled back, and European armies were invading France. Soon Paris itself was besieged, and the students, Sadi among them, fought a skirmish on the outskirts of the city.

During Napoleon's brief return to power in 1815, Lazare Carnot was minister of the interior, but, following the Emperor's final abdication, he fled to Germany, never to return to France.

Sadi remained an army officer for most of his life, despite disputes about his seniority, denial of promotion, and the refusal to employ him in the job for which he had been trained. In 1819 he transferred to the recently formed General Staff but quickly retired on half pay, living in Paris on call for army duty. Friends described him as reserved, almost taciturn, but insatiably curious about science and technical processes.

The mature, creative period of his life now began. Sadi attended public lectures on physics and chemistry provided for workingmen. He was also inspired by long discussions with the prominent physicist and successful industrialist Nicolas Clément-Desormes, whose theories he further clarified by his insight and ability to generalize.

The problem occupying Carnot was how to design good steam engines. Steam power already had many uses—draining water from mines, excavating ports and rivers, forging iron, grinding grain, and spinning and weaving cloth—but it was inefficient. The import into France of advanced engines after the war with Britain showed Carnot how far French design had fallen behind. It irked him particularly that the British had progressed so far through the genius of a few engineers who lacked formal scientific education. British engineers had also accumulated and published reliable data about the efficiency of many types of engines under actual running conditions; and they vigorously argued the merits of low- and high-pressure engines, and of single-cylinder and multicylinder engines.

Convinced that France's inadequate utilization of steam was a factor in its downfall, Carnot began to write a nontechnical work on the efficiency of steam engines. Other workers before him had examined the question of improving the efficiency of steam engines by comparing the expansion and compression of steam with the production of work and consumption of fuel. In his essay, *Réflexions sur la puissance motrice du feu et sur les machines propres à développer cette puissance,* published in 1824, Carnot tackled the essence of the process, not concerning himself as others had done with its mechanical details.

He saw that, in a steam engine, motive power is produced when heat "drops" from the higher temperature of the boiler to the lower temperature of the condenser, just as water, when falling, provides power in a waterwheel. He worked within the framework of the caloric theory of heat, assuming that heat was a gas which could be neither created nor destroyed. Though the assumption was incorrect and Carnot himself had doubts about it even while he was writing, many of his results were nevertheless true, notably the prediction that the efficiency of an idealized engine depends only on the temperature of its hottest and coldest parts and not on the substance (steam or any other fluid) which drives the mechanism.

Although formally presented to the Academy of Sciences and given an excellent review in the press, the work was completely ignored until 1834, when Émile Clapeyron, a railroad engineer, quoted and extended Carnot's results. Several factors might account for this delay in recognition; the number of copies printed was limited and the dissemination of scientific literature was slow, and such a work was hardly expected to come from France when the leadership in steam technology had been centred in England for a century. Eventually Carnot's views were incorporated by the thermodynamic theory as it was developed by Rudolf Clausius in Germany (1850) and William Thomson (later Lord Kelvin) in Britain (1851).

Little is known of Carnot's subsequent activities. In 1828 he described himself as a "constructor of steam engines, in Paris." When the Revolution of 1830 in France seemed to promise a more liberal regime, there was a suggestion that Carnot be given a government position, but nothing came of it. He was also interested in improving public education. When absolutist monarchy was restored, he returned to scientific work, which he continued until his death in the cholera epidemic of 1832 in Paris.

(E.M.)

BIBLIOGRAPHY. E. Mendoza (ed.), *Reflections on the Motive Power of Fire, by Sadi Carnot, and Other Papers . . .* (1960), contains translations of Carnot's memoir and two important articles by E. Clapeyron and R. Clausius. The introduction gives biographical details of Carnot's life and a technical discussion of the physics background of his work. The primary source of Carnot's biography is *Réflexions sur la puissance motrice du feu et sur les machines propres à développer cette puissance* (1878; Eng. trans. 1890), which includes a biography by his brother, Hippolyte Carnot. A few more fragments are included in E. Mendoza, "Contributions to the Study of Sadi Carnot and His Work," *Arch. Int. Hist. Sci.,* 12:377–396 (1959). The engineering background is discussed from a technical point of view in two papers: Milton Kerker, "Sadi Carnot and the Steam Engine Engineers," *Isis,* 51:257–270 (1960); and Robert Fox, "Watt's Expansive Principle in the Work of Sadi Carnot and Nicolas Clément," *Notes Rec. R. Soc. Lond.,* 24:233–253 (1969).

Carnot, (Marie-François-) Sadi (b. Aug. 11, 1837, Limoges, Fr.—d. June 24, 1894, Lyon), an engineer turned statesman who served as fourth president (1887–94) of the Third Republic until he was assassinated by an Italian anarchist.

The son of a leftist deputy (Hippolyte Carnot) who was a vigorous opponent of the July Monarchy (after 1830), and grandson of Lazare Carnot, the famous "Organizer of Victory" of the French Revolution, he was educated as an engineer at the École Polytechnique and then the École des Ponts et Chaus-

Sadi Carnot
By courtesy of the Bibliotheque Nationale, Paris

sées (School of Bridges and Highways). After service as a government engineer at Annecy, he was named commissioner of Normandy with responsibility for organizing resistance there in the Franco-German War (1870–71). After a brief term as prefect of Seine-Inférieure he was elected to the Chamber of Deputies from the Côte d'Or *département.* Sitting with the Left Republicans, Carnot concentrated on issues concerning public works and railroad development.

In October 1878 he was appointed undersecretary of public works, and in 1880 he took charge as minister. Elected vice president of the Chamber in April 1885, he served as minister of commerce and finance. In 1887 he was elected president of the republic without actively aspiring to the office.

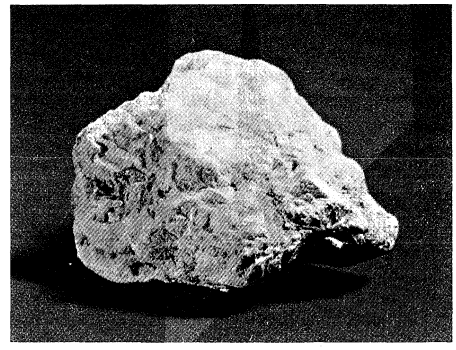
The Carnot presidency was marked by the plots of the political adventurer Gen. Georges Boulanger, labour agitation, anarchist movements, and the Panama Canal scandals (1892). Yet he managed to retain his popularity through 10 different governments formed in the course of seven years. After delivering a speech at a Lyon exposition, he was fatally wounded by the Italian anarchist Sante Caserio. He was buried in the Panthéon next to his illustrious grandfather.

Carnot cycle, in heat engines, ideal cyclical sequence of changes of pressures and temperatures of a fluid, such as a gas used in an engine, conceived early in the 19th century by the French engineer Sadi Carnot. It is used as a standard of performance of all heat engines operating between a high and a low temperature.

In the cycle the working substance of the engine undergoes four successive changes: expansion by heating at a constant high temperature; reversible adiabatic expansion; compression by cooling at a constant low temperature; and reversible adiabatic compression. The engine receives heat (from the heat source) during the expansion at high temperature, delivers work during the reversible adiabatic expansion, rejects heat (to the heat sink) during the compression at low temperature, and receives work during the reversible adiabatic compression. The ratio of the net work output to the heat input is equal to the ratio of the difference between the temperatures of the heat source and the heat sink divided by the temperature of the heat source. It represents Carnot's principle in that it is the largest such ratio of any engine operating between the two temperatures.

carnotite, radioactive, bright-yellow, soft and earthy vanadium mineral that is an important source of uranium. A hydrated potassium uranyl vanadate, $K_2(UO_2)_2(VO_4)_2 \cdot nH_2O$, pure carnotite contains about 53 percent uranium, 12 percent vanadium, and trace amounts of radium. It is of secondary origin, having been formed by alteration of primary uranium-vanadium minerals. It occurs chiefly with tyuyamunite (its calcium analogue) in sandstone, either disseminated or locally as small pure masses, particularly around fossil wood.

Carnotite has provided most of the uranium production from secondary deposits; it is also mined for vanadium and radium. From 1911 to 1923, ores containing carnotite were mined in Colorado for radium. From 1937 to 1943, carnotite was again mined, primarily for vanadium. After World War II it was mined extensively in the U.S. for uranium. The greatest known concentration of carnotite deposits is in the western U.S., particularly in the Colorado Plateau area. Other deposits occur in Wyoming, South Dakota, and Pennsylvania. Carnotite has been found in small quantities at many localities throughout the world; commercial deposits outside the U.S. occur near Kokand and Ferghana in eastern Uzbekistan.



Carnotite found near Green River, Utah
By courtesy of the MacFall Collection; photograph, Mary A. Root—EB Inc.

For detailed physical properties, *see* vanadate mineral (table).

Carnuntum, the most important ancient Roman legionary camp of the upper Danube frontier, situated at Petronell, 20 miles east of Vienna. It was the emperor Tiberius' base in his attacks on the Marcomanni (AD 6), after which a fort for one legion was erected, although it was replaced about AD 73 by a stone camp.

In AD 106 it became the capital of the province of Upper Pannonia. Here the emperor Marcus Aurelius wrote the second book of his *Meditations* during his campaign against the Marcomanni (171–173). The Conference of the Emperor was held here in 307. After its destruction by barbarians in the Marcomannic Wars, the camp was rebuilt in 375 but was finally destroyed by fire about 400.

Caro, Annibale (b. June 19, 1507, Civitanova Marche, Papal States—d. Nov. 21, 1566, Rome), Roman lyric poet, satirist, and translator, remembered chiefly for his translation of Virgil's *Aeneid* and for the elegant style of his letters.

Secretary first to Msgr. Giovanni Gaddi in Florence and in Rome, then to Cardinal Pier Luigi Farnese, Caro received benefices that freed him to write. His poetry, collected as *Rime* in 1569, and his satires are unimportant.

Caro's most outstanding works are his free and graceful *Lettere familiare* (pub. 1572–74; "Familiar Letters") and a smooth translation of Virgil's *Aeneid* (1581). He also wrote one of the most original comedies of his time, *Straccioni* (completed 1544), and a version of Longus' *Daphnis and Chloe* called *Amori pastorali di Dafni e Cloe* ("The Pastoral Loves of Daphnis and Chloe").

Caro, Anthony (Alfred) (b. March 8, 1924, London), English sculptor of abstract, loosely geometrical metal constructions.

After service in the Fleet Air Army of the Royal Navy during World War II, Caro studied engineering at Christ's College, Cambridge. In 1946 he began to study sculpture, first at Regent Street Polytechnic, London, and later at the Royal Academy Schools (1947–52). Also during this period, he assisted the sculptor Henry Moore in his studio. Caro taught at St. Martin's School of Art in London (1953–79).

His student sculpture was primarily figurative, but in the late 1950s he began experimenting with the welded beams, rods, and planes that became his hallmark. On a visit to the U.S. in 1959 Caro met the sculptor David Smith, and the two formed a mutually influential relationship. Much of Caro's mature technique followed Smith's example.

Though some of his work adheres to a rigid, rational geometry (*e.g.* "Sailing Tonight," 1971–74), the characteristic Caro suggests lyrical movement, improvisation, and chance; his "Ledge Piece" (1978), commissioned for the East Building of the National Gallery of Art, Washington, D.C., seems to spill over its high perch from the pull of gravity. A catalogue raisonée of his work by Dieter Blume was published in 1979 (rev., 1981).

Caro, Joseph ben Ephraim: *see* Karo, Joseph ben Ephraim.

carob (*Ceratonia siliqua*), tree of the pea family (Fabaceae), native to the eastern Mediterranean region and cultivated elsewhere. It is sometimes known as locust, or St. John's bread, in the belief that the "locusts" on which John the Baptist fed were carob pods. The tree, about 15 metres (50 feet) tall, has pinnately compound (feather-formed), glossy

Carob (*Ceratonia siliqua*)
A.J. Huxley—EB Inc.

evergreen leaves with thick leaflets. It has red flowers followed by flat, leathery pods 7.5–30 centimetres (3–12 inches) long. The pods contain 5 to 15 hard brown seeds embedded in a sweet, edible pulp.

Carobert OF ANJOU (king of Hungary): *see* Charles I *under* Charles (Hungary).

Carol (Romanian personal name): *see under* Charles, except as below.

Carol I, original name KARL EITEL FRIEDRICH, PRINZ VON HOHENZOLLERN-SIGMARINGEN (b. April 20, 1839, Sigmaringen, Hohenzollern-Sigmaringen—d. Oct. 10, 1914, Sinaia, Rom.), first king of Romania, whose long reign (as prince, 1866–81, and as king, 1881–1914) brought notable military and economic development along Western lines but signally failed to confront the basic problems of an overwhelmingly rural nation.

Originally the German prince Karl of Hohenzollern-Sigmaringen, Carol was educated at Dresden and Bonn and in 1864 served as an officer of the Prussian Army in the war against Denmark. With the tacit approval of his cousin, the French emperor Napoleon III, he was offered the throne of Romania after the deposition of the reigning prince, Alexan-

dru Cuza (February 1866), and in April 1866 was elected prince by plebiscite. In 1869 he married the princess Elizabeth of Wied, who later gained fame as the poetess Carmen Sylva. His Germanophile sentiments caused him to be domestically unpopular during the Franco-Prussian War (1870–71), and in 1871 a local revolution almost forced his abdication; but he regained popular support for his military leadership at the Battle of Plevna during the Russo-Turkish War (1877–78), and, with Romania's complete independence from the Ottoman Empire, he was finally crowned king (May 1881). In 1883 he concluded an alliance with Germany and Austria-Hungary, which remained a closely guarded state secret until the outbreak of World War I. He fostered the development of urban industrial and financial interests with a large measure of success and significantly built the national military establishment; but his neglect of festering rural problems—especially peasant land hunger—found its issue in the bloody peasant rebellion of 1907, which claimed perhaps 10,000 lives. His rule brought a great measure of dignity and stability to the administration of government, but his opportunistic manipulation of political parties also perpetuated some of the worst features of Romanian public life.

Carol II (b. Oct. 15, 1893, Sinaia, Rom.—d. April 4, 1953, Estoril, Port.), king of Romania (1930–40), whose controversial reign ultimately gave rise to a personal, corporatist dictatorship.

Carol II
Camera Press

The eldest son of King Ferdinand I, Carol became crown prince upon the death of his great uncle, King Carol I (October 1914). His domestic life was a constant source of scandal, marked as it was by a morganatic marriage with an officer's daughter, Zizi Lambrino; a second unhappy marriage to Helen, daughter of King Constantine I of Greece; and a continuing liaison with a Jewish adventuress, Magda Lupescu—an affair that finally obliged him to renounce his rights to the throne and go into exile (1925).

Although he was officially excluded from the Romanian succession by an act of January 1926, as well as by his father's will, he returned in 1930 and replaced the regency that had governed for his young son Michael, taking the royal oath on June 8, 1930. Flamboyant and energetic, an admirer of the authoritarian methods of the Italian dictator Benito Mussolini, he gradually undermined the already uncertain bases of Romanian democracy; and in February 1938, to counter the growing political menace of the chief national Fascist group, the Iron Guard, he proclaimed a corporatist dictatorship. In December 1938, to supplant the then disbanded political parties and provide a program of social reform, he established the Front of National Rebirth (Frontul Renasterii Nationale) with himself as head. After Romania was divested of territory in Transylvania, Dobrogea, Bukovina, and Bessarabia by the Axis powers and the Soviet Union during World War II, he was forced to abdicate (Sept. 6, 1940) in favour of his son Michael and once again seek exile. He married Lupescu in July 1947.

carol, broadly, a song, characteristically of religious joy, associated with a given season, especially Christmas; more strictly, a late medieval English song on any subject, in which uniform stanzas, or verses (V), alternate with a refrain, or burden (B), in the pattern B, V_1, B, V_2 . . . B. The medieval words *carol* and *carole* (French and Anglo-Norman) might mean a popular dance song with pagan associations, a courtly dance or dance song, a song of popular piety, a polyphonic (multipart) song in a certain style, and a popular religious procession.

During the golden age of the English carol (*c.* 1350–1550), most carols could be defined by the burden-verse form. In addition, the carol seems to have crystallized in the early 14th century essentially as a popular religious song.

A handful of carol tunes and about 500 texts survive from the period. Most refer to the Virgin Mary, the Christ child, or the saints whose feasts follow Christmas; there are also a few Passiontide or Easter carols, songs with texts of moral counsel, and a few amorous, satirical, and topical texts. The versification shows skill, ingenuity, and assurance. Many carols are macaronic, mixing two languages, usually in Latin and English.

During the 15th century, the carol continued as a popular religious song, but it also developed as art music and as a literary form. Musically, it is the most important English *forme fixe* ("fixed form"), comparable to the French rondeau, virelai, and ballade. The 15th-century carol repertory is one of the most substantial monuments of English medieval music. The musical form is often elaborated—a burden for two soloists is followed by another for three-part chorus, and the two-voice verse may be punctuated by a choral refrain. The early carols are rhythmically straightforward, in modern $\frac{6}{8}$ time; later the basic rhythm is in $\frac{3}{4}$, with many cross-rhythms ($\frac{6}{8}$ and $\frac{3}{2}$), with the words subordinated to the music. The upper part or parts are more elaborate than the tenor, the bottom part, which usually seems to carry the tune, as in the famous Agincourt carol "Deo gratias Anglia." As in other music of the period, the emphasis is not on harmony, but on melody and rhythm.

At the end of the 15th century, carols appeared in a court songbook, the *Fayrfax Manuscript,* written for three or four voices in a flexible, sophisticated style based on duple (two-beat) rhythm. They are mostly on themes connected with the Passion of Christ, and the words often decisively determine the musical effect. Composers are often mentioned—William Cornyshe, Robert Fayrfax, and John Browne. From a decade or two later survive the only examples of court carols—light songs, apparently of popular origin, in simple versions by court composers, *e.g.,* Henry VIII's "Green groweth the holly." The polyphonic carol was written by professional musicians for trained choirs.

The carol disappeared swiftly and almost completely with the Reformation. It was largely supplanted by the metrical psalm.

A carol revival began in the second half of the 18th century. The best Christmas hymns of the era, *e.g.,* Charles Wesley's "Hark, the herald angels sing," still lack the distinctive carol touch. The revival built on collections of traditional broadsides, which included "The first Nowell," and "A Virgin Most Pure." Two other sources were the English folk carol ("I saw three ships") and translated foreign carols ("Patapan," a French *noël*).

Carol, Martine, original name MARIE-LOUISE-JEANNE MOURER (b. May 16, 1922, Biarritz, Fr.—d. Feb. 16, 1967, Monte-Carlo), French film actress, the reigning blond sex symbol in the late 1940s and early 1950s.

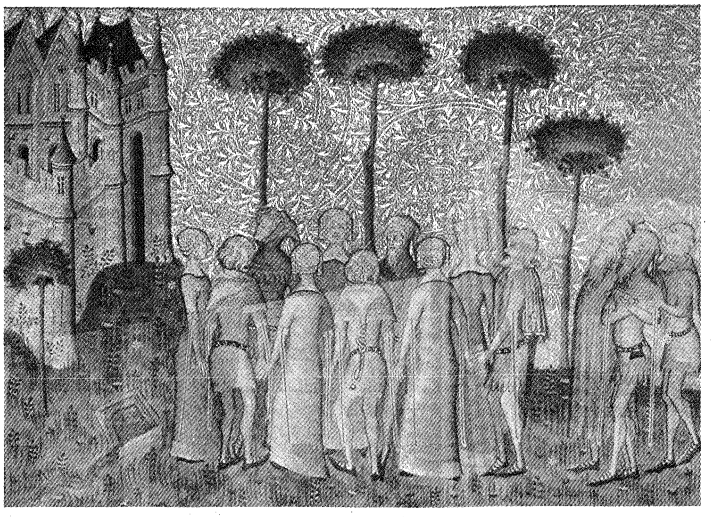
Appearing early in her career under the stage names of Catherine and Maryse Arley, she made her film debut in 1943, winning her first starring role in 1948. As the leading box-office star in France in the early 1950s, she appeared in several films as a genteel seductress; including the *Caroline Chérie* (1951) series and *Les Belles de nuit* (1952; "Beauties of the Night").

Carol was showcased by her director-husband Christian-Jaque in a series of elaborate period pieces such as *Madame Du Barry* (1954). Despite her creditable performance in the title role of *Lola Montès* (1955; *The Sins of Lola Montès*), Carol's career declined sharply in the late 1950's.

Carolan, Turlough: *see* O'Carolan, Turlough.

carole, medieval European dance in a ring or chain, performed to the singing of the dancers. An indefinite number of persons participated, linking arms and following the step of the leader. The origins of the carole are in ancient ring dances of May and midsummer festivals and, more remotely, in the ancient Greek *choros,* or circular, sung dance. Mentioned as early as the 7th century, the carole spread throughout Europe by the 12th century and declined during the 14th century.

There is good evidence that caroles were danced to ballads. Many ballad refrains sug-



Carole, miniature from "Remède de Fortune," by Guillaume de Marchant, 14th century; in the Bibliothèque Nationale, Paris (MS. Fr. 1586, fol. 51)
By courtesy of the Bibliotheque Nationale, Paris

gest dance movements (*e.g.*, "bow-down, bow-down"). A relic of medieval Danish caroling survives in the circular ballad dances of the Faeroe Islands. The medieval French word *carole* (*chorea* in Medieval Latin, *reigen* in Middle High German) referred only to sung chain and ring dances; *danse* (Medieval Latin *ballatio,* Middle High German *tanz*) indicated a couple dance with instrumental accompaniment.

Chain dances of common origin with the carole and danced to singing or instrumental music persist in the 20th century in the Balkans (*e.g.*, the Romanian hora, Yugoslavian kolo, Bulgarian *horo,* and Greek *syrtos*) and elsewhere (the farandole and carmagnole of France; the Catalonian sardana). In modern Switzerland a few *coraules* survive; they begin as a chain and end with couples dancing. *Choros* in modern Greek still means a circular dance. The branle, danced in the late Middle Ages, derived from the carole. Some authorities believe that country dancing, with its lines or circles of couples, also derives from the carole.

Carolina, town, northeastern Puerto Rico, part of metropolitan San Juan, located about 12 miles (19 km) east of the national capital. Situated in the floodplain of the Río Loíza just above its estuary, the town was in 1816 constituted a pueblo, named Trujillo Bajo; in 1857 the barrios (wards) north of the Loíza were separated under a new name, San Fernando de la Carolina, after Charles II of Spain. Under the new name, the town eventually absorbed the remainder of Trujillo Alto.

Nearby is the site of Isla Verde international airport, the busiest in Puerto Rico. Sugarcane and tobacco are grown in the surrounding fields and processed locally; other industry includes a textile mill, manufacture of clay products, and production of high-quality sand for glass manufacture. Pop. (1980) 147,835.

Caroline OF ANSBACH (b. March 1, 1683, Ansbach, Brandenburg-Ansbach—d. Nov. 20, 1737, London), wife of King George II of Great Britain (reigned 1727–60). Beautiful and intelligent, she exercised an influence over her husband that was decisive in establishing and maintaining Sir Robert Walpole as prime minister (1730–42).

The daughter of a German prince, Caroline married George Augustus (later King George

Caroline of Ansbach, detail of an oil painting after a portrait by Sir Godfrey Kneller, 1716; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

II) in 1705. After her father-in-law became King George I in 1714, she helped ease the difficult situation created by the bitter quarrel between the king and her husband. Nevertheless, during the three years (1717–20) when George Augustus was banned from court, she made their London residence a lively centre of opposition to the crown. Upon George II's accession in 1727, Caroline prevented him from ousting Walpole, who had become a leading minister, and she continued to dominate her husband until her death. Peter Quennel's biography, *Caroline of England,* was published in 1939.

Caroline OF BRUNSWICK-WOLFENBÜTTEL, in full CAROLINE AMELIA ELIZABETH, German KAROLINE VON BRAUNSCHWEIG-WOLFENBÜTTEL, or KAROLINE AMALIE ELISABETH (b. May 17, 1768, Brunswick—d. Aug. 7, 1821, London), wife of King George IV of the United Kingdom who—like her husband, who was also her cousin—was the centre of various scandals.

The daughter of Charles William Ferdinand, duke of Brunswick-Wolfenbüttel, Car-

Caroline of Brunswick-Wolfenbüttel, pen and ink sketch by Sir George Hayter; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

oline married George (then prince of Wales) on April 8, 1795, but they separated soon after the birth of their only child, Princess Charlotte (Jan. 7, 1796). In December 1805 a committee of the Privy Council acquitted her of the charge of having given birth to a son by another man.

Excluded from the court while her husband was regent (1811–20) for his insane father, George III, she lived chiefly in Italy from 1814 and was believed to have maintained an adulterous relationship with her Italian courier, Bartolomeo Pergami (in England often called Bergami). After his accession on Jan. 29, 1820, George IV tried to pay her to remain on the Continent, but in June she returned to England. Thereupon the government introduced a bill to dissolve the marriage and deprive her of the title of queen. A lengthy hearing (August 17–November 10) ended with the abandonment of the bill by the House of Lords. She was prevented from entering Westminster Abbey at George's coronation (July 19, 1821), became ill, and died 19 days later.

Caroline Atoll, also called THORNTON ISLAND, coral formation in the Central and Southern Line Islands, part of Kiribati, southwestern Pacific Ocean, about 450 miles (720 km) northwest of Tahiti. It is made up of 20 islets, with a total area of 1.45 square miles (3.76 square km), that rise to 20 feet (6 m) and enclose a shallow lagoon (6 miles by 1 mile).

Once occupied by Polynesians, the islets were sighted in 1795 by Capt. William R. Broughton, an Englishman. Claimed by Britain in 1868, the atoll became a part of the Gilbert and Ellice Islands Colony in 1972 and a part of independent Kiribati in 1979. There are no permanent inhabitants.

Caroline Islands, archipelago in the western Pacific Ocean, the islands of which comprise the Federated States of Micronesia (Kosrae, Pohnpei, Truk, and Yap) and the Republic of Palau. The Carolines may be divided into two physiographic units: to the east, coral caps surmount mountains of volcanic origin; while to the west, the islands are sections of the Earth's crust that have been folded and pushed above the surface of the ocean. Both units have formations rising above 500 feet (150 m). The total land area is about 500 square miles (1,295 square km) and includes the islands of Yap, Pohnpei, Truk, Kosrae (Kusaie), Babelthuap, and Ulithi. The climate is tropical, with mean monthly temperatures ranging from 79° to 83° F (26°–28° C). Rainfall may exceed 180 inches (4,570 mm) on high islands. In an average year more than 20 typhoons originate in or around the centre of the group.

The eastern Carolines were probably settled earlier than the 2nd century AD, and there is evidence indicating that Chinese trade goods had reached the western islands by the 7th century. Visited in the 16th century by Spanish navigators who named the islands for their king, Charles II, they were colonized by Spain only in the 19th century. Sold to Germany after the Spanish–American War (1898), in 1914 they were seized by Japan, who held them after 1919 as a League of Nations mandate. During World War II the islands, which had been heavily fortified by Japan, were occupied by the United States and became in 1947 part of a United Nations strategic trust territory under U.S. jurisdiction. The trust territory ceased to exist in 1986, but the Federated States of Micronesia and the Republic of Palau remained in close association with the United States.

Copra is the chief export, with handicrafts second. Experiments have been made on Pohnpei in the commercial cultivation of cacao and pepper, for which conditions are ideal. Tourism, from both Japan and the United States, has been encouraged. The high western islands were mined for copper, iron, bauxite, and other ores during Japanese occupation. Some islands support tuna fishing.

Great diversity of physical types, cultures, and languages prevails within the Carolines, with the western islands exhibiting an intermingling of Melanesian and Philippine influences and the eastern showing Polynesian characteristics. Nukuoro and Kapingamarangi islands represent the western limits of Polynesian culture. Pop. (1983 est.) 97,400.

Consult the INDEX *first*

Carolingian DYNASTY, family of Frankish aristocrats and the dynasty (AD 750–887) that they established to rule western Europe. The name derives from the large number of family members who bore the name Charles, most notably Charlemagne.

A brief treatment of the Carolingians follows. For full treatment, *see* MACROPAEDIA: France.

The family came to power as hereditary mayors of the palace of the Frankish kingdom of Austrasia, and by the time of Pepin II of Herstal (or Heristal), who became mayor of the palace in 679, they had reduced their nominal Merovingian kings to mere figureheads. Indeed, in 687 Pepin II gained effective rule over the entire Frankish realm when he defeated his Neustrian rival, Ebroin. At his death in 714 Pepin left a legitimate heir, a child of six, and an illegitimate son, Charles Martel. By 725 Charles Martel had established himself as ruler of the Franks, although he maintained the fiction of Merovingian sovereignty until 737, when following the death of Theodoric IV he let the throne remain vacant. Charles Martel died in 741, and his sons Pepin III the Short and Carloman divided the realm between themselves. Upon Carloman's abdication in 747 Pepin III became the sole ruler. His position was so secure that in 750 he deposed the last of the Merovingians, Childeric III, and, with the support of Pope Zacharias,

had himself elected king by an assembly of Frankish nobles and consecrated by a bishop of the Roman church.

The realm was again divided on Pepin's death in 768, but the death three years later of the younger son Carloman reunited it in the hands of the elder, Charles, who became known as Charlemagne (*q.v.*). Charlemagne extended Frankish power by conquest over virtually all of Gaul and into Germany and Italy, and he made tributaries of the Bohemians, Avars, Serbs, Croats, and other peoples of eastern Europe. He formed an alliance with the papacy and in 774 created a papal state in central Italy. On Christmas Day 800, in the presence of Pope Leo III, he was crowned emperor of the restored Roman Empire. The unity that Charlemagne was able to impose on western Europe, however, fell victim to the ancient Frankish custom of dividing the realm among all a deceased king's sons. On the death of Charlemagne's sole surviving son and successor, Louis the Pious, in 840, three of his sons contested the succession. In the Treaty of Verdun in 843 they agreed to divide the empire into three kingdoms. Francia Occidentalis in the west went to Charles the Bald, Francia Orientalis in the east went to Louis the German, and Francia Media, including the Italian provinces and Rome, went to Lothair, who also inherited the title of emperor.

Subsequent partitions of the three kingdoms, together with the rise of such new powers as the Normans and the Saxons, whittled away at Carolingian authority. The imperial title passed from Lothair to his son Louis II in 855, from Louis II to his uncle Charles the Bald in 875, and after an interregnum following Charles's death in 877 to Charles III the Fat, youngest son of Louis the German, in 881. By the time Charles III was deposed in 887 Carolingian power had all but dissolved in the empire, though Carolingian kings returned to power in France in 893/898–923 and 936–987.

Carolingian art, classic style produced during the reign of Charlemagne (768–814) and thereafter until the late 9th century. Charlemagne's dream of a revival of the Roman Empire in the West determined both his political aims and his artistic program. His strong patronage of the arts spurred a remarkable return to Roman classicism in the copying of Early Christian models and the influence of contemporary Byzantine and Greco-Roman styles, though the classicism was modified by local traditions favouring linearity and patterning and by Carolingian innovations (*see also* Anglo-Saxon art; Merovingian art). Thus the Carolingian Renaissance was really a renovation rather than a true rebirth of classicism. It was, nevertheless, important for having revived the antique heritage in the West and for transmitting that interest to subsequent art. By the death of Charlemagne, the style was well defined, and even though local schools became more independent as the central authority of the empire weakened, the line of development continued until the chaotic late 9th century.

The influence of Roman architecture can be seen in the revival of the Early Christian basilica (*q.v.*), with its T-shaped plan; in fact, monks from Fulda were sent to Rome to measure St. Peter's in order that it might be reproduced locally. Byzantine architecture was also influential. The octagonal plan of S. Vitale, Ravenna (*c.* 526–547), for example, was the model for the Palatine Chapel (consecrated 805), built by Charlemagne for his court at Aachen. Finally, many features are Carolingian inventions that arose in response to special needs. The most important of these were the westwork, or fortress-like construction with towers and inner rooms through which one entered the nave; and the outer crypt, or extensive chapel complexes below and beyond the eastern apse (projection at one end of the church). The significance of the westwork is not clear, but the crypt complex served the rising cult of saints, providing space for worship and for burial near their relics.

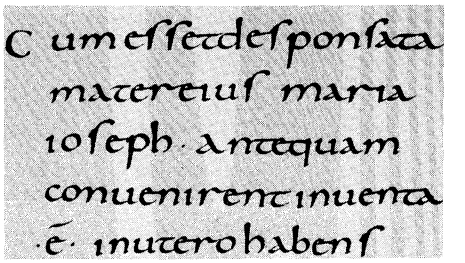
Located at Aachen were the imperial bronze foundry and the scriptorium, where manuscripts were copied and illuminated, though manuscript workshops at Tours, Metz, and Corbie also enjoyed imperial patronage.

Ivory bookcover from the Lorsch Gospels, early 9th century; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London, Crown copyright

Manuscript illuminations (*see* Ada group) and the relief scenes of ivory and metalwork (sculpture in the round was rare) reflect an interest in copying classical motifs and models; the landscapes illustrating the Utrecht Psalter (*c.* 830; Utrecht, Bibliotheek der Rijksuniversiteit), for example, suggest the murals that adorned the walls of Roman villas. Mosaics and murals were also produced, but few have survived.

Carolingian minuscule, in calligraphy, clear and manageable script established by the educational reforms of Charlemagne in the latter part of the 8th and early 9th centuries. As



Carolingian minuscule script from the Gospels of Lothair written at Tours, France, *c.* 850 (Paris, Bibliothèque Nationale, Lat. 266)

By courtesy of the Bibliotheque Nationale, Paris

rediscovered and refined in the Italian Renaissance by the Humanists, it survives as the basis of the present-day Roman alphabet.

A learned English cleric, Alcuin of York, was in charge of Charlemagne's program, which was in itself a true literary renascence. The principal centre was St. Martin's at Tours, of which Alcuin was abbot. Alcuin had previously been head of the cathedral school at York and of Charlemagne's Palace School at Aachen and had to his credit a number of splendid manuscripts known as the Golden Gospels. The most famous of these is the Godescalc Gospels (Bibliothèque Nationale, Paris), written before 783, with a dedication in Carolingian minuscule to Charlemagne.

The crowning achievement of the Tours school of scholars, Carolingian minuscule scribes, and artists was attained in the mid-9th century in the Gospels of Lothair produced by Alcuin's successors.

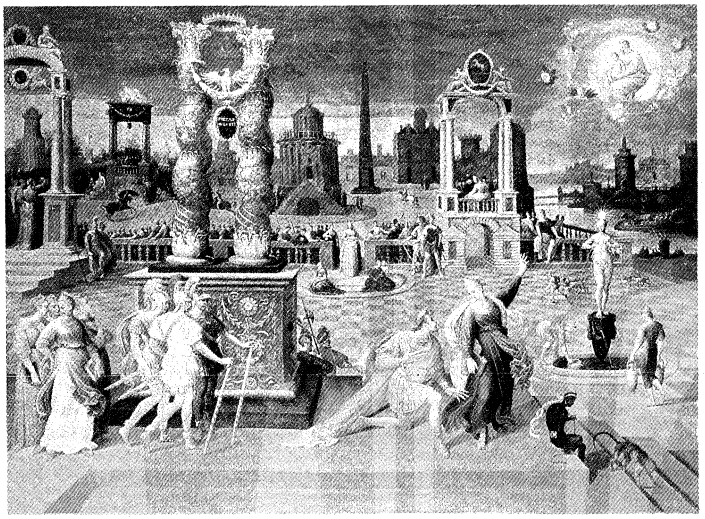
Carolus (Latin personal name): *see under* Charles.

carom billiards: *see* French billiards.

Caron, Antoine (b. *c.* 1515, Beauvais, Fr.—d. 1593), one of the few significant painters in France during the reigns of Charles IX and Henry III; his work is notable for reflecting the elegant but unstable Valois court during the Wars of Religion (1560–98).

Caron was hired by Francesco Primaticcio, an Italian Mannerist painter, between 1540 and 1550 to work on the embellishment of the château of Fontainebleau. After the ascension of Henry III, he was commissioned to paint a series of works on the *Story of Artemis,* glorifying the widowhood of the queen mother, Catherine de Médicis; they were later made into tapestries.

Caron's few existing works fall into three main categories: (1) Allegorical topics, representing the life of the Valois court, including



"Augustus and the Tiburtine Sibyl," oil on canvas by Antoine Caron, *c.* 1580; in the Louvre, Paris

Giraudon—Art Resource/EB Inc.

"Triumph of the Seasons," with its depiction of parties, picnics, and orchestras; the Artemis series; and "History of the Kings of France." (2) Paintings on the theme of massacre, such as "Massacre Under the Triumvirate," recalling the bloodshed of the Wars of Religion. (3) Fantasy and magic, as in "Astrologers Studying an Eclipse" and "Augustus and the Tiburtine Sibyl." The allegorical treatment of court life, the violence, and the magic all express salient aspects of life in the late 16th century.

Stylistically, Caron was a Mannerist. His elongated figures, in twisted postures and with small heads and tapering arms and legs, frequently inhabit vast spaces. Caron's exaggerated perspective, in which the forms seem to disappear into space, and his nonnaturalistic use of colour are also in the Mannerist style.

Caron de Beaumarchais, Pierre-Augustin: *see* Beaumarchais, Pierre-Augustin Caron de.

Carondelet, (Francisco Luis) Hector, baron de (b. *c.* 1748, Noyelles, Flanders—d. Aug. 10, 1807, Quito, Ecuador), governor of the Spanish territory of Louisiana and West Florida from 1791 to 1797.

Carondelet was born of a distinguished Burgundian family and married into an influential Spanish family. He had served in a number of other Spanish colonial posts before his appointment to New Orleans.

Though he struggled valiantly with the many difficulties he met there and managed to construct a canal connecting New Orleans with the Gulf and to make a considerable number of other civic improvements, the problems presented by the native Indians and by U.S. encroachment proved to be too much for him. Both the United States and Spain claimed territory north of the 31st parallel of latitude, and to defend Spain's claim Carondelet formed alliances with local Indian tribes to repel U.S. settlers, installed a gunboat fleet on the Mississippi River, and built fortifications in the disputed area.

He also negotiated with General James Wilkinson and others in Kentucky to effect the secession of the trans-Appalachian territories from the United States and to secure their alliance with Spain. All this was terminated by Pinckney's Treaty (Treaty of San Lorenzo) in October 1795, in which Spain—embroiled in the French Revolutionary and Napoleonic Wars—agreed to set the U.S. southern boundary at latitude 31° and conceded U.S. citizens free passage on the Mississippi and tax-free storage of goods at New Orleans. Carondelet was relieved of his position in 1797 and became governor-general of Quito.

Caroni River, river in northwestern Trinidad island, in the Trinidad and Tobago group in the southern Caribbean Sea. It rises near Valencia on the southern edge of the Northern Range uplands and flows roughly west to empty via the saline mangrove channels of the Caroni Swamp into the Gulf of Paria, between Trinidad and Venezuela, a mile or so south of Port-of-Spain. It drains the area between the Northern and Central ranges. Its length is about 25 miles (40 km), and it is partly navigable by flat-bottomed boats. In 1592 St. Joseph, on the Caroni's banks, became the first Spanish settlement.

Caroní River, Spanish RÍO CARONÍ, river in Bolívar state, southeastern Venezuela. Its headwaters flow from the slopes of Monte Roraima in the Sierra Pacaraima, where Venezuela, Brazil, and Guyana meet.

The Caroní flows generally northward across the Guiana Highlands, covering much of southeastern Venezuela and emptying into the Orinoco River at San Félix, in the Ciudad Guayana area. It has a length of 430 miles (690 km). Although rapids hinder navigation near its mouth, the lower course of the river is navigable by launch. The spectacular Angel Falls, highest in the world (3,212 feet [979 m]), are on a headstream of the Caroní. The river's great hydroelectric potential has been harnessed at Macagua and Guri dams.

Carora, city, west central Lara state, northwestern Venezuela, on the Morere, an affluent of the Río Tocuyo, west of Barquisimeto. It lies at 1,128 feet (344 m) above sea level. The city has a fine parish church, a Franciscan convent, and a hermitage. Founded in 1572, it enjoyed considerable prosperity in colonial times, when its population numbered about 10,000. Horses, mules, and cattle are raised locally; and in addition to hides and leather, Carora exports coffee and rubber. Pop. (1981) 58,694.

Carossa, Hans (b. Dec. 15, 1878, Tölz, Ger. [now in W.Ger.]—d. Sept. 12, 1956, Rittsteig, W.Ger.), poet and novelist whose contribution to the development of the German autobiographical novel is outstanding and unique in the 20th century.

Carossa, a physician who practiced in Passau, Nürnberg, and Munich, lived most of his life in Bavaria, whose people and their Catholic Christianity, pagan folklore, and superstitions are described and pondered in much of his work.

Carossa's literary career began with a book of lyric poetry, *Stella Mystica* (1902; "Mystical Star"), in which a reflective, philosophical attitude dominates the expression of emotions. This attitude of detachment toward his own life and a desire to seek and bring forth the most noble in humankind remains dominant throughout his work. His first novel, *Doktor Bürgers Ende* (1913; "The End of Doctor Bürger"; revised and republished in 1930 as *Die Schicksale Doktor Bürgers,* "The Fortunes of Doctor Bürger"), in which a young doctor, driven to despair by the suffering around him, commits suicide when he fails to save the woman he loves, is an exploration of, as well as a variation on, Goethe's "Werther" theme—Carossa expressed his indebtedness to Goethe in *Die Wirkungen Goethes in der Gegenwart*

Carossa
Bavaria-Verlag

(1938; "Goethe's Influence Today"). *Rumänisches Tagebuch* (1924; *A Roumanian Diary;* republished in 1934 as *Tagebuch im Kriege,* "War Diary") is an evaluation of Carossa's observations as an army doctor in Romania during World War I and a probe into the deeper mysteries of life: it was the first of his books to gain recognition outside of Germany.

More directly autobiographical works are *Eine Kindheit* (1922; *A Childhood*), *Das Jahr der schönen Täuschungen einer Jugend* (1941; *The Year of Sweet Illusions*), *Verwandlungen einer Jugend* (1928; *Boyhood and Youth*), and *Ungleiche Welten* (1951; "Different Worlds"). Carossa's last and unfinished work, *Der Tag des jungen Arztes* (1955; "The Day of the Young Doctor"), is essentially an exploration of the conflicts between his duties as a physician and his responsibilities as a writer.

carotene, any of several organic compounds widely distributed as pigments in plants and animals and converted in the livers of many animals into vitamin A. These pigments are highly unsaturated hydrocarbons (having many double and triple bonds), belonging to the isoprenoid series. Several isomeric forms (same formula but different molecular structures) are subsumed under the name.

In plants, carotenes impart yellow, orange, or red colours to flowers (dandelion, marigold), fruits (pumpkin, apricot), and roots (carrot, sweet potato). In animals they are visible in fats (butter), egg yolks, feathers (canary), and shells (lobster).

The most important provitamin (source of the vitamin) A is β-carotene, first isolated from carrots in 1831. Studies by several scientists culminated in deduction of its structure in 1931 and its synthesis in 1950.

carotenemia, also called XANTHOSIS, CAROTENODERMIA, or ARTIFICIAL JAUNDICE, yellow skin discoloration caused by excess blood carotene; it may follow overeating of such carotenoid-rich foods as carrots, sweet potatoes, or oranges.

carotenoid, any of a group of nonnitrogenous yellow, orange, or red pigments (biochromes) that are almost universally distributed in living things. There are two major types: the hydrocarbon class, or carotenes, and the oxygenated (alcoholic) class, or xanthophylls. Synthesized by bacteria, fungi, lower algae, and green plants, carotenoids are most conspicuous in the petals, pollen, and fruit (*e.g.,* carrots, sweet potatoes, tomatoes, and citrus fruits) of the flowering plants. They can also be seen in the autumn foliage of deciduous trees and shrubs. In the leaves of green plants, carotenoids serve as accessory pigments in photosynthesis, trapping solar energy and passing it to chlorophyll, the primary photosynthetic pigment. All animals and protozoans also contain carotenoids, which they obtain by ingestion. Vitamin A, for example, is one of the substances that animals obtain from the ingestion of carotene. Carotenoids also play a major role in the biological coloration of animals.

Carothers, Wallace Hume (b. April 27, 1896, Burlington, Iowa, U.S.—d. April 29, 1937, Philadelphia), American chemist who developed nylon, the first synthetic polymer fibre to be produced commercially (in 1938) and one that laid the foundation of the synthetic-fibre industry.

At the University of Illinois and later at Harvard University, Carothers did research and teaching in organic chemistry. In 1928 he was appointed director of research in organic chemistry by E.I. du Pont de Nemours & Company at its laboratory in Wilmington, Del. He investigated the structure of substances of high molecular weight and their formation by polymerization. These fundamental investigations led to the development of nylon, an artificial fibre with properties similar and in many ways superior to such natural fibres as wool, cotton, and silk, and to neoprene, a synthetic rubber derived from vinylacetylene. Despite his success, Carothers committed suicide after a long period of depression.

carotid artery, one of several arteries that supply blood to the head and neck. Of the two common carotid arteries, which extend headward on each side of the neck, the left originates in the arch of the aorta over the heart; the right originates in the brachiocephalic trunk, the largest branch from the arch of the aorta. Each common carotid artery divides into an external and an internal carotid artery.

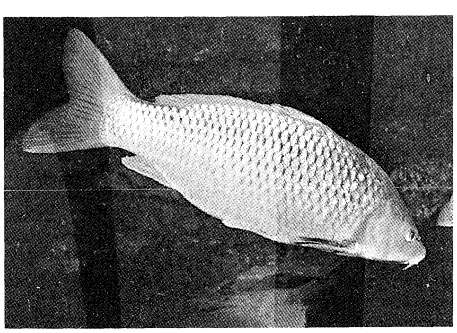
Each internal carotid artery ascends through the carotid canal in the temporal bone into the cranial cavity. It gives off an opthalmic branch to the eyeball and other contents of the orbit and then divides into the anterior and middle cerebral arteries. The internal carotid arteries, together with the vertebral arteries, which are the arteries of primary supply for the brain, are distinguished by lying at some depth from the surface in their course to the organ, by having curves or twists in their course, and by having no larger collateral branches.

The external carotid artery ascends through the upper part of the side of the neck and behind the lower jaw into the parotid gland, where it divides into various branches. The external carotid artery gives off the following branches: (1) superior thyroid to the larynx and thyroid gland; (2) lingual to the tongue and sublingual gland; (3) facial to the face, palate, tonsil, and submaxillary gland; (4) occipital to the sternomastoid muscle and back of the scalp; (5) posterior auricular to the back of the ear and the adjacent part of the scalp; (6) superficial temporal to the scalp in front of the ear and, by its transverse facial branch, to the back part of the face; (7) maxillary, giving muscular branches to the muscles of mastication, meningeal to the dura mater, dental to the teeth, and other branches to the nose, palate, and tympanum; and (8) ascending pharyngeal, which supplies the pharynx, palate, tonsils, and dura mater.

Caroto, Gian Francesco (b. *c.* 1480, Verona, Republic of Venice—d. 1555, Verona), Venetian painter whose largely derivative works are distinguished by their craftsmanship and sense of colour.

During a sojourn in Mantua, Caroto came under the influence of the vigorous linearism and classical orientation of Andrea Mantegna. Returning to Verona, he painted religious works and portraits in oil, tempera, and fresco. Among his important earlier works is the "Entombment" (National Gallery of Art, Washington, D.C.); two of his principal later works are the "Madonna in Glory with Saints" (1528; S. Fermo Maggiore, Verona) and "St. Ursula" (1545; S. Giorgio, Verona). The landscape backgrounds of his half-length Madonnas sometimes convey a feeling of mystery suggestive of the works of Leonardo da Vinci, and his later style owes something to the classicism of Raphael. Caroto was the leading artist in Verona until his death.

carp (*Cyprinus carpio*), hardy, greenish-brown fish of the family Cyprinidae native to Asia but introduced into Europe, North America, and elsewhere. A large-scaled fish with two barbels on each side of its upper jaw, the carp lives alone or in small schools in quiet, weedy, mud-bottomed ponds, lakes, and rivers. It is omnivorous, and in rooting about for food it often roils the water, increasing turbidity and adversely affecting many plants and animals. As a result, it is often considered undesirable, and much effort may be devoted to its extermination.



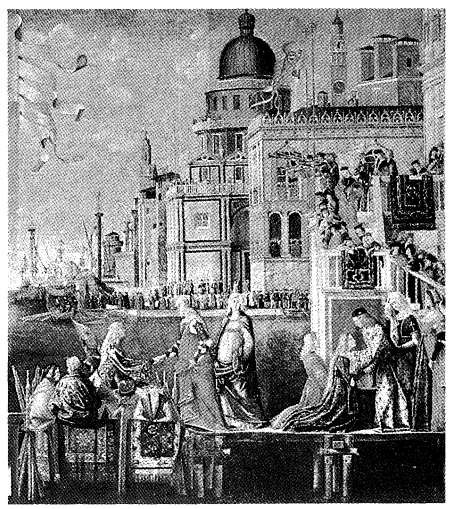
Carp (*Cyprinus carpio*)
Jacques Six

In winter the carp becomes torpid, retires to the bottom, and stops feeding. It usually spawns in spring, when the female deposits numerous eggs on plants or detritus, usually in shallow water. The eggs hatch four to eight days later. Carp grow rapidly, attain sexual maturity about the third year, and in captivity may live more than 40 years. They average about 35 centimetres (14 inches) in length, but may grow to more than 100 centimetres and 22 kilograms (49 pounds).

The carp is often raised for food, especially in Europe and Asia, because it is possible to produce large amounts of fish per acre. Two domesticated varieties of the species are the mirror carp (with a few large scales) and the leather carp (almost scaleless). The crucian carp (*Carassius carassius*) is a barbel-less European relative of the goldfish.

carp louse: *see* fish louse.

Carpaccio, Vittore (b. *c.* 1460, Venice—d. 1525/26, Venice), greatest early Renaissance narrative painter of the Venetian school. He may have been a pupil of Lazzaro Bastiani, but the dominant influences on his early work were those of Gentile Bellini and Antonello da Messina.



Meeting of Prince Ereus and St. Ursula and the Departure of the Betrothed, detail of a panel from the cycle "Scenes from the Life of St. Ursula," by Vittore Carpaccio, c. 1495; in the Accademia di Belle Arti, Venice
SCALA—Art Resource/EB Inc.

One of Carpaccio's few indisputable early paintings is "Salvator Mundi and the Four Evangelists" (Contini Bonacossi Collection, Florence). Around 1490, he began painting a cycle of scenes from the legend of St. Ursula for the Scuola di Sta. Orsola, now in the Accademia in Venice. In these works, Carpaccio emerged as a mature artist of originality, revealing a gift for organization, a narrative skill, and a command of light. The genre scene of the "Dream of St. Ursula" has been noted particularly for its wealth of naturalistic detail.

Carpaccio's later career can be charted in terms of three further narrative cycles. The first of these survives intact in the Scuola di S. Giorgio degli Schiavoni, in Venice. In the three scenes from the life of St. Jerome in this cycle, dating from 1502, the factor of direct observation plays an even larger part than in the St. Ursula cycle, and these paintings, from an artistic standpoint, represent the climax of Carpaccio's art. A cycle of scenes from the life of the Virgin, executed after 1504 for the Scuola degli Albanesi, is now scattered. Also dispersed is the cycle of scenes from the life of St. Stephen, painted between 1511 and 1520, that is stylistically reminiscent of his earlier works. He executed in 1510 the great altarpiece of the "Presentation in the Temple" for S. Giobbe (now in the Accademia, Venice). His last dated works are two organ shutters for the Duomo at Capodistria (1523).

In the 19th century, Carpaccio's rendering of architecture and the luminous atmosphere of his paintings were praised by John Ruskin. Only in later criticism, however, were his love of pageantry and his interest in storytelling accepted as incidental features in a style of great seriousness and originality. Capable of psychological subtlety and of deep compassion, Carpaccio was also the first and greatest Venetian painter of *vedute* ("townscapes").

carpal bone, any of several small angular bones that in man make up the wrist (carpus), and in horses, cows, and other quadrupeds the "knee" of the foreleg. They correspond to the tarsal bones of the rear or lower limb. Their number varies. Primitive vertebrates typically had 12. In modern amphibians, reptiles, and birds, the number is reduced by fusion. In man there are eight, arranged in two rows. The bones in the row toward the forearm are the scaphoid, lunate, triangular, and pisiform. The row toward the fingers, or distal row, includes the trapezium (greater multangular), trapezoid (lesser multangular), capitate, and hamate. The distal row is firmly attached to the metacarpal bones of the hand. The proximal row articulates with the radius (of the forearm) and the articular disk (a fibrous structure between the carpals and malleolus of the ulna) to form the wrist joint.

Carpathian Geosyncline, an arcuate extension of the Tethys Geosyncline (*q.v.*) that underwent mountain building in Middle Cenozoic time and gave rise to the present Carpathian Mountains.

Carpathian Mountains, crescent-shaped mountain range in east central Europe, extending approximately 900 mi (1,450 km) in a system of parallel structural ranges eastward from the Danube Gap near Bratislava, Czech., southward to Braşov, Romania, and southeastward to the portion of the Danube Valley called the Iron Gate, near Orşova, Romania.

The following article summarizes information about the Carpathian Mountains. For full treatment, *see* MACROPAEDIA: Europe.

The Carpathians include portions of Czechoslovakia, Poland, Hungary, Romania, and the Soviet Union. Although they are the eastward continuation of the Alps, the Carpathians differ considerably from them; their structure is less compact, their summits are lower, and they are split up into a number of mountain blocks separated by basins. Gerlachovský Štít (Mount Gerlach), the highest peak, rises to 8,711 ft (2,655 m).

Three ranges make up the Carpathian Mountains. The Outer Carpathians, made up of rocks composed of flysch (a sequence of shales interbedded with sandstones), run from near Vienna through Moravia, along the Polish–Czechoslovak frontier and through the western Ukraine into Romania, ending in an abrupt bend of the Carpathian arc north of Bucharest. The Inner Carpathians are composed of numerous separate blocks of ancient crystalline and metamorphic cores onto which younger sedimentary rocks have been overthrust. In the west lies the Central Slovakian block, in the southeast lies the East Carpathian block, and the isolated Bihor Massif occupies the centre. The third and innermost range of the Carpathians is built of young Tertiary volcanic rocks formed less than 50,000,000 years ago, differing in extent in the western and eastern sections. In the western section the mountains extend in the shape of an arc enclosing the Central Slovakian block to south and east. The eastern section runs nearly in a straight line from northwest to southeast, following the line of tectonic dislocation parallel with this

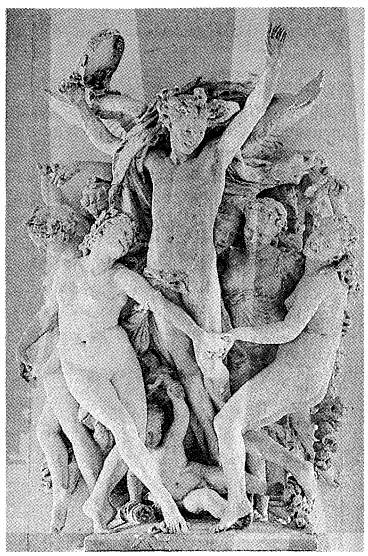
part of the mountains. Between this volcanic range and the South Carpathian block, the Transylvanian Basin spreads out, filled with loose rock formations of young Tertiary age.

Water runoff from the Carpathians escapes for the most part into the Black Sea by way of the Danube and Dnestr rivers. Agriculture, forestry, and tourism are economically important in the Carpathians.

Carpatho-Rusin Catholic Church: *see* Ruthenian Catholic Church.

Carpaţii Meridionali (Romania): *see* Transylvanian Alps.

Carpeaux, Jean-Baptiste, also called JULES CARPEAUX (b. May 11, 1827, Valenciennes, Fr.—d. Oct. 12, 1875, Courbevoie), the leading French sculptor of his time. His works,



"The Dance," plaster sculpture by Jean-Baptiste Carpeaux, 1865–69; formerly on the facade of the Opéra, Paris, now in the Louvre, Paris

By courtesy of the Musee du Louvre, Paris, Cliche Musees Nationaux

expressing a rhythm and variety that were in opposition to contemporary French academic sculpture, form a prelude to the sculpture of Auguste Rodin.

For some time Carpeaux was a student of the prominent French sculptor François Rude. Winning the 1854 Rome Prize enabled him to live at Rome (1854–61), where he was influenced by the works of such Italian Renaissance sculptors as Michelangelo, Donatello, and Verrocchio. He established his reputation with "Ugolino and His Sons" (1861), a dramatic bronze for the Tuileries Gardens, Paris, and won favour at the court of Napoleon III, receiving many commissions for portrait busts. His most famous work, "The Dance" (completed 1869), a sculptural group for the facade of the Paris Opéra, created a sensation and was attacked as immoral. His works were frequently the subject of hostile criticism, and in his last years he suffered from fears of persecution.

Carpentaria, Gulf of, shallow, rectangular inlet of the Arafura Sea (part of the Pacific Ocean), indenting the northeastern coast of Australia. Neglected for centuries, the gulf became internationally significant in the late 20th century with the exploitation of its bauxite, manganese, and prawn (shrimp) resources. Its area is 120,000 sq mi (310,000 sq km) and the maximum depth is 230 ft (70 m).

The gulf floor is the continental shelf common to Australia and New Guinea. A ridge extends across Torres Strait, separating the floor of the gulf from the Coral Sea, and another ridge extends northward from Wessel Island to separate the floor of the gulf from that of the Banda Basin of the Arafura Sea. The gulf-floor gradient is very low; the great western plains of Queensland drain north or northwestward, across the shore and well out into the gulf, in a very gentle fall of only one foot per mile. As the plains approach the sea, they merge into a belt of salt flats, which are widest just west of the Flinders River. About 20 rivers drain into the gulf; they wind profusely in their lower courses and have extensive deltas.

The eastern side of the gulf was first explored by the Dutch between 1605 and 1628, and the southern and western coasts were discovered by the explorer Abel Tasman in 1644. The gulf was named after Pieter Carpenter, who visited the area in 1628.

The gulf lies on the northern, central, and western half of the Carpentaria Basin. Mesozoic sedimentary rocks (about 200,000,000 years old), which lie on a basement of very old Precambrian rocks, are some 5,000 ft thick. Later rock layers, about 50,000,000 years old, have, on the shores of the gulf, given rise to layers of bauxite up to 33 ft thick. Overlying these deposits on Wellesley and Sir Edward Pellew islands are beds of sandstone that may represent a higher stand of sea level than that of today. Huge manganese deposits in the west of the gulf appear to have been formed along an irregular shoreline of an ancestral gulf.

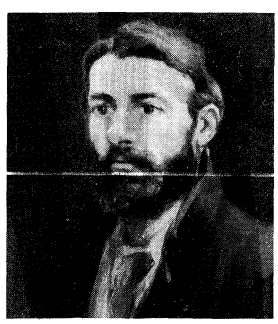
The salt pans of the southeastern gulf shores are the result of complexly interacting factors. In summer, with very flat land drainage, monsoonal rain, magnified tides, and wind piling up the sea on shore, the salt pan area is submerged by the sea, and behind it the land area is submerged by the drainage water backing up the blocked estuaries. The junction of saltwater and freshwater floods is marked by the transition from bare salt pan to vegetated plains.

By the late 20th century, prawn fishing had developed rapidly. Processing is done in specially equipped ships and, on shore, at Groote Eylandt and Thursday Island. Banana prawns are the major catch. Huge manganese deposits are being developed on Groote Eylandt and equally vast bauxite deposits are being exploited at Weipa, on the Cape York Peninsula, and at Gove Peninsula, in Arnhem Land.

As a result of these economic developments, settlement on the shores and islands of the gulf increased from a mere handful to several thousands, and transport and communication links with the rest of Australia and the world are being improved.

Carpenter, Edward (b. Aug. 29, 1844, Brighton, Sussex, Eng.—d. June 28, 1929, Guildford, Surrey), English writer identified with social reform and the late 19th-century, anti-industrial arts and crafts movement.

He entered Cambridge in 1864 and was elected a fellow and ordained in 1869. In 1874, revolting against the social and religious conventions of his time, he became a travelling lecturer for the newly founded university extension movement, which attempted to serve people unable to attend the universities.



Edward Carpenter, detail of a portrait by R.E. Fry; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

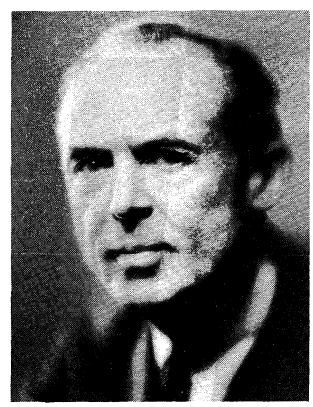
Carpenter had long been influenced by the work of Walt Whitman, whose poetry had altered the course of his life and whose verse forms he followed in his long, unrhymed poem *Towards Democracy* (1883; expanded 1905). He had met Whitman on a visit to the United States in 1877. In 1883 he bought a small farm in Derbyshire, where he lived until 1922 with a succession of working-class friends.

As a Socialist, he was a follower of William Morris and more interested in the reform of society and return to rural crafts than in political revolution. His papers on social subjects (*England's Ideal*, 1887; *Civilization: Its Cause and Cure*, 1889, enlarged, 1921) brought him many visitors. These papers were widely translated, as were his later works on the relation of art to life (*Angels' Wings*, 1898; *The Art of Creation*, 1904) and on relationships between the sexes (*Love's Coming-of-Age*, 1896; *The Intermediate Sex*, 1908)—both influenced by Havelock Ellis. He had a lifelong interest in music and composed the well-known labour song, "England Arise."

Carpenter, Harlean (American actress): *see* Harlow, Jean.

Carpenter, John Alden (b. Feb. 28, 1876, Park Ridge, Ill., U.S.—d. April 26, 1951, Chicago), U.S. composer, prominent in the 1920s and one of the earliest to use jazz rhythms in orchestral music.

Carpenter studied at Harvard under the conservative, German-influenced composer John Knowles Paine but joined his father's shipping



John Carpenter, 1932

By courtesy of the Library of Congress, Washington, D.C.

supply firm, of which he was vice president (1909–36). In 1906 he studied music under Sir Edward Elgar. After 1936 he concentrated solely on composition. Basically a conservative composer influenced by the French Impressionists, he incorporated jazz rhythms into his *Concertino for Piano and Orchestra* (1917) and into his ballets *Krazy Kat* (1922) and *Skyscrapers* (1926); the last was later made into a symphonic piece. His humorous orchestral suite *Adventures in a Perambulator* also won considerable popularity.

Carpenter, M(alcolm) Scott (b. May 1, 1925, Boulder, Colo., U.S.), second U.S. astronaut to make an orbital spaceflight. In "Aurora 7" he made the fourth Mercury flight, circling the Earth three times on May 24, 1962. He directed part of the flight by manual control.

Carpenter entered the U.S. Navy in 1949 and served in the Korean War. He had been a Navy test pilot and had attended the Naval Air Intelligence School in 1958. He was one of seven men selected in April 1959 for the National Aeronautics and Space Administra-

tion's Project Mercury. In 1964 he broke his left arm in a motorcycle accident. The resultant inability to rotate his arm properly forced his removal from spaceflight status.

Scott Carpenter, 1964

By courtesy of the National Aeronautics and Space Administration

In 1965 Carpenter was detached from the space program to lead two teams in the Sealab II experiment, living and working 205 feet (62.5 metres) under the Pacific Ocean as part of the U.S. Navy's effort to find better rescue methods for submarines. In 1967 he helped set up Sealab III but retired from naval duty in 1969 to enter private oceanography and energy research.

Carpenter, Mary (b. April 3, 1807, Exeter, Devon, Eng.—d. June 14, 1877, Bristol, Gloucestershire), British philanthropist, social reformer, and founder of free schools for poor children, the "ragged schools."

Carpenter was educated in the school run by her father, a Unitarian minister, in Exeter. In 1829 she and her mother opened a girls' school in Bristol. Later she founded a ragged school in a Bristol slum (1846), a reformatory for boys (1852), and another for girls (1854).

In 1833, through the Indian leader Rammohan Ray and the Boston philanthropist Joseph Tuckerman, she became interested in India, which she visited four times. After her third visit (1869–70) Carpenter decided that she could supervise her model school for Hindu girls more effectively from England than in India. In the year of her return, she established a National Indian Association to inform English opinion on the needs of India. Three years later she visited North America and reported on the defects of the prison systems there, particularly in Canada.

Carpenter supported the movement for higher education for women and wrote pamphlets and books on ragged schools, reformatories, juvenile delinquency, and Indian social reform, all of which aroused interest and were responsible for legislation affecting reformatories and industrial schools.

Mary Carpenter, portrait after a photograph, c. 1860; in the City Art Gallery, Bristol, Eng.

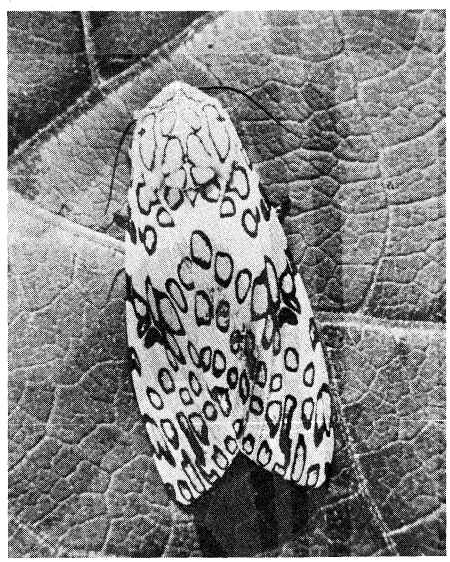
By courtesy of the City Art Gallery, Bristol, Eng.

carpenter bee, any of the insects of the family Xylocopidae (order Hymenoptera) found in most parts of the world. The small carpenter, *Ceratina,* is about six millimetres long and of metallic coloration. It nests in plant stems, which the female first hollows out and then packs with pollen and eggs. A number of individual cells are placed in a row, separated by thin partitions of wood debris mixed with saliva. The large carpenter, *Xylocopa,* somewhat resembles the bumblebee but differs in having a nonhairy abdomen and in its habit of nesting in a tunnel excavated within solid wood.

Carpenter Gothic, style of architecture that utilized Gothic forms in domestic U.S. architecture in the mid-19th century. The houses executed in this phase of the Gothic Revival style show little awareness of and almost no concern for the original structure and proportions of Gothic buildings and ornamentation. Much of this work could never have been executed if the scroll saw, also called the fret saw, had not been invented.

Carpenter Gothic is an eclectic and naive use of the most superficial and obvious motifs of Gothic decoration. Turrets, spires, and pointed arches were applied, in many instances with abandon, and there was usually no logical relationship of ornamentation to the structure of the house. At its best the work of the independent carpenter created some lively and charming homes. Carpenter Gothic houses were built throughout the United States, but surviving structures are found chiefly in the Northeast and the Midwest.

carpenter moth, any member of the small cosmopolitan insect family Cossidae (order Lepidoptera). Adults have vestigial mouthparts, long, thick bodies and gray to brown

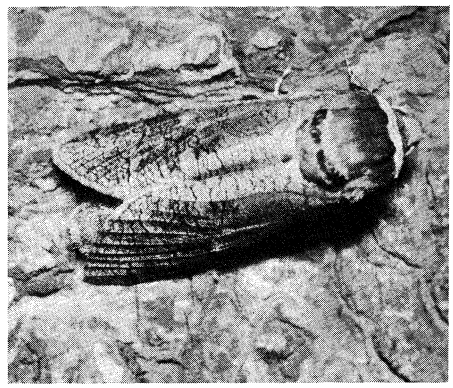


Leopard moth (*Zeuzera pyrina*)

Lynwood M. Chace—The National Audubon Society Collection/Photo Resources

wings that are frequently mottled or spotted. The wingspan varies from under 2.5 centimetres (one inch) in the temperate zone to about 25 centimetres (10 inches) in *Xyleutes boisduvali* of Australia. The pale, nearly hairless larvae, which live one to three years, bore in wood or pithy stems and are highly destructive.

The carpenterworm moth (*Prinoxystus robiniae*) has a wingspan of about 5 cm (2 in.) and is the most familiar North American cossid. The mahogany-coloured larvae of the goat moth (*Cossus cossus*) attack deciduous trees and exude a strong, goatlike odour. The leopard moth (*Zeuzera pyrina*) has white wings with black or blue blotches; its larvae bore in deciduous and fruit trees for about



Goat moth (*Cossus cossus*)

G.E. Hyde from the Natural History Photographic Agency—EB Inc.

two years before pupating within their larval burrows.

Carpentier (y Valmont), Alejo (b. Dec. 26, 1904, Havana—d. April 24, 1980, Paris), novelist, musicologist, and journalist, at various times a Cuban insurgent, exile, and government official.

A second-generation Cuban of French and Russian parentage, Carpentier was educated in music and architecture at the University of Havana and studied in Paris. He returned to Cuba in 1920 and aligned himself with an avant-garde group of writers. He made his living as a journalist. When he openly condemned the Machado dictatorship in 1927, he was imprisoned and later, using another writer's passport, escaped to France, where he remained until 1939.

The documentary novel *¡Ecué-Yamba-Ó!,* begun while he was in prison, was published in Madrid in 1933. It is a sympathetic account of Negro life and culture in Cuba. In 1928 he became actively engaged in the Surrealist movement, contributing frequently to André Breton's journal *Révolution Surréaliste,* but later rejected the movement.

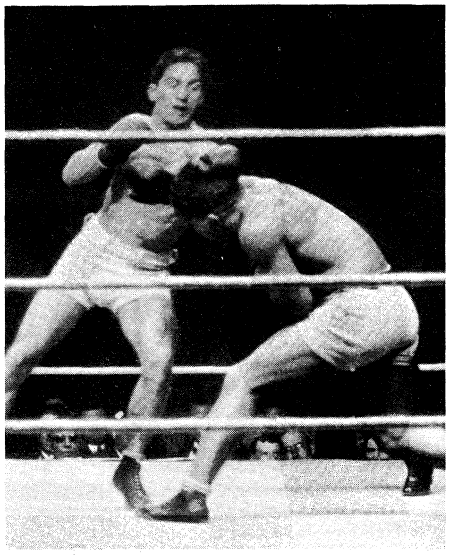
He worked in radio broadcasting (1932–39), and when he returned to Cuba he became director of radio station CMX in Havana, was editor of the newspaper *Tiempo nuevo,* and became professor of musicology at the Conservatorio Nacional (1941). In 1943 a visit to Haiti led to the novel *El reino de este mundo* (1949; *The Kingdom of This World,* 1957), a mixture of fantastic elements grounded in social reality, which told the story of the early 19th-century Haitian tyrant Henri Christophe. Throughout the 1940s and 1950s, Carpentier spent much time in Europe and North and South America, including service as cultural attaché in the Cuban embassy at Paris. From 1943 he contributed to *Orígenes,* a major Cuban cultural journal with influence throughout the Spanish-speaking world. He published a history of Cuban music, *La música en Cuba,* in 1946.

A trip to the interior of Venezuela in 1941 led to his masterpiece, *Los pasos perdidos* (1953; *The Lost Steps,* 1956, rev. ed., 1967), a widely acclaimed novel that tries to define the essence of Spanish-American reality as coexistence between primeval myths and a civilization imposed by the Spanish conquest.

Guerra del tiempo (1958; *War of Time,* 1970), a collection of stories and a novella, deals with repression and violence in Cuban life in the 1950s in terms of aspects of time. Carpentier returned to Cuba from Venezuela in June 1959, toward the end of the Castro revolution, bringing with him the manuscript of the novel *El siglo de las luces* (1962; *Explosion in the Cathedral,* 1963). It interprets the contradictions of the French Revolution, its violence and its loss of ideals, from a Caribbean point of view. Its ornate style is characteristic of all Carpentier's novels. After *Tientos y diferencias* (1964; "Acts of Feeling and Differ-

ences"), a collection of essays on cultural and literary themes, Carpentier became director of a series of weekly radio broadcasts on Cuban culture and the world. From 1970 he was again cultural attaché in the Cuban embassy at Paris. *El recurso del método* (1974; *Reasons of State,* 1976) is about the career of the dictator Machado. *Concierto barroco* (1974) is a stylistically complex novel that reaffirms Carpentier's views on the mixture of cultures in Spanish America.

Carpentier, Georges, byname ORCHID MAN (b. Jan. 12, 1894, Lens, Fr.—d. Oct. 27, 1975, Paris), French boxer who was a world light-heavyweight champion (1920–22) and a European champion at four weight classes. His victories over British opponents—Joe Beckett, "Bombardier" Billy Wells, and Ted "Kid" Lewis—made him a national hero.



Carpentier (left) fighting George Cook
EB Inc.

Carpentier attracted international attention on July 2, 1921, when he fought Jack Dempsey for the world heavyweight championship in Jersey City, N.J., but was knocked out in the fourth round. The bout was the first prizefight for which ticket sales exceeded $1,000,000. He staged a comeback match against Gene Tunney on July 24, 1924, in New York City but went down in the 14th round, hurt by a controversial low blow. After fighting in 109 bouts, winning 56 by knockouts, Carpentier retired in 1927. He became a fashionable restaurateur in Paris and was elected to the Boxing Hall of Fame in 1964.

carpentry, the art and trade of cutting, working, and joining timber. This term includes both structural timberwork in framing and items such as doors, windows, and staircases.

A brief treatment of carpentry follows. For full treatment, *see* MACROPAEDIA: Building Construction.

In the past, when buildings were often wholly constructed of timber framing, the carpenter played a considerable part in building construction; along with the mason he was the principal building worker. The scope of the carpenter's work has altered, however, with the passage of time. Increasing use of concrete and steel construction, especially for floors and roofs, means that the carpenter plays a smaller part in making the framework of buildings, except for houses and small structures. On the other hand, in the construction of temporary formwork and shuttering for concrete building, the carpenter's work has greatly increased.

Because wood is widely distributed throughout the world, it has been used as a building material for centuries; many of the tools and techniques of carpentry, perfected after the Middle Ages, have changed little since that time. On the other hand, world supplies of wood are shrinking, and the increasing cost of obtaining, finishing, and distributing timber has brought continuing revision in traditional practices. Further, because much traditional construction wastes wood, engineering calculation has supplanted empirical and rule-of-thumb methods. Stress grading of timber and mechanical joints (*i.e.*, grading materials in terms of the stresses they are capable of withstanding), the development of laminated timbers such as plywood, and the practice of prefabrication have also simplified and lowered the cost of carpentry.

The framing of houses generally proceeds in one of two ways: in platform (or Western) framing floors are framed separately, story by story; in balloon framing the vertical members (studs) extend the full height of the building from foundation plate to rafter plate. The timber used in the framing is put to various uses. The studs usually measure 2 × 4 inches (5 × 10 centimetres) and are spaced at regular intervals of 16 in. (41 cm). They are anchored to a horizontal foundation plate at the bottom and a plate at the top, both 2 × 4-in. timber. Frequently stiffening braces are built between studs at midpoint and are known as noggings. Window and door openings are boxed in with horizontal 2 × 4-in. lumber called headers at the top and sills at the bottom.

Floors are framed by anchoring 2 × 9-in. lumber called joists on the foundation for first floor and on the plates of upper floors. They are set on edge and placed in parallel rows across the width of the house. Crisscross bracings that help them stay parallel are called herringbone struts. In subsequent stages, a subfloor consisting of planks or plywood is laid across the joists, and on top of the subfloor is placed the finished floor—narrower hardwood planks that fit together with tongue-and-groove edges or any variety of covering.

The traditional pitched roof is made from inclined studs or rafters that meet at the peak. For wide roof spans extra support is provided by adding a horizontal cross brace, making the rafters look like the letter A, with a V-shaped diagonal support on the cross bar. Such supports are called trusses. The principal timbers used for framing and most carpentry in general are in the softwood group and include redwoods (pine, fir, etc., from Baltic sources), Canadian spruces and Douglas fir, British Columbian pine, and western red cedar. Cedar is useful for roofing and siding shingles as well as framing since it has a natural resistance to weathering and needs no special preservation treatment.

Besides the structural work, a carpenter's work may extend to interior jobs, requiring some of the skills of a joiner. These jobs include making door frames, cabinets, countertops, and assorted molding and trim. Much of the skill involves joining wood inconspicuously for the sake of appearance, as opposed to the joining of unseen structural pieces (*see* joint).

The standard hand tools used by a carpenter are hammers, pliers, screwdrivers, and awls for driving and extracting nails, setting screws, and punching guide holes, respectively. Planes are hand-held blades used to reduce and smooth wood surfaces, and chisels are blades that can be hit with a mallet to cut out forms in wood. The crosscut saw cuts across wood grain, and the rip saw cuts with the grain. Tenon and dovetail saws are used to make precise cuts for the indicated joints, and a keyhole saw cuts out holes. The level shows whether a surface is perfectly horizontal or vertical, and the trisquare tests the right angle between adjacent surfaces. These instruments are complemented by the use of power tools.

carpet: *see* rug and carpet.

carpet grass (*Axonopus affinis*), mat-forming perennial grass of the family Poaceae, native to sandy soils in southeastern North America. It is occasionally used as a lawn and pasture grass there and in warm parts of Australia.

A. compressus, a broader-leaved, closely related species native to South Africa, is also known as carpet grass. It too is used for lawns.

carpet moss, any of the plants of the genus *Hypnum* (order Bryales), which form dense green mats in many habitats throughout the

Carpet moss (*Hypnum cupressiforme*)
Ingmar Holmasen

world, especially on decaying wood in moist areas. A few species are aquatic. There are about 20 North American species of *Hypnum.* The feather moss (*q.v.*), or plume moss, formerly *H. crista-castrensis,* is now considered to be a member of the genus *Ptilium.*

Male and female reproductive organs of some species of carpet mosses are borne on separate plants, and the cylindrical, curved capsules (spore cases) have beaked lids. The bright green *H. haldanianum* has straight, spreading phyllids (leaves); those of *H. cupressiforme,* common in Europe and rare but widely distributed in North America, are curved. The "sheet moss" used by florists is usually a golden-green species, *H. curvifolium.* Carpet moss has been used to stuff bedding; it was once believed to induce sleep.

carpet moth, any of several species of small, delicate moths belonging to the insect family Geometridae (order Lepidoptera). Together with the so-called pugs and waves, the carpet moths number about 12,000 species of Geometridae, occurring worldwide. Some carpet moths are active by night and some by day. They settle with their broad, patterned wings (span 2–4 centimetres) outstretched and flattened against the resting surface. They develop from twiglike caterpillars or loopers (*see* measuring worm). Certain species damage foliage; others are crop pests.

carpet shark, any of the approximately 25 species of sharks constituting the family Orectolobidae, found in all oceans. Many species are large, but they are not considered dangerous to humans, although they may protect themselves if harmed. Carpet sharks are live-bearers, as are many other groups of sharks.

The nurse shark (*Ginglymostoma cirratum*), which reaches a length of more than 4 metres (14 feet), is the only species of carpet shark found in the Atlantic. Nurse sharks are bottom feeders, primarily eating crustaceans.

carpetbagger, during the Reconstruction period (1865–77) following the U.S. Civil War, any Northern politician or financial adventurer accused of going South to use the newly

enfranchised freedmen as a means of obtaining office or profit. The epithet originally referred to an unwelcome stranger coming, with no more property than he could carry in a satchel (carpetbag), to exploit or dominate a region against the wishes of some or all of its inhabitants. Although carpetbaggers

"The Man with the (Carpet) Bags"; cartoon by Thomas Nast, 1872, depicting the Southern attitude toward Northerners during Reconstruction
The Granger Collection

often supported the corrupt financial schemes that helped to bring the Reconstruction governments into ill repute, many of them were genuinely concerned with the freedom and education of black citizens.

Carpi, town, Modena province, Emilia-Romagna region of northern Italy, north of Modena city. Carpi is distinguished by its great piazza, the largest in the region. Notable landmarks include the Renaissance town hall, formerly the castle of the Pio family, lords of Carpi from 1319 to 1525; the cathedral (begun 1514), with a Baroque facade (1667); the Romanesque church of Sta. Maria in Castello, or La Sagra (altered 1515); the former cathedral, with a Romanesque campanile (1217–21); and several other fine old churches. A rail junction and commercial centre, Carpi's industries include food processing, straw plaiting, distilling, and the manufacture of shirts and hosiery. Pop. (1981 prelim.) mun., 60,-507.

Carpi, Jacopo Berengario da: *see* Berengario da Carpi, Jacopo.

Carpi, Ugo da (b. *c.* 1480, Carpi, Duchy of Modena—d. between 1520 and 1532), painter and printmaker, the first Italian practitioner of the art of the chiaroscuro woodcut, a technique involving the use of several wood blocks to make one print, each block cut to produce a different tone of the same colour.

Carpi was active in Venice and Rome. Many of his chiaroscuro prints are after drawings by Raphael and Parmigianino. His claim to the invention of this process has long been contested. Hans Burgkmair and Lucas Cranach were known to have made chiaroscuro prints in the north before 1510, whereas there is no definite evidence of Ugo's work in this technique until 1516, when he appealed to the Venetian senate for protection from his imitators. None of his paintings survives.

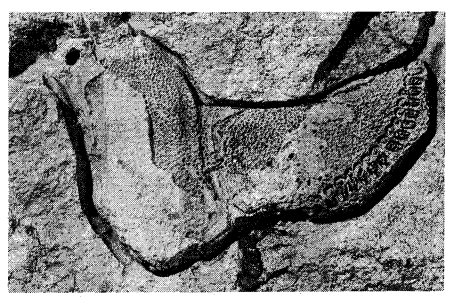
Carpini, Giovanni da Pian del (Franciscan author): *see* Giovanni da Pian del Carpini.

Carpocratian, follower of Carpocrates, a 2nd-century Christian Gnostic, *i.e.,* a religious dualist who believed that matter was evil and the spirit good and that salvation was gained through esoteric knowledge, or gnosis. The sect flourished in Alexandria. Carpocratians revered Jesus not as a redeemer but as an ordinary man whose uniqueness flowed from the fact that his soul had not forgotten that its origin and true home was within the sphere of the unknown perfect God. In other words, Jesus was to them a fellow Gnostic and as such a model for imitation. Carpocratians completely rejected the created world by identifying themselves with spiritual reality. They claimed to communicate with demonic spirits and presented this as proof of their power over, and superiority to, the material world. The subversion of Jewish biblical law was considered a serious responsibility because they claimed it came from evil angels who created the world.

The Carpocratians have been called libertine Gnostics because they contended that the attainment of transcendent freedom depended on having every possible experience, sinful or otherwise. Such an array of experiences normally required more than one lifetime, so the Carpocratians espoused the doctrine of the transmigration of souls, perhaps inspired by Indian or Pythagorean beliefs.

Apparently the Carpocratians had a more fully developed cult than other Gnostic groups, for they made brightly coloured icons with images of Plato, Pythagoras, Aristotle, Jesus, and others. Indeed, they were the first sect known to have used pictures of Christ. They also practiced magic for such purposes as the making of love potions.

carpoid, member of an extinct group of unusual echinoderms (modern echinoderms include starfish, sea urchins, and sea lilies), known as fossils from rocks of Middle Cambrian to Early Devonian age (the Cambrian Period began about 570,000,000 years ago, and the Devonian Period began 395,000,000 years ago). Unlike other echinoderms, the carpoids display no radial symmetry, nor do they



Carpoid
By courtesy of the trustees of the British Museum (Natural History); photograph, Imitor

seem to have had a water-vascular system. They do possess a calcitic system of plates, however, as well as stemlike or armlike appendages; carpoids generally have flat bodies. Some seem to possess gill slits, a feature found in primitive chordates; the carpoids may be related to the most primitive chordates or vertebrates and are ancestral to the more advanced echinoderms.

Carr, E(dward) H(allett) (b. June 28, 1892, London—d. Nov. 3, 1982, Cambridge, Cambridgeshire, Eng.), British political scientist and historian specializing in modern Russian history.

He joined the Foreign Office in 1916 and was assistant editor of *The Times* during 1941–46. He was subsequently tutor and fellow of Balliol College, Oxford, and a fellow of Trinity College, Cambridge. His best known works include the biography *Michael Bakunin* (1937) and the multivolume, four-part series *A History of Soviet Russia,* which includes *The Bolshevik Revolution 1917–23* (vol. 1, 1950; vol. 2, 1952; vol. 3, 1953), *The Interregnum 1923–24* (vol. 4, 1954), *Socialism in One Country 1924–26* (vol. 5, 1958; vol. 6, 1959; vol. 7, 1964), and *The Foundations of a Planned Economy, 1926–29* (vol. 8, with R.W. Davies, 1969, vol. 9, 1971, vol. 10, 1976–78). He also wrote *The New Society* (1951), *What Is History?* (1961), *1917: Before and After* (1968), and *From Napoleon to Stalin* (essays, 1980).

Carr, Emily (b. Dec. 13, 1871, Victoria, B.C., Can.—d. March 2, 1945, Victoria), painter and writer, regarded as a major Canadian artist for her paintings of western coast Indians and landscape.

While teaching art in Vancouver, B.C., Carr made frequent sketching trips to British Columbian Indian villages. Her work had little financial success and was interrupted for long periods by her attempts to earn a living. After ill health ended her painting trips, she turned to writing, producing six autobiographical books that were enlivened by satiric character studies. Among them are *Klee Wyck* (1941), dealing with the Indians; *The House of All Sorts* (1944), describing her experiences as a boardinghouse owner and dog breeder in Victoria; *Growing Pains* (1946), an autobiography; and *Pause: A Sketch Book* (1953), telling of her stay in an English sanatorium.

To make the best use of the Britannica, consult the INDEX *first*

Carr, John Dickson, pseudonym CARR DICKSON, OR CARTER DICKSON (b. Nov. 30, 1906, Uniontown, Pa., U.S.—d. Feb. 27, 1977, Greenville, S.C.), U.S. writer of detective fiction whose work, both intellectual and macabre, is considered among the best in the genre.

Carr's first novel, *It Walks by Night* (1930), won favour that endured as Carr continued to create well-researched "locked-room" puzzles of historical England. Though he wrote more than 70 books—as many as six a year—his work remained realistic and exciting. One of his later works is *The Hungry Goblin* (1972).

Carr's other successful work includes *The Life of Sir Arthur Conan Doyle* (1949) and *The Exploits of Sherlock Holmes* (1954), the further deeds of Doyle's famous sleuth co-written by Carr and Doyle's youngest son, Adrian. *The Bride of Newgate* (1950) is a historical novel in which a woman marries a condemned man an hour before he is to die. Carr also compiled an impressive crime reference library, and, while in England (1931–48), he wrote mysteries for the British Broadcasting Corporation, some of which were filmed.

Carr, Sir Robert: *see* Somerset, Robert Carr, earl of.

Carr-Saunders, Sir Alexander (Morris) (b. Jan. 14, 1886, Reigate, Surrey, Eng.—d. Oct. 6, 1966, Thirlmere, Cumberland), sociologist, demographer, and educational administrator who, as vice chancellor of the University of London, was largely responsible for establishing several overseas university colleges, some of which became independent universities. Among them were the universities of Khartoum, The Sudan; Malaya at Kuala Lumpur; Ibadan, Nigeria; the West Indies at Kingston, Jam.; and East Africa in Kenya, Tanzania, and Uganda.

Educated in biology, Carr-Saunders became a social worker in the East End of London, helping to direct (1912–13) Toynbee Hall, the pioneer British settlement house. Simultaneously, he studied law and was called to the bar in 1913. He was a professor of social sciences at the University of Liverpool (1923–37) and director of the London School of Economics and Political Science, University of London (1937–56). He began his work with the university colleges outside Europe shortly after World War II. He was knighted in 1946.

Carr-Saunders' first important book, *The Population Problem* (1922), was one of the earliest significant historical studies in demog-

raphy. His *World Population* (1936) contained demographic data on numerous countries that had never before been the subjects of such study. He also wrote *A Survey of the Social Structure of England and Wales* (with D. Caradog Jones, 1927), *The Professions* (with P.A. Wilson, 1933), and *New Universities Overseas* (1961).

Carrà, Carlo (b. Feb. 11, 1881, Quargnento, Italy—d. April 13, 1966, Milan), one of the most influential Italian painters of the first half of the 20th century, best known for his still lifes in the style of Metaphysical painting.

Carrà studied painting briefly in Brera but was largely self-taught. In 1909 he met the poet Marinetti and the artist Umberto Boccioni, who converted him to Futurism, an aesthetic movement that exalted patriotism, modern technology, dynamism, and speed. "The Funeral of the Anarchist Galli" (1911; Museum of Modern Art, New York City) shows the dynamic action, power, and violence characteristic of the Futurists.

With World War I the classic phase of Futurism ended and, although Carrà's collage "Patriotic Celebration, Free Word Painting" (1914; Gianni Mattioli Foundation, Milan) is based on Futurist concepts, he soon began to paint in a style of greatly simplified realism. "Lot's Daughters" (1915; Ernesto Bestagini Collection, Milan), for example, is an attempt to recapture the solidity of form and the stillness of the 13th-century painter Giotto. This new style was crystallized in 1917, when he met the painter Giorgio De Chirico, who taught him to convey in his paintings the unsettling sense of life in everyday objects. Carrà and De Chirico called their style *pittura metafisica* ("Metaphysical painting"), and their works of this period have a superficial similarity.

In 1918 Carrà broke with De Chirico and *pittura metafisica.* Throughout the 1920s and '30s, he painted melancholy figurative works based on the monumental realism of the 15th-century Italian painter Masaccio. Through such moody but well-constructed works as "Morning by the Sea" (1928; Gianni Mattioli Foundation, Milan) and through his many years of teaching at the Milan Academy, he greatly influenced the course of Italian art between World Wars I and II.

Carracci FAMILY, family of three Italian painters born in Bologna: the brothers Agostino (baptized Aug. 16, 1557—d. Feb. 23, 1602, Parma) and Annibale (b. Nov. 3, 1560—d. July 15, 1609, Rome) and their cousin Lodovico (baptized April 21, 1555—d. Nov. 3, 1619, Bologna). They were celebrated artists who founded in 1582 in Bologna an academy influential in recovering the classicizing tradition of the High Renaissance from the affectations of Mannerism and creating a classical Baroque style.

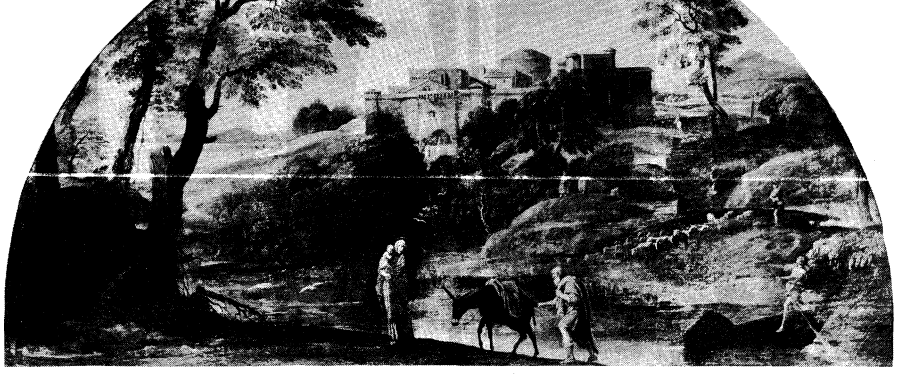
Lodovico, the eldest, had nearly finished his professional studies before his cousins had begun their education. He studied with the fashionable painter Prospero Fontana. Later he went to Florence and then to Parma and later visited Venice to work with the great master Jacopo Tintoretto. Ultimately planning to open a rival school in his native Bologna, he sent for his two cousins and induced them to abandon their handicrafts (Agostino being a goldsmith and Annibale a tailor) for the profession of painting. The precocious talents of the two brothers were developed in tours of northern Italy, their visits to Venice and Parma being of special significance. On their return the three relatives, assisted by an eminent anatomist, Anthony de la Tour, opened in 1582, an academy of painting under the name of the Incamminati. The affability and zeal of the Carracci family rapidly lifted their academy in popular estimation. They continued together until, at the invitation of Cardinal Farnese, Agostino and Annibale went to Rome in 1600 to paint the gallery of the Cardinal's palace. The former went on to Parma to paint the great salon of the Casino, where he died on the eve of finishing his renowned painting of "Celestial, Terrestrial, and Venal Love." Annibale continued to work alone at the Farnese gallery until the designs were completed. He then retired to Naples. Lodovico always remained at his academy in Bologna, and after death was interred in the church of Sta. Maria Maddalena.

The influence of the three Carracci was felt long and far afield; on 17th-century art in Flanders, particularly through the active admiration of Rubens; and, through the policy of the French Academy in Rome, on young French artists until the end of the 18th century. In addition, each of the three Carracci developed a distinctive artistic personality in his own right. Annibale was the truest artist of the three and the greatest; Agostino, the most cerebral, was a natural court painter; whereas Lodovico, the eldest and the leader of the family at first, conveyed a deep feeling of religious mystery in his early paintings. All three were also graphic artists of some importance.

MAJOR WORKS. *Lodovico Carracci:* "St. Francis Adoring the Crucifix" (1583–84; Capitoline Museum, Rome); "Portrait of a Youth" (*c.* 1583; Capitoline Museum); "Mystical Marriage of a Saint" (*c.* 1583; Beretta Collection, Bologna, Italy); "The Baptism of Christ" (*c.* 1583; Alte Pinakothek, Munich); "The Annunciation" (*c.* 1585; Pinacoteca Nazionale, Bologna); "The Vision of St. Anthony of Padua" (*c.* 1585; Rijksmuseum, Amsterdam); "The Conversion of St. Paul" (*c.* 1587–88; Pinacoteca Nazionale); "Madonna dei Bargellini" (1588; Pinacoteca Nazionale); "History of Rome" (fresco, 1588–92; Palazzo Salem, Bologna); "Madonna and Child with St. Francis, St. Joseph and Donors" (1591; Pinacoteca Civica e Galleria d'Arte Moderna, Cento, Italy); "Supper in the House of Simon" (1592; Pinacoteca Nazionale); "The Martyrdom of St. Ursula" (1592; Pinacoteca Nazionale); "The Preaching of the Baptist" (1592; Pinacoteca Nazionale); "Flora" (1592–93; Galleria e Museo Estense, Modena, Italy); "La Dea Opi" (1592–93; Galleria e Museo Estense); "Martyrdom of S. Angelo" (*c.* 1598; Pinacoteca Nazionale); "The Martyrdom of St. Ursula" (1600; SS. Nicola e Domenico, Imola, Italy); "The Assumption" (1601; Corpus Domini, Bologna); "The Divine Providence" (*c.* 1604–05; Capitoline Museum); "Apostles at the Tomb of the Virgin" (1606–09; Galleria Nazionale, Parma, Italy); "Funeral of the Virgin" (1606–09; Galleria Nazionale); "St. Peter Repenting" (1617; S. Pietro, Bologna).

Annibale Carracci: "The Crucifixion and Saints" (1583; Sta. Maria della Caritâ, Bologna); "The Butcher's Shop" (*c.* 1583; Christ Church, Oxford); "The Baptism of Christ" (1585; S. Gregorio, Bologna); "The Triumph of Truth" (1585; Hampton Court Palace, Middlesex, Eng.); "Deposition" (1585; Galleria Nazionale); "The Assumption" (1587; Gemäldegalerie, Dresden, E.Ger.); "Self-Portrait and Portrait of the Father and Nephew Antonio" (1587–88; Brera, Milan); "Enthroned Madonna with St. Matthew" (1588; Gemäldegalerie); "St. Roch Giving Alms" (1588–95; Gemäldegalerie); "Madonna with SS. Luke and Catherine" (1592; Louvre, Paris); "The Assumption of the Virgin" (1592; Pinacoteca Nazionale); "Christ at the Tomb" (1593; Louvre); "Hercules at the Crossroad" (1595; Museo e Gallerie Nazionali de Capodimonte, Naples); frescoes (1597 to 1603–04; Palazzo Farnese, Rome); "The Assumption" (1600–01; Sta. Maria del Popolo, Rome); "Christ Appearing to St. Peter on the Appian Way" ("Domine, Quo Vadis?"; *c.* 1601; National Gallery, London); "Pietà" (*c.* 1603; Kunsthistorisches Museum, Vienna); "The Dead Christ Mourned" ("The Three Maries"; *c.* 1603; National Gallery); "Martyrdom of St. Stephen" (*c.* 1604; Louvre); "Flight into Egypt" (*c.* 1604; Galleria Doria-Pamphili, Rome); "Entombment" (*c.* 1604; Galleria Doria-Pamphili); "Christ and the Samaritan at the Well" (*c.* 1604–05; Kunsthistorisches Museum); "Pietà" (*c.* 1607; Louvre).

Agostino Carracci: "Communion of St. Francis" (1582–83; Dulwich College Picture Gallery, London); "Bacchus and Ariadne" (1584–85; Pinacoteca Nazionale); "Adoration of the Shepherds" (1584; Sta. Maria Della Pioggia); "Madonna with Child and Saints" (1586; Galleria Nazionale); "The Communion of St. Jerome" (1591–93; Pinacoteca Nazionale); "Assumption of the Virgin" (1591–93; Pinacoteca Nazionale); "Pluto" (1592; Galleria e Museo Estense); "Christ and the Adultress" (*c.* 1594; Brera); "Portrait of Giovanna Paolini-Guicciardini" (1598; Staatliche Museen Preussischer Kulturbesitz, West Berlin).



"Flight into Egypt," oil on canvas by Annibale Carracci, *c.* 1604; in the Galleria Doria-Pamphili, Rome
Anderson—Alinari from Art Resource

BIBLIOGRAPHY. The earliest considerable source from the first quarter of the 17th century, but then unpublished, is Giulio Mancini, *Considerazioni sulla pittura,* ed. by Adriana Marucchi and Luigi Salerno, 2 vol. (1956–57). The earliest published lives of the Carracci, on which all subsequent accounts depend, are Giovanni P. Bellori, *The Lives of Annibale & Agostino Carracci* (1968; originally published in his *Le vite de' pittori . . . ,* 1672); and Carlo C. Malvasia, *Felsina Pittrice,* 2 vol. (1678, reissued 1975). Heinrich Bodmer, *. . . Ludovico Carracci . . .* (1939), is the first modern monograph (in German) on this artist. Denis Mahon, *Studies in Seicento Art and Theory* (1947, reprinted 1971), contains a brilliant critical rehabilitation of the Carracci. The *Mostra dei Carracci: catalogo critico* (1956), with complete bibliography to that date, established a massive basis for fresh investigations. John R. Martin, *The Farnese Gallery* (1965), is a richly illustrated book devoted to the principal enterprise of Annibale, especially to its iconography. Diane D. Bohlin, *Prints and Related Drawings by the Carracci Family: A Catalogue Raisonné* (1979), provides full information on approximately 240 prints of the Carracci. Donald Posner, *Annibale Caracci,* 2 vol. (1971), is a full-scale treatment. Charles Dempsey,

Annibale Carracci and the Beginnings of Baroque Style (1977), argues for a new interpretation of Annibale.

carrack porcelain, Chinese blue-and-white export pieces of the reign of Wan-li (1573–1620) during the Ming period. When a Portuguese armed merchantman, or *carraca,* was captured by the Dutch off Canton in 1602, the foundation year of the Dutch East India Company, the booty and subsequent prizes of Oriental porcelain were auctioned at Amsterdam for several million guilders. The Dutch *kraakporselein* was to have considerable influence on European pottery and taste, being copied at Delft and elsewhere. The vitreous-looking ware appears in many contemporary Dutch still-life paintings and interiors; it is decorated in a greyish-blue colour, spontaneously painted and somewhat coarser in finish than China's own domestic ware of the period, and features such subjects as deer, ducks in pairs, rocks, and landscapes.

carrageen (alga): *see* Irish moss.

Carraig Dubh (Ireland): *see* Blackrock.

Carraig na Siúire (Ireland): *see* Carrick on Suir.

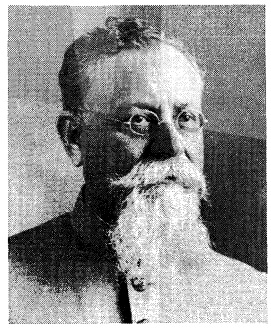
Carranza, Bartolomé de, also called BARTOLOMÉ DE MIRANDA (b. 1503, Miranda de Arga, Spain—d. May 2, 1576, Rome), Dominican theologian and archbishop of Toledo who was imprisoned for nearly 17 years by the Spanish Inquisition.

Bartolomé de Carranza, engraving
By courtesy of the Biblioteca Nacional, Madrid

He entered the Dominican convent of Benalaque near Guadalajara and had a brilliant scholastic career, holding responsible positions in his order. As the Holy Roman emperor Charles V's envoy, he took an active part (1545–47) in the Council of Trent.

In 1546 Carranza published his *Summa conciliorum* ("Summary of the Council Meetings") and his *Quattuor controversiae* ("Four Controversies")—an important study of the authority within the church of tradition, Scripture, the pope, and the councils—which forestalled the work of the Dominican theologian Melchor Cano, who accused Carranza of Lutheran opinions. In 1554–57 he was in England as adviser to King Philip II of Spain at the King's marriage to Queen Mary I of England. In 1557 Philip named him archbishop of Toledo and primate of Spain. His *Comentarios sobre el catechismo christiano* (1558;"Commentaries on the Christian Catechism") brought about renewed accusations of Lutheranism. Carranza was arrested by the Inquisition (Aug. 22, 1559) and accused of urging Bible reading by lay persons and advocating the writing of theology in the vernacular. Though the Council of Trent in 1563 declared his work sound, Philip and the Inquisition would not yield, presumably for political reasons. Pope Pius V called him to Rome in 1567, but he was not acquitted until 1576, when he was sent to the Dominican priory of the Minerva, where he died 18 days later.

Carranza, Venustiano (b. Dec. 29, 1859, Cuatro Ciénegas, Mexico—d. May 20/21, 1920, Tlaxcalantongo), a leader in the Mexican civil war following the overthrow of the dictator Porfirio Díaz and the first president of the new Mexican Republic. A moderate who was



Venustiano Carranza, c. 1910
Archivo Casasola

tainted by his association with Díaz and his alliance with newer forces of exploitation, Carranza opposed the sweeping changes that followed the revolution.

The son of a landowner, Carranza became active in local and state politics in 1877. In 1910, as governor of Coahuila, he joined the struggle of Francisco Madero against Díaz and in 1913 led the forces against Victoriano Huerta, who had assassinated Madero. After Huerta fled in 1914, Carranza's Constitutionalist army began to splinter. Rebels under the leadership of Pancho Villa and Emiliano Zapata opposed his provisional government, demanding immediate social reforms. He secured his position as provisional president, however, when his army, led by Gen. Alvaro Obregón, defeated the forces of Villa at Celaya in April 1915.

Carranza favoured political, not social, reform. Only reluctantly did he accept the provisions of the 1917 constitution establishing basic reforms in land ownership, control of natural resources, and labour and social legislation. When he became the constitutional president on May 1, 1917, he did little to effectuate those provisions. His term was marked by continued difficulties with Villa and Zapata, serious financial problems, and general social unrest brought on by his reluctance to institute far-reaching reforms.

Carranza was an ardent nationalist and was involved in serious controversy with the United States. Earlier (April 1914) he had opposed U.S. occupation of Veracruz, even though it was aimed at his enemy, Huerta; in March 1916 he had prevented the military expedition led by U.S. Gen. John J. Pershing from capturing Villa, who had raided Columbus, New Mex.; and he angered the United States by his efforts (1918) to bring the oil industry under Mexican control. He was instrumental in keeping Mexico neutral in World War I.

When Carranza's term as president was due to end in December 1920, he attempted to force the election of his chosen successor, Ignacio Bonillas, despite opposition from his more radical generals. Obregón led an armed rebellion in April 1920, and Carranza fled the capital. When he headed for Veracruz with government records and treasure, his train was attacked. With a few followers, he fled on horseback into the mountains. On the night of May 20/21 he was betrayed and murdered.

Carrara, city, Massa-Carrara province, Toscana (Tuscany) region of north central Italy, on the Carrione River in the foothills of the Alpi Apuane, just northwest of Massa and east of La Spezia. Acquired by the Malaspina family in 1428, it constituted, with Massa, the principality (1568) and duchy (1633) of Massa-Carrara (*q.v.*). Notable landmarks include the 12th- to 14th-century cathedral, built in the Pisan style, and the academy of fine arts, housed in the former ducal palace. The city is famous for some of the world's finest marble, called Carrara, taken from nearby quarries and used by sculptors from Michelangelo to Henry Moore.

The Marina di Carrara, immediately to the southwest, is a beach resort on the Ligurian Sea, with port facilities for handling marble. Pop. (1981 prelim.) mun., 68,460.

Carrara FAMILY, also called CARRARESI, a medieval Italian family who ruled first as feudal lords about the village of Carrara in the countryside of Padua and then as despots in the city of Padua.

On transferring to Padua itself in the 13th century, they exploited the feuds of urban politics first as Ghibelline and then as Guelf leaders and were thus able to found a new and more illustrious dominion. It began with the election of Jacopo da Carrara as perpetual captain general of Padua in 1318 but was not finally established, with Venetian help, until the election of his nephew Marsiglio in 1337. For approximately 50 years the Carraresi ruled with no serious rivals except among members of their own family. Marsiglio was succeeded without incident by Ubertino (1338–45), but Marsigliello, who succeeded Ubertino, was deposed and murdered by Jacopo di Niccolò (1345–50). Jacopo was then murdered by Guglielmino and succeeded by his brother Jacopino di Niccoló (1350–55), and Jacopino in turn was dispossessed and imprisoned by his nephew, Francesco il Vecchio (1355–87). The Carrara court was one of the most brilliant of the time. Ubertino in particular was a patron of building and the arts, and Jacopo di Niccolò was a close friend of Petrarch.

The lordship of Padua, however, though it extended to Belluno and Feltre (1361) and to Treviso (1383), was too small and finally too unpopular to survive the cupidity of greater neighbours, especially Venice and the Visconti of Milan. Francesco il Vecchio, reversing the family policy, inclined to the Visconti against the Venetians and formed an alliance (1385) with Gian Galeazzo Visconti against the della Scala, who were backed by Venice. His policy was ill-conceived: though Verona was taken, the Visconti promptly formed a further alliance with Venice itself and the Este for the conquest of Padua. Francesco had to surrender his dominions (1388) and died a prisoner of the Visconti (1392). His son and grandsons tried to retrieve their family fortunes but were ultimately destroyed by the Venetians.

Carrasquilla, Tomás (b. Jan. 17, 1858, Santo Domingo, Antioquia, Colom.—d. Dec. 19, 1940, Medellín), Colombian novelist and short-story writer who is best remembered for his realistic depiction of the people of his native Antioquia. His portrayal of the daily life and customs of the Antioqueños, in a simple and direct style, reflects his love of his land and its people and a deep understanding of their problems and the social forces that created them.

When the Colombian Civil War interrupted his study of law at Antioquia University, Carrasquilla began his long literary career with the publication of *Frutos de mi tierra* (1896; "Fruits of My Native Land"), a realistic novel critical of the hypocrisy of small-town life that immediately appealed to a wide audience. He continued to deal with regional subjects in his short stories and in such later novels as *El Padre Casafús* (1914; "Father Casafús") and *La Marquesa de Yolombó* (1928; "The Marchioness of Yolombó"). His blindness in later life did not prevent him from completing the work many critics consider his best, *Hace*

tiempos, 3 vol. (1935–36; "Long Ago"), which he was forced to dictate.

carrel, cubicle or study for reading and literary work; the word is derived from the Middle English *carole,* "round dance," or "carol." The term originally referred to carrels in the north cloister walk of a Benedictine monastery and today designates study cubicles in libraries. Carrels are first recorded in the 13th century at Westminster Abbey, London, though they probably existed from the late years of the 12th century.

The carrels in the cloister of Gloucester cathedral (formerly Benedictine Abbey of St. Peter) represent the most complete series of carrels in existence. Built as an integral part of the cloister in 1381–1412, there are 20 of them, two to each bay, divided by short partition walls, lighted by the cloister windows, and roofed at the level of the window transoms. Each originally contained a desk.

Carrel, Alexis (b. June 28, 1873, Sainte-Foy-lès-Lyon, Fr.—d. Nov. 5, 1944, Paris), French surgeon, sociologist, and biologist who received the 1912 Nobel Prize for Physiology or Medicine for developing a method of suturing blood vessels and who laid the groundwork for further studies of transplantation of blood vessels and organs. He also investigated preservation of tissues outside the body and the application of the process to surgery. His strain of chick heart tissue was kept alive for more than 30 years.

Carrel received his M.D. (1900) from the University of Lyon. In 1904 he left France for the U.S., working first at the University of Chicago and then at the Rockefeller Institute for Medical Research in New York City. During World War I Carrel returned to France, where he helped to develop the Carrel–Dakin method of treating wounds with antiseptic irrigations. After 1919 he continued his work at the Rockefeller Institute until World War II. In 1941 he became director of the Fondation Française pour l'Étude des Problèmes Humains in Paris.

His writings include *Man, the Unknown* (1935); *The Culture of Organs* (with C.A. Lindbergh, 1938); and *Reflections on Life* (1952).

Carrel-Dakin fluid: *see* Dakin's solution.

Carreño, (Maria) Teresa (b. Dec. 22, 1853, Caracas—d. June 12, 1917, New York City), celebrated Venezuelan pianist who was a player of great power and spirit, known to her public as the "Valkyrie of the piano."

She was given her first piano lessons by her father, Manuel Antonio Carreño, a politician and talented amateur pianist. Exiled because of a revolution, the family settled in New York in 1862; there Carreño studied with Louis Moreau Gottschalk. She next spent four years in Paris as a pupil of Georges Mathias and Anton Rubinstein, after which she embarked upon a long and highly successful concert career. She was particularly esteemed in Germany, where she lived and taught for more than 30 years.

At various times she composed works for the piano as well as a string quartet and the *Petite danse tsigane* for orchestra; developed a mezzo-soprano voice of sufficient calibre to enable her to appear as an opera singer; and, with the second of her four husbands, Giovanni Tagliapietra, a baritone, organized and directed an opera company in Caracas. Her third husband was the pianist Eugène d'Albert. Her first husband, whom she married in 1872, was Emile Sauret, a violinist; her fourth husband (married 1902) was Arturo Tagliapietra, a brother of her second husband.

Carreño de Miranda, Juan (b. March 25, 1614, Avilés, Asturias, Spain—d. September 1685, Madrid), painter, considered the most important Spanish court painter of the Baroque period after Velázquez. Influenced and overshadowed both by Velázquez and Van Dyck, he was nonetheless a highly original and sensitive artist in his own right.

"The Duke of Pastrama," oil painting by Juan Carreño de Miranda; in the Prado, Madrid

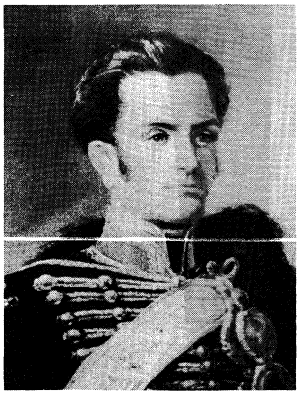
Archivo Mas, Barcelona

Carreño studied painting under Pedro de las Cavas and Bartolomé Román. He assisted Velázquez in the decoration of the Alcázar in Madrid and the other royal palaces and was appointed painter to King Charles II in 1669 and court painter in 1671.

Although he is known primarily as a portraitist, he also painted many religious works in oil and fresco that reveal a unique Baroque sensibility. Such works as his masterpiece, "Founding of the Trinitarian Order" (1666; Courson Castle, near Arpajón), are marked by mastery of execution, subtle interplay of light and shadow, and inventiveness of scene. Following the tradition of Velázquez' court portraits, he painted many pictures of the queen mother, Mariana of Austria, and traced in oil the decline of Charles II from a handsome child to a decrepit old man. Even the most repellent portraits of Charles possess the aristocratic elegance that characterize Carreño's paintings.

Carrera, José Miguel (b. Oct. 15/16, 1785, Santiago, Chile—d. Sept. 4, 1821, Mendoza, Arg.), leader in the early struggle for the independence of Chile and first president of that country.

By a coup d'état in 1811, Carrera placed himself at the head of the national government and later the same year made himself dictator. Soon, however, internecine strife developed in the independence movement that permitted the restoration of Spanish rule. Bernardo O'Higgins was elevated to the leadership of the forces opposing Carrera, who in 1813 was removed from power by the junta in favour of O'Higgins; early in 1814, however, Carrera regained control. During the ensuing invasion of Spanish forces from Peru, both Carrera and O'Higgins were defeated at Rancagua (October 1814). Carrera sought aid against his opponents, first in Buenos Aires and then, in 1815, in the United States. On his return to Argentina in 1816, he was not allowed to continue into Chile, and so he helped Argentine provincial chiefs in sporadic revolts against Buenos Aires. Eventually betrayed by his own men, he was captured and shot.



José Miguel Carrera, detail of a portrait by an unknown artist

By courtesy of the Library of Congress, Washington, D.C.

Carrera, Rafael (b. Oct. 24, 1814, Guatemala City—d. April 4, 1865, Guatemala City), dictator of Guatemala and one of the most powerful figures of 19th-century Central America.

Carrera was born of white and Indian stock, had no formal education, and remained illiterate all his life. Nevertheless, with the support of the Indian peasantry, who revered him, and the lower clergy, who despised the anticlerical liberal government, he captured Guatemala City in 1838 and took power, which he exercised completely and ruthlessly until his death.

Carrera—deeply religious, a strong nationalist, and a political conservative—consolidated his rule in 1840 when he became dictator and took Guatemala out of the United Provinces of Central America, proclaiming it an independent republic. Recalling the Jesuits, he reestablished the Roman Catholic Church in 1852. In 1854 he abolished elections and became president for life. Under Carrera adventurers from Nicaragua led by William Walker were repulsed, two attempts by Mexico to annex Guatemala were thwarted, and the territorial expansion of British Honduras was limited. He intruded frequently into the affairs of neighbouring nations in behalf of their conservative forces.

Although Carrera was crude and brutal, the clergy and upper classes appreciated his regime for its stability, respect for property, and support of the church. The nation gained some economic progress and a measure of racial equality under his rule.

Carrhae (ancient Mesopotamian city): *see* Harran.

Carrhae, Battle of (53 BC), battle that stopped the Roman invasion of Parthian Mesopotamia by the triumvir Marcus Licinius Crassus. War was precipitated by Crassus, who wanted a military reputation to balance that of his partners, Pompey and Julius Caesar. With seven legions (about 44,000 men), but insufficient cavalry, he invaded Mesopotamia, which was defended by a Parthian noble of the Suren family (whose personal name is not known). Learning that Surenas (*i.e.*, "the Suren") was in the desert east of the Euphrates River, Crassus left the cover of the river and struck out toward Carrhae; this move has been condemned as rash, but, since Seleucia on the Tigris was his ultimate objective, he had to cross open country at some time. Suddenly the Parthians were upon him, with a force of about 1,000 armoured knights and nearly 10,000 horse archers. His troops were neither acclimatized nor adapted to desert warfare. While his son Publius in vain launched a covering attack with his cavalry, the main Roman forces had formed a square against the encircling Parthians and tried unsuccessfully to cover both body and head with their shields against the showers of Parthian arrows.

Surenas' provision of a corps of 1,000 Arabian camels, one for every 10 men, enabled the Parthians to retire by sections and replenish their quivers. Crassus, lacking provisions, was compelled by his demoralized men to negoti-

ate but was cut down by the Parthians in the attempt. About 10,000 Romans escaped, but the rest of Crassus' men were either captured or killed. The Parthians had dealt a stunning blow to Roman prestige in the East, and the death of Crassus had serious repercussions on Roman political life.

carriage, four-wheeled, horse-drawn vehicle, the final refinement of the horse-drawn passenger conveyance. Wagons were also used for this purpose, as were chariots. By the 13th century the chariot had evolved into a four-wheeled form, unlike the earlier two-wheeled version most often associated with the Romans. In the 14th century the passenger coach form of vehicle began to evolve. Coaches featured a rear set of wheels much larger than the front set and, therefore, a shaped body. This provided greater passenger comfort despite its lighter construction and made it possible for it to be pulled by a single horse. These vehicles were first made in Hungary and by the 16th century were in use throughout western Europe. They came to be used in place of the heavier chariots for state processionals and as the general transportation of the upper classes.

By the 17th century, heavier vehicles had evolved, including the omnibus, to be pulled by teams of horses over long distances. At the same time, lighter vehicles designed for style and speed were also developed, and the suspension of all such vehicles was gradually enhanced by the addition of steel springs and leather braces. Some of these carriages were further improved by being enclosed with wood, glass, and cloth. In the 18th and 19th centuries a wide variety of carriage types were in common use. In the United States the stagecoach became familiar as a means of public transportation. In Europe the cabriolet, a two-wheeled vehicle, was used for this purpose. Much of the construction and form of the carriage could be seen in the automobiles that came into use in the early part of the 20th century.

carriage of goods, in law, the transportation of goods by land, sea, or air. The relevant law governs the rights, responsibilities, liabilities, and immunities of the carrier and the persons employing the services of the carrier.

A brief treatment of the law of the carriage of goods follows. For full treatment, *see* MACROPAEDIA: Transportation Law.

Apart from the general law relating to carriers, law concerning carriage of goods is divided into three main areas: carriage of goods by land, carriage of goods by sea, and carriage of goods by air.

A carrier is a person who, gratuitously or for reward, carries passengers or goods, for business or personal reasons, from one place to another by land, sea, or air. Anglo-American common law divides carriers into two basic types: common carriers and private carriers. Common carriers hold themselves out as willing to carry persons or goods from place to place within the areas where they ply for hire. Such carriers are under obligation to accept all business offered to them if they have space. With few exceptions, in the case of goods, common carriers are strictly liable for loss, damage, or delay to the goods while in transit. An example of an exception is the interception or damage of goods in war by an enemy. Another example is the loss, damage, or delay resulting from an "act of God" (*e.g.*, earthquakes, volcanic eruptions, sudden and unforeseen floods).

The wide-ranging, strict liability of common carriers for goods in their charge has been limited by statute. Carriers' liability can be further limited by special contract. In some cases, a private contract between the carrier and the consignor of goods has the effect of excluding the operation of statutory provisions. In such instances, a common carrier will be regarded for the purposes of the law as a private carrier.

Unlike common carriers, private carriers are under no obligation to accept all business offered to them. Each act of carriage is performed under private contract; for example, contracts for furniture removal. In the case of private carriers, liability for loss, damage, or delay to goods in transit is limited to instances involving negligence. The onus of proving that loss, damage, or delay has *not* resulted from negligence is on the carrier. This liability for negligence may, however, be further limited by the agreed terms of the contract of carriage.

International carriage by road and rail is subject to international conventions (Berne Convention [1890 to 1961], Geneva Convention [1965]). An international convention covering the carriage of goods by sea gave rise to the Hague Rules (1924). Carriage of goods by air is also regulated by international convention (Warsaw Convention [1929], as amended by the Hague Protocol [1955] and the Guadalajara Convention [1961]).

Carrick, district, county of Cornwall and Isles of Scilly, England, extending as a 15-mi- (24-km-) wide band from the north to the south coast, across the centre of the Cornish peninsula. It covers an area of 178 sq mi (461 sq km).

Carrick has fertile farmland and a rural landscape, in contrast to the area of Redruth–Camborne to the west, scarred by past mining, and the St. Austell region to the east, with its vast pits and spoil heaps of the china clay industry. It is the locale of the county town, Truro, and a major port, Falmouth. Evidence of mining penetrates into the northwestern area, with tin production near Chacewater. Carrick is dominated by flat plateau surfaces, reaching 500 ft (150 m) in places, and incised by rivers.

The annual rainfall is normally between 40 and 50 in. (1,000 and 1,250 mm), which, together with mild winters, has encouraged mixed farming with an emphasis on dairying; some cattle and sheep are fattened. Barley is the major feed crop. On the protected west side of the Fal estuary, some fruit, early potatoes, and a variety of vegetables are grown. Hamlets and isolated farms are found on the plateau. Rock outcroppings on both the north and south coasts produce a spectacular coastline with cliffs, headlands, and sandy bays. On the north coast are 3 mi of sand dunes between Perranporth and Holywell. Tourism has helped the expansion of such villages as Perranporth, St. Agnes, and St. Mawes.

Truro is the focus for both ridge and valley routes and is an important administrative, distribution, and service centre.

The mouth of the River Fal and its tributaries have been submerged by a rise in sea level to form a deepwater inlet with several branches. The main inlet is Carrick Roads, and Falmouth is located on a peninsula on the western side of its entrance. Penryn is located at the head of navigation on an arm of Carrick Roads. Pop. (1982 est.) 76,200.

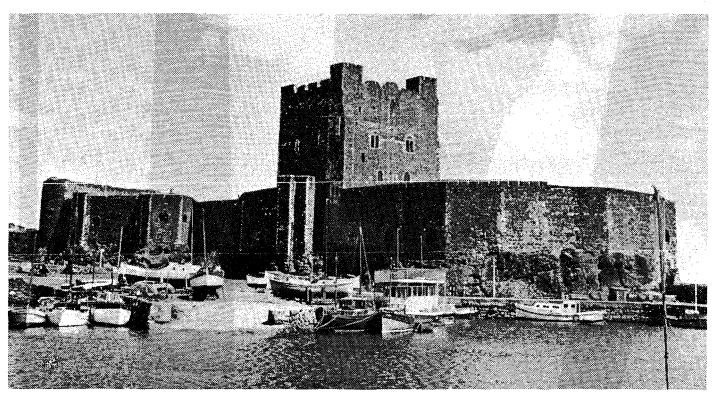
Carrick (Scotland): *see* Kyle and Carrick.

Carrick, John Stewart, earl of: *see* Robert III *under* Robert (Scotland).

Carrick on Suir, Irish CARRAIG NA SIÚIRE, town, County Tipperary, Ireland, on the River Suir. Located beside the foothills of the Comeraghs and having steep, narrow streets, it is connected with its southern suburb Carrickbeg, in County Waterford, by two bridges across the Suir. Ormonde Castle, begun in 1309, was the seat of the Butlers, the dukes of Ormonde. Anne Boleyn, mother of Elizabeth I of England, is said to have been born there. In the 19th century, Carrick on Suir was an important manufacturing town. Present industries include textiles, pharmaceuticals, tanning, and leather manufacture. Pop. (1981) 5,566.

Carrickfergus, Irish CARRAIG FHEARGHAIS, town, seat, and district (established 1973), formerly in County Antrim, Northern Ireland, on the northern shore of Belfast Lough (inlet of the sea). The name, meaning "rock of Fergus," commemorates King Fergus, who was shipwrecked off the coast *c.* AD 320. Because of its strategic position on a rocky spur above the harbour, Carrickfergus Castle, a perfectly preserved relic of the Norman period, has played a large part in Irish history. It was besieged and taken by the Scot Edward Bruce, brother of King Robert I the Bruce, in 1316, but reverted to English rule in 1318 and remained an isolated stronghold of the English crown. In the English Civil War (1642–51) the castle was one of the chief places of refuge for the Protestants of Antrim; in 1642 the first presbytery held in Ireland met there. It was later held by partisans of the English king James II but surrendered in 1689 to the Duke of Schomberg, and in 1690 William III landed there on his expedition to Ireland.

Although chartered since the reign of Elizabeth I, the corporation of Carrickfergus town was superseded in 1840 by a board of municipal commissioners. Carrickfergus was the county town (seat) of Antrim until 1850. Local industries include synthetic fibre works and cigarette and clothing factories. The parish Church of St. Nicholas, begun by John de Courci at the end of the 12th century, is renowned for its monument (1625) to Lord Chichester, lord deputy of Ireland (1604–14). Carrickfergus district has an area of 30 sq mi (77 sq km) and is bordered by Newtownabbey district to the west and Larne district to the north. Its northwestern section is hilly terrain, sloping southward to the flat shores of Belfast Lough. Salt is mined at the village of Eden, northeast of Carrickfergus town, and a sizable wooded area in western Carrickfergus district affords scenic camping and hiking. Carrick-

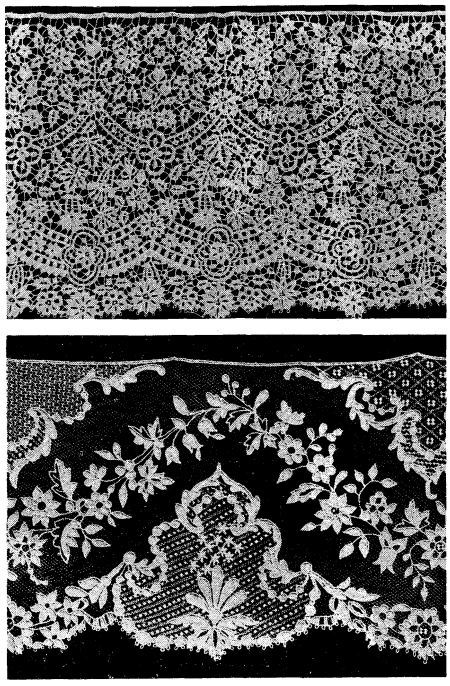


Carrickfergus Castle facing Belfast Lough, Northern Ireland

Al Greene—Shostal/EB Inc.

fergus town is a pleasure-boat centre and is connected by road to Belfast. Pop. (1981) town, 17,633; district, 28,458.

Carrickmacross, lace produced at Carrickmacross, County Monaghan, Ire., from 1820, with interruptions, to the end of the century. There are two varieties, appliqué and guipure. The former is made by drawing the design, which usually has a continuous outline, on



(Top) Carrickmacross guipure, *c.* 1880; (bottom) Carrickmacross appliqué, *c.* 1886; both in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

a glazed, firm fabric, and covering it with a net and a close weave muslin. The outline is covered by a whipped cord, and the excess muslin is cut away, leaving the net ground intact. Guipure has no net, the design elements being held together with brides and the excess muslin cut away. Frequently, both varieties are used together.

Carrier, French PORTEUR, also called TAKULLI, Athabascan-speaking Indian tribe centred in the upper branches of the Fraser River between the Coast and Rocky mountains in what is now central British Columbia. Their name derives from the custom whereby widows carried the ashes of their deceased husbands in knapsacks for three years. They also assumed the name Takulli (People Who Go upon the Water), of obscure origin.

The Carrier shared many of the customs of the Northwest Pacific Coast Indians. For food they relied chiefly on the plentiful river salmon, hunted various local game, and collected such wild plant foods as berries and roots. They exploited the abundant forest wood for producing such items as canoes, weapons, cooking vessels, and carved pillars denoting noble crests (though their artistic accomplishments were generally poorer than those of the coastal Indians). Southern Carrier lived in semi-subterranean houses; northern Carrier made gabled houses of poles and planks much like those of their coastal neighbours. Both types of dwellings were communal.

The Carrier were semi-sedentary, having seasonal homes in regular organized villages. Their social organization was much like that of the coastal Indians: elaborate class structures composed of nobles, commoners, and slaves, with complex obligations usually to marry outside one's lineage, clan, and house. Each subgroup had exclusive rights to its territory, and encroachments by other subgroups constituted grounds for bloody reprisal or at least compensation. The Carrier also practiced the potlatch (*q.v.*), the custom of large gift-giving feasts or ceremonies for the recognition of such events as marriage, ennoblement, or death.

Their religious beliefs centred vaguely on a great sky god but dealt chiefly with innumerable spirits in nature, which were contacted through dreams, visions, ritual, and magic. They also believed in both reincarnation and a nebulous afterlife.

European diseases and the disruptions of their old way of life had drastically reduced the Carrier population to about 4,500 in the late 20th century, presaging possible eventual extinction.

carrier, in physiology, any substance that permits or facilitates the penetration and transfer of a water-soluble substance in and through the lipid layer of a cell membrane to the cytoplasm, where the water-soluble substance is utilized. *See also* active transport.

Carrier, Jean-Baptiste (b. March 16, 1756, Yolet, Fr.—d. Dec. 16, 1794, Paris), radical democrat of the French Revolution who gained notoriety for the atrocities he committed against counterrevolutionaries at Nantes.

Jean-Baptiste Carrier, lithograph by F.-S. Delpech after a portrait by J.-B. Belliard

By courtesy of the Bibliotheque Nationale, Paris

By 1790, the year after the outbreak of the Revolution, Carrier was counsellor to the *bailliage* (administrative district) of Aurillac. He became a prominent member of the Jacobin and Cordeliers clubs—two very influential revolutionary societies—and in September 1792 he was elected to the National Convention.

In March 1793 Carrier helped set up the Revolutionary Tribunal that tried suspected counterrevolutionaries. The Jacobins, in alliance with the Parisian lower classes, seized control of the Revolution in June 1793, and in August the Committee of Public Safety (the National Convention's executive body) sent Carrier on a mission to Brittany. Two months later he was ordered to save Nantes from the antirepublican insurgents of the Vendée.

Since he was unable to obtain enough food for the rebels jailed at Nantes, Carrier ordered many of them to be guillotined or shot. In addition, between November 1793 and January 1794 he had more than 2,000 prisoners loaded into boats that were scuttled in the Loire River. Word of these *noyades* ("mass drownings") reached Paris, and, on Feb. 8, 1794, Robespierre, the chief spokesman of the Committee of Public Safety, had Carrier recalled. Carrier helped bring about Robespierre's downfall on 9 Thermidor (July 27, 1794) and, during the ensuing Thermidorian reaction against the Jacobin regime, was convicted of mass murder and guillotined.

Carrier, Willis Haviland (b. Nov. 26, 1876, Angola, N.Y., U.S.—d. Oct. 7, 1950, New York City), U.S. inventor and industrialist who formulated the basic theories of air conditioning. In 1902, while an engineer with the Buffalo Forge Company, Carrier designed the first system to control temperature and humidity. His "Rational Psychrometric Formulae," introduced in a 1911 engineering paper, initiated scientific air-conditioning design. He was a founder (1915) of the Carrier Corporation, manufacturer of air-conditioning equipment.

Carrier-Belleuse, Albert (-Ernest), original name ALBERT-ERNEST CARRIER DE BELLEUSE (b. June 12, 1824, Anizy-le-Château, Aisne, Fr.—d. June 3, 1887, Sèvres), notable French sculptor who in his time was Auguste Rodin's greatest rival. He produced works noted for their grace and form rather than their inventiveness, including "L'Amour et l'Amitié" (1857), "Jupiter et Phébé" (1860), and "Bacchante" (1863). His celebrated pupil, Rodin, assisted him at Brussels in 1871 on the "Caryatides" of the new Bourse.

carrier wave, in electronics, the unmodulated single-frequency electromagnetic wave that carries the desired information— *i.e.,* is modulated by the information. *See* modulation.

Carriera, Rosalba (Giovanna) (b. Oct. 7, 1675, Venice—d. April 15, 1757, Venice), portrait painter and miniaturist who set a fashion for pastel portraits in the Rococo period, particularly in France.

Carriera first became known for her miniature portraits on snuffboxes. She was responsible for replacing the use of a vellum ground in miniatures with ivory. By the age of 25 she was a member of the Academy of St. Luke in Rome.

Her art flattered the refined and affected taste of her times. Notables passing through Venice had her do their portraits. The collector and financier Pierre Crozat encouraged her to go to Paris. She did so in March 1720, accompanied by her family, and became the idol of the French capital. She received commissions for 36 portraits, among them one of Louis XV as a child. She became a member of the French

Rosalba Carriera, self-portrait in pastel; in the Uffizi, Florence

Alinari—Art Resource/EB Inc.

Royal Academy in 1720 and the next year returned to Venice. In 1730 in Vienna the Empress became her patron and pupil. After 1750 her sight failed.

Carrière, Eugène (b. Jan. 17, 1849, Gournay, Fr.—d. March 27, 1906, Paris), French painter, lithographer, and sculptor known for his scenes of domestic intimacy and for his portraits of distinguished literary and artistic

personalities, including his friends Alphonse Daudet, Anatole France, and Paul Verlaine.

In 1870 Carriére entered the École des Beaux-Arts in Paris, and after service in the Franco-Prussian War he returned to Paris to study with one of the leading French academic painters, Alexandre Cabanel. From 1877 he frequently included his wife in his portrayals of family groups and pictures of maternity. He employed the rich colours of Rubens and Velázquez until about 1890, when he began to develop his own distinctive style: figures shrouded in a pearly mist, delicate, predominantly gray tonalities, and soft modelling.

Carrillo, Julián (b. Jan. 28, 1875, Ahualulco, Mex.—d. Sept. 9, 1965, Mexico City), Mexican composer, a leading 20th-century exponent of microtonal music.

Of Indian descent, Carrillo grew up mainly in Mexico City. He showed considerable musical talent very early. Later, in his early 20s, after studying violin and composition in Mexico City, he began to study in Europe. Throughout his life he toured extensively in both western Europe and the U.S. From 1905 on, he held many important music positions in Mexico as composer, conductor, teacher, writer on music, and administrator.

Carrillo's interest in microtonal music (*i.e.* using intervals smaller than a half step) was stimulated in 1895 by a class in Mexico on acoustics. He realized that the musical whole tone could be divided not only into two semitones (as it had been for centuries) but also into three third tones, four quarter tones, and so on. In the 1920s he began intensive investigations into the possibilities of composing with these microtonal intervals, through sixteenth tones, which he considered the smallest interval listeners could readily hear. He created a new system of music notation and had special instruments built on which his microtonal works could be performed.

Of Carrillo's six symphonies, three are microtonal. Two of his five masses are microtonal, as are six of his works for solo instruments with orchestra. He also composed chamber music and music for single instruments in both microtonal and non-microtonal idioms and wrote a number of articles and books. He published an autobiography in 1945.

Carrillo, Santiago (b. Jan. 18, 1915, Gijón, Spain), secretary general of the Spanish Communist Party (Partido Comunista de España) from 1960 to 1982, who received wide publicity from his book *Eurocommunism and the State* (*Eurocommunismo y Estado*; 1977), which strongly espoused the freedom and independence of the several national Communist parties.

A native of Asturias, Carrillo joined the Communist Party at the time of the Popular Front's electoral victory in Spain in 1936. He was in charge of public order in Madrid, and some held him responsible for the massacre of prisoners at Paracuellos in November of that year. After the Civil War he went to the Americas, and he later spent many years in Paris. He participated in the founding, in July 1974, of the Junta Democrática Española, which partially united the opposition to the Franco regime, and in March 1977 he helped found the Coordinación Democrática, which incorporated the opposition parties and Spain's regional autonomy movements.

After its legalization in 1977, the Spanish Communist Party maintained a low profile while winning votes and parliamentary seats. Carrillo cooperated in the drafting of Spain's new constitution and supported the government in its attempts to cope with Spain's economic difficulties and its efforts to overcome terrorism. He favoured working for "a plurality of political parties and for democratic alternation between the majority and the minority," and he supported the Basque and Catalan sections of the Communist Party in their desire to take an independent stance based on the needs of their own regions.

Internationally, his advocacy of national Communism, called Eurocommunism, was widely applauded by many other Western European Communist parties and by Yugoslavia but got a chilly reception from the Soviet Union.

Carrillo y Sotomayor, Luis (b. 1583?, Córdoba—d. 1610, Puerto de Santo María, Spain), Spanish poet known as the chief exponent of *culturismo,* which developed from the highly ornate and rhetorical style *gongorismo,* originated by the poet Luis de Góngora. In his treatise on poetry, *Libro de la erudición poética* (mod. ed., 1946), he attempted to justify his methods by claiming the merits of obscurity in poetry.

Although his life was short and his output small, he is considered to have written several fine poems. The ambitious *Fábula de Acis y Galatea* is his best known work. His work was published, edited not too carefully, by his brother Alonso in 1611 and reedited in 1613.

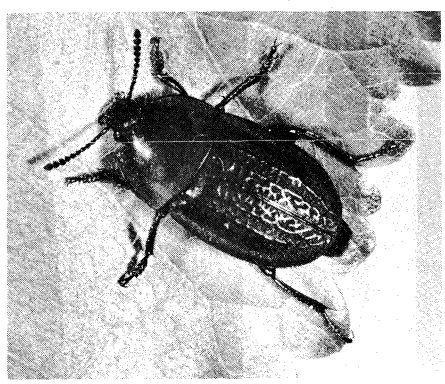
Carrington, Richard Christopher (b. May 26, 1826, London—d. Nov. 27, 1875, Churt, near Farnham, Surrey, Eng.), English astronomer who, by observing the motions of sunspots, discovered the equatorial acceleration of the Sun; *i.e.*, that it rotates faster at the equator than near the poles. He also discovered the movement of sunspot zones toward the Sun's equator as the solar cycle progresses.

The son of a brewer, Carrington was educated at Cambridge and in 1853 established his own observatory at Redhill, Reigate, Surrey. He published *A Catalogue of 3,735 Circumpolar Stars* (1857), but in 1865 his health failed and he did little work thereafter.

Carrío de la Vandera, Alonso, pseudonym CONCOLORCORVO (b. 1715, Gijón, Spain—d. 1778?), Spanish colonial administrator whose accounts of his travels from Buenos Aires to Lima are considered to be a precursor of the Spanish-American novel.

El lazarillo de ciegos caminantes (1775; *El Lazarillo: A Guide for Inexperienced Travellers Between Buenos Aires and Lima,* 1965) was originally attributed to Don Calixto Bustamente, Carrío's Indian guide and travelling companion. Investigation revealed that Carrío had published the book under this pseudonym to avoid punishment for having been critical of the Spanish regime. Critics have praised its clear and vibrant style, detailed descriptions of people and places, and satiric picaresque tone. Carrío's realistic observations of the life and customs of the *gauderios,* the cowboys of the pampa, contrast sharply with the highly romanticized picture of later writers.

carrion beetle, any of the approximately 230 species of the insect family Silphidae (order Coleoptera). The majority of these beetles feed on the bodies of dead and decaying animals, transforming them into a state more readily available to the environment. A few live in beehives as scavengers, and some eyeless ones live in caves, feeding on bat droppings. Carrion beetles range from minute to 35 millimetres in size, averaging around 12 millimetres (½ inch). Many are brightly coloured—orange, yellow, or red—while others are black. The flat, flexible body and wings allow these insects to crawl under dead animals. The long, flat larvae that emerge from eggs deposited in carrion have a triangular point at each tapering end. After they emerge from the eggs the larvae feed for the first few days on a brown liquid regurgitated by the parents.

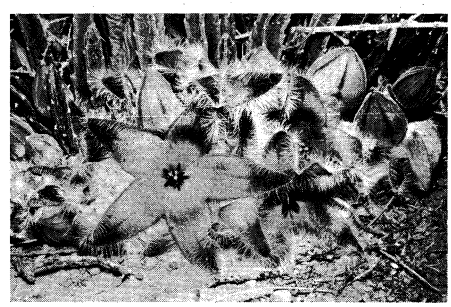


Carrion beetle (*Silpha ramosa*)
Herbert Lanks

Because carrion beetles dig the ground out from under a carcass and, in effect, bury it, they have also been known as burying beetles. They have been known to bury a dead mouse in several minutes and to move the body of a rat several feet to a spot where digging is easier.

carrion-feeder: *see* scavenger.

carrion flower, any of about 100 species of cactus-like plants of the genera *Stapelia* and *Huernia* of the milkweed family (Asclepiadaceae), native to tropical areas of southern Africa. They are named for the unpleasant odour of their large flowers. The carrion odour attracts flies, which pollinate the plants. Carrion flowers have thick, four-sided, grooved stems, often coloured or covered with outgrowths. The plants lack true leaves but have scales or spines. The flowers grow out from the angles of the stem and have purple, red, or yellow bars and markings. A few species are cultivated as ornamentals.



Zulu-giant (*Stapelia gigantea*)
E.S. Ross

Smilax herbacea, a native American woodland vine, has malodorous flowers and is also called carrion flower. It is of the Liliaceae family.

carrion hawk: *see* caracara.

Carrión's disease: *see* bartonellosis.

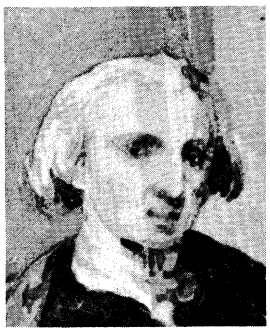
Carroll, Anna Ella (b. Aug. 29, 1815, Somerset County, Md., U.S.—d. Feb. 19, 1894, Washington, D.C.), political pamphleteer and constitutional theorist who claimed to have played a role in determining Union strategy during the U.S. Civil War (1861–65).

A member of a distinguished Maryland family, Carroll emerged in the 1850s as a vigorous supporter of the anti-Catholic and anti-foreign Know-Nothing Party. During the Civil War, she became a propagandist for the Union side in her sensitive border state. In 1861–62 she wrote two lengthy pamphlets stressing the unconstitutionality of the Confederacy and espousing the power of the president in the readmission of seceded states and outlining the theory later actually used by Pres. Abraham Lincoln to assert his right to control the emancipation of slaves and the postwar Reconstruction.

In 1861 Carroll submitted to the War Department a Tennessee River invasion plan, which she acknowledged at the time to be that of Charles Scott, a riverboat pilot and amateur

war strategist. The plan was not adopted, but after the war she embarked on a campaign to obtain federal reimbursement for what she claimed was her successful wartime invasion strategy. Her dubious claim won occasional supporters, but endorsements were obtained in a questionable manner. Among woman suffragists, she became a symbol of the female victim of male injustice in the 1880s.

Carroll, Charles (b. Sept. 19, 1737, Annapolis, Md.—d. Nov. 14, 1832, Baltimore), American patriot leader, longest surviving signer



Charles Carroll, wash drawing on paper by Thomas Sully, 1826; in the John Hill Morgan collection, Yale University Art Gallery

By courtesy of the Yale University Art Gallery, John Hill Morgan collection

of the Declaration of Independence, and the only Roman Catholic to sign that document.

Until 1765 Carroll attended Jesuit colleges in Maryland and France and studied law in France and England. Before and during the American Revolution, he served on committees of correspondence and in the Continental Congress (1776–78), where he was an important member of the board of war. In 1776, with Benjamin Franklin, Samuel Chase, and his cousin, the Rev. John Carroll, he was sent to Canada in a fruitless effort to persuade Canadians to join the cause of the 13 colonies.

Carroll was a state senator in Maryland (1777–1800) and concurrently a U.S. Senator (1789–92). When political parties were formed in the U.S., he became a Federalist.

To make the best use of the Britannica, consult the INDEX *first*

Carroll, Earl (b. Sept. 16, 1893, Pittsburgh—d. June 17, 1948, near Mount Carmel, Pa., U.S.), U.S. showman, theatrical producer, and director, best known for his *Earl Carroll's Vanities* (1922–48), which were popular revues of songs, dances, and flamboyantly costumed ladies. Over the doors of his Earl Carroll Theatre in New York City and his Earl Carroll Restaurant in Hollywood he emblazoned his slogan, "Through These Portals Pass the Most Beautiful Girls in the World."

Carroll quit school at age 10, worked at odd jobs in Pittsburgh theatres from 1903 to 1910, and at age 16 worked his way around the world. In New York City he became successful as a songwriter (1912–17) and then as a producer and opened his first Earl Carroll Theatre in 1922; there and at a second Earl Carroll Theatre built in 1931 he produced 15 *Vanities* and two *Sketch Book Reviews* in the coming years. In 1938 he built his restaurant (including a theatre) in Hollywood and put on 12 more *Vanities*. Over the years he also produced or directed more than 60 Broadway and other plays and a few motion pictures.

He died in the crash of a commercial airliner, not far from his hometown of Pittsburgh.

Carroll, John (b. Jan. 8, 1735, Upper Marlboro, Maryland—d. Dec. 3, 1815, Baltimore), first Roman Catholic bishop in the United States and the first archbishop of Baltimore. Under his leadership the church became firmly established in the United States.

Carroll was the son of a prominent Maryland family. Because there were no schools for the training of priests in the American colonies, he was sent abroad for his education, first to France and then to Belgium, where he was ordained (*c.* 1767). He taught philosophy and theology at the Jesuit colleges in Liège and Bruges, but the suppression of Jesuits by the papal brief of July 1773, vigorously enforced on the Continent, prompted him to seek refuge in England. By that time, however, the deteriorating relations between England and the Colonies were evident, and, sensing the climate of unrest, Carroll returned to Baltimore in the spring of 1774.

He did not take an active part in the American Revolution, although in 1776, at the request of the Continental Congress, he accompanied a diplomatic mission to Canada, where an unsuccessful attempt was made to secure the aid or neutrality of French-Canadian Catholics. On this mission, Carroll met Benjamin Franklin, who later gave enthusiastic support to Carroll's candidacy as bishop of Baltimore.

In the post-Revolutionary years, Carroll was instrumental in the reorganization of American Catholics, no longer under the jurisdiction of the English church, and in efforts to establish satisfactory relations with Rome. In 1790, at Lulworth Castle in England, he was consecrated bishop of Baltimore—a diocese at that time encompassing the entire United States. As bishop he was particularly concerned with the establishment in the United States of institutions for the training and ordination of native-born priests. In 1791 Bishop Carroll himself founded the Sulpician seminary in Baltimore. He also encouraged Catholic religious orders of every kind to establish branches in the United States, and, with the aid of George Washington, he secured federal funds for Catholic missionaries to the Indians of the West. In 1806 Carroll laid the cornerstone of the Baltimore cathedral, having collaborated with Benjamin Latrobe in the planning and design of the building. Following the erection of four new sees (Boston, New York, Philadelphia, and Bardstown, Ky.) in 1808, Carroll became archbishop (1811). During his years as head of the U.S. church, the Catholic population of the country grew from about 25,000 to 200,000.

Carroll, Lewis, pseudonym of CHARLES LUTWIDGE DODGSON (b. Jan. 27, 1832, Daresbury, Cheshire, Eng.—d. Jan. 14, 1898, Guildford, Surrey), English logician, mathematician, photographer, and novelist, especially remembered for *Alice's Adventures in Wonderland* (1865) and its sequel, *Through the Looking-Glass* (1871), enjoyed as much by adults as by children. His poem *The Hunting of the Snark* (1876) is nonsense literature of the highest order.

Lewis Carroll, shown holding a camera lens; photograph by Oscar G. Rejlander, 1863

By courtesy of the Gernsheim Collection, the University of Texas at Austin

Dodgson was the eldest son and third child in a family of seven girls and four boys born to Frances Jane Lutwidge, the wife of the Rev. Charles Dodgson. He was born in the old parsonage at Daresbury. His father was perpetual curate there from 1827 until 1843, when he became rector of Croft in Yorkshire—a post he held for the rest of his life (though later he became also archdeacon of Richmond and a canon of Ripon cathedral).

Daresbury, in the mid-19th century, was a small country village isolated from the industrial development that was beginning to spread over southern Lancashire. The Dodgson children had few friends outside the family but, like many other families in similar circumstances, found little difficulty in entertaining themselves. Charles from the first showed a great aptitude for inventing games to amuse them. With the move to Croft when he was 12 came the beginning of the "Rectory Magazines," manuscript compilations to which all the family were supposed to contribute. In fact, Charles wrote nearly all of those that survive, beginning with *Useful and Instructive Poetry* (1845; published 1954) and following with *The Rectory Magazine* (*c.* 1850, mostly unpublished), *The Rectory Umbrella* (1850–53), and *Mischmasch* (1853–62; published with *The Rectory Umbrella* in 1932). All are interesting, but only the last two contain items worthy of comparison with the mature works of Lewis Carroll.

Meanwhile, young Dodgson attended Richmond School, Yorkshire (1844–45), and then proceeded to Rugby School (1846–50). He disliked his four years at public school, principally because of his innate shyness, although he was also subjected to a certain amount of bullying; he also endured several illnesses, one of which left him deaf in one ear. After Rugby he spent a further year being tutored by his father, during which time he matriculated at Christ Church, Oxford (May 23, 1850). He went into residence as an undergraduate there on Jan. 24, 1851.

Dodgson's academic career was all that could be desired. He excelled in his mathematical and classical studies in 1852; on the strength of his performance in examinations, he was nominated to a studentship (called a scholarship in other colleges). In 1854 he gained a first in mathematical Finals—coming out at the head of the class—and proceeded to a bachelor of arts degree in December of the same year. He was made a "Master of the House" and a senior student (called a fellow in other colleges) the following year and was appointed lecturer in mathematics (the equivalent of today's tutor), a post that he held until he resigned it in 1881. He held his studentship until the end of his life.

As was the case with all fellowships at that time, the studentship at Christ Church was dependent upon his remaining unmarried, and, by the terms of this particular endowment, proceeding to holy orders. Dodgson was ordained a deacon in the Church of England on Dec. 22, 1861. Had he gone on to become a priest he could have married and would then have been appointed to a parish by the college. But he felt himself unsuited for parish work and, though he considered the possibility of marriage, decided that he was perfectly content to remain a bachelor.

Dodgson's association with children grew naturally enough out of his position as an eldest son with eight younger brothers and sisters. He also suffered from a bad stammer (which he never wholly overcame, although he was able to preach with considerable success in later life) and, like many others who suffer

from the disability, found that he was able to speak naturally and easily to children. It is therefore not surprising that he should begin to entertain the children of Henry George Liddell, dean of Christ Church. Alice Liddell and her sisters Lorina and Edith were not, of course, the first of Dodgson's child friends. They had been preceded or were overlapped by the children of the writer George Macdonald, the sons of the poet Alfred, Lord Tennyson, and various other chance acquaintances. But the Liddell children undoubtedly held an especially high place in his affections—partly because they were the only children in Christ Church, since only heads of houses were free both to marry and to continue in residence.

Properly chaperoned by their governess, Miss Prickett (nicknamed "Pricks"—"one of the thorny kind," and so the prototype of the Red Queen in *Through the Looking-Glass*), the three little girls paid many visits to the young mathematics lecturer in his college rooms. As Alice remembered in 1932, they

> used to sit on the big sofa on each side of him, while he told us stories, illustrating them by pencil or ink drawings as he went along .... He seemed to have an endless store of these fantastical tales, which he made up as he told them, drawing busily on a large sheet of paper all the time. They were not always entirely new. Sometimes they were new versions of old stories; sometimes they started on the old basis, but grew into new tales owing to the frequent interruptions which opened up fresh and undreamed-of possibilities.

On July 4, 1862, Dodgson and his friend Robinson Duckworth, fellow of Trinity, rowed the three children up the Thames from Oxford to Godstow, picnicked on the bank, and returned to Christ Church late in the evening: "On which occasion," wrote Dodgson in his diary, "I told them the fairy-tale of *Alice's Adventures Underground,* which I undertook to write out for Alice." Much of the story was based on a picnic a couple of weeks earlier when they had all been caught in the rain; for some reason, this inspired Dodgson to tell so much better a story than usual that both Duckworth and Alice noticed the difference, and Alice went so far as to cry, when they parted at the door of the deanery, "Oh, Mr. Dodgson, I wish you would write out Alice's adventures for me!" Dodgson himself recollected in 1887

> how, in a desperate attempt to strike out some new line of fairy-lore, I had sent my heroine straight down a rabbit-hole, to begin with, without the least idea what was to happen afterwards.

Dodgson was able to write down the story more or less as told and added to it several extra adventures that had been told on other occasions. He illustrated it with his own crude but distinctive drawings and gave the finished product to Alice Liddell, with no thought of hearing of it again. But the novelist Henry Kingsley, while visiting the deanery, chanced to pick it up from the drawing-room table, read it, and urged Mrs. Liddell to persuade the author to publish it. Dodgson, honestly surprised, consulted his friend George Macdonald, author of some of the best children's stories of the period. Macdonald took it home to be read to his children, and his son Greville, aged six, declared that he "wished there were 60,000 volumes of it."

Accordingly, Dodgson revised it for publication. He cut out the more particular references to the previous picnic (they may be found in the facsimile of the original manuscript, later published by him as *Alice's Adventures Underground* in 1886) and added some additional stories, told to the Liddells at other times, to make up a volume of the desired length. At Duckworth's suggestion he got an introduction to John Tenniel, the *Punch* magazine cartoonist, whom he commissioned to make illustrations to his specification. The book was published as *Alice's Adventures in Wonderland* in 1865. (The first edition was withdrawn because of bad printing, and only about 21 copies survive—one of the rare books of the 19th century—and the reprint was ready for publication by Christmas of the same year, though dated 1866.)

The book was a slow but steadily increasing success, and by the following year Dodgson was already considering a sequel to it, based on further stories told to the Liddells. The result was *Through the Looking-Glass and What Alice Found There* (dated 1872; actually published December 1871), a work as good as, or better than, its predecessor.

By the time of Dodgson's death, *Alice* (taking the two volumes as a single artistic triumph) had become the most popular children's book in England: by the time of his centenary in 1932 it was one of the most popular and perhaps the most famous in the world.

There is no answer to the mystery of *Alice*'s success. Many explanations have been suggested, but, like the Mad Hatter's riddle ("The riddle, as originally invented, had no answer at all"), they are no more than afterthoughts. The book is not an allegory; it has no hidden meaning or message, either religious, political, or psychological, as some have tried to prove; and its only undertones are some touches of gentle satire—on education for the children's special benefit and on familiar university types, whom the Liddells may or may not have recognized. Various attempts have been made to solve the "riddle of Lewis Carroll" himself; these include the efforts to prove that his friendships with little girls were some sort of subconscious substitute for a married life, that he showed symptoms of jealousy when his favourites came to tell him that they were engaged to be married, that he contemplated marriage with some of them—notably with Alice Liddell. But there is little or no evidence to back up such theorizing. He in fact dropped the acquaintance of Alice Liddell when she was 12, as he did with most of his young friends. In the case of the Liddells, his friendship with the younger children, Rhoda and Violet, was cut short at the time of his skits on some of Dean Liddell's Christ Church "reforms." For besides children's stories, Dodgson also produced humorous pamphlets on university affairs, which still make good reading. The best of these were collected by him as *Notes by an Oxford Chiel* (1874).

Besides writing for them, Dodgson is also to be remembered as a fine photographer of children and of adults as well (notable portraits of the actress Ellen Terry, the poet Alfred, Lord Tennyson, the poet-painter Dante Gabriel Rossetti, and many others survive and have been often reproduced). Dodgson had an early ambition to be an artist: failing in this, he turned to photography. He photographed children in every possible costume and situation, finally making nude studies of them. But in 1880 Dodgson abandoned his hobby altogether, feeling that it was taking up too much time that might be better spent. Suggestions that this sudden decision was reached because of an impurity of motive for his nude studies have been made, but again without any evidence.

Before he had told the original tale of *Alice's Adventures,* Dodgson had, in fact, published a number of humorous items in verse and prose and a few inferior serious poems. The earliest of these appeared anonymously, but in March 1856 a poem called "Solitude" was published over the pseudonym Lewis Carroll. Dodgson arrived at this pen name by taking his own names Charles Lutwidge, translating them into Latin as Carolus Ludovicus, then reversing and retranslating them into English. He used the name afterward for all his nonacademic works. As Charles L. Dodgson, he was the author of a fair number of books on mathematics, none of enduring importance, although *Euclid and His Modern Rivals* (1879) is of some historical interest.

His humorous and other verses were collected in 1869 as *Phantasmagoria and Other Poems* and later separated (with additions) as *Rhyme? and Reason?* (1883) and *Three Sunsets and Other Poems* (published posthumously, 1898). The 1883 volume also contained *The Hunting of the Snark,* a narrative nonsense poem that is rivalled only by the best of Edward Lear.

Later in life, Dodgson had attempted a return to the *Alice* vein but only produced *Sylvie and Bruno* (1889) and its second volume, *Sylvie and Bruno Concluded* (1893), which has been described aptly as "one of the most interesting failures in English literature." This elaborate combination of fairy-tale, social novel, and collection of ethical discussions is unduly neglected and ridiculed. It presents the truest available portrait of the man. *Alice,* the perfect creation of the logical and mathematical mind applied to the pure and unadulterated amusement of children, was struck out of him as if by chance; while making full use of his specialized knowledge, it transcends his weaknesses and remains unique. (R.L.G.)

MAJOR WORKS. *Children's books. Alice's Adventures in Wonderland* (1865); *Through the Looking-Glass and What Alice Found There* (1871); *The Wasp in the Wig: A "Suppressed" Episode* [of the latter] (1977).

Verse. Phantasmagoria and Other Poems (1869); *The Hunting of the Snark* (1876); *Rhyme? and Reason?* (1883); *The Collected Verse* (1929).

Mathematical books. A Syllabus of Plane Algebraical Geometry (1860); *Euclid and His Modern Rivals* (1879); *Curiosa Mathematica* (1888–93). *Symbolic Logic,* Part I (1896), published with Part II (1977), ed. by William W. Bartley III.

Other works. Sylvie and Bruno, 2 vol. (1889–93), novel.

BIBLIOGRAPHY. The primary sources are *The Life and Letters of Lewis Carroll,* by his nephew Stuart Dodgson Collingwood (1898, reprinted 1967); *The Diaries of Lewis Carroll,* 2 vol., ed. and augmented by Roger Lancelyn Green (1953); and *The Letters of Lewis Carroll,* 2 vol., ed. by Morton N. Cohen and Roger Lancelyn Green (1979). The best of later biographies is Derek Hudson, *Lewis Carroll,* rev. ed. (1976) and Anne Clark, *Lewis Carroll* (1979); and the fullest is Florence Becker Lennon's, published in 1945 as *Victoria Through the Looking-Glass,* and in a revised edition in 1962 as *The Life of Lewis Carroll.* Other studies of importance include Helmut Gernsheim, *Lewis Carroll: Photographer,* new ed. (1969); Morton N. Cohen, *Lewis Carroll, Photographer of Children: Four Nude Studies* (1979), reproduces the only known extant photographs and discusses them; Alexander L. Taylor, *The White Knight: A Study of C.L. Dodgson* (1952); Roger Lancelyn Green's "Bodley Head Monograph," *Lewis Carroll* (1960); and Jean Gattegno, *Lewis Carroll* (1970), in French.

For bibliography, see *The Lewis Carroll Handbook,* by S.H. Williams and Falconer Madan (1931 and rev. by Roger Lancelyn Green in 1962); and Edward Lewis Guiliano, *Lewis Carroll: An Annotated International Bibliography 1960–1977* (1981); for collections of his works, see the so-called *Complete Works of Lewis Carroll,* ed. by Alexander Woollcott (1937); and the fuller, but still not complete, *The Works of Lewis Carroll,* ed. by Roger Lancelyn Green (1965). For special editions of the two *Alice* books, see *The Annotated Alice,* ed. by Martin Gardner (1960); and *Alice,* in the "Oxford English Novels Series," ed. by Roger Lancelyn Green (1971). The manuscript of *Alice's Adventures Underground,* originally given to Alice Liddell, is now in the British Museum; so also are the surviving volumes of his *Diary.* No other major work seems to be extant in manuscript, but the four family magazines and miscellaneous juvenilia and mathematical and logical items are scattered among various collections, mainly in the United States. One of the magazines was published as *The Rectory Magazine* (1976) in facsimile.

Carrollton, city, seat (1829) of Carroll County, western Georgia, U.S., near the Little Tallapoosa River. Formerly called Troupsville, it was renamed (1829) for the Maryland patriot Charles Carroll. It developed as a trade and processing centre for surrounding fertile farmland and has a growing industrial base manufacturing textiles and wire and metal products. Carrollton is the seat of West Georgia College (1933), a branch of the University System of Georgia. Inc. 1856. Pop. (1980) 14,078.

carrot (*Daucus carota*), herbaceous, generally biennial plant of the Apiaceae family that produces an edible taproot. Among common varieties root shapes range from globular to long, with lower ends blunt to long-pointed. Besides the orange-coloured roots, white-, yellow-, and purple-fleshed varieties are known.

Carrot (*Daucus carota*)
Kenneth and Brenda Formanek—EB Inc.

The carrot is native to Afghanistan and neighbouring lands. Wild carrot has become distributed as a weed in Europe, the United States, and other temperate lands. Carrots were cultivated in the Mediterranean region before the Christian Era and in China and northwestern Europe by the 13th century. They are now extensively grown throughout the temperate zones. In the 20th century, knowledge of the value of carotene (provitamin A) has increased appreciation of the carrot, a rich source of the nutrient.

The plants require cool to moderate temperatures and are not grown in summer in the warmer regions. They require deep, rich, but loosely packed soil. Modern machines sow the seeds thinly in bands to give room for plant development without need for thinning. An erect rosette of doubly compound, finely divided leaves develops above ground normally in the first season. The edible carrot and attached roots are below. After a rest period at temperatures near freezing, large, branched flower stalks arise. The ends of the main stalk and branches bear large compound umbels of tiny white or pinkish flowers. The seeds are one-seeded halves of small spiny fruits called schizocarps. Seeds as purchased for planting have the spines removed.

Fresh carrots should be firm and crisp, with smooth and unblemished skin. Bright-orange colour indicates high carotene content; smaller types are the most tender. Carrots are used in salads and as relishes and are served as cooked vegetables and in stews and soups.

Carrucci, Jacopo: *see* Pontormo, Jacopo da.

carrying capacity, the maximum number of animals of one or more species that can be supported by a particular habitat or area through the most unfavourable period of the year. The carrying capacity is different for each species in a habitat because of that species' particular food, shelter, and social requirements and because of competition from other species that may have similar requirements.

Carson (of Duncairn), Edward Henry Carson, Baron (b. Feb. 9, 1854, Dublin—d. Oct. 22, 1935, Minster, Kent, Eng.), lawyer and politician known as the "uncrowned king of Ulster," who successfully led northern Irish resistance to the British government's attempts to introduce Home Rule for the whole of Ireland.

Although Carson was to become the champion of the northern province, he was born into a Protestant family in southern Ireland and was reared and educated there. Early in his Irish legal career (from 1877), he came to mistrust the Irish nationalists. As senior crown prosecutor for Dublin, he sternly enforced the Crimes Act of 1887, securing numerous convictions for violence against Irish estates owned by English absentee landlords. Appointed Irish solicitor general in 1892, he was elected to the British House of Commons in the same year, was called to the English bar in 1893, and served as British solicitor general from 1900 to 1905. During these years Carson achieved his greatest success as a barrister. In 1895 his cross-examination (in his role as queen's counsel) of Oscar Wilde largely secured the Irish writer's conviction for homosexuality.

On Feb. 27, 1910, Carson accepted the parliamentary leadership of the anti-Home Rule Irish Unionists and, forfeiting his chance to lead the British Conservative Party, devoted himself entirely to the Ulster cause. His dislike of southern Irish separatism was reinforced by his belief that the heavy industry of Belfast was necessary to the economic survival of Ireland. The Liberal government (1908–16) under H.H. Asquith, which in 1912 decided to prepare a Home Rule bill, could not overcome the effect of Carson's obstructionist speeches in Commons. The covenant of resistance to Home Rule, signed by Carson and other leaders in Belfast on Sept. 28, 1912, and afterward by thousands of Ulstermen, was followed by his establishment of a provisional government in Belfast in 1913. Early in that year he recruited a private Ulster army that openly drilled for fighting in the event that the Home Rule Bill was enacted. In preparation for a full-scale civil war, he successfully organized the landing of a large supply of weapons from Germany at Larne, County Antrim, on April 24, 1914. The British government, however, began to make concessions to the northern Irish, and in July 1914 Carson agreed to Home Rule for Ireland apart from Ulster (effected in 1921).

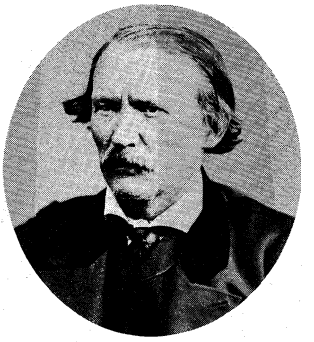
Appointed attorney general in Asquith's wartime coalition ministry on May 25, 1915, Carson resigned on October 19 because of his dissatisfaction with the conduct of the war. In David Lloyd George's coalition ministry (1916–22) he was first lord of the Admiralty (Dec. 10, 1916, to July 17, 1917) and then a member of the war Cabinet as minister without portfolio (to Jan. 21, 1918). Accepting a life peerage, he served from 1921 to 1929 as lord of appeal in ordinary.

The Life of Lord Carson, 3 vol. (1932–36), was written by Edward Marjoribanks and Ian Colvin. A later biography is *Carson* (1953), by H. Montgomery Hyde.

Carson, Kit, byname of CHRISTOPHER CARSON (b. Dec. 24, 1809, Madison County, Ky., U.S.—d. May 23, 1868, Ft. Lyon, Colo.), American frontiersman, trapper, soldier, and Indian agent whose contributions to westward expansion in the United States rank him among the nation's great folk heroes.

At 15 Carson ran away from his home in Missouri to join a caravan of traders bound for Santa Fe. From experienced frontiersmen he learned fur trapping and trading, a career he pursued for 15 years.

A chance encounter in 1842 with the explorer John C. Frémont made Carson an active participant in the clash of empires that eventually



Kit Carson
By courtesy of the Library of Congress, Washington, D.C.

extended the boundaries of the continental United States to its present size (Alaska excluded). He served as a guide to Frémont's government-financed explorations of the West in 1842 and 1843–44, and he was with him in California at the conclusion of the third expedition in 1846, when Frémont provoked the uprising generally known as the Bear Flag Revolt. En route to Washington, D.C., carrying dispatches from Frémont, Carson met Gen. Stephen W. Kearny, who pressed him into service as a guide for his command headed for California with presidential orders to take over the region for the United States. From then until the end of the war with Mexico (1848) Carson alternated fighting and guiding with dispatch-bearing to Washington, where his reputation for bravery, loyalty, and devotion to duty won for him many friends in high office.

Even though he was a noted Indian fighter, his fairness and his sympathy for the plight of the Indian made him an ideal choice for his duties as Indian agent at Taos in March 1854. But by 1861 he was back in the field to serve the cause of the Union in the U.S. Civil War in the Southwest, becoming Colonel Carson of the 1st New Mexico Volunteers. He was appointed superintendent of Indian affairs for Colorado Territory in January 1868, a position he held at the time of his death.

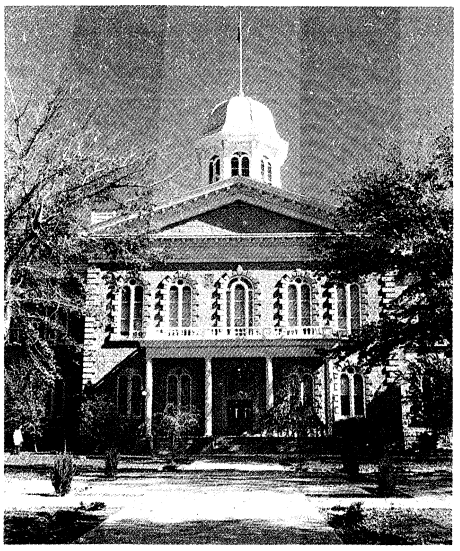
Carson's name is preserved variously throughout the Southwest, including Nevada's capital at Carson City; Ft. Carson, Colo.; and Carson Pass in California.

Carson, Rachel (Louise) (b. May 27, 1907, Springdale, Pa., U.S.—d. April 14, 1964, Silver Spring, Md.), U.S. biologist well known for her writings on environmental pollution and the natural history of the sea.

Carson received her M.A. from Johns Hopkins University in 1932 and did postgraduate work at Woods Hole Marine Biological Laboratory. A deep interest in wildlife from her childhood led Carson to a long career with the U.S. Bureau of Fisheries, later the U.S. Fish and Wildlife Service. In 1951 she published *The Sea Around Us,* which won the National Book Award. Her prophetic *Silent Spring* (1962) created a worldwide awareness of the dangers of environmental pollution. Among her other works are *Under the Sea-Wind* (1941) and *The Edge of the Sea* (1955).

Carson City, capital of Nevada, U.S., in Eagle Valley near the eastern foothills of the Sierra Nevada Range, 30 mi (48 km) south of Reno and 14 mi east of Lake Tahoe. Founded in 1858 on the site of Eagle Station (later Eagle Ranch), it was renamed for Christopher ("Kit") Carson, the frontiersman. It was made the seat of Carson County, Utah Territory, on March 1, 1861, a day before the Territory

of Nevada was created by the U.S. Congress. On Nov. 25, 1861, Carson City became the territorial capital and on Nov. 29 was made



State Capitol, Carson City, Nev.
Donald Dondero

county seat of the newly designated Ormsby County. When Nevada acquired statehood in 1864, Carson City became the seat of the new state government. In 1969 Carson City and Ormsby County were consolidated to form one governmental unit, the city and county of Carson City.

Mormon agriculturalists settling in the area influenced the city's development, as did wagon and stage routes over the nearby Sierra Nevada passes into California. In 1859 discovery of silver in the Virginia City area, 15 mi northeast, rapidly stimulated Carson City's economy. At nearby Empire, on the Carson River, mills treated the ore of the Comstock Lode (one of the world's richest deposits), brought down from Virginia City by the Virginia and Truckee Railroad, which maintained extensive shops at Carson City. Along with the Comstock, the railroad declined and was abandoned in 1950. To coin the immense silver output of the Comstock, the federal government established a mint at Carson City, which later became the Nevada State Museum.

Mining (copper and some silver) is still an economic factor. Livestock raising, tourism, government business, and legalized gambling are the economic mainstays. The Nevada State Capitol (1871) houses a collection of historic exhibits. Western Nevada Community College was established there in 1971. Inc. 1875. Pop. (1970) 15,468; (1980) 32,022.

Carstares, William, Carstares also spelled CARSTAIRS (b. Feb. 11, 1649, Cathcart, near Glasgow—d. Dec. 28, 1715, Edinburgh), Presbyterian minister and leader of the Scottish church at the time of the Revolution Settlement.

Carstares was ordained in exile in Holland. During the reign of Charles II he was twice arrested for subversive activities in England and Scotland. At the time of the Rye House plot, an unsuccessful attempt to overthrow Charles, he confessed his complicity under torture in Edinburgh but was allowed to return to Holland, where he became minister to an English-speaking congregation at Leiden (1685) and chaplain to Prince William of Orange. After William's accession to the English throne (the Settlement of 1688), Carstares headed the Church of Scotland and University of Edinburgh. Later he advised Queen Anne on the treaty uniting Scotland and England (1707) and successfully maintained the independent Presbyterian nature of the Church of Scotland.

Carstens, Asmus Jacob, Asmus Jacob also spelled ERASMUS JAKOB (b. May 10, 1754, Sankt Jürgen, near Schleswig, Den.—d. May 25, 1798, Rome), portrait and historical painter of the German Neoclassical school who did much to infuse a classical spirit into the arts of the late 18th century.

He studied at Copenhagen Academy (1776–83) but was largely self-educated. He went to Italy in 1783, where he was impressed by Leonardo da Vinci's "Last Supper" and Giulio Romano's frescoes in the Palazzo del Te in Mantua. He went to Berlin in 1787 and within three years became a professor at the Academy there. In 1792 he moved to Rome on a grant from the Prussian state to study fresco painting. There he was inspired by the works of Raphael and Michelangelo and strove for a noble and monumental style depicting classical themes.

Carstens often used scenes from Greco-Roman mythology as his themes. His subjects were taken from Homer, Pindar, Dante, and Shakespeare, among others. His public exhibition in Rome in 1795 of such paintings as "Night with Her Children Sleep and Death" (1795; Kunstsammlungen zu Weimar, Weimar, E.Ger.) drew critical acclaim and gained him so many supporters that he remained there until his death.

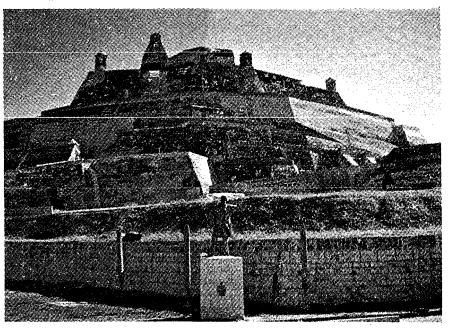
Carstensz, Mount, also called GUNUNG CARSTENSZ (Indonesia): *see* Jaya, Mount.

cart, two-wheeled vehicle drawn by a draft animal, used throughout recorded history by numerous societies for the transportation of freight, agricultural produce, refuse, and people. The cart, usually drawn by a single animal, was first known to be used by the Greeks and the Assyrians by 1800 BC (although it is generally assumed that such vehicles could have been used as early as 3500 BC as an extension of the invention of the wheel).

Carts have been made in several ways, with emphasis usually placed upon simplicity of construction. The shafts were frequently but extensions of the framework of the body, and, depending upon the nature of the load to be hauled, the body itself might simply consist of a few crossed wooden stakes or a sturdy box.

More recently, carts have been used as racing vehicles and for personal transport. Unlike the more primitive carts, these later vehicles were equipped with springs for the comfort of the rider.

Cartagena, capital of Bolívar department, northern Colombia, at the northern end of the Bahía (bay) de Cartagena. The old walled sections, including the 17th-century fortress of San Felipe de Barajas, lie on a peninsula and the island of Getsemaní, but the city now spreads over the islands of Manga and Manzanillo (site of the airport) and the mainland below the Cerro (hill) La Popa. In the old



The 17th-century fortress of San Felipe de Barajas, Cartagena, Colom.
Walter R. Aguiar—EB Inc.

section are the ornate cathedral, the church of San Pedro Claver (1603), the Palace of the Inquisition (1706), the main plaza, and the University of Cartagena (1827).

Founded in 1533, Cartagena de Indias gained fame after the mid-16th century when great fleets stopped annually to take on gold and other products of northern South America for convoy to Spain. The city became a centre for the Inquisition and a major slave market.

In 1811 the province of Cartagena declared its independence from Spain, and years of fighting followed. After falling into Spanish hands from 1815 to 1821, the city was recaptured by patriot forces. In the early national period, Cartagena continued as Colombia's leading port, but it was handicapped by inadequate connections with the interior. By the 1840s it had declined in population and commerce. In the 20th century it experienced renewed growth and is now Colombia's fifth largest city. Probably the most significant factor in Cartagena's revitalization was the opening of petroleum fields in the Río Magdalena Valley after 1917. The completion of the pipeline from Barrancabermeja to the Bahía de Cartagena in 1926, and the building of an oil refinery, helped make the city the country's chief oil port; platinum and coffee are other important exports. Manufactures include sugar, tobacco products, cosmetics, textiles, fertilizer, and leather goods. Tourism is of increasing importance. Pop. (1979 est.) 435,361.

Cartagena, port city, in the province and region of Murcia, southeastern Spain, the site of Spain's chief Mediterranean naval base. Its harbour, the finest on the east coast, is a deep, spacious bay dominated to seaward by four hills crowned with forts and approached by a narrow entrance guarded by batteries. The outer bay is sheltered by an island, Islote Escombrera. It was founded in the 3rd century BC on the site of an ancient Iberian settlement by the Carthaginian general Hasdrubal. After its capture by Publius Cornelius Scipio (later surnamed Africanus) in 209 BC, it flourished as the Carthago Nova of the Romans. In 425 it was pillaged by the Goths. Cartagena was a bishopric from about 400 to 1289, when the see was removed to Murcia. Under the Moors it became an independent principality, which was destroyed by Ferdinand II of Castile in 1243, restored by the Moors, and finally conquered by James I of Aragon in 1269. Its easily defended natural harbour lent itself to rebuilding, and in the 16th century Philip II made it a great naval port. It was a Loyalist naval base during the Spanish Civil War of 1936–39.

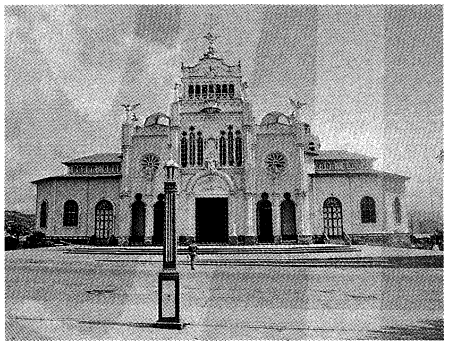
Parts of the old town wall remain, as does the ruined Castillo de la Concepción, built in the 12th century on Roman foundations; the city's archaeological museum contains Iberian, Greek, and Roman artifacts.

As a great commercial port, Cartagena was adversely affected during the early 20th century by the increasing importance of Barcelona, Málaga, and Alicante, all on the same coast. It exports some olive oil, dried fruits, minerals (lead, zinc, silver, iron, copper, sulfur), and esparto fibre. Fewer minerals were exported after the opening of an independent port in 1898 at Portman, a mining village on a sheltered bay 11 mi (18 km) east. Cartagena has, however, important smelting works; its manufactures include glass and esparto fabrics. As a naval base, it has an arsenal and extensive dockyards. Pop. (1981) 172,751.

Cartago, province, east central Costa Rica. Most of the territory of 1,000 sq mi (2,600 sq km) lies in the rugged Central and Talamanca cordilleras, though the northeastern portion dips toward the Caribbean lowlands. It contains the town of Turrialba, centre of the Inter-American Institute of Agricultural Sciences, which maintains a large experimental farm to study methods of increasing food

production in Latin America. The chief products of the province are coffee and potatoes. Cartago (*q.v.*) is the provincial capital and an important marketing centre. Pop. (1983 est.) 259,916.

Cartago, capital, Cartago province, east central Costa Rica. Lying at 4,720 ft (1,439 m) above sea level, the city is located on the fertile Meseta Central, at the foot of Irazú Volcano. Cartago was founded in 1563 and was the capital of Costa Rica until 1823. There are, however, no authentic colonial buildings since the town was attacked repeatedly by pirates during the 17th century and has also been damaged severely by earthquakes. The streets have been reconstructed along a grid pattern, and new buildings in colonial style have been



Basilica of Our Lady of the Angels, Cartago, Costa Rica
Ernst Jahn

erected. The Basilica of Our Lady of the Angels, patroness of Costa Rica, with a famous black Madonna, is a much frequented place of pilgrimage. Cartago is also known for its Sunday market. Nearby San José, the national capital, is accessible via the Pan-American Highway and the Costa Rica Railway. Pop. (1983 est.) 27,929.

Cartan, Élie-Joseph (b. April 9, 1869, Dolomieu, Fr.—d. May 6, 1951, Paris), French mathematician who greatly developed the theory of Lie groups and contributed to the theory of subalgebras.

In 1894 Cartan became a lecturer at the University of Montpellier, where he studied the structure of continuous groups introduced by the noted Norwegian mathematician Sophus Lie. He later examined theories of equivalence and their relation to the theory of integral invariants, mechanics, and the general theory of relativity. After he moved to the University of Lyon in 1896, he worked on linear associative algebra, developing general theorems based on the work of Benjamin Peirce of Harvard and exhibiting a subalgebra of the German mathematician Ferdinand Georg Frobenius. In 1912 Cartan became a professor at the Sorbonne, and a year later he discovered the spinors, complex vectors that are used to transform three-dimensional rotations into two-dimensional representations.

Although a profound theorist, Cartan was also able to explain difficult concepts to the ordinary student. Recognition of his work did not come until late in his life. He was made a member of the Académie des Sciences in 1931 and a fellow of the Royal Society of London in 1947. His works include *La Géométrie des espaces de Riemann* (1925; "The Geometry of Riemann Spaces") and *La Théorie des groupes continus et des espaces généralisés* (1935; "The Theory of Continuous Groups and Generalized Spaces").

Cartan, Henri(-Paul) (b. July 8, 1904, Nancy, Fr.), French mathematician who made fundamental advances in the theory of analytic functions.

Son of the distinguished mathematician Élie Cartan, Henri Cartan began his academic career as professor of mathematics at the Lycée Caen (1928–29). He was appointed deputy professor at the University of Lille in 1929 and two years later became professor of mathematics at the University of Strasbourg. In 1940 he joined the faculty of the University of Paris, where he remained until 1969, and from 1970 to 1975 he taught at Orsay.

In addition to his work on analytic functions, Cartan contributed to the theory of sheaves, homological theory, algebraic topology, and potential theory. His major works include *Homological Algebra* (1956) and *Elementary Theory of Analytic Functions of One or Several Complex Variables* (1963).

Carte, Richard D'Oyly (b. May 3, 1844, London—d. April 3, 1901, London), English impresario remembered for having managed the first productions of Gilbert and Sullivan operas, for elevating his era's musical taste, and for contributing to the development of theatre technology.

Originally a composer, Carte became a music manager, representing the French composer Gounod. After commissioning Gilbert and Sullivan to write *Trial by Jury* (1875), he formed the Comedy Opera Company Ltd. (1876) for the production of operettas, introducing to England works by Lecocq and Offenbach. In 1881 he founded the Savoy Theatre, home of the immensely popular Gilbert and Sullivan productions and London's first theatre to use electric lighting. In an attempt to establish serious opera, Carte built the Royal English Opera House (1887; now the Palace Theatre), for which Sullivan wrote *Ivanhoe* (1891). Despite subsequent commissions to other English composers (*e.g.,* Sir Frederic Hymen Cowen), that enterprise collapsed. After Carte's death, the touring companies he established, known as the D'Oyly Carte Opera Company, continued to produce Gilbert and Sullivan works.

carte-de-visite, calling card, especially one with a photographic portrait of the bearer, which was immensely popular in the middle of the 19th century. The carte-de-visite was originated by the Parisian portrait photographer André-Adolphe-Eugène Disdéri (1819–90?). In 1854 he patented the four-lensed carte-de-visite camera, which made eight 3.25- by 2.25-inch (8.44- by 5.69-centimetre) negatives on one full-sized plate. The large print made from that plate was cut up, and the small, inexpensive portraits were separately mounted on cards measuring about 4 by 2.5 in. to serve as visitors' cards.

Uncut print from a carte-de-visite negative by André-Adolphe-Eugène Disdéri, *c.* 1860
George Eastman House Collection

The carte-de-visite became a fad after the French emperor Napoleon III posed for Disdéri. Cartes-de-visite were often exchanged on birthdays and holidays, and the carte-de-visite album became a common feature of Victorian parlours. During the American Civil War, Mathew B. Brady and other photographers did a booming business in them in Washington, D.C., and New York City. After the 1860s the fashion for cartes-de-visite waned. The cartes of celebrities and royalty remain collectors items.

Carte du ciel (French: Map of the Heavens), projected photographic mapping of some 10,000,000 stars in all parts of the sky that was planned to include all stars of the 14th magnitude or brighter and to list in an associated catalog all of the 12th magnitude or brighter. The plan, devised about 1887 by Amédée Mouchez, director of the Paris Observatory, involved the cooperation of 18 observatories located around the world in an attempt to photograph the entire sky on plates, each covering an area only 2° square. Technical advances in the 20th century have allowed stellar positions to be accurately determined from single photographs covering much larger areas of the sky, and the *Carte du ciel,* in which decades of labour were invested, remains incomplete. Its accompanying catalog was essentially finished by 1958.

cartel, association of independent firms or individuals for the purpose of exerting some form of restrictive or monopolistic influence on the production or sale of a commodity or group of commodities. The most common arrangements are aimed at regulating prices or output or dividing up markets. Members of a cartel maintain their separate identities and financial independence while engaging in common policies. Their common interest in exploiting the monopoly position that the combination helps to maintain is the source of the Cartel's stability. Combinations of cartel-like form originated at least as early as the Middle Ages, and some writers claim to have found evidences of cartels even in ancient Greece and Rome.

The main reason usually advanced for the establishment of cartels is for protection from "ruinous" competition, which, it is alleged, causes the entire industry's profits to be too low. Cartelization is said to provide for distributing fair shares of the total market among all competing firms. The most common practices employed by cartels in maintaining and enforcing their industry's monopoly position include the fixing of prices, the allocation of sales quotas or exclusive sales territories and productive activities among members, the guarantee of minimum profit to each member, and agreements on the conditions of sale, rebates, discounts, and terms.

Cartels result in a price to the consumer higher than the competitive price. Cartels may also maintain inefficient firms in an industry and prevent the adoption of cost-saving technological advances that would result in lower prices. Though a cartel tends to establish a high degree of price stability as long as it lasts, it is subject to conflicts of interest among its members; a breakdown of the cartel may lead to violent price fluctuations.

In Germany the cartel has been the most common form of monopolistic organization in modern times. German cartels are usually horizontal combinations of producers, firms that turn out competing goods; sometimes, however, they consist of so-called integrated enterprises, which range from the production of raw material to intermediate goods and to finished commodities; such combinations of firms constitute vertical integration. A strong impetus to form combinations came from German industry's increasing desire to dominate foreign markets in the decade before World War I. Tariff protection kept domestic prices high, enabling the firms to sell abroad at a loss.

During both world wars the German governments favoured cartels to facilitate the transition to a war economy. After World War II, cartels and other forms of restraint of trade

were outlawed until the end of Allied occupation. Legislation that was adopted in 1957 forbade various forms of "restriction of competition" but exempted from control certain cartel agreements—*e.g.*, export cartels.

International cartel agreements, normally among firms enjoying monopoly positions in their own countries, were first concluded in the period between World Wars I and II. Most such cartels, especially those in which German firms were partners, were dissolved during World War II, but some continued to exist. Later, some steps were taken in the chemical and allied fields to revive some of the old cartel agreements. Because each government views cartels differently and because the various partners of an international combination are subject to different national laws, a uniform policy is difficult to establish.

BIBLIOGRAPHY. Ervin Hexner and Adelaide Walters, *International Cartels* (1945); George W. Stocking *et al.*, *Cartels in Action* (1946); Alfred Plummer, *International Combines in Modern Industry* (1951).

Cartel des Gauches (French political faction): *see* Gauches, Cartel des.

Carter FAMILY, singing group consisting of Alvin Pleasant Carter, known as A.P. Carter (b. April 15, 1891, Maces Spring, Va., U.S.—d. Nov. 7, 1960, Kentucky), his wife Sara, *née* Dougherty (b. July 21, 1898, Flatwoods, Va.—d. Jan. 8, 1979, Lodi, Calif.), and his sister-in-law Maybelle Carter, *née* Addington (b. May 10, 1909, Nickelsville, Va.—d. Oct. 23, 1978, Nashville, Tenn.), a leading force in the spread and popularization of Appalachian Mountain folk songs.

The family's recording career began in 1927 in response to an advertisement placed in a local newspaper by a talent scout for Victor records. Over the next 14 years, with two of Sara's children and three of Maybelle's (Helen, June, and Anita) also appearing, they recorded more than 300 songs for various labels, representing a significant cross section of the mountain-music repertory, including old ballads and humorous songs, sentimental pieces from the 19th and early 20th century, and many religious pieces. They later performed extensively on radio and popularized many songs that became standards of folk and country music; some of these were "Jimmy Brown, the Newsboy," "Wabash Cannonball," "It Takes a Worried Man To Sing a Worried Song," and "Wildwood Flower."

After the Carter family's original group broke up in 1941, subsequent groups of one or more of the original members plus various relatives continued to perform under the Carter Family name. Maybelle ("Mother") Carter performed regularly with her daughters, as a soloist, and later with her son-in-law, the singer Johnny Cash. The Original Carter Family was the first group admitted to the Country Music Hall of Fame.

Carter, Elizabeth (b. Dec. 16, 1717, Deal, Kent, Eng.—d. Feb. 19, 1806, London), English poet, translator, and member of a famous group of literary "bluestockings" who gathered around Mrs. Elizabeth Montagu.

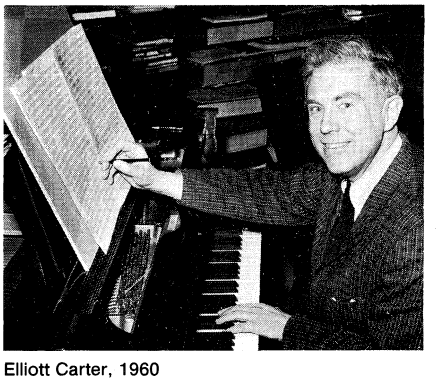
Carter was the daughter of a learned cleric who taught her Latin, Greek, and Hebrew. She was not a precocious child, but she persevered with an industry that affected her health, studying also French, German, Italian, Portuguese, Arabic, astronomy, ancient geography, ancient and modern history, and music, as well as the housewifery that caused Dr. Samuel Johnson to say "My old friend, Mrs. Carter, could make a pudding as well as translate Epictetus from the Greek, and work a handkerchief as well as compose a poem." Her *Poems upon Particular Occasions* were published in 1738 and *Poems on Several Occasions* in 1762. It was her translations, however, that ensured her reputation. In 1749 she undertook her most considerable work, a

Elizabeth Carter, portrait by Sir Thomas Lawrence; in the National Portrait Gallery, London
By courtesy of the National Portrait Gallery, London

translation, *All the Works of Epictetus Which Are Now Extant*, published in 1758.

Carter, Elliott (Cook, Jr.) (b. Dec. 11, 1908, New York City), American composer whose erudite style and novel principles of polyrhythm, called metrical modulation, won worldwide attention. He was twice awarded the Pulitzer Prize for music, in 1960 and 1973.

Born of a wealthy family, Carter was educated at Harvard University, where he first majored in English and later studied music under Walter Piston and Gustav Holst. His interest in music dated from his teens and was fostered by the composer Charles Ives, who was Carter's neighbour in 1924–25.



Elliott Carter, 1960
AP/Wide World Photos

Carter began composing seriously in 1933 while studying in Paris with Nadia Boulanger. His early works displayed an original diatonic style that was strongly influenced by the rhythmic and melodic patterns of Greek music and prose, reflecting Carter's interest in classical literature. Among his early works were choral and instrumental pieces and a ballet. His *First Symphony* dates from 1942, as does an especially representative work of this period, *The Defense of Corinth,* for narrator, men's chorus, and two pianos.

His *Piano Sonata* (1945–46) marked a turning point in Carter's stylistic development; in it he used a complex texture of irregularly cross-accented counterpoint within a large-scale framework. The *Cello Sonata* (1948) found the principles of metrical modulation well-established. The technique culminated in his *String Quartet No. 1* (1951), characterized by the densely woven counterpoint that became a hallmark of his style. Both that quartet and the *String Quartet No. 2* (1959; Pulitzer Prize) became part of the standard repertory. The *Variations for Orchestra* (1954–55) marked another phase of Carter's development, leading to a serial approach to intervals and dynamics. The *Double Concerto* for harpsichord, piano, and two chamber orchestras (1961), which won rare praise from Igor Stravinsky, displayed Carter's interest in unusual instrumentation and canonic texture (based on melodic imitation). The conflict generated between the two orchestral groups and the great difficulty of the concerto were mirrored in the *Piano Concerto* (1964–65). *Concerto for Orchestra* was first performed in 1970 and the *String Quartet No. 3* (Pulitzer Prize) in 1973. His *Brass Quintet* premiered in 1974, *Duo for Violin and Piano* in 1975, *A Mirror on Which to Dwell*, song cycle based on poems of Elizabeth Bishop, in 1975, and *A Symphony of Three Orchestras*, inspired by Hart Crane's *The Bridge*, in 1977.

Carter, Howard (b. May 9, 1873, Swaffham, Norfolk, Eng.—d. March 2, 1939, London), British archaeologist who made one of the richest and most celebrated contributions to Egyptology: the discovery (1922) of the largely intact tomb of King Tutankhamen.

At the age of 17 Carter joined the British-sponsored archaeological survey of Egypt. He made (1893–99) drawings of the sculptures and inscriptions at the terraced temple of Queen Hatshepsut in ancient Thebes. He next served as inspector general of the Egyptian antiquities department. While supervising excavations in the Valley of the Tombs of the Kings in 1902, he discovered the tombs of Hatshepsut and Thutmose IV.

Around 1907 he began his association with the 5th Earl of Carnarvon, a collector of antiquities who had sought out Carter to supervise excavations in the valley. On Nov. 4, 1922, Carter found the first sign of what proved to be Tutankhamen's tomb, and three days later he reached its sealed entrance. For the next 10 years Carter supervised the removal of its contents, most of which are housed in the Cairo Museum. He published *Thoutmôsis IV* (1904) and *The Tomb of Tut-ankh-Amen* (1923–33) with, respectively, P.E. Newberry and A.C. Mace. An account of the Tutankhamen excavation may be found in C.W. Ceram's *Gods, Graves, and Scholars* (2nd ed., 1967).

Carter, Jimmy, original name JAMES EARL CARTER, JR. (b. Oct. 1, 1924, Plains, Ga.), 39th president of the United States (1977–81).

The son of a peanut warehouser and Georgia state legislator, Carter graduated from the U.S. Naval Academy at Annapolis in 1946. He served in the navy for seven years, five of them on submarines, working with Adm. Hyman G. Rickover on the nuclear submarine program. At his father's death in 1953 he resigned his commission and returned to Georgia to manage the family peanut farm operations. He won election as a Democrat to the Georgia State Senate in 1962 and was re-elected in 1964. Carter won the governorship of Georgia in 1970. In his inaugural address he announced that "the time for racial discrimination is over" and proceeded to open Georgia's government offices to blacks and women. He reorganized the existing maze of state agencies and consolidated them into larger units while introducing stricter budgeting procedures for them.

Carter announced his candidacy for the Democratic nomination for president in 1974, just before his term as governor ended. Though lacking a national political base or major backing, Carter managed through tireless and systematic campaigning to assemble a broad constituency whose votes enabled him to win the Democratic nomination in July 1976. Carter chose the liberal U.S. senator Walter F. Mondale of Minnesota as his running mate and defeated the incumbent Republican president, Gerald R. Ford, in November 1976, winning 51 percent of the popular vote and garnering 297 electoral votes to Ford's 240.

During his administration, Carter tried to re-

inforce his image as a man of the people. He adopted an informal style of dress and speech in public appearances, held frequent press conferences, and reduced the pomp of the presidency. Carter's ambitious programs for social, administrative, and economic reform, however, met with opposition in Congress despite the Democratic majorities in both the House of Representatives and the Senate. By 1978 Carter's initial popularity had dissipated in the face of his inability to convert his ideas into legislative realities.

In foreign affairs, although Carter's championship of international human rights received prominent attention, his major achievements were on the more pragmatic level of patient diplomacy. In 1977 he obtained two treaties between the United States and Panama that would give the latter control over the Panama Canal at the end of 1999 and would guarantee the neutrality of that waterway thereafter. On Jan. 1, 1979, Carter established full diplomatic relations between the United States and China and simultaneously broke official ties with Taiwan. In 1978 Carter brought

Jimmy Carter, 1979
UPI/Bettmann Newsphotos

Egyptian president Anwar el-Sādāt and Israeli prime minister Menachem Begin together at Camp David and secured their agreement to the Camp David accords, which ended the state of war that had existed between the two countries since Israel's founding in 1948. The accords provided for the establishment of full diplomatic and economic relations between them on condition that Israel return the occupied Sinai Peninsula to Egypt. In 1979, also, Carter signed with Soviet leader Leonid Brezhnev in Vienna a new bilateral strategic arms limitation treaty (SALT II) that would establish parity in strategic nuclear weapons delivery systems between the two superpowers on terms that could be adequately verified. (Carter removed the treaty from consideration by the Senate in January 1980 after the Soviet Union invaded Afghanistan.)

However, these substantial foreign policy successes were soon overshadowed by a serious crisis in foreign affairs and by a groundswell of popular discontent over the results of Carter's economic policies. On Nov. 4, 1979, a mob of Iranian students stormed the U.S. embassy in Tehrān and took the diplomatic staff there hostage. Their actions were soon sanctioned by Iran's revolutionary government, and a standoff developed between the United States and Iran over the issue of the captive diplomats. Carter's response was to temporize and try to negotiate the hostages' release while avoiding a direct confrontation with the Iranian government. This stance initially met with public approval, but by the time a secret U.S. military mission in April 1980 failed to rescue the hostages, Carter's inability to obtain the hostages' release had become a major political liability for him. Carter responded more forcibly to the Soviet Union's invasion of Afghanistan in 1979 when he placed an embargo on the shipment of American grain to that country and pressed for a U.S. boycott of the 1980 summer Olympics that were due to be held in Moscow.

On the home front, Carter's management of the economy was arousing widespread concern. The inflation rate had climbed higher each year since he took office, rising from 6 percent in 1976 to more than 12 percent by 1980. Unemployment remained high at 7.5 percent, and volatile interest rates reached a high of 20 percent or more twice during 1980.

Despite the apparent failure of his domestic reform and economic policies and the diplomatic crises of 1979, Carter won the Democratic presidential nomination in 1980. But public confidence in Carter's executive abilities had fallen to an irretrievable low, and in the elections held that November he was overwhelmingly defeated by Republican nominee Ronald W. Reagan, winning only 41 percent of the popular vote. In 1982 Carter published *Keeping Faith,* a volume of presidential memoirs, and in 1985 *The Blood of Abraham: Insights Into the Middle East* appeared.

Carter, Mrs. Leslie, *née* CAROLINE LOUISE DUDLEY (b. June 10, 1862, Lexington, Ky., U.S.—d. Nov. 13, 1937, Los Angeles), actress with a sweeping, highly dramatic style, often called "the American Sarah Bernhardt."

Married at 18, she undertook a stage career nine years later after her husband divorced her for infidelity. She had a successful career under the management of the theatrical producer and playwright David Belasco, who taught her acting before starring her in such plays as *The Heart of Maryland* (1895–98); *Zaza* (1898–99), from the French play by Simon Berton; and Belasco's *Madame Du Barry* (1901). The partnership ended in 1906 when she remarried; Belasco refused ever to speak to her again. In her days with Belasco she played only six roles. Although she continued acting into her 70s, she never again achieved her former success.

Carteret, Sir George, BARONET (b. *c.* 1610, probably Jersey, Channel Islands—d. January 1680, New Jersey [U.S.]), British Royalist politician and colonial proprietor of New Jersey.

A British naval officer and lieutenant governor of Jersey, Carteret made the island a Royalist stronghold during the English Civil War and privateered in the Stuart cause, thereby winning a knighthood (1644) and a baronetcy (1645). After the capture of the island in 1651 by a Parliamentary force, he went into exile in France, where he served in the French navy, but he returned to England at the Restoration (1660). There he became a powerful administrator and legislator. Censured by Parliament for laxity in account keeping, he gave up the naval treasury in 1667, though he subsequently held other important posts.

In 1663 Carteret was one of the eight original proprietors to whom King Charles II granted the area of Carolina in North America. The following year he received property rights to half of New Jersey, named for his birthplace in his honour. Friction in the colony and disappointing financial returns led the other owner, John Berkeley, 1st Baron Berkeley of Stratton, to sell out to the Quakers in 1674. With them Carteret agreed upon a division of the colony in 1676; he kept East Jersey, which his heirs sold to William Penn and other Quakers two years after his death.

Carteret, John: *see* Granville, John Carteret, 1st Earl.

Cartesianism, the philosophical and scientific traditions derived from the writings of the French philosopher René Descartes.

A brief treatment of Cartesianism follows. For full treatment, *see* MACROPAEDIA: Cartesianism, Descartes and.

Descartes is considered to be the father of modern philosophy in that he decisively broke with the basic philosophical assumptions of Scholastic philosophy, derived from the works of Aristotle and St. Thomas Aquinas, which had dominated European thought throughout the later medieval period. Descartes put at the centre of philosophical concern two related problems: first, whether a form of human knowledge that is immune to all skepticism is possible; and second, whether one can make sense of the nature of mind and its relationship to matter. These have remained central problems in Western philosophy and can be said to permeate systems of thought that are not normally described as Cartesian.

Cartesians have generally supported Descartes's central doctrines—namely, that reality can be divided into mind, the essence of which is thinking, and matter, the essence of which is extension in three dimensions; that the ideas of God, mind, and matter are innate and are not derived from experience; and that the correct method in arriving at philosophical truth is to doubt everything until one can find a proposition or idea that is indubitable, clear, and distinct. Most of Descartes's followers agreed also with Descartes in believing that there was at least one such proposition, namely the individual's recognition that he is thinking and that therefore he exists: *Cogito, ergo sum* ("I think, therefore I am").

Most Cartesians believed that from this single indubitable truth one could refute skepticism and build a system of philosophy and science that depended on human reason alone.

But almost immediately Cartesian philosophy was faced with a challenge to one of its central doctrines about the duality of mind and matter. If, as Descartes maintained, mind and matter are distinct, how is any interaction possible between them? One of the most important thinkers in the Cartesian tradition, Nicolas Malebranche, attempted to solve this problem by arguing that indeed mind and matter cannot interact because they are distinct. But he explained that when human beings believe that certain mental acts cause certain bodily actions, it is because on every such occasion God causes their physical actions to correspond to their mental acts and vice versa. This doctrine became known as Occasionalism.

Critics also argued that if causal interaction between the mind and the body and between mind and matter in general does not take place, then the mind cannot have direct experience of the external world. This leaves open the possibility that one might have ideas about the external world which do not correspond at all to the real external world. One solution to this problem was to assert that only the existence of an omnipotent, benign, and constantly watchful God could ensure that one's ideas about reality and reality itself were in harmony. This weakened the greatest intellectual appeal of the Cartesian system—its claim to have developed a philosophical and scientific system based entirely on human reason.

Other features of the Cartesian system—in particular the notion that animals are mere machines and that after death, when the connection between the mind and the body is broken, the mind, or soul, has no memory of individuals, thus making the reunion of loved ones impossible—helped to make the Cartesian system increasingly unpopular in the late 17th century. Continued Cartesian-inspired attacks on Scholastic philosophy even led to the Roman Catholic Church banning the teaching of Cartesianism.

By the later 17th century the Cartesian metaphysical system had lost much of its appeal. However, the exploration of the relationship between mind and matter has remained an important legacy of Cartesianism, as has the

search for a philosophical method that involves no metaphysical or religious presuppositions. The status of Descartes's argument "I think, therefore I am" has prompted interesting discussions, such as whether this proposition, using language as it does, itself presupposes the existence of a community of speakers.

In recent years the American linguist Noam Chomsky has given new currency to Descartes's view that central ideas must be innate, arguing that only the existence of innate mental structures can explain how children quickly develop the ability to generate an infinite number of new, semantically correct sentences, most of which they have not encountered before.

Beyond these specific philosophical topics Cartesianism has remained an important, pervasive influence on Western philosophy, stressing as it does the importance of the quest for certainty based on reason alone, and the supreme virtue of mental and linguistic clarity.

Carthage, Phoenician KART-HADASHT, Latin CARTHAGO, great city of antiquity, traditionally founded on the north coast of Africa by the Phoenicians of Tyre in 814 BC. It is now a residential suburb of the city of Tunis. Its Phoenician name means New Town.

A brief treatment of ancient Carthage follows. For full treatment, *see* MACROPAEDIA: North Africa: *History.*

Various traditions concerning the foundation of Carthage were current among the Greeks, who called the city Karchedon; but the Roman tradition is better known because of the *Aeneid,* which tells of the city's foundation by the Tyrian princess Dido, who fled from her brother Pygmalion (the name of a historical king of Tyre). The inhabitants were known to the Romans as Poeni, a derivation from the word Phoenikes (Phoenicians), from which the adjective Punic is derived.

The date of the foundation of Carthage was probably exaggerated by the Carthaginians themselves, for it does not agree with the archaeological data. Nothing earlier than the last quarter of the 8th century BC has been discovered, a full century later than the traditional foundation date.

The site chosen for Carthage in the centre of the shore of the Gulf of Tunis was ideal: the city was built on a triangular peninsula covered with low hills and backed by the Lake of Tunis with its safe anchorage and abundant supplies of fish. The site of the city was well protected and easily defensible. On the south the peninsula is connected to the mainland by a narrow strip of land. The ancient citadel, the Byrsa, was on a low hill overlooking the sea. Some of the earliest tombs have been found there, though nothing remains of Carthage's domestic and public buildings.

The standard of cultural life enjoyed by the Carthaginians was probably far below that of the larger cities of the classical world. Punic interests were turned toward commerce. In Roman times Punic beds, cushions, and mattresses were regarded as luxuries, and Punic joinery and furniture were copied. Much of the revenue of Carthage came from its exploitation of the silver mines of North Africa and southern Spain, begun as early as 800 BC.

From the middle of the 3rd century to the middle of the 2nd century BC, Carthage was engaged in a series of wars with Rome. These wars, which are known as the Punic Wars (*q.v.*), ended in the complete defeat of Carthage by Rome. When Carthage finally fell in 146 BC, the site was plundered and burned, and all human habitation there was forbidden.

In 122 BC the Roman Senate entrusted Gaius Gracchus and Marcus Fulvius Flaccus with the foundation of a colony on the site of Carthage. Though the venture was unsuccessful, Julius Caesar later sent a number of landless citizens there, and in 29 BC Augustus centred the administration of the Roman province of Africa at the site. Thereafter it became known as Colonia Julia Carthago, and it soon grew prosperous enough to be ranked with Alexandria and Antioch. Carthage became a favourite city of the emperors, though none resided there. Of its history during the later empire very little is known, but from the mid-3rd century the city began to decline.

From the end of the 2nd century it had its own Christian bishop, and among its luminaries were the Church Fathers Tertullian and St. Cyprian. Throughout the 4th and 5th centuries Carthage was troubled by the Donatist and Pelagian controversies.

In AD 439 the Vandal ruler Gaiseric entered almost unopposed and plundered the city. Gelimer, the last Vandal king, was defeated at nearby Decimum by a Byzantine army under Belisarius, who entered Carthage unopposed (AD 533). Carthage, after its capture by the Arabs in 705, was totally eclipsed by the new town of Tunis.

Though Roman Carthage was destroyed, much of its remains can be traced, including the outline of many fortifications and an aqueduct. The former Byrsa area was adorned with a large temple dedicated to Juno, Jupiter, and Minerva, and near it stood a temple to Asclepius. Also on the Byrsa site stood an open-air portico, from which the finest Roman sculptures at Carthage have survived. Additional remains of the Roman town include an odeum, another theatre constructed by Hadrian, an amphitheatre modeled on the Roman Colosseum, numerous baths and temples, and a circus.

The Christian buildings within the city, with the exception of a few Vandal structures, are all Byzantine. The largest basilica was rebuilt in the 6th century on the site of an earlier one. Churches probably existed during the 3rd and 4th centuries, but of these no traces remain.

Carthage, city, seat of Hancock county, western Illinois, U.S., near the Mississippi River. Laid out in 1833 and named for the ancient North African city, the community was hostile to the Mormons who had settled at nearby Nauvoo. On June 27, 1844, Joseph Smith, the founder of Mormonism, and his brother Hyrum, who were in the Carthage City Jail awaiting trial on charges of treason, were shot to death by a mob that stormed the building. This act elevated Smith to martyrdom, and the jail is preserved as a monument. The city is an agricultural trading centre and is the seat of Robert Morris (junior) College (1965). Inc. 1837. Pop. (1984 est.) 2,946.

Carthage, city, seat of Jasper county, southwestern Missouri, U.S. It lies along Spring River, just east of Joplin. Established in 1842, it was named for ancient Carthage. During the Civil War, it was a centre of border warfare and was destroyed by Confederate guerrillas in 1863; it was rebuilt in 1866. Carthage is an agricultural-trade centre (fruits, small grains, dairy products) and is noted for its gray-marble quarries; diversified manufactures include clothing, shoes, spring wire products, and explosives. The stages of the Civil War Battle of Carthage (July 5, 1861) are indicated by historic markers. Carthage was the birthplace of Belle Starr, a woman outlaw who joined Confederate guerrilla leader William C. Quantrill's bushwhackers. Inc. city, 1873. Pop. (1986 est.) 11,325.

Carthage, Exarchate of, semiautonomous African province of the Byzantine Empire, centred in the city of Carthage, in North Africa. It was established in the late 6th century by the Byzantine emperor Maurice (reigned 582–602) as a military enclave in Byzantine territory occupied largely by African Berbers.

The exarch (governor), appointed by the emperor, was endowed with unlimited military and civil power but was expected to represent and enforce imperial policies. Though a military governor, he did not immediately replace all the civil officials; they continued to function much as they had before but now acted under the exarch's orders.

Such an office presented the emperor with a potential rival. In 610 the ruthless domestic practices and weak foreign policy of the emperor Phocas (reigned 602–610) were challenged by the Exarch of Carthage. An African fleet commanded by the exarch's son, Heraclius, sailed to Constantinople. Receiving the support of the masses, he overthrew Phocas and ascended the throne to form a new dynasty.

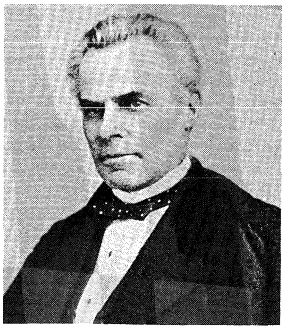
The Exarchate of Carthage successfully repulsed Arab attacks in the early 7th century, but it succumbed in 697–698. It has been viewed as the beginning of the Byzantine theme (province or district) organization, utilized from the 7th century as a means of provincial administration.

Carthaginian Wars: *see* Punic Wars.

Carthusian, member of ORDER OF CARTHUSIANS (O.Cart.), an order of monks founded by St. Bruno of Cologne in 1084 in the valley of Chartreuse, north of Grenoble, Fr. The Carthusians, who played an important role in the monastic-reform movement of the 11th and 12th centuries, combine the solitary life of hermits with a common life within the walls of a monastery. The monks live in individual cells, where they pray, study, eat, and sleep, gathering in the church only for the night office, morning mass, and afternoon vespers. They eat together on Sundays and at great feasts, when they also have a period of conversation; and once a week they take a long walk together. The monks wear hair shirts and practice total abstinence from meat, and, on Fridays and other fast days, they take only bread and water. The lay brothers' life is also strictly ordered but is lived in community. At the Grande Chartreuse, as the motherhouse is known, the lay brothers distill the liqueur that bears the name of the motherhouse and of which the profits are distributed to neighbouring religious causes and charities. Carthusian nuns, with a few monasteries in France and Italy, are also strictly cloistered and contemplative. The Carthusians spread slowly, but, by 1521, the order numbered 195 houses in every country of Catholic Europe. Vocations to Carthusian solitude are rare; it is the one form of communal religious life that has never required and never experienced reform.

Cartier, Sir George Étienne, BARONET (b. Sept. 6, 1814, St. Antoine, Lower Canada [now Quebec]—d. May 20, 1873, London), statesman, Canadian prime minister jointly with Sir John Macdonald (1858–62), and promoter of federation and the improvement of Anglo-French relations in Canada.

Cartier practiced as a lawyer until 1837, when he took part in the rebellion that sent



George Étienne Cartier, 1867
By courtesy of the Public Archives of Canada

him into several months of exile in the United States. Elected as a Liberal to the Canadian Legislative Assembly in 1848, he was appointed provincial secretary in 1855 and two years later attorney general for Canada East (formerly Lower Canada).

His alliance with Macdonald, in which Cartier represented Canada East, developed the Liberal-Conservative Party in Canada. He promoted many useful measures, including the abolition of seigneurial tenure (estates held by feudal tenure) in Canada East and the codification of civil law. He was involved with the building of the Grand Trunk Railway through eastern Canada and the resolve to build the Canadian Pacific Railway. Despite great opposition, he carried his native province into federation by 1867, and he was created a baronet of the United Kingdom the following year.

As minister of militia and defense in Macdonald's first Confederation Cabinet, Cartier reformed the nation's military land forces, but a political disagreement with the Roman Catholic Church brought his defeat in the 1872 election. Another seat was found for him, but he died before he could serve.

Cartier, Jacques (b. 1491, Saint-Malo, Brittany, Fr.—d. Sept. 1, 1557, near Saint-Malo), French mariner, whose explorations of the North American coast and the St. Lawrence River (1534, 1535, 1541–42) laid the basis for later French claims to Canada. He appears also to have voyaged to Brazil.

When King Francis I of France decided in 1534 to send an expedition to explore the northern lands in the hope of discovering gold, spices, and a passage to Asia, Cartier received the commission.

Cartier sailed from Saint-Malo on April 20, 1534, with two ships and 61 men; he explored the Gulf of St. Lawrence as far as Anticosti Island, then seized two Indians at Gaspé and sailed back to France. His report piqued the curiosity of Francis I sufficiently for him to send Cartier back the following year, with three ships and 110 men, to explore further. Guided by the two Indians he had brought back, he sailed up the St. Lawrence as far as Quebec and established a base near an Iroquois village. In September he proceeded with a small party as far as the island of Montreal, where navigation was barred by rapids. He was warmly welcomed by the resident Iroquois, but he spent only a few hours among them before returning to winter at his base. He had, however, learned from the Indians that two rivers led farther west to lands where gold, silver, copper, and spices abounded.

The severity of the winter came as a terrible shock, Quebec being farther south than Paris and no Europeans since the Vikings having wintered that far north on the American continent. Scurvy claimed 25 of Cartier's men. To make matters worse, the explorers earned the enmity of the Iroquois. Thus, in May, as soon as the river was free of ice, they treacherously seized some of the Iroquois chiefs and sailed for France. Cartier was able to report only that great riches lay farther in the interior and that a great river, said to be 800 leagues (about 2,000 miles [3,200 kilometres]) long, possibly led to Asia.

War in Europe prevented Francis I from sending another expedition until 1541. This time, to secure French title against the counterclaims of Spain, he commissioned a nobleman, Jean-François de La Rocque de Roberval, to establish a colony in the lands discovered by Cartier, who was appointed Roberval's subaltern. Cartier sailed first, arriving at Quebec on August 23; Roberval was delayed until the following year. Cartier again visited Montreal, but as before he remained only a few hours and failed to go even the few miles necessary to get beyond the rapids. The subsequent maps based on the knowledge he provided fail to indicate that he had reached a large island at the confluence of the Ottawa and St. Lawrence rivers.

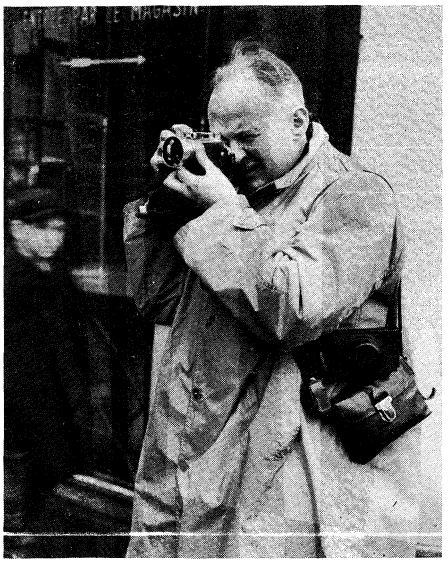
The winter at his new base above Quebec proved as severe as the earlier one. Cartier appears to have been unable to maintain discipline among his men, and their actions again aroused the hostility of the local Indians. But what were thought to be gold and diamonds were found in abundance. In the spring, not waiting for Roberval to arrive with the main body of colonists, Cartier abandoned the base and sailed for France. En route he stopped at Newfoundland, where he encountered Roberval, who ordered him back to Quebec. Cartier, however, stole away during the night and continued back to France. There, his gold and diamonds were found to be dross. Roberval enjoyed no better success. After one winter he abandoned the plan to found a colony and returned to France. The disappointment at these meagre results was very great. Not for more than half a century did France again show interest in these new lands.

Cartier received no new commissions from the crown. He apparently spent his remaining years attending to his business affairs at his estate near Saint-Malo. His claim to fame rests on his exploration of the St. Lawrence River to the height of navigation. Yet his failure to proceed any farther (when it would have been easy to do so), his treacherous dealings with the Iroquois, and his leaving Roberval in the lurch detract somewhat from his stature.

(W.J.E.)

BIBLIOGRAPHY. The journals of Cartier's voyages, in original and translation, were edited by H.P. Biggar, *The Voyages of Jacques Cartier* (1924), as was *A Collection of Documents Relating to Jacques Cartier and the Sieur de Roberval* (1930). Bernard G. Hoffman, *Cabot to Cartier* (1961), critically examines the source material. The best account of Cartier's voyages is in Marcel Trudel, *Histoire de la Nouvelle-France: Les vaines tentatives 1524–1603* (1963). Briefer accounts, in English, are contained in J.B. Brebner, *The Explorers of North America* (1933); and W.J. Eccles, *The Canadian Frontier, 1534–1760* (1969).

Cartier-Bresson, Henri (b. Aug. 22, 1908, Chanteloup, Fr.), French photographer whose humane, spontaneous photographs helped establish photojournalism as an art form. His



Cartier-Bresson
Jean Marquis—Magnum

theory that photography can capture the meaning beneath outward appearance in instants of extraordinary clarity is perhaps best expressed in his book *Images à la sauvette* (1952; *The Decisive Moment*).

Cartier-Bresson was born and attended school in a village not far from Paris. In 1927–28 he studied in Paris with André Lhote, an artist and critic associated with the Cubist movement. Lhote implanted in him a lifelong interest in painting, a crucial factor in the education of his vision. In 1929 Cartier-Bresson went to Cambridge, where he studied literature and painting.

As a boy, Cartier-Bresson had been initiated into the mysteries of the simple "Brownie" snapshot camera. But his first serious concern with the medium occurred in about 1930, after seeing the work of two major 20th-century photographers, Eugène Atget and Man Ray. Making use of a small allowance, he travelled in Africa in 1931, where he lived in the bush, recording his experiences with a miniature camera. There, he contracted blackwater fever, necessitating his return to France. The portability of a small camera and the ease with which one could record instantaneous impressions must have struck a sympathetic chord, and in 1933 he purchased his first 35-millimetre Leica. The use of this type of camera was particularly relevant to Cartier-Bresson. It lent itself not only to spontaneity but to anonymity as well. So much did Cartier-Bresson wish to remain a silent, and even unseen, witness, that he covered the bright chromium parts of his camera with black tape to render it less visible, and he sometimes hid the camera under a handkerchief. The man was similarly reticent about his life and work.

In more than 40 years as a photographer, Cartier-Bresson wandered continually around the world. But there was nothing compulsive about his travels, and he explicitly expressed a desire to move slowly, to "live on proper terms" in each country, to take his time, so that he became totally immersed in the environment.

In 1937, the year of his marriage to Ratna Mohini, Cartier-Bresson produced a documentary film, his first, on medical aid in the Spanish Civil War. The date also marked his first reportage photographs made for newspapers and magazines. His enthusiasm for filmmaking was further gratified when, from 1936 to 1939, he worked as an assistant to the film director Jean Renoir in the production of *Une Partie de campagne* ("Picnic") and *La Règle du jeu* (*The Rules of the Game*). As a photographer he felt indebted to the great films he saw as a youth. They taught him, he said, to choose precisely the expressive moment, the telling viewpoint. The importance he gave to sequential images in still photography may be attributed to his preoccupation with film.

In 1940, during World War II, Cartier-Bresson was taken prisoner by the Germans. He escaped in 1943 and the following year participated in a French underground photographic unit assigned to record the German occupation and retreat. In 1945 he made a film for the U.S. Office of War Information, *Le Retour*, which dealt with the return to France of released prisoners of war and deportees.

Though Cartier-Bresson's photographs had been exhibited in 1933 in the prestigious Julien Levy Gallery in New York City, a more important tribute was paid to him in 1947, when a one-man exhibition was held in that city's Museum of Modern Art. In that same year, Cartier-Bresson, in partnership with the U.S. photographer Robert Capa and others, founded the cooperative photo agency known as Magnum Photos. The organization offered periodicals global coverage by some of the most talented photojournalists of the time. Under the aegis of Magnum, Cartier-Bresson concentrated more than ever on reportage photography. The following three years found him in India, China, Indonesia, and Egypt. This material and more, taken in the 1950s in Europe, formed the subjects of several books published between 1952 and 1956. Such

publications helped considerably to establish Cartier-Bresson's reputation as a master of his craft. One of them, and perhaps the best-known, *Images à la sauvette,* contains what is probably Cartier-Bresson's most comprehensive and important statement on the meaning, technique, and utility of photography. The title refers to a central idea in his work—the decisive moment—the elusive instant when, with brilliant clarity, the appearance of the subject reveals in its essence the significance of the event of which it is a part, the most telling organization of forms. Later books included *Cartier-Bresson's France* (1971), *The Face of Asia* (1972), and *About Russia* (1974).

He was singularly honoured by his own country in 1955, when a retrospective exhibition of 400 of his photographs was held in the Museum of Decorative Arts, Paris, and was then displayed in Europe, the United States, and Japan before the photographs were finally deposited in the Bibliothèque Nationale in Paris. In 1963 he photographed in Cuba; in 1963–64, in Mexico; and in 1965, India. The French filmmaker Louis Malle recalled that, during the student revolt in Paris, in May 1968, Cartier-Bresson was there with his 35-millimetre camera, but, despite the explosive activities, he took photographs at the rate of about four per hour.

In later years Cartier-Bresson diverted most of his interest to making motion pictures—including *Impressions of California* (1969) and *Southern Exposures* (1971). He believed that still photography and its use in pictorial magazines was, to a large extent, being superseded by television. On principle, he always avoided developing his own prints, convinced that the technical exigencies of photography were a harmful distraction. Similarly, he directed the shooting of films and did not wield the camera himself. With this medium, however, he was no longer able to work unobtrusively by himself.

His Leica—his notebook, as he called it—accompanied him wherever he went, and, consistent with his training as a painter, he always carried a small sketch pad. There was for Cartier-Bresson a kind of social implication in the camera. To his mind, photography provided a means, in an increasingly synthetic epoch, for preserving the real and humane world. (A.Sc.)

BIBLIOGRAPHY. Collections of Cartier-Bresson's work may be found in the Bibliothèque Nationale, Paris; the Museum of Modern Art, New York City; and the George Eastman House, Rochester, N.Y. A useful bibliography and several perceptive essays are included in Lincoln Kirstein and Beaumont Newhall, *The Photographs of Henri Cartier-Bresson* (1947); in more recent editions the bibliographies have been deleted. A selected bibliography appears in Nathan Lyons (ed.), *Photographers on Photography* (1966), where also the complete text of Cartier-Bresson's essay in his *Decisive Moment* (1952) is reproduced. No complete biography of Cartier-Bresson exists. There is a brief account of one of his U.S. tours in John Malcolm Brinnin, *Sextet* (1981). The present literature deals mainly with the character of his work. Beaumont Newhall, "The Instant Vision of Henri Cartier-Bresson,"*Camera,* 34:485–489 (1955), is a valuable discussion of the photographer's equipment and manner of working. See also Cartier-Bresson's work, *The World of Henri Cartier-Bresson* (1968) and *Cartier-Bresson: Photographer* (1979).

cartilage, dense connective tissue forming the skeleton of mammalian embryos before bone formation begins and persisting in parts of the human skeleton into adulthood. Cartilage is the only component of the skeletons of certain primitive vertebrates, including lampreys and sharks. It is composed of a dense network of collagen fibres embedded in a firm, gelatinous ground substance that has the consistency of plastic; this structure gives the tissue tensile strength, enabling it to bear weight while retaining greater flexibility than bone. Cartilage cells, called chondrocytes, occur at scattered sites through the cartilage and receive nutrition by diffusion through the gel; cartilage contains no blood vessels, unlike bone.

Three main types of cartilage can be distinguished. Hyaline cartilage is the most widespread and is the type that makes up the embryonic skeleton. It persists in human adults at the ends of bones in free-moving joints, at the ends of the ribs, and in the nose, larynx, trachea, and bronchi. It is a glossy blue-white in appearance and very resilient. Fibrocartilage is the tough, very strong tissue found predominantly in the intervertebral disks; it is similar to other fibrous tissues but contains cartilage ground substance. Yellow, or elastic, cartilage is more pliable than the other two forms because it contains elastic fibres in addition to collagen. In humans it makes up the external ear, the auditory tube of the middle ear, and the epiglottis.

A major role of cartilage in humans is to form a model for later growth of the bony skeleton. Only the clavicle, or collarbone, and some parts of the skull are not preformed in cartilage. In the embryo, the fibrous part of the cartilage gradually calcifies, and chondrocytes are replaced by bone cells, or osteocytes. After birth a thin plate of cartilage, called the epiphyseal plate, persists at the ends of growing bones, finally becoming ossified itself only when the bone behind it has completed its growth. At the growing edge of the plate, chondrocytes continue to grow and divide, while on the trailing edge they are replaced by osteocytes as new bone is laid down. The cartilage plate thus remains of a constant thickness while the bone grows behind it. Once this plate disappears, no further bone growth is possible. *See also* bone.

Consult the INDEX *first*

Cartimandua (fl. 2nd and 3rd quarters of the 1st century AD), queen of the Brigantes, a large tribe in northern Britain, whose rule depended upon support from the invading Roman armies.

After concluding a treaty with Rome early in its conquest of Britain, which began in AD 43, Cartimandua was faced with a series of revolts by anti-Roman elements among her subjects. In 48, Roman forces intervened for the first time to help her quell these disturbances. Three years later the queen's forces arrested the leader of the British resistance, Caratacus, who had fled to Brigantium to rally support for his cause, and turned him over to the Romans. In so doing she assured continuation of Roman support. In 57, when her husband and coruler, Venutius, attempted to overthrow her by stirring up anti-Roman sentiment, the Roman legions put down the uprising. Venutius and Cartimandua were reconciled and reigned together until 69, when she left him for his armour bearer, Vellocatus. Once again Venutius rebelled, and for the third time the queen was rescued by Roman troops. After this insurrection there is no further record of her career. In 71 the Romans defeated the Brigantes under Venutius and annexed their territory. Silver coins minted during the reign of Cartimandua have survived.

cartographic projection: *see* projection.

cartography, the art and science of graphically representing a geographical area, usually on a flat surface such as a map or chart; it may involve the superimposition of political, cultural, or other nongeographical divisions onto the representation of a geographical area.

A brief treatment of cartography follows. For full treatment, *see* MACROPAEDIA: Mapping and Surveying.

Cartography is an ancient discipline that dates from the prehistoric depiction of hunting and fishing territories. The Babylonians mapped the world in a flattened, disk-shaped form, but Ptolemy established the basis for subsequent efforts in the 2nd century AD with an eight-volume work on geography that showed a spherical Earth. Maps produced during the Middle Ages followed Ptolemy's guide, but they used Jerusalem as the central feature and placed East at the top. These representations are often called T-maps because they show only three continents (Europe, Asia, and Africa), separated by the "T" formed by the Mediterranean Sea and the Nile River. More accurate geographical representation began in the 14th century when portolan (seamen's) charts were compiled for navigation.

The discovery of the New World led to the need for new techniques in cartography, particularly for the systematic representation on a flat surface of the features of a curved surface (*see* projection; Mercator projection). The 17th and 18th centuries saw a vast outpouring of printed maps of ever-increasing accuracy and sophistication. Noteworthy among the scientific methods introduced later was the use of the telescope for determining the length of a degree of longitude. Modern cartography largely involves the use of aerial photographs as a base for any desired map or chart; the procedures for translating photographic data into maps are governed by the principles of photogrammetry (*q.v.*) and yield a degree of accuracy previously unattainable. Satellite photography has made possible the mapping of features of the Moon and of several planets and their satellites.

Carton de Wiart, Henri(-Victor), Comte (Count) (b. Jan. 31, 1869, Brussels—d. May 6, 1951, Brussels), statesman, jurist, and author who helped further governmental responsibility for social welfare in Belgium.

Elected in 1896 to the Belgian House of Representatives as a member of the Catholic Party's reform-oriented left wing, he served as minister of justice (1911–18) and helped secure passage of child-welfare legislation (1912). Subsequently, he served as prime minister (1920–21) and minister of social welfare (1932–34). He was later appointed president of the Supreme Court of the Belgian-Luxembourg Economic Council and was the Belgian delegate to the League of Nations (1928–35). In 1945 he reorganized the Catholic Party as the Social Christian Party. Serving as minister without portfolio (1949–50) and minister of justice (1950), he devoted much effort to an unsuccessful attempt to return the exiled Belgian king Leopold III to power.

A member of the Jeune Belgique (Young Belgium), a nationalist literary movement, he wrote historical novels and treatises held to depict a uniquely Belgian national spirit.

cartoon, originally, and still, a full-size sketch or drawing used as a pattern for a tapestry, painting, mosaic, or other graphic art form, but also, since the early 1840s, a pictorial parody utilizing caricature, satire, and usually humour. Cartoons are used today primarily for conveying political commentary and editorial opinion in newspapers and for social comedy and visual wit in magazines.

A brief account of cartoons follows. For full treatment, *see* MACROPAEDIA: Caricature, Cartoon, and Comic Strip; for animated-motion-picture cartoons, *see* Motion Pictures: *Animation.*

While the caricaturist deals primarily with personal and political satire, the cartoonist treats types and groups in comedies of manners. Though William Hogarth had a few predecessors, it was his social satires and depictions of human foibles that later cartoons were judged against. Honoré Daumier anticipated the 20th-century cartoon's balloon-enclosed speech by indicating in texts accom-

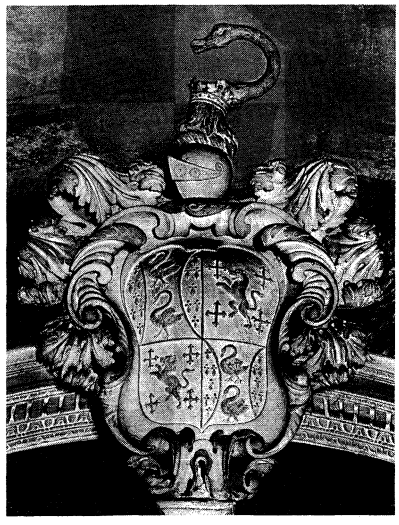
panying his cartoons the characters' unspoken thoughts. Hogarth's engravings and Daumier's lithographs were fairly complete documentaries on the London and Paris of their times.

Thomas Rowlandson lampooned the ludicrous behaviour of a whole series of social types, including "Dr. Syntax," which may well be the grandfather of the later comic strips. Rowlandson was followed by George Cruikshank, a whole dynasty of *Punch* artists who humorously commented on the passing world, Edward Lear, Thomas Nast, Charles Dana Gibson, and "Spy" (Leslie Ward) and "Ape" (Carlo Pellegrini), the two main cartoonists of *Vanity Fair* magazine.

In the 20th century the one-line joke, or single-panel gag, and the pictorial joke without words matured and a huge diversity of drawing styles proliferated. The influence of *The New Yorker* magazine spread to other publications worldwide. The new cartoonists included James Thurber, Charles Addams, Saul Steinberg, Peter Arno, and William Hamilton of the United States and Gerard Hoffnung, Fougasse, Anton, and Emett Rowland of England.

A Pulitzer Prize for editorial cartooning was established in 1922, and a Sigma Delta Chi Award for editorial cartooning was awarded annually after 1942; such cartoonists as Edmund Burck, Herblock, Bill Mauldin, and Rube Goldberg won both. Carl Giles was honoured with the Order of the British Empire in 1959 for his achievements in editorial cartooning.

cartouche, in architecture, ornamentation in scroll form, applied especially to elaborate



Cartouche from the Mellish Monument, Blyth Church, Nottinghamshire, England, *c.* 1733

By courtesy of the Courtauld Institute of Art, London; photograph, © F.J. Palmer

frames around tablets or coats of arms; by extension, the word is applied to any oval shape or even to a decorative shield, whether scrolled or not. The term is also used for an oval frame enclosing the hieroglyphs of the name of an Egyptian sovereign, as well as for the amulet of similar design worn in ancient Egypt as a protection against the loss of one's name (*i.e.,* one's identity).

cartridge, in weaponry, unit of small-arms ammunition, composed of a metal (usually brass) case, a propellant charge, a projectile or bullet, and a primer. The first cartridges, appearing in the second half of the 16th century, consisted merely of charges of powder wrapped in paper; the ball was loaded separately. During the next century, methods of including the ball with the powder were devised. In muzzle-loading a musket, the soldier bit off the end of the paper cartridge, poured a small amount of the powder into the firing pan, poured the rest down the barrel, and rammed the ball and paper down after it.

The breech-loading rifle and various multishot weapons of the 19th century made possible loading the entire cartridge as a unit; many varieties were developed, using paper, linen, animal tissue, collodion, metal, rubber, and other materials. All required an external spark to ignite the propellant. In 1847 a Paris gunsmith, B. Houllier, patented the first cartridge, capable of being fired by the blow of the gun's hammer. In one type, a pin was driven into the cartridge by the hammer action; in the other, a primer charge of fulminate of mercury was exploded in the cartridge rim. Later improvements changed the point of impact from the rim to the centre of the cartridge, where a percussion cap was inserted. The cartridge with a percussion cap, or cup, centred on the base of the cartridge—centre-fire—predominated in all larger calibres, but rimfire cartridges remain popular in small-bore, low-powered ammunition, *e.g.*, .22 calibre. Smokeless nitrocellulose powder replaced black powder as the propellant in the late 19th century.

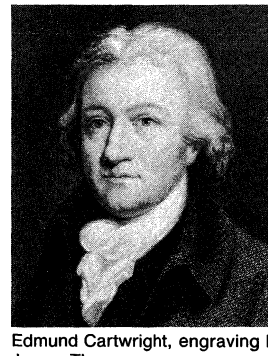
Also in the 19th century, the round ball was replaced by the elongated, or cylindroconoidal, Minié ball, as it was commonly called, with a cavity in the base that expanded on explosion of the charge to engage the rifling threads in the gun barrel. Shotgun cartridges are made of paper or plastic instead of brass.

Cartwright, Alexander Joy (b. April 17, 1820, New York City—d. July 12, 1892, Honolulu), chief codifier of the baseball rules from which the present rules were developed.

A surveyor by profession, Cartwright was one of the founders of the Knickerbocker Base Ball Club, an organization of amateur players in New York City. He was chairman of a club committee that prepared a set of baseball rules, which were adopted in September 1845 and apparently were first used in a game between the Knickerbockers and the New York Nine at Hoboken, N.J., June 19, 1846.

Those 1845 rules were taken in part from Robin Carter's *Book of Sports* (1834), but were original in some important respects. A major innovation legitimized tagging out a base runner rather than hitting him with a thrown ball in order to retire him; this made possible the introduction of a hard ball. Cartwright is generally credited with fixing the distance between bases at 90 feet.

Cartwright, Edmund (b. April 24, 1743, Marnham, Nottinghamshire, Eng.—d. Oct. 30, 1823, Hastings, Sussex), English inventor



Edmund Cartwright, engraving by James Thomson

By courtesy of the Science Museum, London

of the first wool-combing machine and of the predecessor of the modern power loom.

Cartwright began his career as a clergyman, becoming, in 1779, rector of Goadby Marwood, Leicestershire; in 1786 he was a prebendary in Lincoln (Lincolnshire) cathedral. He probably would have spent his life as an obscure country clergyman had his attention not been turned to Sir Richard Arkwright's cotton-spinning mills at Cromford, Derbyshire, which he saw on a visit in 1784. Inspired to construct a similar machine for weaving, he invented a crude power loom, first patented in 1785. That same year he set up a weaving and spinning factory in Doncaster, Yorkshire, but had to surrender it to creditors in 1793. In 1789 he had patented a wool-combing machine; although it lowered manufacturing costs, it did not benefit Cartwright financially. In 1809, however, the House of Commons voted Cartwright £10,000 in recognition of benefits conferred on the nation through his power loom. His other inventions included a cordelier (machine for making rope; 1792) and a steam engine that used alcohol instead of water.

Cartwright, John, byname MAJOR CARTWRIGHT (b. Sept. 17, 1740, Marnham, Nottinghamshire, Eng.—d. Sept. 23, 1824, London), advocate of radical reform of the British Parliament and of various constitutional changes that were later incorporated into the People's Charter (1838), the basic document of the working class movement known as Chartism. His younger brother Edmund was the inventor of the power loom.

John Cartwright joined the Royal Navy about 1758, fought in the Seven Years' War (1756–63), and was promoted to first lieutenant in 1766. In ill health, he retired from the Navy shortly before the revolt (1775) of the North American colonies; he was one of England's earliest supporters of the colonists and in 1774 had published his first plea on behalf of the colonists, entitled *American Independence the Glory and Interest of Great Britain.* In 1775, when the Nottinghamshire Militia was first raised, he was appointed major, and in this capacity he served for 17 years. He was at last superseded because of his celebration of the French Revolution. In 1776 appeared his first work on reform in Parliament, entitled, *Take Your Choice*—a second edition appearing in 1777 under the new title of *The Legislative Rights of the Commonalty Vindicated.* The task of his life was thenceforth chiefly the attainment of universal suffrage and annual Parliaments. In 1778 he conceived the project of a political association, which took shape in 1780 as the Society for Constitutional Information. From this society sprang the more famous Corresponding Society. Major Cartwright was one of the witnesses at the high treason trial of his friends Horne Tooke, John Thelwall, and Thomas Hardy in 1794 and was himself indicted for conspiracy in 1819 and condemned to pay a fine of £100.

Cartwright, Peter (b. Sept. 1, 1785, Amherst County, Va., U.S.—d. Sept. 25, 1872, near Pleasant Plains, Ill.), Methodist circuit rider of the American frontier.

His father, a veteran of the Revolutionary War, took his family to Kentucky in 1790.

Peter Cartwright, detail from an engraving by F.E. Jones

By courtesy of the Commission on Archives and History, the United Methodist Church

There Cartwright had little opportunity for schooling but was exposed to the rude surroundings of the frontier, becoming a gambler at cards and horse racing. This way of life came to an abrupt end when he was converted during the Great Western Revival in 1801. He was received into the Methodist Episcopal Church in June and was soon licensed as an exhorter. In autumn 1802 he was commissioned to form a new circuit of preaching points in an unchurched wilderness around the mouth of the Cumberland River. He was ordained deacon in 1806 and elder in 1808. An able and vigorous speaker, Cartwright preached thousands of times in his more than 60 years as a frontier minister, defending Methodism and vehemently denouncing all other denominations.

Although not an Abolitionist, Cartwright hated slavery; to be on free soil he moved in 1824 to Sangamon County, Ill. There he entered politics to oppose slavery and served several terms in the lower house of the Illinois general assembly. Cartwright recounted his colourful life in his *Autobiography* (1856), which became a leading source for material on the life of the western circuit rider.

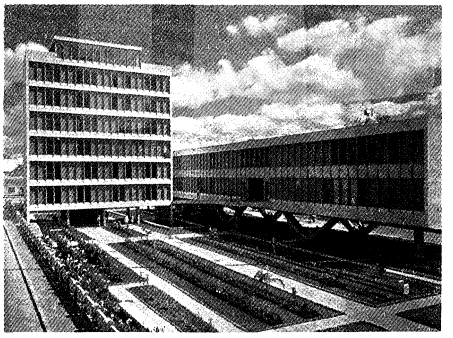
Cartwright, Sir Richard John (b. Dec. 4, 1835, Kingston, Upper Canada—d. Sept. 24, 1912, Kingston, Ont., Can.), statesman and finance minister of Canada's Liberal Party; he supported free trade between the United States and Canada, in opposition to the trade protectionism of the Conservatives.

Sir Richard Cartwright, 1908
By courtesy of the Public Archives of Canada

Already a successful businessman, Cartwright was elected to the Parliament of the united province of Canada as an independent Conservative in 1863. After the Dominion of Canada was created in 1867, Cartwright disagreed with the financial policy of the Conservative Party leader, Sir John A. Macdonald, and went over to the Liberals. From 1873 to 1878 he served as finance minister in Alexander Mackenzie's administration. As chief financial spokesman during the Liberal opposition (1878–96), he advocated unrestricted reciprocity with the U.S. He was knighted in 1879. In 1896 he was minister of trade and commerce in Sir Wilfrid Laurier's administration, and in 1898–99 he represented Canada in the Anglo-American joint high commission at Quebec.

He retired to the Senate in 1904, keeping a portfolio in the Cabinet and serving as premier during Laurier's absence. In 1909–11 he was government leader in the Senate.

Caruaru, city, eastern Pernambuco state, northeastern Brazil, on the Rio Ipojuca, at 1,804 ft (550 m) above sea level. Caruaru originated as a weekly market centre; it was elevated to city status in 1857. Agriculture, livestock, and food processing are the principal sources of income, and there is some light manufacturing. The city has many fairs and religious festivals. It is accessible by train or automobile from Recife, the state capital, to the east, and is a major crossroads for the region. Pop. (1980 prelim.) 137,636.



Municipal Palace and gardens, Caruaru, Braz.
Plessner International

Carúpano, city, northern Sucre state, northeastern Venezuela. On the Caribbean Sea, near the centre of the twin peninsulas Araya and Paria, Carúpano is the commercial nucleus and principal port of an agricultural area, the principal export of which is cacao. Many fertile valleys in the highlands around Carúpano and throughout Sucre (representing a high percentage of the state's land area) are under cultivation. The city has grown slowly, as has all of Sucre; there is much out-migration to the national capital, Caracas, and to other states. Carúpano is accessible by highway and air as well as by sea. Pop. (1981 est.) 82,000.

Carus, in full MARCUS AURELIUS CARUS (d. 283), Roman emperor 282–283.

Carus was probably from either Gaul or Illyricum and had served as prefect of the guard to the emperor Probus (276–282), whom he succeeded. Like his predecessors, Carus adopted the name Marcus Aurelius as a part of his imperial title. After a brief Danube campaign he led his troops against the Sāsānians, penetrating beyond the Tigris, where he died suddenly and mysteriously, allegedly struck by lightning. His sons Numerian and Carinus succeeded him.

Carus, Titus Lucretius: *see* Lucretius.

Caruso, Enrico (b. Feb. 27, 1873, Naples—d. Aug. 2, 1921, Naples), the most admired Italian operatic tenor of the early 20th century and the first leading musician to document his voice on gramophone recordings.

Caruso was of a poor family, the 18th of 20 children. Although he was a musical child who sang Neopolitan folk songs everywhere and joined his parish choir at the age of nine, he received no formal music training until his study with Guglielmo Vergine at age 18. Within three years he made his debut in

Caruso, self-portrait in ink, 1906
The Andre Meyer Collection—J.P. Ziolo

Morelli's *L'Amico Francesco* in Naples at the Teatro Nuovo in 1894. Four years later, after adding a number of impressive roles to his repertoire, he was asked to create the role of Loris in the premiere of Umberto Giordano's *Fedora.* He was a sensation and soon had engagements in Moscow, St. Petersburg (Russia), and Buenos Aires. He made his La Scala debut with *La Bohème* (1900). He then created the chief tenor parts in *Adriana Lecouvreur, Germania,* and *La fanciulla del West,* and for the La Scala company the tenor roles in *La Maschere* and *L'elisir d'amore.* World recognition came in the spring of 1902 after he sang in *La Bohème* at Monte Carlo and in *Rigoletto* at London's Covent Garden. He made his American debut in *Rigoletto* at the opening night of the Metropolitan Opera in New York City on Nov. 23, 1903, and continued to open each season there for the next 17 years, presenting 36 roles in all. His 607th and final performance with the Metropolitan was as Eleazar in *La Juive* (1920).

Caruso became the most celebrated and highest paid of his contemporaries worldwide. His voice was strong, yet lyrical—a characteristic that lessened somewhat in his later career. Its appealing tenor qualities were unusually rich in lower registers and abounded in warmth, vitality, and smoothness.

Carvajal y Mendoza, Luisa de (b. Jan. 2, 1568, Jaraicejo, Extremadura, Spain—d. Jan. 2, 1614, London), missionary who, moved by

Luisa de Carvajal y Mendoza, engraving
By courtesy of the Biblioteca Nacional, Madrid

the execution of the Jesuit Henry Walpole in 1595, decided to devote herself to the cause of the faith in England.

With her share of the family fortune, Luisa founded a college for English Jesuits at Louvain, in the Spanish Netherlands (now Belgium), which was transferred in 1612 to Watten near Saint-Omer, where it remained until the suppression of the order. In 1605 she arrived in England and established herself under the protection of the Spanish ambassador, from whose house she carried on her activities. The same year she made herself conspicuous by her attentions to the Gunpowder Plot prisoners, accused of conspiracy to blow up King James I of England and Parliament. She was arrested in 1608, but the protection of the Spanish ambassador and the desire of the King to stand well with Spain secured her release. She died before attempts to banish her from England could prove successful.

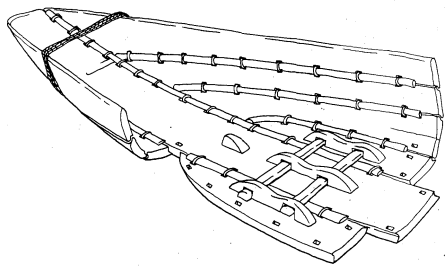
Cārvāka, also called LOKĀYATA (Sanskrit: Worldly Ones), a quasi-philosophical Indian school of materialists who rejected the notion of an afterworld, the authority of the sacred scriptures, the Vedas, and the immortality of the self. Of the recognized means of knowledge (*pramāṇa*), the Cārvāka recognized only direct perception (*anubhava*). They advocated a policy of total opportunism and are often described in literature as addressing princes, whom they urged to act exclusively in their

own self-interest, thus providing the intellectual climate in which a text such as Kauṭilya's *Artha-śāstra* ("Handbook of Profit") could be written.

Although Cārvāka doctrine had disappeared by the end of the medieval period, its onetime importance is confirmed by the lengthy attempts to refute it found in both Buddhist and orthodox Hindu philosophical texts, which also constitute the main sources for knowledge of the doctrine.

Carvalho, Sebastião de (Portuguese leader): *see* Pombal, Sebastião de Carvalho, marquês de.

carvel construction, type of ship construction characteristic in Mediterranean waters during the Middle Ages, as contrasted with clinker construction in northern waters. In carvel construction the planks were fitted edge to edge against a previously built framework; hulls so constructed were smooth and well

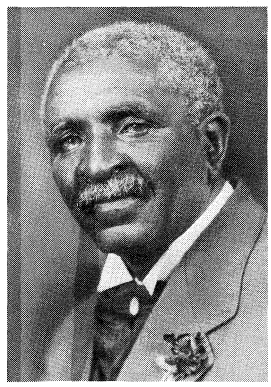


Cutaway section of a boat uncovered at North Ferriby, Humberside, Eng., showing an early example of carvel construction

From Bjorn Landstrom, *The Ship*, illustration copyright 1961 by Bjorn Landstrom; reproduced by permission of Doubleday & Company Inc.

streamlined, but the work required more precision and skilled labour, and the hulls were more prone to weakness and leakage in heavy seas.

Carver, George Washington (b. *c.* 1860, near Diamond Grove, Mo., U.S.—d. Jan. 5, 1943, Tuskegee, Ala.), U.S. agricultural chemist and experimenter, who became a benefactor of the American South and a cultural hero. Adjusting himself to what he considered a transient racial situation in the South, Carver attempted to prepare rural blacks for full citizenship rights by teaching them how to become skilled farmers and useful citizens. He dedicated his life to making Tuskegee Institute, Tuskegee, Ala., an instru-



George Washington Carver

By courtesy of the Tuskegee Institute, Alabama; photograph, P.H. Polk

ment of ministry to the needs of these people, and, in the process, he became an outstanding teacher, artist, humanitarian, and prophet. In addition, his work at the institute resulted in the development of more than 300 derivative food and industrial products from peanuts and more than 100 from sweet potatoes.

Carver was the son of a slave woman owned by Moses Carver. During the Civil War, slave owners found it difficult to hold slaves in the border state of Missouri, and Moses Carver, therefore, sent his slaves, including the young child and his mother, to Arkansas. After the Civil War, Moses Carver learned that all his former slaves had disappeared except for a child named George who had become ill with whooping cough. Frail and sick, the motherless child was returned to his former master's home and nursed back to health. The boy had a delicate sense of colour and form and learned to draw; later in life he was to devote considerable time to painting flowers, plants, and landscapes. He also became well known among the blacks as a singer and organist. Though the Carvers told him he was no longer a slave, he remained on their plantation until he was about 10 or 12 years old, when he left to acquire an education. He spent some time wandering about, working with his hands and developing his keen interest in plants and animals.

By both books and experience, George acquired a fragmentary education. Throughout his adolescence he was a stranger in a strange land, doing whatever work came to hand in order to subsist. The diversity of Carver's talents, later demonstrated in his scientific work, was forecast in these early years of wandering, when he supported himself by varied occupations that included general household worker, hotel cook, laundryman, farm labourer, and homesteader. In his late 20s, he managed to obtain a high school education in Minneapolis, Kansas, by working as a farmhand. After a university in Kansas refused to admit him because he was black, Carver matriculated at Simpson College, Indianola, Iowa, where he studied piano and art, subsequently transferring to Iowa State Agricultural College, where he received a degree in agricultural science in 1894 and a master of science degree in 1896.

Drawn to Tuskegee Institute because he believed its industrial type of education would help solve the race problem, Carver left Iowa for Alabama in the fall of 1896 to head the school's newly organized department of agriculture. He had learned of Booker T. Washington's efforts at Tuskegee to achieve the best interests of the black man through education rather than by political agitation and had been deeply moved by the educator's speeches, which tended to stress conciliation, compromise, and economic development for the black man. Despite many offers elsewhere, Carver remained at Tuskegee because he believed in its destiny as an institution for black people.

After becoming the institute's director of agricultural research in 1896, he devoted his life to research projects aimed primarily at helping Southern agriculture. During his early years as an administrator, he spent most of his time demonstrating ways in which the Southern farmer could improve his economic situation. As an administrator Carver was unable to get along with his colleagues. He clashed not only with other members of the Tuskegee administration and faculty but even with Washington. He was, furthermore, unable to keep his department financially solvent. Nonetheless, his great ability and rare talents in other fields were unquestioned, and he was praised for his capacity as a teacher, lecturer, and experimenter, as well as for his unusual ability to demonstrate the use of various foods and their preservation. By 1910, however, Booker T. Washington had relieved him of his administrative duties, and Carver was able to devote most of his time to research.

Products he derived from such soil-enriching crops as the peanut and the soybean helped to revolutionize the economy of the South by liberating it from excessive dependence on cotton, which depleted the soil. Peanuts and soybeans, since they belong to the legume family, could restore nitrogen to the soil and provide proteins essential for better health for farmers. When he arrived at Tuskegee in 1896, the peanut had not even been recognized as a crop. Within the next half century it became one of the six leading crops throughout the U.S. and, in the South, the second cash crop (after cotton) by 1940. In 1942 the U.S. government allotted 5,000,000 acres of peanuts to farmers. Carver's research program ultimately developed 300 derivative products from peanuts—among them cheese, milk, coffee, flour, ink, dyes, plastics, wood stains, soap, linoleum, medicinal oils, and cosmetics—and 118 from sweet potatoes, including flour, vinegar, molasses, rubber, ink, a synthetic rubber, and postage stamp glue. He also succeeded in making synthetic marble from wood pulp. His exhibits were displayed throughout the South.

Among Carver's many honours were his election as a fellow of the Society for the Encouragement of Arts, Manufactures, and Commerce (London) in 1916 and his receipt of the Spingarn Medal in 1923. Late in his career, Carver declined an invitation to work for Thomas A. Edison at a salary of more than $100,000 a year. Presidents Calvin Coolidge and Franklin Roosevelt visited him, and his friends included Henry A. Wallace, a vice president under Franklin Roosevelt, Henry Ford, and Mohandas Gandhi. Foreign governments requested his counsel on agricultural matters: Joseph Stalin, for example, in 1931 invited him to Russia to superintend cotton plantations in southern Russia and to make a tour of the U.S.S.R., but Carver refused.

Many scientists and some blacks were critical of Carver. Scientists thought of him more as a concoctionist than as a contributor to scientific knowledge and regarded with suspicion his reference to God as a collaborator in the laboratory. Though only a few blacks envied Carver's success, many were critical of his humility and regarded him as subservient—an Uncle Tom. Finally, this small, mild, soft-spoken, innately modest man, eccentric in dress and mannerism, who attempted to live up to Christian teachings, seemed unbelievable because he gave the impression that he disregarded the conventional pleasures and rewards of this life.

These qualities endeared Carver to many whites, who were almost invariably pleased by his humble demeanour and his quiet role in attending strictly to his work in self-imposed segregation at Tuskegee. As a result of his accommodation to the mores of the South, whites came to reward him with a sort of patronizing adulation. While he worked in the Deep South until his death at Tuskegee, people approached Carver as if he were part saint, part scientist, and part performing bear. The pattern of race relations at that time tended to distort the real significance of the contribution of black scientists and scholars, and Carver became increasingly a symbol of the intellectual achievements of Negroes. He fulfilled the white man's conception of the Negro, and he played a convenient role in "interracial politics." Accordingly, Carver's public image was built into that of an intellectual giant. His great desire in later life, nevertheless, was simply to serve humanity; and his work, which began for the sake of the poorest of the Negro sharecroppers, paved the way for a better life for the entire South. His efforts brought about a significant advance in agricultural training in an era when agriculture was the largest single occupation of Americans, and he extended Tuskegee's influence throughout the South by encouraging improved farm methods, diversification, and conservation. (J.L.Ki.)

BIBLIOGRAPHY. Rackham Holt, *George Washington Carver: An American Biography*, rev. ed. (1963), although impressionistic, is still the most useful for adult readers. Arna Wendell Bontemps,

The Story of George Washington Carver (1954), is addressed to a juvenile audience, written with restraint and sensitivity. See also Linda O. McMurry, *George Washington Carver: Scientist and Symbol* (1981); and Barry Mackintosh, "George Washington Carver: The Making of a Myth," *Journal of Southern History,* 42:507–528 (Nov. 1976). The George Washington Carver Papers and the Robert Russa Moton Papers are located at the Tuskegee Institute in Alabama. The Booker T. Washington Papers, located in the Library of Congress, are rich in Carver material from 1896 to 1915.

Carver, John (b. *c.* 1576, Nottinghamshire or Derbyshire, Eng.—d. Apr. 15, 1621, Plymouth, Mass.), first governor of the Pilgrim settlement at Plymouth in New England.

Originally a prosperous businessman when the Separatists decided to emigrate to North America, Carver obtained financial backing for the trip and chartered the "Mayflower." He was elected governor on Nov. 21, 1620, after the signing of the Mayflower Compact. His major accomplishment was the establishment of a treaty of alliance between the Indian chief Massasoit and James I of England.

Carver, Jonathan (b. April 13, 1710, Weymouth, Mass.—d. Jan. 31, 1780, London), early explorer of North America and author of one of the most widely read travel and adventure books in that period.

After serving in the French and Indian War (1754–63), Carver joined the company of Maj. Robert Rogers to explore the great northwestern territories. Alone, he spent the winter

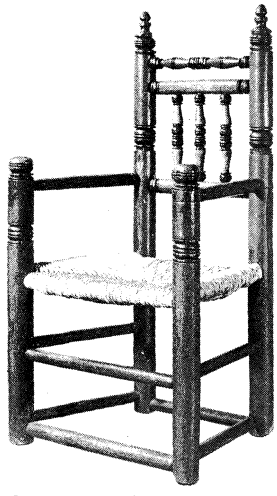
Jonathan Carver, engraving

By courtesy of the Library of Congress, Washington, D.C.

of 1766–67 at a Sioux village on the Minnesota River. Returning to Ft. Mackinac in the spring, he met Capt. James Tute in command of a party sent out by Rogers to explore a route to the Pacific Ocean. Tute brought orders for Carver to join the party as draftsman and third in command. They proceeded up the Mississippi and skirted the shores of Lake Superior to the Grand Portage. Failing to receive supplies, the party abandoned the expedition and returned to Ft. Mackinac (August 1768). Rogers had exceeded his power in employment matters, and Carver was never paid. After nine years of misfortune and poverty, his *Travels Through the Interior Parts of North America in the Years 1766, 1767, 1768* (1778), published in London, was an immediate success. Carver, however, did not live to enjoy any financial reward. He died a broken old man and was buried in potter's field.

Carver, Robert (b. *c.* 1490, Scotland?—d. 1547?), outstanding Scottish composer whose extant works include five masses and two motets. One of the motets, for 19 voices, was found in a large choir book compiled in the first half of the 16th century at Scone Abbey, Perthshire, and now preserved in the National Library of Scotland. References in the volume suggest that Carver took holy orders at the age of 16 and remained at that Augustinian abbey until 1546 or later. Nothing is heard of him after that time.

Carver chair, American spool chair with a rush seat and turned (shaped on a lathe) legs that rise above the seat level to frame the back and to support the armrests. The back normally contained three vertical spindles and was topped with decorative finials.



Carver armchair, ash, American, 1660–90; in the Art Institute of Chicago

By courtesy of The Art Institute of Chicago

Carver chairs were named after John Carver (*c.* 1576–1621), founder and first governor of the Plymouth colony in America. The term Carver is also applied to an armchair in a set of dining chairs; it is normally placed at the head of the table.

Cary, Alice and Phoebe (respectively b. April 26, 1820, near Cincinnati, Ohio, U.S.—d. Feb. 12, 1871, New York City; b. Sept. 4, 1824, near Cincinnati—d. July 31, 1871, Newport, R.I.), U.S. poets whose work was both moralistic and idealistic.

Self-educated, the Cary sisters always wrote in unbroken companionship. Their poems

(Top) Alice Cary, engraving after a photograph; (bottom) Phoebe Cary, engraving by H.W. Smith

Culver Pictures

were first collected in a volume entitled *Poems of Alice and Phoebe Cary* (1849). Alice, much the more voluminous writer of the two, also wrote prose sketches, novels, and poems, the best of which treat the surroundings and friends of her girlhood. Her lyrical poem, "Pictures of Memory," was praised by Edgar Allan Poe. Phoebe published two volumes of poems (1854, 1868) but is best known as the author of the hymn "Nearer Home," beginning "One sweetly solemn thought."

Cary, Henry Francis (b. Dec. 6, 1772, Gibraltar—d. Aug. 14, 1844, London), English biographer and translator, best known for his blank verse translation of *The Divine Comedy* of Dante.

Educated at Oxford, Cary took Anglican orders in 1796 and was later assistant librarian in the British Museum. He published biographies of English and French poets and translated the ancient Greek writers Aristophanes and Pindar. Although Cary's translation of Dante hardly reproduces the original's great strength, it manages to retain some of its vividness. *The Inferno* appeared in 1805–06; the whole work, under the title *The Vision, or Hell, Purgatory, and Paradise, of Dante,* in 1814.

Cary, (Arthur) Joyce (Lunel) (b. Dec. 7, 1888, Londonderry, Ire.—d. March 29, 1957, Oxford, Eng.), English novelist of strong individuality whose characters are marked by their creative energy and their ebullient joy in creating. Cary developed a trilogy form in which each volume is narrated by one of three protagonists.

Cary was born into an old Anglo-Irish family; his mother died when he was eight, and he divided his time between relatives in Ireland and school in England. At 16 he studied painting in Edinburgh and then in Paris. From 1909 to 1912 he was at Trinity College, Oxford, where he read law. He served with the British Red Cross in the Montenegrin army in the Balkan War of 1912–13 and, having joined the colonial service in 1914, served in the Nigeria Regiment during World War I. He was wounded while fighting in the Cameroons and returned to civil duty in Nigeria in 1917 as a district officer. West Africa became the locale of his early novels.

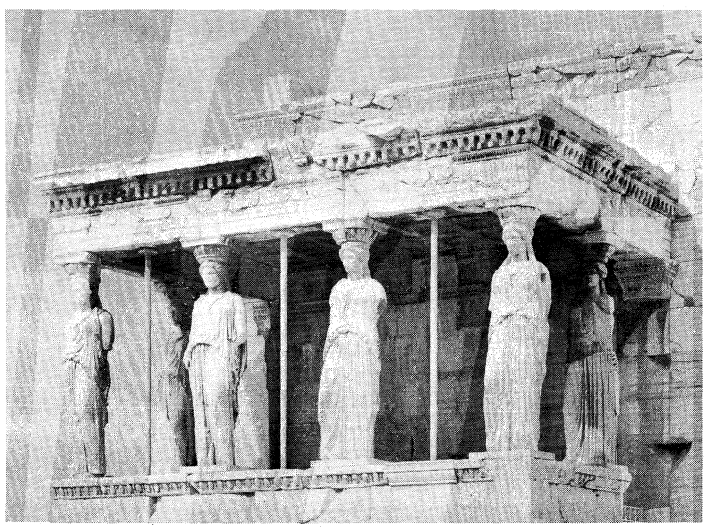
Resolved to become a writer, Cary settled in Oxford in 1920. Although that year he published 10 short stories in the *Saturday Evening Post,* a U.S. magazine, under the pseudonym of Thomas Joyce, he decided he knew too little about philosophy, ethics, and history to continue writing in good conscience. Study occupied the next several years, and it was only in 1932 that his first novel, *Aissa Saved,* appeared. The story of an African girl converted to Christianity but still retaining pagan elements in her faith, it was followed by three more African novels—*An American Visitor* (1933), *The African Witch* (1936), and *Mister Johnson* (1939)—and a novel about the decline of the British Empire, *Castle Corner* (1938). Childhood was the theme of his next two novels: his own in *A House of Children* (1941) and that of a cockney wartime evacuee in the country in *Charley Is My Darling* (1940). His trilogy on art begins with the first-person narration of a woman, Sara Monday, in *Herself Surprised* (1941) and follows with that of two men in her life, the lawyer Tom Wilcher in *To Be a Pilgrim* (1942) and the artist Gulley Jimson in *The Horse's Mouth* (1944), his best known novel. Similarly, his other trilogy is seen from the vantage of a politician's wife in *A Prisoner of Grace* (1952), the politician himself in *Except the Lord* (1953), and the wife's second husband in *Not Honour More* (1955). He planned a third trilogy on religion but was afflicted with muscular atrophy and knew he could not live to complete it. Hence he treated the theme in a single novel, *The Captive and the Free* (1959). His short stories were collected in *Spring Song* (1960).

Cary, Lucius: *see* Falkland, Lucius Cary, 2nd Viscount.

caryatid, draped female figure used instead of a column as an architectural support. In marble architecture they first appeared in pairs in three small buildings (treasuries) at Delphi (550–530 BC), and their origin can be traced back to mirror handles of nude figures carved from ivory in Phoenicia and draped figures cast from bronze in archaic Greece. According to a story related by the 1st-century-BC Roman architectural writer Vitruvius, caryatids represented women of Caryae, doomed to hard labour because the town sided with the Persians in 480 BC.

The most celebrated example is the caryatid porch of the Erechtheum with six figures (420–415 BC). They were directly copied, in alternation with columns, in Hadrian's Villa at Tivoli. Other examples include the figure at the Villa Albani at Rome and two colossal figures in the smaller propylon at Eleusis. They also appeared in the upper stories of Marcus Vipsanius Agrippa's Pantheon and in the colonnade surrounding the Forum of Augustus at Rome, as well as in the Incantada Salonika (Thessaloníki, Greece).

Caryatids are sometimes called *korai* ("maidens"). Similar figures, bearing baskets on their heads, are called canephores (from *kanēphoroi*, "basket carriers"); they represent the maidens who carried sacred objects used at feasts of the gods. The male counterparts of caryatids are referred to as atlantes (*see* atlas).



The caryatid porch of the Erechtheum, the Acropolis, Athens, designed by Mnesicles, 5th century BC

A.F. Kersting

Caryophyllaceae, the pink family of flowering plants (order Caryophyllales), comprising about 70 genera of herbaceous plants, mainly of north temperate distribution. The members are diverse in appearance and habitat; most of them have swollen leaf and stem joints.

Among the important genera are *Stellaria*; *Cerastium* (*see* chickweed); *Arenaria* (including sandwort); *Silene* and *Tychnis* (*see* campion); *Gypsophila* (*see* baby's breath); and *Saponaria* (including soapwort). The most valued horticulturally is *Dianthus*, which includes the carnation (*q.v.*), commonly cultivated by florists and also grown in Europe for use in perfumes; Sweet William (*q.v.*), an old-fashioned garden flower; and the cottage, or grass, pink (*see* pink).

Caryophyllales, also called CENTROSPERMAE, the diverse pink order of flowering plants, belonging to the class called dicotyledon (*q.v.*; characterized by two seed leaves). It is comprised of 10 to 16 families, about 365 genera, and up to 8,800 species distributed throughout the world. Although most of the species are annual or perennial herbs, various families have shrubs, vines, and trees. Herbaceous members include ornamental flowers, weeds, and vegetables.

A brief treatment of Caryophyllales follows. For full treatment, *see* MACROPAEDIA: Angiosperms.

The majority of the food-producing plants of Caryophyllales belong to the goosefoot family (Chenopodiaceae), including spinach (*Spinacea oleracea*), the sugar beet (*Beta vulgaris*), and Swiss chard (*Beta vulgaris* variety *cicla*). Lamb's-quarters (*Chenopodium album*), a cosmopolitan weed, is useful as a potherb when young. Other edible members of the order are rhubarb (*Rheum rhabarbum*) and poke (*Phytolacca americana*).

Many weedy genera comprise the pigweed family (Amaranthaceae). *Amaranthus retroflexus,* the re-rooted, noxious pigweed, has spread northward from the tropics of the Americas and Africa into most agricultural areas of the world. Many persons are allergic to its pollen.

Ornamental plants belong to several families in Caryophyllales. The Nyctaginaceae is known for the four-o'clock (*Mirabilis jalapa*), which flowers late in the day, and *Bougainvillea.* Portulacaceae includes the rose moss (*Portulaca grandiflora*), widely grown as a garden annual, and spring-beauty (*Claytonia virginica*), a wildflower of eastern North America. The pink family (Caryophyllaceae, *q.v.*) has 22 genera of ornamentals.

Although a few families of Caryophyllales reproduce by means of rhizomes (that is, vegetatively), the major means of reproduction is sexual. The production and dispersal of seeds is highly efficient in this order. Inflorescences (flower clusters) of various structural types consist of small, short-stalked, compactly arranged flowers.

In the Amaranthaceae and Chenopodiaceae, sepals are five in number, petals are lacking, and stamens (male) may number up to five. The pistil (female) consists of two carpels as shown by the two terminal, pollen-receptive stigmas and two styles. The swollen, basal ovary is one-chambered and contains a single ovule. After pollination and fertilization, the ovule becomes the seed and the ovary the fruit, which is very small; it ripens dry to become a closed nutlet or an achene. Variations in number of flower parts occur among the thousands of species comprising these two families. In some, male and female parts appear in different flowers, generally on the same plant.

Most members of the Caryophyllales develop a perianth comprised of sepals only. Another attribute of this order is a one-chambered, superior ovary. The developmental patterns of stems and leaves, resemblances of tissues and cells at the microscopic level, and synthesis of unique cell products are used to ascertain relationships.

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caryopsis, also called GRAIN, specialized type of dry, one-seeded fruit (achene) characteristic of grasses, in which the ovary wall is united with the seed coat, making it difficult to separate the two except by special milling processes. All the cereal grains except buckwheat have caryopsides.

Cas-gwent (Wales): *see* Chepstow.

Casa, Giovanni Della (b. June 28, 1503, La Casa, Mugello, Tuscany—d. Nov. 14, 1556, Montepulciano, Siena), Italian bishop, poet, and translator who is remembered chiefly for his popular and widely translated treatise on manners, *Galateo.*

After growing up in Mugello, Della Casa studied in Bologna, Florence, Padova (Padua), and Rome. In 1544 he was named archbishop of Benevento but was sent as papal nuncio to Venice; in 1555 Pope Paul IV made him secretary of state. Besides some youthful satirical verse in the manner of Francesco Berni, Della Casa produced lyrical poems in a majestic style and some political works, such as *Orazioni politiche* (1707; "Political Discourses"), in which he expressed his sorrow for the calamities of Italy.

The work that brought Della Casa immediate renown, however, was his sane and witty *Il galateo.* Written between 1550 and 1555, first published with his *Rime* in 1558, and first translated into English by Robert Peterson in 1576, *Galateo* differs from an earlier etiquette manual, Baldassare Castiglione's *Il cortegiano* ("The Courtier"), in being more concerned with the details of correct behaviour in polite society than with courtly etiquette. Like *Il cortegiano,* Della Casa's manual became widely read throughout Europe.

Casa da Guiné, also called CASA DE GUINÉ E MINA, byname CASA DA INDIA: *see* Guiné, Casa da.

Casa de Contratación, byname CASA DE LAS INDIAS (Spanish trading house): *see* Contratación, Casa de.

Casa Grande, city, Pinal County, south central Arizona, U.S., near the Santa Cruz River and 16 mi (26 km) southwest of the Casa Grande Ruins National Monument. The city is a health resort in an irrigated agricultural (cotton, fruit, alfalfa) area. Local mines produce copper, silver, and gold. The ruins, discovered in 1694 by Eusebio Kino, a Jesuit missionary, are dominated by the Casa Grande (Big House), a four-story adobe watchtower built by Salado Indians in the 14th century. Nearby are partially excavated village sites of an earlier Hohokam Indian culture. Picacho Peak State Park is nearby. Inc. town, 1915; city, 1959. Pop. (1980) 14,971.

Casa Grande Ruins National Monument, pre-Columbian ruins in south central Arizona, U.S., in the Gila Valley, immediately north of Coolidge. Reserved in 1892 and designated a national monument in 1918, the ruins, discovered in 1694 by Eusebio Kino, a Jesuit missionary, are dominated by the Casa

Grande ("Big House"), a four-story building constructed of unreinforced clay and topped by an adobe watchtower. Built by Salado Indians in the early 14th century, it is the only pre-Columbian building of its type in existence. Nearby are partially excavated village sites established many centuries earlier by Hohokam Indians who practiced farming, as attested by remains of an irrigation system. The monument occupies 473 acres (191 hectares) and has a museum in its administration building that displays local artifacts.

Casablanca, Arabic AD-DĀR AL-BAYḌĀʾ, or DAR EL-BEÏDA, principal port of Morocco, on the North African Atlantic seaboard.

The origin of the town is not known. A Berber village called Anfa stood on the present-day site in the 12th century; it became a pirates' base for harrying Christian ships and was destroyed by the Portuguese in 1468. The Portuguese returned to the area in 1515 and built a new town called Casa Branca ("White House"). It was abandoned in 1755 after a devastating earthquake, but the ʿAlawī sultan Sīdī Muhammad ibn ʿAbd Allāh rebuilt the town in the late 18th century. Spanish merchants, who named it Casablanca, and other European traders began to settle there. The French after a time outnumbered other European settlers, and the name Maison Blanche ("White House") became as common as Casablanca.

The town was occupied by the French in 1907, and during the French protectorate (1912–56) Casablanca became the chief port of Morocco. Since then, the growth and development of the city have been continuous and rapid. During World War II the city was the seat of a British–U.S. summit conference in 1943. In 1961 a conference at Casablanca, presided over by King Muḥammad V of Morocco, founded the Casablanca group of African states.

The man-made port of Casablanca is protected from the sea by a breakwater and handles most of Morocco's foreign trade. It is also a port of call for European ships; Boulevard Hansali, which leads to the port, is lined with shops for tourists. Inland from the docks and the harbour is the old medina, the original Arab town. Still enclosed in parts by its original rampart walls, it is a maze of narrow streets and whitewashed brick or stone houses. In a semicircle outside the walls of the medina is the town built by the French. Avenues radiating from Muḥammad V Square are intersected by ring roads that reach to the coast on either side of the harbour. Muḥammad V Square, near the gateway of the old medina, and United Nations Square are the business and administrative centres of the town, where banks, hotels, and large modern shops are located. Farther south, overlooking the gardens of the Park of the Arab League, is the white Cathedral of the Sacré Coeur. West of the park and stretching toward the coast are the gardens and villas of residential districts, such as Anfa. Large numbers of poor Muslims live in shantytowns (*bidonvilles*) on the outskirts of the city.

Buses are the principal means of public transport. Roads connect Casablanca with other major cities. There is also a railway line that runs northeastward into Algeria and Tunisia. The Casablanca-Anfa airport, to the southwest, and the Casablanca-Nouaceur airport, to the east of the city, provide international services.

The rapid commercial progress of Casablanca, especially the growth of its port, has established it as the economic capital of Morocco. It accounts for more than half of the bank transactions and industrial production of Morocco. Casablanca's industries include textiles, electronics, leather works, food canning, and the production of beer, spirits, and soft drinks. Fishing is important in coastal waters, where a fairly wide continental shelf provides a good fishing ground. The catch includes soles, red mullet, turbot, sea eels, crabs, and shrimps.

Casablanca has Arab and French schools at different educational levels. There are also various cultural and utilitarian institutes, such as the Goethe-Institut, the Municipal College of Fine Arts, the Municipal Library, a prehistory society, an institute of fishing, and a horticultural society.

As Morocco's principal centre for recreation, Casablanca has a number of pleasant beaches, parks, and attractive promenades along the seafront. Pop. (1982) 923,620.

Casablanca Conference (Jan. 12–23, 1943), meeting during World War II at Casablanca between President Franklin D. Roosevelt and Prime Minister Winston Churchill and their respective military chiefs and aides, who planned future global military strategy for the Western Allies. Though invited, Joseph Stalin declined to attend.

The work of the conference was primarily military—deciding on the invasion of Sicily (after completion of the North African campaign), apportioning forces for the Pacific theatre and outlining major lines of attack in the Far East, and agreeing on the concentrated bombing of Germany. However, Roosevelt and Churchill also found time to discuss nuclear bomb research, to consider the competing claims for the leadership of the French war effort against the Axis, and, most important of all, to demand an "unconditional surrender" from Germany, Italy, and Japan.

Both the announcement and the policy of unconditional surrender came in for severe criticism after the war, when it was contended that opposition groups in Germany might have overthrown Adolf Hitler and negotiated an earlier peace if they had not been discouraged by fear of Allied vindictiveness. Churchill's reply was that any statement of terms acceptable at that time to Allied leaders and to their peoples, such as the partition of Germany, its complete demilitarization, and reparations in kind and in forced labour, would have been more discouraging still.

Casadesus, Robert (b. April 7, 1899, Paris—d. Sept. 19, 1972, Paris), French pianist and composer best known for his playing of the French repertoire.

He was a member of a distinguished family of French musicians. Casadesus studied with Louis Diémer at the Paris Conservatory where he won several prizes, including the Grand Prix Diémer. Beginning in 1922, he toured extensively in Europe, South America, the United States, and Canada, making his U.S. debut under Arturo Toscanini in 1935. He taught at the American Conservatory at Fontainebleau and in the United States during World War II.

He recorded the complete piano music of Maurice Ravel. In addition to the works of French composers, Casadesus frequently performed music by Wolfgang Amadeus Mozart, Ludwig von Beethoven, and Robert Schumann. His playing was marked by extreme clarity and a Gallic sense of balance. A prolific composer, he wrote works considered adventurous but balanced.

Casal, Julián del (b. Nov. 7, 1863, Havana—d. Oct. 21, 1893, Havana), poet who was one of the most important forerunners of the Modernist movement in Latin America.

After a short period of formal education, Casal was forced to leave school because of failing family fortunes. His first volume of poetry, *Hojas al viento* (1890; "Leaves in the Wind"), clearly shows the influence of the French Parnassian poets, especially Baudelaire. Throughout his poetry, Casal expressed an almost compulsive preference for the artificial and man-made over the natural. A chronic invalid, he died of tuberculosis while preparing his third book, *Bustos y rimas* (1893; "Busts and Rhymes"), which was published shortly after his death.

Casale Monferrato, town, Alessandria province, Piemonte (Piedmont) region, northwestern Italy, on the Po River in the Monferrato Hills east of Turin. It was founded in the 8th century on the site of ancient Bodincomagus. In the 10th century the town belonged to the marquessate of Monferrato, becoming its capital in 1435. It passed to the Gonzaga family in 1536 and was long the subject of dispute between France and Spain. Its citadel (1590) changed hands frequently before being dismantled in 1695 and passing to Savoy in 1707. The seat of a bishopric, Casale Monferrato's notable landmarks include the cathedral of S. Evasio (1107); the 15th-century church of S. Domenico, with a Renaissance portal; the 17th-century castle; and many 18th-century palaces. Lime, cement, and artificial stone are produced, as are farm machinery, electrical appliances, and tartaric acid. Wine is exported. Pop. (1984 est.) mun., 41,161.

Casals, Pablo, Catalan PAU CASALS (b. Dec. 29, 1876, Vendrell, Spain—d. Oct. 22, 1973, Río Piedras, Puerto Rico), Spanish-born cellist and conductor, known for his virtuosic technique, skilled interpretation, and consummate musicianship.

Casals, 1957
UPI—EB Inc.

Casals made his debut in Barcelona in 1891 after early training in composition, cello, and piano. After further study in Madrid and Brussels he returned to Barcelona in 1896 as principal cellist at the Gran Teatro del Liceo. By this time he had established his innovative technique; by making his left-hand positions more flexible and using a freer bowing technique, he created an individual style marked by seeming effortlessness and a singing tone. Casals toured internationally between 1898 and 1917 and formed a celebrated trio with Alfred Cortot (piano) and Jacques Thibaud (violin). Having won an international reputation as a cellist, Casals helped found in 1919 the École Normale de Musique in Paris and also established and conducted the Orquestra Pau Casals in Barcelona.

An outspoken opponent of Fascism, he was forced to move in 1936 to Prades in Catalan

France. He refused to return to Spain after the Spanish Civil War (1936–39) and announced his retirement from public performance in 1946 to protest worldwide recognition of the Franco regime in Spain; in 1950, however, he returned to recording and conducting, choosing spoken over silent protest. In 1956 he moved to Puerto Rico, from which place he continued his personal musical crusade for peace until his death.

Casals was a Romantic who eschewed the drier, literal interpretations of Modernism. His love for the works of J.S. Bach formed the core of his sensibilities. He revitalized appreciation for Bach's cello music, especially with his masterful rendition of the six unaccompanied suites for cello.

Biographical works include his own *Joys and Sorrows* (1970) with Albert E. Kahn and *Pablo Casals: A Biography* (1974) by H.L. Kirk.

Casamance River, river in West Africa, rising in southern Senegal and flowing west through a region also called Casamance that lies between The Gambia and Guinea-Bissau. It receives various small tributaries and empties into the Atlantic Ocean after a course of 190 miles (300 km). The river flows through broad, flat floodplains with luxuriant vegetation. There is a permanent flow as far upstream as Fafakourou (25 miles northeast of Kolda). The Casamance makes a poor waterway, however, and even small boats can only proceed as far as Sédhiou (about 80 miles inland).

Casanare, intendency of Colombia, located in the eastern Llanos (Plains), bounded on the west by the Cordillera Oriental, on the north by the Río Casanare, and on the south and east by the Río Meta. Casanare was an autonomous province during the Colombian wars of independence and a self-governing national territory in the late 19th century. Until 1974, it was formally a part of the department of Boyacá. The intendency covers 17,236 square miles (44,640 square km) of mostly grassland within the Llanos. It is low-lying, tropical in climate (with alternate wet and dry seasons), and has an average elevation of only 330–1,300 feet (100–400 m). The principal economic activity is cattle raising. Subsistence agriculture predominates. Roads were practically nonexistent in the intendency before discovery (1978) and foreign extraction (1983) of local petroleum pools. El Yopal is the capital. Pop. (1985) 110,253.

Casanova, Giovanni Giacomo, byname JEAN-JACQUES, CHEVALIER (knight) DE SEINGALT (b. April 2, 1725, Venice—d. June 4, 1798, Dux, Bohemia [Duchcov, Czech.]), ecclesiastic, writer, soldier, spy, and diplomatist, chiefly remembered as the prince of Italian adventurers and as the man who made the name Casanova synonymous with "libertine." His autobiography, which perhaps exaggerates some of his escapades, is a splendid description of 18th-century society in the capitals of Europe.

Son of an actor, Casanova was expelled as a young man from the seminary of St. Cyprian for scandalous conduct and launched on a colourful, dissolute career. After a time in the service of a Roman Catholic cardinal, he was a violinist in Venice, joined the Masonic Order (1750) in Lyon, then traveled to Paris, Dresden, Prague, and Vienna. Back in Venice in 1755, Casanova was denounced as a magician and sentenced to five years in the Piombi, prisons under the roof of the Doges' Palace. On Oct. 31, 1756, he achieved a spectacular escape and made his way to Paris, where he introduced the lottery in 1757 and made a financial reputation and a name for himself among the aristocracy.

Fleeing from his creditors in Paris in 1760, he assumed the name Chevalier de Seingalt (which he retained for the rest of his life)

Casanova, engraving by Johann Berka, 1788

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

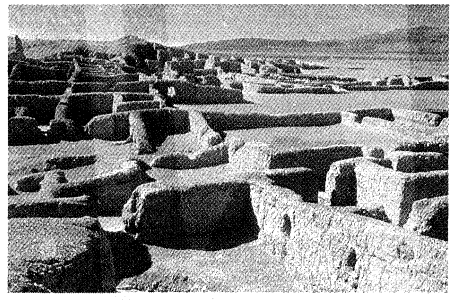
and traveled to southern Germany, Switzerland (where he met Voltaire), Savoy, southern France, Florence (whence he was expelled), and Rome. He also spent some time in London. In Berlin (1764) Frederick II offered him a post. Casanova moved on to Riga, St. Petersburg, and Warsaw. A scandal followed by a duel forced him to flee, and he eventually sought refuge in Spain. Permitted to return to Venetian territory between 1774 and 1782, he acted as a spy for the Venetian inquisitors of state. He spent his final years (1785–1798) in Bohemia as librarian for Count von Waldstein in the château of Dux.

As versatile in his writing as he was in his career, Casanova wrote occasional verse, criticism, a translation of the *Iliad* (1775), and a satirical pamphlet on the Venetian patriciate, especially the powerful Grimani family.

His most important work, however, is his vivid autobiography, first published after his death as *Mémoires de J. Casanova de Seingalt,* 12 vol. (1826–38). (A definitive edition, based on the original manuscripts, was published in 1960–62 with the title *Histoire de ma vie* [*History of My Life*].)

Casas, Bartolomé de Las (Spanish historian): *see* Las Casas, Bartolomé de.

Casas Grandes, town on the Casas Grandes River, in the northwestern corner of Chihuahua state, northern Mexico. When it was settled by the Spaniards in 1661 or 1662, the area belonged to the Suma Indians, who had been reported by Spanish explorers as occupying the valley in the mid-1500s. The name, Spanish for "great houses," refers to the extensive, multistoried ruins of a pre-Columbian town nearby, which was probably founded in 1050 and burned around 1340, after which the abandoned valley lands were occupied by the Suma, who migrated in from the east. Ruins of this type are common in the valleys of the Casas Grandes and its tributaries, as well as in the Santa María and Carmen river valleys. The area is now a national monument under the jurisdiction of the Instituto Nacional de Antropología e Historia. Cotton, cereals, and livestock are raised in the area. Pop. (1980) 10,861.



Ruins of pre-Columbian town, Casas Grandes, Mex.

Walter Aguiar—EB Inc.

Casaubon, Isaac (b. Feb. 18, 1559, Geneva—d. July 1, 1614, London), French classical scholar and theologian who was one of the leading scholars of the era.

Casaubon was born to French Huguenot refugees. Three years after his birth, the family returned to France and settled at Crest in Dauphiné, where Casaubon's father became a pastor. Until he was 19, young Casaubon was educated by his father; at age 19 he was sent to the Academy of Geneva, and in 1581 he became professor of Greek there. He remained there until 1596, making the acquaintances that eventually led to his long correspondence (beginning in 1594) with another leading classical scholar, Joseph Justus Scaliger.

From 1596 to 1599 Casaubon taught at the University of Montpellier. It was during this tenure, while he was engaged upon what is considered to be his masterwork—his edition of and commentary on Athenaeus—that he developed his unique style of illustrative commentary, at once apposite and profuse.

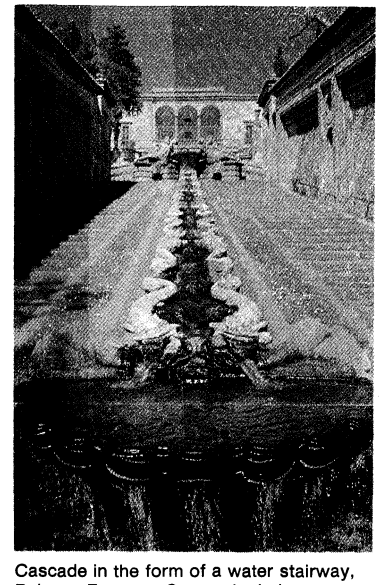
In 1600 Casaubon was called to Paris, where he became involved in a religious controversy between Roman Catholic and Protestant theologians that was to haunt him for the remainder of his life. Casaubon remained in Paris until 1610. He was assigned a pension by King Henry IV and succeeded to the salaried post of sublibrarian of the royal library.

In 1610, after the King's assassination, Casaubon was invited to England, where he was collated to prebendal stalls at Canterbury and at Westminster, and a pension was assigned him from the Exchequer. He was naturalized in 1611. Though he retained his appointments in France, he never returned; instead he spent the remainder of his days in generally unfruitful activity in the service of James I.

In addition to a number of translations with commentaries, Casaubon wrote a two-volume diary, the *Ephemerides* (published 1850). A biography by M. Pattison (1875) was revised in 1892 by H. Nettleship.

cascade, waterfall, especially a series of small falls, consisting of water descending over rocks or boulders. It may be natural, or it may be artificial. The cascade has often been used as a feature of formal gardens.

A garden cascade properly employs a natural supply of water and a sloping site; but the site is usually adapted artificially to take advantage of the stream, and sometimes a cascade



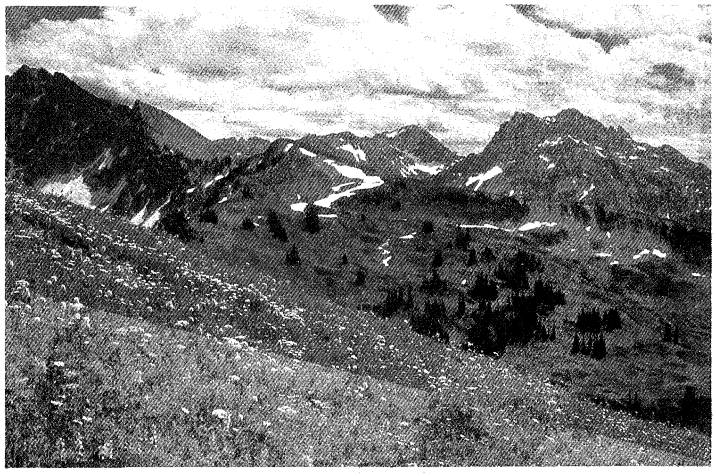
Cascade in the form of a water stairway, Palazzo Farnese, Caprarola, Italy

Edwin Smith

that strives to appear natural is dependent on a head of water artificially created by pumps.

Natural cascades can be the chief reason for a garden's existence in a particular place, as at Tivoli in central Italy, where the fall of the river Aniene was made into the garden of the Villa d'Este. Cascades are often used in architectural gardens in the form of water stairways, as at the Palazzo Farnese at Caprarola, Italy.

Cascade Range, segment of the Pacific Coast Ranges, extending northward for more than 700 mi (1,100 km) from Lassen Peak, in northern California, U.S., through Oregon and Washington to the Fraser River in southern British Columbia, Can. Many peaks exceed 10,000 ft (3,000 m), including Mt. Hood (11,235 ft, highest point in Oregon) and Mt. Rainier (14,410 ft, highest in Washington and the Cascade Range). Others are Mts. Jefferson, Adams, and Shasta. Most of the summits are extinct volcanoes, but Lassen Peak (10,457 ft) and several others have erupted in the recent past. Mount Baker (10,778 ft) steamed heavily in 1975, and Mt. St. Helens (prior to eruptions, 9,677 ft) erupted in 1980 and again in 1981. The mountains lie 100 to 150 mi inland from the Pacific Ocean and separate the moist coastal region from the arid interior. They are continued by the Coast Mountains (British Columbia) to the north and the Sierra Nevada to the south.



The North Cascade Range from Miners Ridge, Wash.
Ray Atkeson—EB Inc.

Marked by glaciation (which has formed many lakes) and stream dissection, the mountains are a headstream region for the Willamette River. Except for the peaks lying above the timberline, the entire range is heavily wooded and is within conservation areas and national forests. The western slope, fed by up to 100 in. (2,500 mm) of precipitation yearly, has dense stands of Douglas fir trees. North Cascades, Mt. Rainier, Crater Lake, and Lassen Volcanic national parks, Lava Beds National Monument, and Manning Provincial Park (Canada) offer unusual natural formations and magnificent scenery. Tourism, outdoor recreation, and water for hydroelectric power, irrigation, and industry are the main activities and assets of the range.

The English navigators George Vancouver and William R. Broughton sighted the snow-capped Cascades in 1792. The U.S. explorers Meriwether Lewis and William Clark, while on their expedition to the northwest in 1806, passed through the range in the 4,000-ft-deep Columbia River Gorge on the Washington–Oregon border. The range was named for the great cascades found near the gorge.

Cascade Tunnel, longest railroad tunnel in the U.S., located in central Washington about 60 mi (100 km) east of Seattle. It carries a line of the Burlington Northern railroad through the Cascade Range between Berne (on the east) and Scenic. It is 41,078 ft (7.8 mi [12.5 km]) long. Constructed from 1925 to 1929, it replaced a shorter (2.6-mi [4.2-km]) tunnel a few miles to the north, providing a less winding route.

Cascais, also spelled CASCAES, town and *concelho* (municipality), Lisboa district, western Portugal, on the Baía (bay) de Cascais, 17 mi (28 km) west of central Lisbon. The town, created (1364) by Pedro I, is now a fishing port and resort on the Portuguese Riviera. Its chapel of Nossa Senhora da Vitória contains the image of Santo António, which accompanied a local infantry regiment during the Peninsular War (1808–14) against the French. The 17th-century Citadel is a residence of the Portuguese president. Prehistoric burial caves are nearby. The popular resort of Estoril is included in the *concelho.* Pop. (1981 prelim.) town, 12,457; *concelho,* 139,150.

cascara sagrada (Spanish: "sacred bark"), the dried bark of the buckthorn *Rhamnus purshiana* (order Rhamnales) used in medicine as a laxative. The tree is cultivated in North America and Kenya. Cascara sagrada is prepared in both liquid and solid forms. The activity apparently results from the combined action of several substances, a number of which have been isolated; they consist chiefly of anthraquinones.

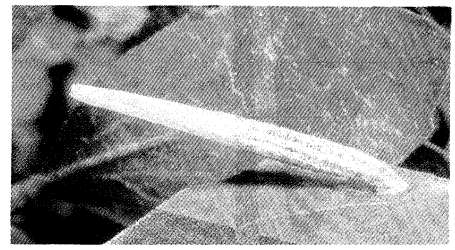
Cascina, town, Pisa province, Toscana (Tuscany) region, central Italy. Local mineral springs are used to treat rheumatism. The town's church of Sta. Maria, in Pisan style, dates from the 12th century. Cascina was a historic battleground in the Pisans' resistance against the Florentines, who sacked it in 1364; remnants of its ancient ramparts are preserved. Industries include furniture manufacture, and there is a cabinet-making school in the town. Pop. (1981 prelim.) mun., 35,511.

Case, Shirley Jackson (b. Sept. 28, 1872, Hatfield Point, N.B., Can.—d. Dec. 5, 1947, Lakeland, Fla., U.S.), U.S. theological scholar and educator who studied the social and environmental influences on the historical evolution of the Christian religion.

Dean of the University of Chicago Divinity School (1933–38), he formulated theories of possible interaction between Christianity and society, thus providing principles for those engaged in the Social Gospel movement. Among his writings are *Jesus: A New Biography* (1927) and investigations in Christian mysticism and millennialism.

case hardening: *see* surface hardening.

casebearer, any larva of the cosmopolitan moth family Coleophoridae (order Lepidoptera) of insects. The larvae are light brown with dark heads; they attack apple, birch, cherry, and willow trees, feeding first as leaf miners and then as casebearers. They attach their cases, which serve as camouflage and protection, perpendicularly to branches, fruits, leaves, or twigs, and protrude from them to feed. The cases, in which the larvae overwinter, are made from leaves, twigs, silk, and excrement. Typical case shapes vary from that of a cigar to a pistol outline.



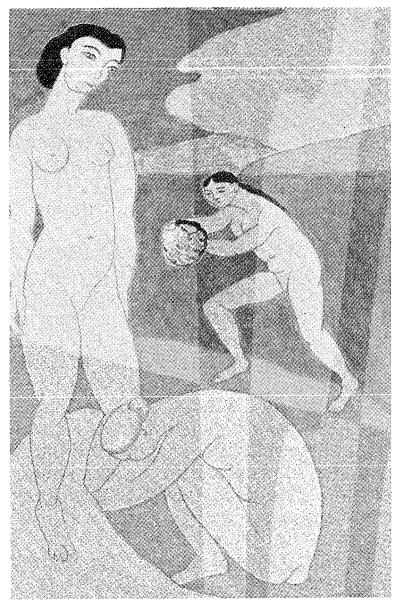
Larval case of baccharis casebearer moth (*Coleophora vicidiflorella*)
William E. Ferguson

Most adults are pale brown or gray with a wingspan of less than 12 millimetres (½ inch). The narrow, pointed wings have a long fringe of hair.

casebearing beetle, any small (under 6 millimetres, or ¼ inch), robust, cylindrical insect belonging to one of several subfamilies in the leaf beetle family Chrysomelidae; *e.g.,* Clytrinae, Cryptocephalinae, Chalamisinae and Lamprosomatinae. The female covers each egg with a layer of excrement; after the larvae hatch, they retain this covering as camouflage and add to it.

When disturbed, the adults pull in their legs; because of their colouring and shape, they resemble caterpillar droppings and are therefore ignored by predators. The European species *Clythra quadripunicata* and the North American species *Coscinoptera dominicana* live in ant nests.

casein painting, painting executed with colours ground in a solution of casein, a phosphoprotein of milk precipitated by heating with an acid or by lactic acid in souring. In the form of homemade curd made from



"Le Luxe II," casein painting by Henri Matisse, 1907–08; in the Statens Museum for Kunst, Copenhagen
By courtesy of the Statens Museum for Kunst, Copenhagen

soured skim milk, it has been a traditional adhesive and binder for more than eight centuries. Refined, pure, powdered casein, which can be dissolved with ammonia, has been used by artists for easel and mural paintings since the latter 19th and early 20th centuries and, more recently, ready-made casein paints in tubes have come into very wide use. An advantage of casein painting is that it can create effects that approach those of oil painting. It permits the use of bristle brushes and a moderate impasto, like oil painting, but not the fusion of tones. It is preferred by some because of speedy drying and mat effects. When dry, the paint becomes water resistant to a considerable degree. Casein paintings may be varnished to further resemble oil paintings, and they are frequently glazed or overpainted with oil colours. As casein is too brittle for canvas, it must be applied to rigid boards or panels.

Casella, Alfredo (b. July 25, 1883, Turin, Italy—d. March 5, 1947, Rome), composer, pianist, conductor, and teacher whose cosmopolitan outlook permeated 20th-century Italian music. He studied in Paris, where he stayed until 1914. After touring as a pianist he returned to Italy in 1915. In 1917 he founded the Società Nazionale di Musica and helped to revive interest in early Italian music. He also published valuable editions of the keyboard works of Bach, Mozart, Beethoven, and Chopin.

His early symphonies (1905–09) show some influence of Strauss and Mahler and his later chamber and orchestral works that of Ravel and Stravinsky. He established a more personal style in the ballet *La Giara* (1924; *The Jar*) and in the orchestral works *Scarlattiana* (1926) and *Paganiniana* (1942). Other notable works were *Italia* for orchestra (1910), the *Partita* for piano and orchestra (1925), and the *Missa solemnis* (1944).

Casement, Sir Roger (David) (b. Sept. 1, 1864, Kingstown, County Dublin, Ire.—d. Aug. 3, 1916, London), distinguished British public servant who was executed for treason and became one of the principal Irish martyrs in the revolt against British rule in Ireland.

Casement was a British consul in Portuguese East Africa (Mozambique; 1895–98), Angola (1898–1900), Congo Free State (1901–04), and Brazil (1906–11). He gained international fame for revealing atrocious cruelty in the exploitation of native labour by white traders in the Congo and the Putumayo River region, Peru; his Congo report (published 1904) led to a major reorganization of Belgian rule in the Congo (1908), and his Putumayo report (1912) earned him a knighthood.

Ill health forced Casement to retire to Ireland in 1912. Although he came from an Ulster Protestant family, he had always sympathized with the predominantly Roman Catholic Irish nationalists. Late in 1913 he helped to form the Irish National Volunteers, and in July 1914 he travelled to New York City to seek American aid for that anti-British force. After World War I broke out in August, Casement hoped that Germany might assist the Irish independence movement as a blow against Great Britain. On arriving in Berlin in November 1914, he found that the German government was unwilling to risk an expedition to Ireland, and that most Irish prisoners of war would refuse to join a brigade that he intended to recruit for service against England.

Later, Casement failed to obtain the loan of German army officers to lead (as he thought essential) the Irish rising planned for Easter 1916. In a vain effort to prevent the revolt, he sailed for Ireland on April 12 in a German submarine. Put ashore near Tralee, County Kerry, he was arrested on April 21 and taken to London, where, on June 29, he was convicted of treason and sentenced to death. An appeal was dismissed, and he was hanged despite attempts by influential Englishmen to secure a reprieve in view of his past services to the British government. During this time, diaries reputedly written by Casement and containing detailed descriptions of homosexual practices were circulated privately among British officials. After years of dispute over their authenticity, the diaries were made available to scholars by the British home secretary in July 1959. It was generally considered that the passages in question were in Casement's handwriting, but there remained the possibility that they had been copied from other sources.

René Marie MacColl's unfavourable biography, *Roger Casement, a New Judgment* (1956), was countered by *The Accusing Ghost: or, Justice for Casement* (1957), by Alfred Noyes, and *The Black Diaries* (1959), by Peter Singleton-Gates and Maurice Girodias. H. Montgomery Hyde's *Trial of Sir Roger Casement* (1960) is one of the "Notable British Trials" series. B.L. Reid's *The Lives of Roger Casement* appeared in 1976.

casement window, earliest form of movable window, wooden or metal framed, with hinges or pivots at the upright side of the vertically hung sash, so that it opens outward or inward along its entire length in the manner of a door. One frame, separately movable, of such a window is called a casement sash.

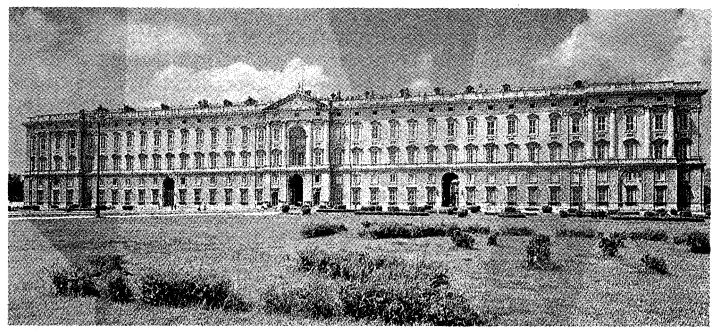
The British and German custom was to have the windows opening outward. A medieval English example is the Falstaff Inn, Canterbury, Kent, Eng., with casement windows below fixed windows, or lights, all composed of small leaded panes. The French casement commonly has two meeting leaves that open inward, requiring careful craftsmanship to prevent weather from penetrating them. These French casements were adapted in the U.S. chiefly as ways to give access onto balconies and porches, and in this doorlike form they are known as French windows, French doors, or casement doors.

Caseros, *cabecera* (principal built-up area) of Tres de Febrero *partido* (political subdivision), in Gran (Greater) Buenos Aires, Argentina, immediately west of the city of Buenos Aires, in Buenos Aires province. The present-day city is the site of the Battle of Caseros (Feb. 3, 1852), in which the Argentine military ruler Juan Manuel de Rosas was overthrown. The *cabecera* acquired its name from the Palomar de Caseros, a historic house built by Bernardo Casero in 1799. At the time of the Battle of Caseros, the site of the city was part of the *partido* of Morón. The area was taken into the *partido* of San Martín in 1864, and in 1959 it was expropriated to establish the *partido* of Tres de Febrero.

Caseros has become an important industrial centre, producing metal goods, paper, glass, textiles, pharmaceuticals, perfume, and bricks. The *cabecera* houses the Colegio Militar de la Nación (National Military College) and a museum dedicated (1941) to the Battle of Caseros and located in the house of Bernardo Casero.

With the growth of the national capital, particularly since 1947, Caseros has been absorbed into the western suburban area of Gran Buenos Aires. Proximity to the national capital offers the citizens of Caseros many of the same transportation and communication links afforded the residents of Buenos Aires city.

Caserta, city, capital of Caserta province, Campania region, southern Italy, north of Naples. The old town (Caserta Vecchia), founded by the Lombards in the 8th century, lies on hills 3 mi (5 km) north-northeast of the modern city, which was a village known as Torre belonging to the Caetani family of Sermoneta until the construction there in the 18th century of the Bourbon royal palace. San Leucio, 2 mi north, is a village founded by Ferdinand IV, king of Naples, in 1789; it has large silk factories. In the Italian Risorgimento (movement for political unity), the Battle of the Volturno (1860), in which the nationalist leader Giuseppe Garibaldi defeated the Neapolitan forces, was fought around Caserta.



The Bourbon Royal Palace, Caserta, Italy
SCALA—Art Resource

In World War II the royal palace served for a time as the headquarters of the Allied command, and the surrender of the German Army in Italy was signed there on April 29, 1945. The palace (1752–74), with a richly decorated interior including a sumptuous chapel and theatre, stands in an extensive park with famous gardens. Parts of it are now used for an air force officers' academy and a commercial school.

On the main railway lines from Naples to Foggia and Rome, Caserta is an agricultural trade centre with food-processing and glass-making industries. Pop. (1981 prelim.) mun., 66,754.

Cases, Emmanuel(-Augustin-Dieudonné-Joseph), comte de Las: *see* Las Cases, Emmanuel(-Augustin-Dieudonné-Joseph), comte de.

cash register, business machine that usually has a money drawer and is designed to record sales transactions. The typical cash register of the mid-20th century, through a system of keys, levers, and gears often electrically driven, indicated the amount of a transaction at the top of the register where it could be seen by both customer and salesman; kept separate totals of sales by various classifications; printed and issued a receipt on cash sales or overprinted a record of the transaction on a docket for charge sales; and kept an audit strip within the register. Some types of machines automatically made change. Frequently, special counters in the register showed the number of customers and the number of transactions of different kinds.

Within a few years the combined electronic revolution and the increasing ubiquity of the digital computer in business operations had caused major manufacturers to convert from the mechanical cash register to an electroni-

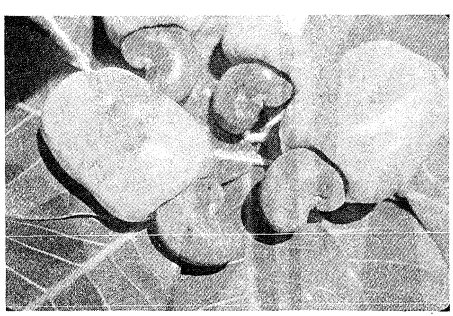
cally operated device that performed the same functions, often driven by and sometimes feeding information into a computer, enabling instant credit checks, recording of transactions, and inventory control entries. Computer-driven cash registers often are equipped with an optical scanning device or a light pen that can read printed or coded price information and product description, recording it and printing it on the customer's receipt.

Cashel, Irish CAISEAL (Stone Fort of Munster), town and urban district, County Tipperary, Ireland. It is dominated by the Rock of Cashel (358 ft [109 m]), a limestone outcrop on the summit of which is a group of ruins

Ancient round tower and Celtic cross atop the St. Patrick's Rock at Cashel, County Tipperary
Colour Library International

that include remains of the town's defenses, St. Patrick's Cathedral (adjoined by a round tower and Cormac's Chapel), the bishop's castle, and an ancient cross. The rock was the stronghold of the kings of Munster from the 4th century. St. Patrick visited Cashel *c.* 450, baptized King Aenghus, and made Cashel into a bishopric. In 1101 the rock was granted to the church by King Murtagh O'Brien. Cormac's Chapel was built between 1127 and 1134, and the cathedral was founded in 1169, then replaced by the present building in the 13th century. Cashel also has a Georgian cathedral (1784), the seat of the Protestant bishop. Pop. (1981) 2,436.

cashew, edible seed or nut of *Anacardium occidentale* (family Anacardiaceae), a tropical and subtropical evergreen shrub or tree; where the soil is fertile and the humidity high, the plant may grow to 12 metres (40 feet) in height. The tree is chiefly important for the



Cashew apples and nuts (*Anacardium occidentale*)
W.H. Hodge

nuts it produces, but it produces wood used for shipping crates, boats, charcoal, etc., and a gum similar to gum arabic. The species is related to the American poison ivy and poison sumac and must be handled with care by susceptible individuals.

The nut, shaped like a large, thick bean, is sometimes more than 2.5 centimetres (1 inch) long and forms in an unusual way. It appears as though one of its ends had been forcibly sunk into the calyx end of a pear-shaped, swollen stem, called the cashew apple, which is about three times as large as the nut and reddish or yellow. The cashew apple is used locally in beverages, jams, and jellies. The nut has two walls, or shells, the outer smooth and glasslike over the surface, thin and somewhat elastic but stout, and olive green until maturity, when it becomes strawberry roan. The inner shell is harder and must be cracked like the shells of other nuts. A brown oil between the shells blisters human skin and is used as a lubricant, an insecticide, and in the production of plastics. More than 500,000 metric tons are produced annually. The cashew, rich and distinctively flavoured, is a characteristic ingredient of numerous chicken and vegetarian dishes of southern India.

The fruits are picked by hand, and the nuts are first detached, then sun dried. In some localities the dried nuts are roasted by being placed among burning logs, where the heat causes the outer shells to burst open and release the oil. The oil quickly catches fire, giving off fumes injurious to the eyes and skin. In improved methods of roasting, the poisonous properties are dispelled in roasting cylinders. Later, the inner shells are broken open by hand and the kernels heated to remove the skins.

The cashew is native to tropical Central and South America. Portuguese missionaries took it to East Africa and India during the 15th century, where it became abundant at low altitudes near the seacoast. About a quarter of U.S. imports of cashews are from India.

cashmere, animal-hair fibre forming the downy undercoat of the Kashmir goat and belonging to the group of textile fibres called specialty hair fibres (*q.v.*). Although the word cashmere is sometimes incorrectly applied to extremely soft wools, only the product of the Kashmir goat is true cashmere.

The fibre, known as pashm or pashmina in some parts of Asia, became known for its use in beautiful shawls and other handmade items produced in Kashmir, India. In the early 19th century cashmere shawls reached their greatest popularity, and the shawls of England, France, and the town of Paisley, Scot., were made to imitate the original Kashmir shawls.

The cashmere goat has a protective outer coat of coarse fibre 1.5 to 8 inches (4 to 20 centimetres) in length. The downy undercoat is made up of the fine, soft fibre commonly called cashmere, ranging from 1 to 3.5 inches long. Most down fibre is plucked or combed out by hand during the molting season. Iranian cashmere, however, is obtained by shearing. The annual yield per animal ranges from a few ounces to one pound (about 0.5 kilogram). A sweater requires the fleece of 4 to 6 goats; an overcoat uses the production of 30 to 40. Some fibre, called pulled cashmere, is taken from the skins of slaughtered animals.

The fleece is cleaned to remove such impurities as grease and vegetable matter. Coarse hairs are removed by various mechanical dehairing processes that are frequently kept secret by their developers. Processing reduces the final yield by about 50 percent. The amount of coarse hair remaining greatly affects price, with fibre having the lowest hair content commanding the highest price. High-quality cashmere-coating fabrics usually contain less than 5 percent of the coarse hair; fine-quality sweaters contain less than 1 percent. The scales forming the outer layer, or epidermis, of the fine fibre are less distinct than those of wool although more definite than in mohair; the cortical layer is striated and contains varying amounts of pigment that produce the fibre colour; and there is no distinct medulla (central canal). The fibres have diameters finer than those of the best wools. The Kashmir goats of China and Mongolia yield fibre with diameters ranging from 14.5 to 16.5 microns (a micron is about 0.00004 inch); that of Iranian goats is 17.5 to 19.5 microns. Colour, usually gray or tan, varies from white to black.

Fabric made of cashmere is warm and comfortable to the wearer, and it has excellent draping qualities and soft texture. The fibre, which absorbs and retains moisture much like wool, is somewhat weaker than fine wool and considerably weaker than mohair. It is highly susceptible to damage by strong alkalies and high temperatures. Dark fibres are bleached to obtain light shades, although the process may reduce strength and softness. Cashmere fabrics are subject to abrasion in wearing; pilling, or bunching together of surface fibres, is a problem in knitwear.

Cashmere is used mainly for fine coat, dress, and suit fabrics and for high quality knitwear and hosiery. It is sometimes blended with other fibres. The strong, coarse hair separated from the down is used locally for grain bags, ropes, blankets, and tent curtains. Because world production is so small and gathering and processing are costly, cashmere is a luxury fibre. Demand and, consequently, price are affected by fashion trends. New man-made fibres with similar texture and fineness, produced at much lower cost, have become a source of competition.

The major producers of cashmere are China, Mongolia, and Iran. Cashmere is also produced on the Indian subcontinent and in Afghanistan and Turkey. The United States, United Kingdom, and Japan are leading consumers.

cashoo (plant extract): *see* catechu.

Casimir, also spelled CAZIMIR, KASIMIR, or KAZIMIR, Polish KAZIMIERZ, name of Polish dukes and kings grouped below chronologically and indicated by the symbol •.

• **Casimir I,** byname CASIMIR THE RESTORER, or THE MONK, Polish KAZIMIERZ ODNOWICIEL, or MNICH (b. July 25, 1016—d. at latest Nov. 28, 1058), duke of Poland who reannexed the formerly Polish provinces of Silesia, Mazovia, and Pomerania (all now in Poland), which had been lost during his father's reign, and restored the Polish central government.

Only surviving son of Duke Mieszko II and Richeza (Ryksa) of Palatine Lorraine, Casimir I, who had taken monastic orders, received papal dispensation and ascended the throne after his father's death (1034). In 1037 he was deposed; manoeuvres of the magnates against his supremacy coincided with a popular revolt against the landowners and with an anti-Christian uprising by pagan tribes. Exiled to Germany, he won military aid from the German kings Conrad II and Henry III and by 1040 had regained his throne. He married the Russian princess Dobronega and, supported by her brother, the grand prince Yaroslav the Great of Kiev, regained the provinces of Mazovia and Pomerania in 1047. He took Silesia (1050) from the Bohemians, though he had to pay annual tribute to the Bohemian princes as compensation. He reestablished the Polish central government, revived the Roman Catholic Church, and suppressed the pagan tribes that had helped to depose him. As ruler of Poland, however, he was never crowned king, and German suzerainty over Poland was, in fact, reestablished during his reign.

• **Casimir II,** byname CASIMIR THE JUST, Polish KAZIMIERZ SPRAWIEDLIWY (b. 1138—d. May 5, 1194), duke of Kraków and of Sandomierz from 1177 to 1194. A member of the Piast dynasty, he drove his brother Mieszko III from the throne and spent much of his reign fighting him. Mieszko actually regained power briefly in 1190–91, retaking Kraków. Casimir became Poland's most powerful ruler

and, at the Congress of Lenczyca (1180) was so recognized by the nobility and clergy, who, in exchange for privileges, vested hereditary rights in his descendants. He was succeeded by his son Leszek I, who spent years in battle against other claimants.

• **Casimir III,** byname CASIMIR THE GREAT, Polish KAZIMIERZ WIELKI (b. April 30, 1310, Kujavia, Pol.—d. Nov. 5, 1370), king of Poland from 1333 to 1370, called "the Great" because he was deemed a peaceful ruler,

Casimir III, sarcophagus figure, after 1370; in Wawel Cathedral, Kraków

By courtesy of Panstwowe Zbiory Sztuki na Wawelu, Krakow

a "peasant king," and a skillful diplomat. Through astute diplomacy he annexed lands from western Russia and eastern Germany. Domestically he unified the government, codified its unwritten law, endowed new towns with the self-government of the Magdeburg Law, and founded Poland's first university.

Casimir was the second king of the reunited and resuscitated Poland that for nearly two centuries had been split up into numerous small principalities. His father, Władysław I, who had succeeded in reuniting Great Poland and Little Poland, renewed the long-forgotten kingship with his coronation in Kraków in 1320. Casimir continued the work of his father, adding two large and important regions (Red Russia and Masovia) to the country and making it a solid and respected partner among the other 14th-century powers in central Europe. In addition, he provided the country with a well-organized government, and thus so strengthened feelings of popular unity that after his death (although he left no legal heir) there were no attempts at restoring the former duchies and principalities. His mother was Jadwiga, daughter of Bolesław the Pious (Pobożny) of Great Poland. After the death of his elder brother in 1312, Casimir was regarded as heir and was prepared for the kingship by Jarosław, later archbishop of Gniezno and Casimir's counsellor. Of his three sisters, one, Elizabeth, who in 1320 married King Charles Robert of Hungary, figured prominently in his foreign and dynastic policy.

Dynastic alliances. In 1325 Casimir married Aldona-Ona, the pagan daughter of Gediminas (Giedymin), duke of Lithuania. Baptized before the wedding, Aldona brought with her thousands of Polish prisoners of war (one chronicle tells of 24,000) as a sign of reconciliation between Poland and the then still heathen Lithuania. The marriage seems to have been unhappy, and the Queen died in 1339 leaving no sons. Two years later Casimir married a German princess, Adelhaid of Hesse, but this marriage proved barren, and Adelhaid was sent home in 1356. A third marriage in 1365 with the Silesian princess Hedwig of Glogau-Sagan still brought no legal heir. The question of a successor was, therefore, one of Casimir's main problems. He finally designated as his heir his nephew, Louis of Hungary. Since Louis had no sons either, Casimir named as his second choice Casimir of western Pomerania, a son of his eldest daughter. The act strengthened the position of the nobility, whose consent had to be obtained by the granting of privileges.

The marriages of his daughters and grandchildren further strengthened Casimir's foreign support. His second daughter was married to Louis of Brandenburg (1345); the third was betrothed to Wenzel, son of the Holy Roman emperor Charles IV (1369), and the Emperor himself married first a grandniece and, later, a granddaughter of Casimir. The King thus had relatives in several important contemporary dynasties: the Wittelsbachs, the Anjous, the Luxemburgs, and the Lithuanians (later known as the Jagiellons). Casimir also had many mistresses, about whom little is known; the most famous of them, the beautiful Jewess, Esther, may have been invented by the chroniclers to explain the King's notable friendliness toward the Jews.

Foreign policy. Casimir's foreign policy reflected his own character: prudent, cool, obstinate, and self-controlled. He preferred diplomacy to war, though he did not entirely refrain from the latter, as shown by a series of forced occupations of foreign territory, notably Red Russia, in 1340 and 1349. At the beginning of Casimir's reign Poland was beset by several difficulties: the King of Bohemia claimed the Polish crown; the German knights of the Teutonic Order disputed East Pomerania; and the country lacked powerful allies. By a series of treaties concluded with Hungary, Bohemia, and the Teutonic Order between 1335 and 1348, Casimir obtained a strong ally in Hungary and dropped his claims to Silesia and East Pomerania (claims that would in any case have been difficult to realize). The Bohemian king, in exchange, dropped his claims to Poland; and the Order withdrew from the territories of Kujavia and Dobrzyn, which it had occupied. Having his western frontier secure, Casimir was now able to occupy the former duchies of Halič and Vladimir (Red Russia) and to unite them step-by-step (though never completely) to Poland. As a result of this carefully planned policy, the Masovian princes, long anxious to preserve their independence, declared themselves Casimir's vassals (1351–53); even in the West some German nobles preferred Casimir's to Brandenburg's lordship.

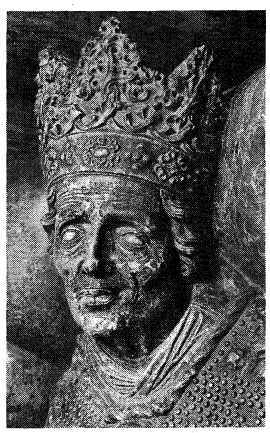
By 1370 Casimir, under different titles, had increased his territory to about 90,000 square miles (233,000 square kilometres) from about 50,000 at his accession. More important than these territorial gains, some of which were lost after Casimir's death, was the growth of the King's prestige throughout Europe. A congress held in Kraków in 1364 was attended by the kings of Hungary, Bohemia, Denmark, and Cyprus, as well as a great number of other princes. Casimir, who 30 years previously had been a humble petitioner at the Congress of Visegrâd in Hungary, was now asked to arbitrate a quarrel between the Emperor and Louis of Hungary.

Domestic achievements. Domestically, Casimir encouraged economic activity and attempted to unite the country under one prince, one law, and one currency. He founded several new towns—two of them named Kazimierz after himself—and gave them, together with already existing towns, the so-called Magdeburg Law, the privilege of self-government. Casimir built more than 50 castles, fostered church building, and embellished the royal castle at Kraków. A special court was established in Kraków to arbitrate in all quarrels and to administer the law codified in the *Liber juris Teutonici* ("Book of Teutonic Law"). The former privileges of the Jews were confirmed and improved. Though Casimir was able to inaugurate his principle of one law in Little Poland and Great Poland, Masovia and Red Russia kept their own nonwritten law. Wishing to educate native lawyers and administrators, he founded the University of Kraków in 1364, which, however, flourished for only a few years before his death in a hunting accident in 1370.

Since little is known of Casimir's sympathies, personal interests, thoughts, and feelings, he must be judged on his deeds, which characterize him as an especially good, wise, and, to a degree, even modern ruler. He was a sober administrator but not a hero; a man who earned the respect of his contemporaries and posterity but was, perhaps, too cool, too aloof, and too faultless to obtain great sympathy.

(G.K.S.R.)

• **Casimir IV,** byname CASIMIR JAGIELLONIAN, Polish KAZIMIERZ JAGIELLOŃCZYK (b. Nov. 30, 1427—d. June 7, 1492), grand duke of Lithuania (1440–92) and king of Poland (1447–92), who, by patient but tena-



Casimir IV, sarcophagus figure by Veit Stoss; in Wawel Cathedral, Kraków

By courtesy of Panstwowe Zbiory Sztuki na Wawelu, Krakow

cious policy, sought to preserve the political union between Poland and Lithuania and to recover the lost lands of old Poland. The great triumph of his reign was the final subjugation of the Teutonic Knights (1466).

Casimir was the second son of Władysław II Jagiełło and his fourth wife, Zofja Holszańska. His father was already over 75 at Casimir's birth, and his brother Władysław III, three years his senior, was expected to become king before his majority. Casimir was thus the second in succession to the throne, and, after Władysław had succeeded his father in 1434, he became the legal heir. Strangely, little was done for his education; he was never taught Latin, nor was he trained for the responsibilities of office, despite the fact he was the only brother of the sovereign. Yet the necessity of taking office was thrust upon him in 1440, when the grand duke of Lithuania, Sigismund, was murdered. The boy was sent to Wilna to act as governor for his brother, but he was proclaimed grand duke in a coup d'etat by the leading boyars (nobles), who evidently hoped to use him as a convenient tool.

The coup practically severed the ties between Lithuania and Poland, but these were restored after Władysław III's death in the Battle of Varna against the Turks (Nov. 10, 1444). The Poles, having to elect a new king, had no other candidate but Casimir. The young man, despite his lack of experience, knew how to wield his new power. He acted to preserve the hereditary rule of the dynasty in Lithuania with no connection with Poland other than the common monarchy, and, when he was finally crowned king of Poland (June 25, 1447), he had succeeded in affirming his right to live in Lithuania and choose his counsellors freely. Considering his deeds and policy

(no personal utterances of his are recorded), it may be inferred that he regarded himself more as the head of a dynasty than as the elected king of Poland. His policy, therefore, is partly family policy, and in cases of conflict between dynasty and state the former had priority. His marriage to Elizabeth of Habsburg in 1454 had clear political aims; as the daughter of Albert II of Habsburg, Elizabeth had claims to Bohemia and Hungary. In fact, this first connection between the Habsburgs and the Jagiellons was a happy one; because of her six sons and seven daughters (born between 1456 and 1483) Elizabeth was called the "mother of Jagiellons." Casimir did everything he could to provide his children with advantageous marriages. In this he was more than successful: the eldest son, Władysław, became king of Bohemia (1471) and of Hungary (1490); three others were his successors on the thrones of Lithuania and Poland; one became an archbishop and, later, a cardinal. Five of his daughters were married to German princes, as a result of which the Polish name Casimir became a familiar one among German dynasties. When he died he left a dynasty renowned among the courts of Europe.

Because of his neglected education, Casimir seems to have been personally narrow, preferring hunting in Lithuania to court life in Cracow (Kraków); he often absented himself from the Polish capital for more than a year at a time. On the other hand, he evidently had a strong feeling of his dignity and was able to show it distinctly.

In foreign policy, Casimir had few far-reaching plans or great ambitions. He neither organized a crusade against the Turks as his brother had done, nor did he build up an efficient defense system against the aggressions of the Grand Duchy of Moscow. He failed also to support Moscow's enemies and contented himself with the favourable treaty of 1449, which, however, did little to prepare Lithuania for the attacks that were to begin in 1486. Thus, a number of Russian princes, vassals of Lithuania, went over to the Muscovite grand duke after 1486 because they had obtained no protection from Casimir. When, in 1484, two important harbours on the Black Sea, Kilia and Akkerman—previously under Lithuania's protection—were captured by the Turks, Casimir made little attempt to recover them. Although these territorial losses at the end of his reign did not seriously threaten Lithuania, they did weaken its former dominant position in eastern Europe.

Similarly, in Poland the King showed little initiative in foreign policy. When the Prussians, however, revolted in 1454 against their overlord, the Teutonic Order, and placed themselves under the protection of Casimir, he was aware that this was a unique opportunity to destroy the power of the Order and incorporated the whole of Prussia by the act of March 6, 1454. When, as a result, war broke out and Polish troops were severely defeated near Konitz (Sept. 18, 1454), it was mainly the King's perseverance and stubbornness that led to the final success in the second Treaty of Toruń (Thorn; Oct. 19, 1466). Though the Order retained a part of its former territory and "Royal Prussia" was not formally incorporated but only united with the kingdom while preserving its own diet and administration, this treaty was Casimir's most important foreign policy success. Thus, in spite of his own sympathies, his reign was more successful for Poland than for his beloved Lithuania.

In domestic affairs Casimir was relatively passive but anxious to preserve the prerogatives of the crown, notably his right to nominate bishops. In the question of territories in dispute between his two states (Volhynia and Podolia) he was not impartial but favoured Lithuania. During the war against the Order he was forced to grant the Polish nobility substantial concessions by the Privilege (statute) of Nieszawa (November 1454); these, however, became important only after his death, and royal power was not greatly diminished during his lifetime. Casimir governed his realm mostly by counsellors of his own choice after the death of the almost all-powerful bishop of Cracow, Zbigniew Oleśnicki, in 1455.

Casimir was neither a splendid ruler nor a good and wise administrator, but a mistrusting, cautious, and sober head of a large family who regarded Lithuania as his personal estate; he enjoyed authority, and his reign was remembered as being both successful and peaceful. (G.K.S.R.)

BIBLIOGRAPHY. A biography in English does not exist. See A. Bruce Boswell, "Jagiello's Successors," and F. Papee, "Imperial Expansion and the Supremacy of the Gentry, 1466–1506," in *The Cambridge History of Poland,* vol. 1, pp. 232–272 (1950), for a discussion of Casimir and his reign.

Casimir-Périer, Jean(-Paul-Pierre) (b. Nov. 8, 1847, Paris—d. March 11, 1907, Paris), French politician and extremely wealthy businessman who served brief and undistinguished terms as a premier and as the fifth president of the Third Republic.

The son of a former minister of the interior, he served as a captain during the Franco-German War (1870–71). In 1876 he was elected to the Chamber of Deputies as a Left Republican from the Aube *département,* serving as its vice president (1890–92) and president (1893). On Dec. 4, 1893, he formed his own Cabinet, which fell within six months because of his inability to cope with anarchist uprisings and the vexing church–state issue.

Casimir-Périer returned to the presidency of the Chamber (June 1894) and in the wake of the assassination of Sadi Carnot was elected (June 27, 1894) president of the Third Republic. Unable to control his premier, Charles-Alexandre Dupuy, and faced with the mounting fury of the Dreyfus affair, he quickly became a target for the political left. His most vigorous assailant, the journalist Gérault-Richard, was convicted of slander, but then the Socialist leader Jean Jaurès picked up the cudgel. Gérault-Richard's release by the Chamber of Deputies proved so embarrassing that, after only six months in office, Casimir-Périer resigned, abandoning politics to become chairman of the vast Anzin mining enterprise.

casino, originally (early 19th century), a public hall for music and dancing; by the second half of the century, the term meant essentially a collection of gaming rooms.

The classic example, for long the world's best known, is the casino at Monte-Carlo, opened in 1861, although the modern gambling rooms were not built until 1879, when the casino was enlarged. The casino has long been a major source of income for the principality of Monaco. Casinos operated illegally in the United States into the 20th century at Saratoga Springs, N.Y., and New York City and at West Baden, Ind.

Casino at Monte-Carlo, Monaco, designed by Charles Garnier, 1879

J. Allan Cash

The 20th-century casino, which may also be called a gambling, or gaming, house or club, is a place where gamblers can risk their money against a common gambler, called the banker, or the house. Casinos have almost a uniform character throughout the world. In Europe and South America, they are permitted at many or most holiday resorts and not elsewhere. In Great Britain, licensed and supervised gambling clubs, mainly in London, have operated since 1960. Club membership is easily obtainable. Casinos are also regulated by the government in France, which boasts the majority of European casinos, including those at Cannes, Nice, Divonne-les-Bains, and Deauville-les-Bains. Other famous European casinos are found at Estoril, Port.; Corfu, Gr.; and Baden-Baden and Bad Homburg von der Höhe, W.Ger. In the United States, legal casinos are in Nevada (Las Vegas, Reno, Lake Tahoe), New Jersey (Atlantic City), and North Dakota (Fargo) and by special license in Puerto Rico. There are casinos in Argentina, Colombia, and Ecuador. The casino at Havana, Cuba, was closed after the revolution in 1959.

The casino typically accepts all bets made by its patrons within a limit established so that a patron cannot win more than the casino can afford to pay. Every game offered gives the casino a mathematical expectancy of winning, and it is unlikely that a casino might lose money on its games, even for one day. Because of this virtual assurance of gross profit, casinos regularly offer big bettors extravagant inducements in the form of free spectacular entertainment, transportation, and elegant living quarters. Even lesser bettors are offered reduced-fare transportation, hotel rooms, free drinks and cigarettes while gambling, and other inducements. Such promotional expenses may exceed profits and cause a net loss over the year.

Of the games played regularly at casinos, roulette is found throughout the world, being a principal gambling game in France, where the casinos reduce their advantage to less than 1 percent to entice big bettors. In the Americas, roulette appeals more to small bettors, and the casinos take a larger percentage. Crap shooting attracts the big bettors in American casinos, most of which demand an advantage no greater than 1.4 percent, some only 1 percent or less. Slot machines are the economic mainstay of U.S. casinos, the income resulting from high volume, rapid play at sums ranging from a nickel to a dollar, and the ability to adjust machines for any desired profit.

Of casino card games, Baccarat, in its popular form Chemin de Fer, is the principal gambling game in Great Britain and those European continental casinos most often patronized by the English, such as those at Deauville, Biarritz, and on the Riviera. Blackjack is a fixture in American casinos and Trente et Quarante in the French. Other card games are seldom played in casino gambling, although most U.S. casinos have a Poker table.

Casino, also spelled CASSINO, card game for two to four players, best played with two. A 52-card deck is used. In the two-handed game the dealer gives his opponent two cards, deals two face up on the table, and gives two to himself. He repeats this, giving himself, his opponent, and the table a total of four cards each. No further cards are dealt to the table.

The goal is to take in cards from the table. A card from the hand may take all others of the same rank on the table; called pairing, it is the only way face (court) cards can be taken. A

card the numerical value of which equals that of two cards on the table (a 10, and 6 and 4) can take in those cards; this is called combining. A 10, for example, can take any 10 face up, as well as a 6, 3, and ace (1). Cards may also be won by building; a card is played to the table to form an announced combination that can be captured by another hand card on the next turn. The opponent may take the build if he has the necessary card. When a player is unable or unwilling to take in, he places a card from his hand on the table face up: this is called trailing. After the first four cards are played, the dealer deals four more to his opponent and himself, successively, until all cards are dealt.

The suits of the cards are of no significance, except to capture spades and two special cards: big casino—the 10 of diamonds—and little casino—the two of spades; only their number count. Points are scored as follows: the most cards, 3; the most spades, 1; big casino, 2; little casino, 1; and each ace, 1. Game is usually 11 or 21.

Three-handed Casino follows the same rules as two-handed. In partnership Casino, four play in two partnerships.

Casiquiare, also spelled CASSIQUIARE, navigable waterway in southern Venezuela. It branches off from the Orinoco River downstream from Esmeralda and meanders generally southwestward for approximately 140 mi (225 km), joining the Río Guainía to form the Negro, a major affluent of the Amazon, across from Sardina, Colombia.

Casket Letters, the eight letters and a series of irregular sonnets asserted by James Douglas, 4th earl of Morton, to have been found by his servants in a silver casket in the possession of a retainer of James Hepburn, 4th earl of Bothwell, on June 20, 1567, six days after the surrender of Mary Queen of Scots to her rebels at Carberry Hill. If they are genuine—particularly Letter II, or the Glasgow letter—they prove Mary's full complicity with Bothwell in the murder of her husband, Henry Stewart, Lord Darnley, in the preceding February. The contents of the casket were produced at Westminster, on Dec. 14, 1568, before a body of English commissioners appointed by Queen Elizabeth I to investigate the charges brought by Mary, then a prisoner in England, against the rebel Scottish lords and by them against her. The originals were in French, but translations had already been made into Scottish Gaelic, and further translations were made into English. After the conference, the casket and its original contents were brought back to Scotland and entrusted to Morton's care; a few years after the execution of Morton in 1581, they disappeared—possibly at the hands of Mary's son, James VI.

Whether the letters are authentic or forged preoccupied historians for centuries, with no conclusive results. Even if the letters are completely spurious, however, the circumstantial evidence may be sufficient to indicate Mary's guilt.

Čáslavská, Věra (b. May 3, 1942, Prague), Czech gymnast who won 22 medals at the Olympic Games and in world and European championships in the 1950s and 1960s.

Čáslavská began her athletic career as a figure skater, but at the age of 15 she turned to gymnastics, first appearing in international competition at the 1958 world championships, where she won a silver medal in the team event. She won the European title on the balance beam in the 1959 world championships and finished a close second to the Russian Larissa Latynina at the 1962 world championships. Čáslavská placed first over-all in the 1964 Olympics at Tokyo, also taking gold medals in the beam and the vault. In the 1965 and 1967 world championships, she won every gymnastic event. At the 1966 world championship, she contributed to the Czech team's victory over the Russians, winning the gold in the combined exercises. She closed her career spectacularly in the 1968 Olympic Games at Mexico City, winning four gold medals—in the individual combined exercises and for the uneven bars, the floor exercises, and the vault—and three silver medals—as a member of her team for the combined exercises and for the beam and the floor exercises. After the games she married the Czech middle-distance runner Josef Odložil.

Caslon, William (b. 1692, Cradley, Worcestershire, Eng.—d. Jan. 23, 1766, Bethnal Green, London), English typefounder who between 1720 and 1726 designed the typeface that bears his name. His work helped to modernize the book, making it a separate creation rather than a printed imitation of the old hand-produced book.

Caslon began his career as an apprentice to an engraver of gunlocks and barrels. In 1716 he opened his own engraving shop in London and soon began to make tools for bookbinders and silver chasers. When his work came to the attention of the printer John Watts, Caslon was given the task of cutting type punches for various presses in London. In 1720 he designed an "English Arabic" typeface used in a psalter and a New Testament by the Society for Promoting Christian Knowledge. Two years later he cut excellent roman, italic, and Hebrew typefaces for the printer William Bowyer; as a result of his success, he received loans and sufficient trade to enable him to set up a complete typefoundry. Twice in subsequent years he outgrew his quarters and had to move; he became internationally famous and received orders from many foreign printers.

After 1735 Caslon's eldest son, William (1720–88), joined him and by about 1742 had become a partner. Though the son lacked his father's great abilities, he maintained the reputation of the firm and, with the aid of his wife, Elizabeth, managed it skillfully. After William's death in 1788, the original Caslon & Son foundry was divided among his heirs.

Casnewydd (Wales): *see* Newport.

Caso Andrade, Alfonso (b. Feb. 1, 1896, Mexico City—d. Nov. 30, 1970, Mexico City), Mexican lawyer, government official, and leading anthropologist who explored the early Oaxacan cultures and is best remembered for his excavation of Tomb Seven at Monte Alban, the earliest known North American necropolis. His discovery and analysis of the burial offerings at Tomb Seven proved that Monte Alban had been occupied by the Mixtecs. Caso's other celebrated accomplishment was the deciphering of the Mixtec codices.

Although he also addressed himself to issues in social and applied anthropology, in his later years he absorbed himself in problems involving the indigenous Mexican Indian peoples and formulated a theory, now superseded, of who the Indians were.

Caso was also active in the struggle to secure the rights of the indigenous people, and founded to this end the Instituto Nacional Indigenista, of which he was the first director. He also headed the Museo Nacional and the Instituto Nacional de Antropología e Historia.

Casper, city, seat (1890) of Natrona County, east central Wyoming, U.S., on the North Platte River. It originated around Ft. Caspar at the site of a pioneer crossing on the Oregon Trail and the Pony Express route. The fort, now restored, was named for Lt. Caspar Collins, slain by Indians while trying to rescue a stranded wagon train. Founded in 1888 as a tent town prior to the arrival of the Chicago and North Western Railway, Casper was the misspelling of the railroad clerk who filed the plat. In the 1890s the Salt Creek Oil Field, just north, gave the town its start in the oil business. The oil fields include Teapot Dome, centre of the scandal that rocked the administration of Pres. Warren G. Harding in 1922. The economy is based on the production of oil and natural gas and the manufacture of oil field equipment, augmented by mining (uranium, coal, bentonite) and cattle and sheep raising. The city is the trading centre for a large hinterland and is the seat of Casper College (1945). Casper Mountain Park and Medicine Bow National Forest are to the southeast. The Central Wyoming Fair and Rodeo is held in August. Memorabilia of frontier days are displayed at the Old Fort Caspar Museum. Inc. town, 1889; city, 1917. Pop. (1970) 39,361; (1980) 51,016; metropolitan area (SMSA), 71,856.

Caspersson, Torbjörn Oskar (b. Oct. 15, 1910, Motala, Swed.), Swedish cytologist and geneticist who initiated the use of the ultraviolet microscope to determine the nucleic acid content of cellular structures such as the nucleus and nucleolus.

He received his M.D. from the University of Stockholm in 1936, served from 1944 to 1977 as medical director of the Nobel Institute for Medical Cell Research and the Wallenberg Laboratory for Experimental Cell Research in Stockholm and from 1977 as professor and head of the medical cell research and genetics department of the Faculty of Medicine of the Kungliga Karolinska Mediko-Kirurgiska Instituet in Stockholm. He also served on boards and councils dealing with biological research and international relations, especially those of UNESCO, and was a visiting lecturer at a number of European and U.S. universities.

In *Cell Growth and Cell Function* (1950) Caspersson summarized much of his research by theorizing that nucleic acids must be present for protein synthesis to occur. First to perform cytochemical studies on the giant chromosomes found in insect larvae, he also investigated the role of the nucleolus in protein synthesis and examined the relationship between heterochromatin quantity (the amount of a chromosome with few or no genes) and the rate of growth of cancer cells.

Caspian Depression, Russian PRIKASPIYSKAYA NIZMENNOST, flat lowland, Kazakh Soviet Socialist Republic and Russian Soviet Federated Socialist Republic, much of it below sea level at the north end of the Caspian Sea. It is the largest such area of the Soviet Union, occupying about 77,220 sq mi (200,000 sq km). Both the Ural and Volga rivers flow through the depression into the Caspian. Rainfall is sparse, from 6 to 8 in. (150 to 200 mm) in the south to about 12 in. in the north. Only isolated oases are intensively cultivated; there is some sheep grazing. The region includes the important Emba River oil fields; large amounts of salt are also extracted.

Caspian Sea, Russian KASPIYSKOYE MORE, Persian DARYĀYE KHEZER, world's largest inland sea, lying east of the Caucasus Mountains at Europe's southeasternmost extremity, and dominating the huge, flat expanses of west central Asia.

The following article summarizes information about the Caspian Sea; for full details, *see* MACROPAEDIA: Asia.

The elongated basin of the Caspian Sea sprawls for nearly 750 mi (1,200 km) from north to south, although its average width is only 200 mi (320 km). Its area is approximately 143,000 sq mi (371,000 sq km). More than 80 percent of the sea's shoreline falls within Soviet territory, while the remainder, in the south, borders Iran at the foot of the Elburz Mountains. The three major tributaries of the Caspian are the Volga, Ural, and Terek rivers, all draining into the sea from the

north; their combined annual flow accounts for approximately 88 percent of all river water entering the sea.

The Caspian possesses as many as 50 islands, most of them quite small. Its basin is generally divided into the North, Middle, and South Caspian, based largely on seabed relief and partly on hydrological characteristics. The flat, sedimentary plain of the North Caspian is the shallowest portion of the sea, with an average depth of 13 to 20 ft (4 to 6 m). The Middle Caspian forms an irregular depression with an abrupt western slope and a gentler eastern gradient. A depression reaching a maximum depth of 3,360 ft (1,024 m) dominates the South Caspian.

The North Caspian lies in moderately continental climatic zone, while all of the Middle and most of the South Caspian lies in the moderately hot belt. Summer air temperatures average between 75° and 79° F (24° and 26° C), with an absolute maximum of 111° F (44° C) in the desert climate of the eastern shores. Winter temperatures range from 14° F (−10° C) in the north to 50° F (10° C) in the south. Average annual rainfall varies from 67 to 8 in. (1,700 to 200 mm) over the sea. Evaporation from the sea surface is very high, reaching as much as 40 in. per year. As a result, salinity varies from a mere 0.1 percent near the Volga outlet to a high of 32 percent in the Kara-Bogaz-Gol Gulf, where intense evaporation occurs.

Long-term fluctuations in the area and depth of the Caspian Sea have been recorded over the centuries, the lower levels being the result of climatic change causing river inflow and increased evaporation. These natural conditions have recently been compounded by reservoir construction on the Volga and by river-water consumption and diversion for irrigation and industry. The Caspian was long famous for its large sturgeon catch, but this has been reduced greatly in recent decades as a result of a decline in sea level and the drying up of the most favourable spawning grounds. Oil and gas have now become the region's most important resources, following extensive geological surveys in the 1940s and 1950s. The Caspian is also of great importance in the transportation networks of the region. Astrakhan, Baku, Makhachkala, Krasnovodsk, and Shevchenko are its chief port cities in the Soviet Union; Bandar-e Auzalī is the chief Caspian port of Iran.

Cass, Lewis (b. Oct. 9, 1782, Exeter, N.H., U.S.—d. June 17, 1866, Detroit), U.S. Army officer and public official who served as governor of Michigan Territory for 18 years (1813–31) and remained active in national Democratic politics till 1860; he was defeated for the presidency in 1848.

Cass, daguerreotype

By courtesy of the Chicago Historical Society

During the War of 1812 he rose from the rank of colonel of volunteers to brigadier general in the regular army. As secretary of war in Pres. Andrew Jackson's Cabinet (1831–36), he directed the conduct of the Black Hawk and Seminole wars. For the next six years he served as minister to France.

As a member of the U.S. Senate (1845–48, 1849–57), Cass became a leader of the 1846 bloc demanding the "reannexation" of all the Oregon country south of latitude 54°40′ N or war with England. He supported Pres. James K. Polk's administration during the Mexican War (1846–48) and opposed the Wilmot Proviso, an antislavery proposal applying to land acquired from Mexico.

In the 1848 presidential campaign, Cass was the Democratic nominee but was defeated by the Whig candidate, Zachary Taylor. He served as secretary of state (1857–60) under Pres. James Buchanan, but he retired from the post when the President refused to take a firmer attitude against secession.

cassabanana, also called CURUBA (*Sicana odorifera*), perennial vine, of the gourd family (Cucurbitaceae), native to the New World tropics and cultivated as an ornamental plant for its sweet-smelling, edible fruit. The cassabanana vine is fleshy and tall, with many tendrils. Both male and female flowers are yellow and borne on the same plant, but the male flowers are smaller. The oblong or cylindrical orange-red fruit may be 60 centimetres (about 24 inches) long. The cassabanana may be cultivated as an annual plant in temperate areas but may not bear flowers or fruit in the cooler climate.

Cassadaga Stage, division of Upper Devonian rocks and Late Devonian time in North America (the Devonian Period began about 395,000,000 years ago and lasted about 50,000,000 years); like most Upper Devonian stages, the Cassadaga Stage grades laterally from red beds in the east to black shales in the west. In the mountainous western region of North America, different depositional conditions (*e.g.*, water depth or sediment supply) existed, and the Cassadaga Stage begins there with marine limestones. The Cassadaga Stage precedes the Conewango Stage and follows the Chemungian Stage.

Cassai, Rio (Africa): *see* Kasai River.

Cassander (b. *c.* 358 BC—d. 297), son of the Macedonian regent Antipater and king of Macedonia 305–297. He was one of the *diadochoi* ("successors"), the Macedonian generals who fought over the empire of Alexander the Great after his death in 323. After Antipater's death in 319, Cassander refused to acknowledge the new regent, Polyperchon. With the aid of Antigonus I Monophthalmus, ruler of Phrygia, Cassander seized Macedonia and most of Greece, including Athens (319–317). When Antigonus returned from the eastern provinces intending to reunite Alexander's empire under his own sovereignty, Cassander joined forces with Ptolemy I, Seleucus, and Lysimachus (rulers of Egypt, Babylon, and Thrace, respectively) to oppose him. Between 315 and 303 the two sides clashed frequently. Cassander lost Athens in 307 and his other possessions south of Thessaly in 303–302, but the defeat of Antigonus at the Battle of Ipsus in Phrygia (301) secured Cassander's control of Macedonia.

Even though he had already murdered Alexander IV and Roxana, the son and widow of Alexander the Great, Cassander did not take the royal title until 305. His ruthlessness toward Alexander's family was partly dictated by political considerations, but his personal hatred for the dead king was evidenced by his rebuilding of Thebes, which had been levelled by Alexander as punishment for the Theban rebellion.

Cassandra, in Greek mythology, the daughter of Priam, the last king of Troy, and his wife Hecuba. Cassandra was loved by the god Apollo, who promised to bestow on her the power of prophecy if she would comply with his desires. Cassandra accepted the proposal, received the gift, and then refused her favours. Apollo revenged himself by ordaining that her prophecies should never be believed. In the distribution of the booty after the capture of Troy, Cassandra fell to Agamemnon and was later murdered with him. She was worshipped, under the name of Alexandra, with Apollo. *See also* Agamemnon.

cassandra (shrub): *see* leatherleaf.

Cassandre, pseudonym of ADOLPHE-JEAN-MARIE MOURON (b. Jan. 24, 1901, Kharkov, Ukraine, Russian Empire—d. June 19, 1968, Paris), French graphic artist, stage designer, and painter, whose poster designs greatly influenced advertising art in the first half of the 20th century.

After studying art at the Académie Julian in Paris, he gained a reputation with such posters as "Étoile du Nord" (1927) and "Dubo Dubon Dubonnet" (1932). The Dubonnet posters were among the earliest designed specifically to be seen from fast-moving vehicles, and they introduced the idea of the serial poster, a group of posters to be seen in rapid succession to convey a complete idea.

In 1926 Cassandre became a cofounder of the advertising agency Alliance Graphique and soon turned his attention to experimental typography. In 1929 he designed Bifur, a new typeface. Later, he designed two other typefaces, Acier Noir (1935) and Piegnot (1937).

From 1936 to 1938 Cassandre made several visits to the U.S. Returning to France in 1939, he abandoned poster art and devoted himself to designing stage sets for such plays as Jean Giraudoux's *Amphitryon 38* and to painting.

cassation, in music, 18th-century genre for orchestra or small ensemble in several short movements, akin to the 18th-century serenade and divertimento and, like these, often intended for performance outdoors. Among suggested origins of the term are the Italian *cassa*, "drum" (two of Mozart's cassations open with march movements), or the Austrian dialectal *gassatim gehen*, "to go into the street."

Cassation, Cour de (French judiciary): *see* Cour de Cassation.

Cassatt, Mary (b. May 22, 1844, Allegheny City, Pa., U.S.—d. June 14, 1926, Château de Beaufresne, near Paris), U.S. painter and printmaker who exhibited with the Impressionists.

"Women Admiring a Child," pastel by Mary Cassatt; in the Detroit Institute of Arts

Courtesy of the Detroit Institute of Arts

Much of her early life was spent in Europe with her wealthy family. She attended the Pennsylvania Academy of the Fine Arts (1861–65) and worked briefly with Charles Joshua Chaplin in Paris, but she preferred working in her own way and copying old masters.

Although she was never actually a pupil of Edgar Degas, he was a close friend, and Cassatt was much influenced by him. He admired her entry in the Salon of 1874, and at his invitation she joined the Impressionists and afterward showed her works at their exhibits.

Degas's influence is apparent in Cassatt's mastery of drawing and in her unposed, asymmetrical compositions. Like him, she was innovative and inventive in exploiting the medium of pastels, in which she executed some of her best works.

Initially, Cassatt was a figure painter whose subjects were groups of women drinking tea or on outings with friends. After the great exhibition of Japanese prints held in Paris in 1890, she brought out her series of 10 coloured prints; *e.g.*, "Woman Bathing" and "The Coiffure," in which the influence of the Japanese masters Utamaro and Toyokuni is apparent. In these etchings, combining aquatint, dry point, and soft ground, she brought her printmaking technique to perfection. Her emphasis shifted from form to line and pattern. Soon after 1900 her eyesight began to fail, and by 1914 she had ceased working. The principal motif of her mature and perhaps most familiar period is mothers caring for small children; *e.g.*, "The Bath" ("La Toilette," *c.* 1892; Art Institute of Chicago).

Cassatt urged her wealthy American friends and relatives to buy Impressionist paintings, and in this way, more than through her own works, she exerted a lasting influence on American taste. She was largely responsible for selecting the works that make up the H.O. Havemeyer Collection in the Metropolitan Museum of Art, New York City.

cassava, also called MANIOC, MANDIOC, or YUCA (*Manihot esculenta*), tuberous edible plant of the spurge family (Euphorbiaceae) from the American tropics. It is cultivated throughout the tropical world for its tuberous roots, from which cassava flour, breads, tapioca, a laundry starch, and even an alcoholic beverage are derived. Cassava probably was first cultivated by the Maya in Yucatán.

A cyanide-producing sugar derivative occurs in varying amounts in most varieties. Primitive peoples developed a complex refining system to remove the poison by grating, pressing, and heating the tubers. The poison (hydrocyanic acid) has been used for darts and arrows.

An extremely variable species, cassava probably is a hybrid. It is a perennial with conspicuous, almost palmate (fan-shaped) leaves resembling those of the castor bean but more deeply parted into five to nine lobes. The fleshy roots are reminiscent of dahlia tubers. Different varieties range from low herbs through many-branched, 1-metre- (3-foot-) tall shrubs to slender, unbranched 5-m trees. Some are adapted to dry areas of alkaline soil and others to acid mudbanks along rivers.

All the approximately 160 species of the genus *Manihot* are sun-loving natives of tropical America. Ceará rubber is produced from *M. glaziovii,* from northeastern Brazil. Food items such as the gelatinous fufu of West Africa and the bami mush of Jamaica come from cassava. Additional cassava products include an alcoholic beverage made by Indians in South America, the powdery casabe cakes of Yucatán, and tapioca, the only cassava product on northern markets.

Casse, Pierre-Emmanuel-Albert, Baron Du: *see* Du Casse, Pierre-Emmanuel-Albert, Baron.

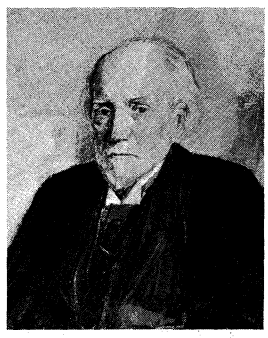
Cassegrain reflector, in astronomical telescopy, an arrangement of mirrors to focus incoming light at a point close to the main light-gathering mirror. The design was proposed in 1672 by N. Cassegrain, a French scientist of whom virtually nothing else is known.

In the Cassegrain reflector, parallel rays of light entering the telescope are reflected from a large concave mirror toward the focal point of that mirror, which is called the prime focus of the telescope. Before reaching the prime focus, the light rays are reflected again by a small convex mirror that brings them to a focus near a small hole in the centre of the main mirror.

The value of the Cassegrain reflector was not fully appreciated until a century later, when the English optician Jesse Ramsden found that this design reduces blurring of the image caused by the sphericity of the lenses or mirrors. This blurring (spherical aberration) may be entirely corrected by making the large, concave mirror paraboloidal and the small, convex mirror hyperboloidal. The Cassegrain reflector has been employed in radio transmitters and receivers.

Cassel (West Germany): *see* Kassel.

Cassel, (Karl) Gustav (b. Oct. 20, 1866, Stockholm—d. Jan. 14, 1945, Djursholm?, Swed.), Swedish economist who gained international prominence through his work on world monetary problems at the Brussels Conference in 1920 and on the League of Nations Finance Committee in 1921.

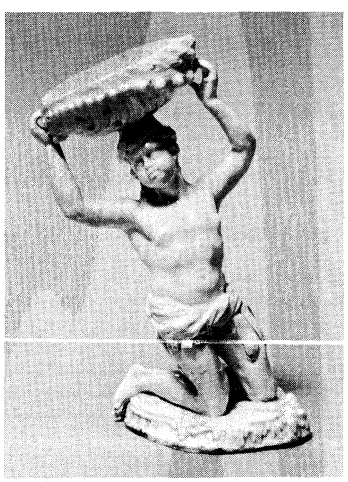


Cassel, portrait by Arne Cassel, 1940; in the Nationalmuseum, Stockholm
By courtesy of the Svenska Portrattarkivet, Stockholm

Cassel was educated at the universities of Uppsala and Stockholm and became professor of economics at the latter (1904–33). In his theoretical studies, he rejected the marginal utility value theory of English and Austrian economists.

He served as Swedish delegate to several meetings of the International Chamber of Commerce and in 1933 was sent by the Swedish government to the World Economic Conference in London.

Cassel porcelain, Cassel also spelled KASSEL, porcelain produced by a factory at Kassel, Hesse, under the patronage of the Landgrave of Hesse. The factory fired hard-paste porcelain in 1766, though complete tea or coffee services were not produced until 1769. Most surviving examples are painted in underglaze blue. The factory is particularly noted for modelled classical groups, animal groups, the seasons, and similar figure work. It closed in 1788.



Cassel porcelain saltcellar in the form of a kneeling figure, *c.* 1775; in the Victoria and Albert Museum, London
By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

Casselian Stage: *see* Chattian Stage.

Cassella Farbewerke Mainkur Aktiengesellschaft (German: Cassella Dyeworks Mainkur Limited-liability Company), German chemical corporation founded in 1789 by Leopold Cassella (1766–1847) in Frankfurt and today a subsidiary of Hoechst Aktiengesellschaft (*q.v.*).

From 1789 to 1870 the company dealt only in the import and selling of coloured woods and natural dyestuffs; in the latter year it took up the manufacture of dyestuffs. Although the company underwent a series of name changes, it was known as Leopold Cassella & Co. when, in 1904, it merged with Farbewerke Hoeschst (Hoechst Dyeworks). In 1925, when Hoechst joined the new chemical cartel, IG Farben (*q.v.*), Cassella reasserted its independence and was not absorbed by the cartel until 1937. After World War II, in the dissolution of IG Farben, Cassella again became independent (under its current name)—but only briefly, for by 1970 Hoechst AG had purchased a controlling interest in Cassella.

Cassella products include dyes; auxiliary materials for the textile, paper, and leather industries; raw materials for paints; synthetic resins for laminated plastic sheeting; and pharmaceuticals.

Casserius, Julius, Italian GIULIO CASSERIO (b. 1552?, Piacenza, Italy—d. 1616, Padua), anatomist who gave the first detailed descriptions of the organs of speech and hearing. His texts are notable for their descriptive accuracy and detailed investigation into human and comparative anatomy.

Casserius, detail of an engraving
Alinari—Art Resource/EB Inc.

Casserius was a servant of Hieronymus Fabricius ab Aquapendente, professor of anatomy and surgery at the University of Padua. Instructed in anatomical dissection by Fabricius and by Hieronymus Mercurialis, he gained such skill that he became the substitute for Fabricius in anatomical instruction in 1604 and after 1609 held the chair of surgery. He was one of William Harvey's instructors.

Casserius' anatomical works include *De vocis auditusque organis historia anatomica* (1601; "Anatomical Treatise on the Organs of Speech and Hearing") and *Tabulae anatomicae* ("Anatomical Tables"), published posthumously in 1627.

cassette, also called TAPE CASSETTE, in audio and video recording, flat, rectangular container made of plastic or lightweight metal that holds magnetic tape for audio or video record-

ing and replay. A tape cassette is designed so that it can be inserted in a recorder and used immediately; it eliminates the need to thread a portion of the tape manually before starting the recorder. In a cassette the tape begins on a feed reel at one side and moves along guides through the record-playback mechanism, after which it passes on to the take-up reel on the opposite side.

Audiocassette tape is only 0.15 inch (3.8 millimetres) wide but can carry four to eight tracks. Videocassette tape used in home video recorders is ½ inch (12.7 millimetres) wide; the type employed by television broadcasters measures 2 inches (5 centimetres) in width.

Audiocassettes, which were introduced for home use in the 1960s, may be provided with prerecorded materials or with blank tape so that users can record whatever they wish. Videocassettes, which became available to consumers in the early 1970s, may also contain prerecorded materials, such as reproductions of popular motion pictures, or blank tape for recording television programs and for producing home movies. A lightproof magazine for photographic film or plates is also styled a cassette.

cassia, also called CHINESE CINNAMON, spice consisting of the aromatic bark of the *Cinnamomum cassia* plant of the family Lauraceae. Similar to true cinnamon, cassia bark has a more pungent, less delicate flavour and is thicker than cinnamon bark. It contains from 1 to 2 percent oil of cassia, a volatile oil, the principal component of which is cinnamic aldehyde. Cassia bark is used as a flavouring in cooking and particularly in liqueurs and chocolate. Southern Europeans prefer it to cinnamon, but, in North America, ground cinnamon is sold without distinction as to the species from which the bark is obtained.

Cassia bark is peeled from stems and branches and set aside to dry. Some varieties are scraped. While drying, the bark curls into quills. The colour varies from light reddish brown for the thin, scraped bark to gray for the thick, unscraped bark. Ground cassia is reddish brown in colour. Cassia from China is less aromatic than that from Vietnam and Indonesia. Cassia from all three countries has a sweet, aromatic, and pungent flavour. Vietnamese, or Saigon, cassia is particularly highly esteemed.

Cassia buds, the dried, unripe fruits of *Cinnamomum cassia* and *Cinnamomum loureirii*, have a cinnamon-like aroma and a warm, sweet, pungent taste akin to that of cassia bark. The whole buds are added to foods for flavouring. The brown, immature fruit is snugly held in a cuplike, hard, wrinkled, grayish-brown calyx (the whole commonly called a bud) varying in size but ordinarily 0.4 inch (11 millimetres) long, including the calyx tube; the upper part of the bud may be about 0.25 in. in diameter.

Confusion sometimes arises with another group of plants because *Cassia* is the generic name of an extensive genus of leguminous plants, which, in addition to various other medicinal products, is the source of senna (*q.v.*) leaves.

Cassian, Saint John, Latin JOHANNES CASSIANUS, also called JOHANNES EREMITA, or JOHANNES MASSILIENSIS (b. 360, the Dobruja, Scythia—d. 435, Marseille; Eastern feast day February 29; feast day in Marseille July 23), ascetic, monk, theologian, and founder and first abbot of the famous abbey of Saint-Victor at Marseille. His writings, which have influenced all Western monasticism, themselves reflect much of the teaching of the hermits of Egypt, the Desert Fathers. Cassian's theology stemmed from, and was subordinate to, his concept of monasticism. He became a leading exponent, in its early phase, of Semi-Pelagianism (*q.v.*), a heresy that flourished in southern France during the 5th century.

Probably of Roman birth, Cassian became a monk at Bethlehem and later visited and was trained by the hermits and monks of Egypt. About 399 he went to Constantinople, where he was ordained deacon by the patriarch, St. John Chrysostom. A few years later, after John had been illegally deposed, Cassian went to Rome to plead John's cause with the Pope and while there was ordained priest (405). Nothing is then known of his life until 415, when he founded a nunnery at Marseille, and also the abbey of Saint-Victor, of which he remained abbot until his death.

Cassian's most influential work is his *Institutes of the Monastic Life* (420–429); this, and his *Collations of the Fathers* (or *Conferences of the Egyptian Monks*), written as dialogues of the Desert Fathers, were influential in the further development of Western monasticism. His theological dissertation *On the Incarnation of the Lord,* written against the heretic Nestorius at the request of Pope Leo I, is an inferior work.

Cassidy, Butch, byname of ROBERT LEROY PARKER (b. April 13, 1866, Beaver, Utah, U.S.—d. 1909?, Concordia Tin Mines, near San Vicente, Bolivia?), American outlaw and foremost member of the Wild Bunch (*q.v.*), a collection of bank and train robbers who ranged through the western United States in the 1880s and '90s.

Robert Parker took his alias from Mike Cassidy, an older outlaw from whom he learned cattle rustling and gunslinging (1884–87). Thereafter—except for two years of chiefly cowboying (1891–92) and two years (1894–96) in Wyoming State Prison—he was teamed up with a succession of outlaws. His favourite friend and confederate was Elzy Lay, with whom, alone or in a gang, he helped rob a number of trains, banks, and paymasters and rustled horses and, less often, cattle. The year after Elzy was arrested and imprisoned (1899), Cassidy teamed up with Harry Longabaugh, the Sundance Kid. By then, sheriff posses and Pinkerton detectives were capturing or closing in on members of the Wild Bunch, and Cassidy and Sundance (with Sundance's girlfriend, Etta Place) escaped first to New York City and then to South America (1901). (Etta Place returned home in 1907.) From 1902 to 1906 they owned and ran a ranch in Chubut province, Argentina, but thereafter they returned to outlawry. Drifting from country to country, they robbed banks, trains, and mine stations until 1909, when, according to Pinkerton agents, they were trapped by a group of mounted soldiers near San Vicente, Bolivia, where Sundance was mortally shot and Cassidy shot himself. Another story puts their death in Mercedes, Uruguay, in December 1911, cut down by soldiers during a bank robbery. Still other stories have Cassidy (either alone or with Sundance) returning to the United States, drifting about from Mexico to Alaska, and dying in obscurity in 1937 in the Northwest or in Nevada (possibly Spokane, Wash., or Johnny, Nev.).

Cassin, René (-Samuel) (b. Oct. 5, 1887, Bayonne, Fr.—d. Feb. 20, 1976, Paris), French jurist, president of the European Court of Human Rights, and principal author of the UN Declaration of the Rights of Man; he won the 1968 Nobel Prize for Peace.

The son of a Jewish merchant, Cassin studied law before entering the French Army in World War I. During the war he sustained a severe abdominal wound, the effects of which troubled him for the rest of his life. He later became a professor of international law in Paris and then, from 1924 to 1938, served as a French delegate to the League of Nations assemblies and disarmament conferences in Geneva. After the fall of France in June 1940, he joined Gen. Charles de Gaulle in London and served as a key member of the Free French government in exile.

After World War II Cassin became president of the Council of State (Counseil d'État), France's highest administrative court, and held other high legal and administrative offices in France. Internationally, he helped found the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1944 and was a French delegate to UNESCO from 1945 to 1952. A French representative to the United Nations from 1946 to 1968, he was president of the UN Commission on the Rights of Man (1947–48) and helped to draft the Declaration of the Rights of Man. From 1965 to 1968 he was president of the European Court of Human Rights. Cassin received the Nobel Prize for Peace on Dec. 20, 1968, the 20th anniversary of the ratification of the UN Declaration. He was also a Zionist and campaigner for Jewish rights and was president of the Alliance Israélite in France.

Cassini, (Jacques-)Dominique, comte de (count of), also called CASSINI IV (b. June 30, 1748, Paris—d. Oct. 18, 1845, Thury, Fr.) French geodesist and astronomer, who completed his father's map of France, which was later used as the basis for the *Atlas National* (1791). The son of César-François Cassini de Thury, he succeeded him as director of the Observatoire de Paris in 1784, but the French Revolution interrupted his plans for restoring and reequipping the observatory. He briefly cooperated with the revolutionary government, but his monarchist sympathies prevailed, and he was denounced and arrested. After some months in prison he withdrew to Thury in 1794. Later, Napoleon I made him a senator and count.

Cassini, Gian Domenico (Italian), French JEAN-DOMINIQUE CASSINI (b. June 8, 1625, Perinaldo, Republic of Genoa—d. Sept. 14, 1712, Paris), Italian-born French astronomer who, among others, discovered Cassini's division, the dark gap between the rings A and B of Saturn; he also discovered four of Saturn's moons. In addition, he was the first to record observations of the zodiacal light.

Cassini's early studies were principally observations of the Sun, but after he obtained more powerful telescopes, he turned his attention to the planets. Observing the shadows of Jupiter's satellites as they passed between that planet and the Sun, he was able to measure Jupiter's rotational period. In 1666, after similar observations of Mars, he found the value of 24 hours 40 minutes for Mars's rotational period; it is now given as 24 hours 37 minutes 22.6 seconds. Two years later he compiled a table of the positions of Jupiter's satellites that was used in 1675 by the Danish astronomer Ole Rømer to establish that the speed of light is finite. In addition, he wrote several memoirs on flood control, and he experimented extensively in applied hydraulics.

Hearing of Cassini's discoveries and work, King Louis XIV of France invited him to Paris in 1669 to join the recently formed Académie Royale des Sciences. Cassini assumed the directorship of the Observatoire de Paris after it was completed in 1671, and two years later he became a French citizen.

Continuing the studies begun in Italy, Cassini discovered the Saturnian satellites Iapetus (1671), Rhea (1672), Tethys (1684), and Dione (1684). Between 1671 and 1679 he made observations of the Moon, compiling a large map, which he presented to the Académie. In 1675 he discovered Cassini's division and expressed the opinion that Saturn's rings were swarms of tiny moonlets too small to be seen individually, an opinion that has been substantiated. In 1683, after a careful study of the zodiacal light, he concluded that it was of cosmic origin and not a meteorological phenomenon, as some proposed.

In 1683 Cassini began the measurement of the arc of the meridian through Paris. From the results, he concluded that the Earth is somewhat elongated (it is actually somewhat flattened at the poles). A traditionalist, he accepted the solar theory of Copernicus within limits, but he rejected the theory of Johannes Kepler that planets travel in ellipses and proposed that their paths were certain curved ovals, which came to be known as Cassinians, or ovals of Cassini. Although Cassini resisted new theories and ideas, his discoveries and observations unquestionably place him among the most important astronomers of the 17th and 18th centuries.

Cassini, Jacques (b. Feb. 8, 1677, Paris—d. April 18, 1756, Thury, Fr.), French astronomer who compiled the first tables of the orbital motions of Saturn's satellites.

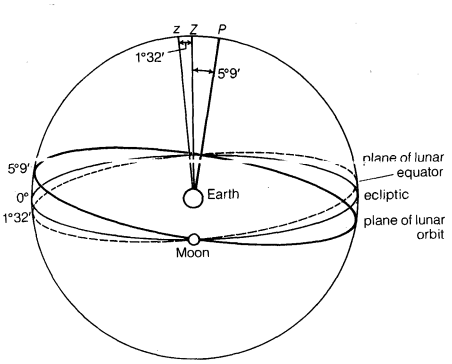
He succeeded his father, the astronomer Gian Domenico Cassini, as head of the Observatoire de Paris in 1712, and in 1718 he completed the measurement of the arc of the meridian (longitude line) between Dunkerque and Perpignan. In his *De la grandeur et de la figure de la terre* (1720; "Concerning the Size and Shape of the Earth"), he supported the theory that the Earth is an elongated sphere, rather than flattened.

Cassini's astronomical studies are found principally in *Éléments d'astronomie* (1740; "Elements of Astronomy") and *Tables astronomiques du soleil, de la lune, des planètes, des étoiles fixes et des satellites de Jupiter et de Saturne* (1740; "Astronomical Tables of the Sun, Moon, Planets, Fixed Stars, and Satellites of Jupiter and Saturn"). An ardent opponent of Newton's gravitational theory, he continually defended his father's work; but he was unable to reconcile his observations with his father's theories.

Cassini de Thury, César-François, also called CASSINI III (b. June 17, 1714, Thury, Fr.—d. Sept. 4, 1784, Paris), French astronomer and geodesist, who continued surveying work undertaken by his father, Jacques Cassini, and began construction of a great topographical map of France.

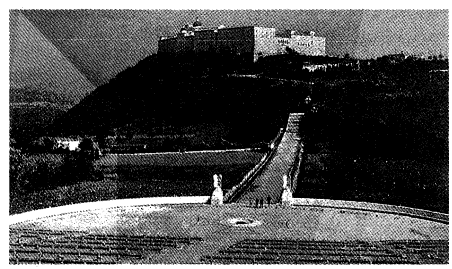
Although he, his father, and his grandfather had defended the Cartesian view that the Earth is a prolate spheroid (with a polar diameter greater than the equatorial diameter), Cassini III abandoned that position in the face of growing evidence that favoured the opposite, so-called Newtonian view that the Earth is flattened at the poles. He succeeded his father as director of the Observatoire de Paris in 1771, but his achievements as an astronomer were less distinguished then those as a geodesist and cartographer. One of his chief works is *Description géométrique de la Terre* (1775; "Geometric Description of the Earth").

Cassini's laws, three empirical rules that accurately describe the rotation of the Moon, formulated in 1693 by Giovanni Domenico Cassini. They are: (1) the Moon rotates uniformly about its own axis once in the same time that it takes to revolve around the Earth; (2) the Moon's equator is tilted at a constant angle (about 1°32′ of arc) to the ecliptic, the plane of Earth's orbit around the Sun; and (3) the ascending node of the lunar orbit (*i.e.*, the point where the lunar orbit passes from south to north on the ecliptic) always coincides with the descending node of the lunar equator (*i.e.*, the point where the lunar equator passes from north to south on the ecliptic). As a consequence of the third law, the north pole of the Moon as projected on the sky (point *z*), the north pole of the ecliptic (point *Z*), and the north pole of the lunar orbit (point *P*, inclined at an angle of about 5°9′ to the ecliptic) all lie close to one another on a great circle.



Planes of the ecliptic, the lunar equator, and the lunar orbit

Cassino, Latin CASINUM, town, Frosinone province, Lazio (Latium) region, central Italy, on the Rapido River at the foot of Monte (mount) Cairo, southeast of Rome. It originated as Casinum, a town of the Volsci (an ancient people prominent in the 5th century BC), the site of which is adjacent to the modern town on the lower slopes of the mountain with a citadel at the summit. Casinum passed under Roman control in 312 BC, and thereafter prospered. It became a bishopric in the 5th century AD, but suffered badly from the successive barbarian incursions. In 529, when St. Benedict of Nursia established the nucleus of his famous monastery on Monte Cassino, the ancient citadel was already derelict. A remnant of the city below lingered on until it was abandoned by the remaining inhabitants *c.* 866 for the present site, originally called Eulogomenopolis, later San Germano, and since 1871 Cassino. The settlement was strengthened in the 9th century by the building of the Rocca Ianula (fortress), where in 1139 Pope Innocent II was besieged and captured by Roger II of Sicily, and where in 1230 Pope Gregory IX made peace with the Holy Roman emperor Frederick II. It was sacked by French troops in 1799.



The restored Benedictine monastery on Monte Cassino, Italy
Rotalfoto

The Benedictine monastery, stormed by the Lombards in 589, the Saracens in 884, and the Normans in 1030, and temporarily deserted, was each time refounded on the original site. The parent house of Western monasticism, it was during the Middle Ages an outstanding centre of the arts and of learning. Paul the Deacon (*c.* 720–799) wrote his history of the Lombards there, founding a long tradition of historical scholarship; and the radical reconstruction of the abbey in the 11th century by the abbot Desiderius (later Pope Victor III) was a major event in the history of Italian architecture. In 1349 the buildings suffered from a severe earthquake, and the church and monastery were almost entirely rebuilt in the 16th and 17th centuries.

During World War II (1944) Cassino was a key point in the German winter defensive line (Garigliano–Sangro) blocking the Allied advance to Rome. At the beginning of January 1944 the U.S. 5th Army won a position facing Cassino across the Garigliano River. Heroic fighting by Allied troops, including French, Italian, and Polish units, met heroic German resistance in three savage battles. On February 15 the allies bombed and demolished the Benedictine monastery, erroneously believing that the Germans had occupied and fortified it. Actually, the Germans were able to remove both the monks and the treasures of the abbey; and, after the bombardment ceased, they in fact occupied and fortified the ruins. A month later Allied aircraft dropped 1,400 tons of bombs on Cassino, leaving the town so heaped with rubble that tanks could not operate until bulldozers cleared paths for them. Finally in mid-May the Allies did break through German lines and, joined a few days later by forces bursting out of the Anzio beachhead, were able to take Rome. German and Allied war cemeteries, still visited by thousands annually, mark the scenes of the fighting. After the war, both the town and abbey were rebuilt on their previous sites, the town on a completely new plan, the abbey following substantially the lines of its predecessor. Little or nothing of the abbey's decorative detail was recoverable, but the famous bronze doors, cast in Constantinople for the abbot Desiderius in 1066, were found and restored. The archives, library, and some paintings were saved. Of ancient Casinum the only monuments of note are the amphitheatre, the theatre, and the ruins of the Cappella del Crocifisso, a Roman mausoleum converted into a church in the 10th century. Of the medieval town little more than the site of the upper town, clustered around the ruins of Rocca Ianula, can be discerned.

An agricultural and commercial centre, Cassino manufactures toys. Pop. (1981 prelim.) mun., 31,139.

Cassino (card game): *see* Casino.

Cassiodorus, in full FLAVIUS MAGNUS AURELIUS CASSIODORUS (b. *c.* AD 490, Scylletium, Bruttium, Kingdom of the Ostrogoths—d. *c.* 585, Vivarium Monastery, near Scylletium), historian, statesman, and monk, who helped to save the culture of Rome at a time of impending barbarism.

During the period of the Ostrogothic kings in Italy he was quaestor (507–511), consul in 514, and at the death of Theodoric in 526 *magister officiorum* ("chief of the civil service"). Under Athalaric he became praetorian prefect in 533. Not long after 540 he retired and founded a monastery named Vivarium, to perpetuate the culture of Rome. Neither a great writer nor scholar, he collected manuscripts, enjoining his monks to copy pagan as well as Christian authors, an example that was followed elsewhere in later centuries.

His works fall into two groups: (1) historical and political and (2) theological and grammatical. In the first category are the *Variae*, 12 books published in or not much later than 537, which contain, as models of style, 468 official letters and documents that Cassiodorus composed in the names of Theodoric, Athalaric, Theodat, and Vitiges, as well as the edicts he issued as praetorian prefect; and the *Chronicon* (519), a history of the period from Adam to 519. Among the second grouping of his works are *De anima*, in which Cassiodorus drew upon Augustine and Claudianus Mamertus and which is mainly concerned with the nature of the soul and life after death; and the *Institutiones divinarum et saecularium litterarum*, which is perhaps the most important of his works. Written for his monks, the first part discusses the study of scripture and touches on the Christian fathers and historians. The second, widely used in the Middle Ages, gives a brief exposition of the seven liberal arts, a kind of encyclopaedia of pagan learning regarded as indispensable for understanding the Bible. The *De orthographia*, a compilation made by Cassiodorus in his 93rd year from the works of eight grammarians, is valuable because it contains extracts from works now lost. His *De artibus ac disciplinis liberalium litterarum*

contains one of the principal sources of early medieval music theory, *Institutiones musicae.*

Cassiopea, genus of marine jellyfish constituting the order Rhizostomeae (class Scyphozoa, phylum Cnidaria) found in tropical waters. Members of the genus measure from 100 to 120 millimetres (4 to 4.8 inches) in diameter and from 20 to 30 m in height. They are flattish, with four to six flat, short-sided branches projecting from both sides of the mouth, or oral, arms. Each of these tentacles supports several pouches that contain symbiotic algae (zooxanthellae); such symbionts also occur over the disk of the medusa (*q.v.*). The algae are varied in colour and so give rise to medusae of many different colour varieties. The medusa of the *Cassiopea* is thought to gain nutrients from the photosynthesizing algae. Accordingly, it lies inverted in shallow water, exposing the maximum number of algae to sunlight. It swims infrequently. *Cassiopea* has a sessile (attached) stage typical of scyphozoan jellyfish: it grows from a polyp and, upon reaching a certain size, is released as a free-swimming form. The genus is harmless to humans.

Cassiopeia, abbreviated CAS, in astronomy, a constellation of the northern sky, easily recognized by a group of five bright stars forming a slightly irregular W. It lies at 1 hour right ascension (the coordinate of the celestial sphere analogous to longitude on the Earth) and 60° north declination (angular distance north of the celestial equator). Tycho's nova, one of the few recorded supernovae in the Galaxy, appeared in Cassiopeia in 1572.

Cassiquiare River: *see* Casiquiare.

Cassirer, Ernst (b. July 28, 1874, Breslau, Silesia, Ger.—d. April 13, 1945, New York City), German Jewish philosopher, educator, and prolific writer remembered for his interpretation and analysis of cultural values.

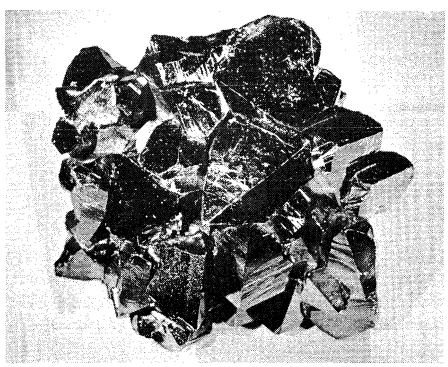
Educated in German universities, he was strongly influenced at the University of Marburg by Hermann Cohen, founder of the Marburg school of Neo-Kantianism. Cassirer taught in Berlin, worked as a civil servant during World War I, and in 1919 became professor of philosophy at the University of Hamburg, where he served as rector from 1930. When Adolf Hitler came to power, he left Germany and taught at Oxford (1933–35), Göteborg, Swed. (1935–41), and at Yale (1941–44) and Columbia (1944–45) universities in the United States.

Cassirer's philosophy, based primarily on the work of Kant, extends that philosopher's basic principles concerning the ways in which human concepts structure the natural world. Because scientific and cultural views had changed considerably since Kant's day, Cassirer felt it necessary to revise Kantian doctrines to include a wider range of human experience. In his major work, *Die Philosophie der symbolischen Formen,* 3 vol. (1923–29; *The Philosophy of Symbolic Forms,* 1953–57), he examined the mental images and the functions of the mind that underlie every manifestation of human culture. In another significant work, *Substanzbegriff und Funktionsbegriff* (1910; *Substance and Function,* 1923), he treated the related topic of concept formation. Attacking the view that a concept is formed by abstracting from a number of particular instances, he argued that the concept, as an instrument in organizing human knowledge, is already preexistent before any task involving the classification of particulars can even be performed. After examining the various forms of man's cultural expression, he concluded that man is essentially characterized by his symbolizing activity. Among Cassirer's other writings are *Sprache und Mythos* (1925; *Language and Myth,* 1946); *Die Philosophie der Aufklärung* (1932; *The Philosophy of the Enlightenment,* 1951); *An Essay on Man* (1944); and *The Myth of the State* (1946). His work is studied in *The Philosophy of Ernst Cassirer* (1949), vol. 6 of *The Library of Living Philosophers,* ed. by P.A. Schilpp.

Cassirer

By courtesy of Yale University Archives, Yale University Library

cassiterite, also called TINSTONE, heavy, red to brown, metallic, hard tin dioxide (SnO_2) that is the major ore of tin. Commercially important deposits occur in high-temperature hydrothermal veins and in placers; cassiterite also occurs in granite and pegmatites. Early in the 15th century, the cassiterite veins in central Europe (principally Saxony and Bohemia) were mined for tin; peak production occurred there in the 17th century. In the 18th and much of the 19th centuries, the very large vein deposits of Cornwall were the major source of tin. Today most of the world's cassiterite is mined in Malaysia, Indonesia, Bolivia, Zaire, China, Thailand, and Nigeria; other countries produce smaller amounts. For detailed physical properties, *see* oxide mineral (table).



Cassiterite from Araca, Bolivia

B.M. Shaub

Cassius, Gaius, byname PARMENSIS (Latin: "of Parma") (b. Parma—d. after 31 BC), one of the assassins of Julius Caesar. After the death of Caesar he joined the party of Marcus Junius Brutus and Gaius Cassius Longinus (the more famous Cassius and prime mover of the assassination).

After Caesar's assassination, Cassius was in command of the fleet that engaged Publius Cornelius Dolabella off the coast of Asia, but after the battle of Philippi he joined Sextus Pompeius in Sicily. When Sextus Pompeius was defeated at Naulochus by Agrippa and fled to Asia, Cassius went over to Mark Antony and was present at Actium (31), where Antony was defeated by Octavian (the future emperor Augustus). Cassius afterward fled to Athens, where he was put to death by Octavian.

Cassius is credited with satires, elegies, epigrams, and tragedies; and Horace, to judge from a remark in the *Epistles,* thought well of his poetry. Nothing of his work survives: the hexameters with the title *Cassii Orpheus* are the work of a 16th-century humanist. The story that Lucius Varius Rufus took his tragedy *Thyestes* from a manuscript found among the papers of Cassius is due to a confusion.

Cassius, Gaius Avidius: *see* Avidius Cassius, Gaius.

Cassius Longinus, Gaius (d. 42 BC, near Philippi, Macedonia), prime mover in the conspiracy to assassinate Julius Caesar in 44 BC.

Little is known of his early life. As a quaestor in 53 BC, Cassius served under Marcus Licinius Crassus and saved the remnants of the Roman army defeated by the Parthians at Carrhae (modern Harran, Tur.). For the next two years he successfully repelled the Parthian attacks on Syria. Cassius became tribune in 49, and the outbreak of the Civil War between Caesar and the Optimates in that year saved him from being brought to trial for extortion in Syria. In that war he at first commanded part of the fleet of Caesar's opponent, Pompey the Great. After Pompey was decisively defeated by Caesar at Pharsalus in Thessaly (48), Cassius was reconciled to Caesar, who made him one of his legates.

In 44 Cassius became *praetor peregrinus* and was promised the governorship of Syria for the following year. The appointment of his junior, Marcus Junius Brutus, as *praetor urbanus,* deeply offended him, and he became one of the busiest conspirators against Caesar, taking a very active part in the assassination. Forced by popular resentment to withdraw from Rome after the murder, he left Italy for Syria, where he raised a large army and defeated Publius Cornelius Dolabella, to whom the province had been assigned by the Senate. When in 43 the Caesarian leaders Mark Antony, Octavian (later the emperor Augustus), and Marcus Aemilius Lepidus formed the Second Triumvirate, Cassius and his fellow conspirator, Brutus, combined their armies, crossed the Hellespont, marched through Thrace, and encamped near Philippi in Macedonia. Their intention was to starve out the enemy, but they were forced into an engagement. Brutus was successful against Octavian, but Cassius, defeated by Mark Antony, gave up all for lost and ordered his freedman to slay him. He was lamented by Brutus as "the last of the Romans" and buried at Thasos. (He had married Brutus' half sister Junia Tertia, who lived until AD 22.)

A man of considerable ability, he was a good soldier and took an interest in literature, but in politics he was actuated by vanity and ambition and had an uncontrollable temper and sharp tongue. His portrait in Shakespeare's *Julius Caesar,* though vivid, is scarcely historical.

Cassius Longinus, Gaius (fl. 1st century AD), prominent Roman jurist, a pupil of the famous jurist Massurius Sabinus, with whom he founded a legal school.

Cassius was consul in AD 30, proconsul of Asia in 40–41, and governor of Syria in 45–49. Banished by the emperor Nero in 65, he was recalled by the emperor Vespasian (ruled 69–79) and died at an advanced age. Extracts from his chief work, the *Libri juris civilis,* in 10 books, were incorporated into the Digest issued by the 6th-century Byzantine emperor Justinian I.

Cassius Longinus, Quintus (d. 47 BC at the mouth of the Ebro River, Tarraconensis), Roman official whose tyrannical government of Spain greatly injured Julius Caesar's cause in Spain during the civil war (49–45) between Caesar and the Optimates. He was either a brother or a cousin of the famous assassin of Caesar.

As tribune in 49, he supported Caesar, who made him governor of Farther Spain. Cassius' oppression of the Spanish provincials led

to a revolt at Corduba (Córdoba), which he put down with merciless severity. Some of his troops then revolted (48) and proclaimed a new governor. Cassius was allowed to leave the province but died in a shipwreck at the mouth of the Ebro River.

Cassius Vecellinus, Spurius (fl. late 6th and early 5th centuries BC), Roman consul who, by bringing peace to the area around Rome, contributed to the growth of the city in an early phase of its development.

A patrician, Cassius is said to have held the consulate three times. During his first term (502 BC) he defeated the Sabines, a people who lived northeast of Rome. During his second consulate (493) he concluded with the Latins the mutual defense treaty that lasted until about 380 and remained the basis of Latin status. Some sources—of questionable authority—maintain that during a third consulate (486) Cassius proposed an agrarian law to assist needy plebeians, a measure violently opposed both by the patricians and by the wealthy plebeians, who, according to the same sources, had Cassius condemned and executed.

Cassivellaunus, also spelled CASSIVELAUNUS (fl. 1st century BC), powerful British chieftain who was defeated by Julius Caesar during his second raiding expedition into Britain (54 BC). He led his tribe, the Catuvellauni (a Belgic people who lived in modern Hertfordshire), against the invaders, making effective use of guerrilla tactics and chariot warfare. Finally Caesar captured the principal fortified settlement, since identified as a site in present-day Wheathampstead, Hertfordshire. The British leader was granted peace when he agreed to provide hostages and pay an annual tribute to Rome. These promises, however, were probably not meant to be kept, and it appears certain that the tribute was never paid.

cassock, long garment worn by Roman Catholic and other clergy both as ordinary dress and under liturgical garments. The cassock, with button closure, has long sleeves and fits the body closely. In the Roman Catholic Church the colour and trim vary with the ecclesiastical rank of the wearer: the pope wears plain white, cardinals black with scarlet trim, archbishops and bishops black with red trim, and lesser clergy plain black. In choir and church ceremonies the pope wears a white silk cassock; cardinals wear scarlet, except in penitential seasons when they wear purple; and lesser clergy wear plain black.

Contemporary cassock

Algimantas Kezys

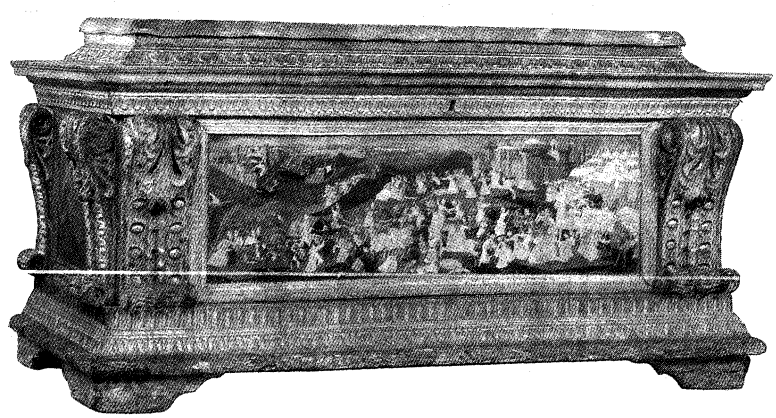
The cassock, though part of the canonical costume of the clergy, is not a liturgical vestment. It was originally the out-of-doors and domestic dress of European laity as well as clergy, and its survival among the latter when the secular fashions had changed is merely the outcome of ecclesiastical conservatism. In mild weather it was the outer garment; in cold weather it was worn under the tabard (a tunic with or without short sleeves) or chimere (a loose, sleeveless gown); sometimes in the Middle Ages the name chimere was given to it as well as to the sleeveless upper robe. In winter the cassock was often lined with furs varying in costliness with the rank of the wearer, and its colour also varied in the Middle Ages with ecclesiastical or academic status.

In the Roman Catholic Church the cassock is frequently worn by the clergy whenever they appear, both in ordinary life (except in Protestant countries) and under their vestments in church. In the Church of England the cassock, which with the gown is prescribed by a canon of 1604 as the canonical dress of the clergy, has been continuously, though not universally, worn by the clergy since the Reformation. It has long ceased, however, to be their everyday walking dress and is now usually worn only in church, at home, or more rarely by clergy within the precincts of their own parishes. The custom of wearing the cassock under the vestments is traceable in England to about the year 1400.

In the Eastern Church the cassock's equivalent is called a rhason.

cassone, Italian chest, usually used as a marriage chest, and the most elaborately decorated piece of furniture of the Renaissance. Cassoni traditionally were made in pairs and sometimes bore the respective coats of arms of the bride and groom. They contained the bride's clothes, linen, and many other items of her dowry. In the 15th century, when the greatest importance was attached to suitable marital alliances between Florence's wealthiest families, the cassone reached great heights of artistic achievement. Florentine artists such as Sandro Botticelli, Paolo Uccello, and Donatello were employed to decorate cassoni with paintings set in an architectural framework. Battle scenes and classical and literary themes were especially popular. A number of paintings from cassoni of this period have been preserved.

Sixteenth-century cassoni were elaborately carved with mythological and grotesque figures, decorated with gilt gesso, putti (cupids), and swags of fruit and flowers, or enriched with intarsia (mosaics of wood). Although the finest marriage chests came from Italy, they were also used in other countries.



Renaissance cassone, gilded poplar with painted panel, from the Palazzo Strozzi, Florence, c. 1475; in the Metropolitan Museum of Art, New York City

The Metropolitan Museum of Art, New York City, John Stewart Kennedy Fund, 1913, (14.39), copyright © 1986 by The Metropolitan Museum of Art

cassoulet, French dish of white beans baked with meats; it takes its name from its cooking pot, the *cassole d'Issel.* Originating in Languedoc in southwest France, cassoulet was once simple farmhouse fare, but it has been elaborated into a rich and complex dish. The basic cassoulet from the town of Castelnaudary adds to the beans fresh pork and ham plus tomatoes, garlic, onions, herbs, and stock; that of Carcassonne contains in addition mutton and partridges in season, while in Toulouse to the basic cassoulet are added duck or *confit d'oie* (pieces of goose poached and preserved in goose fat) and Toulouse sausage. Bread crumbs and goose fat form a crust on the top of the dish.

cassowary, any of several species of large flightless birds of the Australo-Papuan region. Cassowaries are the sole members of the family Casuariidae, order Casuariiformes, the order that also includes the emus. The cassowary has been known to kill men with slashing blows of its feet: the innermost of its three toes bears a long, dagger-like nail. The

Common, or Australian, cassowary (*Casuarius casuarius*)

Anthony Mercieca from Root Resources—EB Inc.

bird moves rapidly along narrow tracks in the bush, its naked blue head protected by a bony helmet, or casque. The body is black in adults, brownish in immature birds. The male incubates three to six green eggs, each about 13 centimetres (5 inches) long, for about 50 days in a leafy nest on the ground and may also provide most of the early care of the striped young. Cassowaries forage for fruits and small animals. There are three species (counted by some experts as six), each with several races. The common, or Australian, cassowary, *Casuarius casuarius,* which inhabits New Guinea, nearby islands, and Australia, is the largest—almost 1½ metres (5 feet) tall—and has two long, red wattles on the throat.

cast iron, one of the two forms in which iron is smelted; the other is wrought iron. Cast iron contains 2 to 4 percent carbon, along with varying amounts of silicon, manganese, sulfur, and phosphorus. The Chinese produced cast iron as early as the 6th century BC, and it was produced in Europe by the 12th century, but it was of secondary importance until the development of improved techniques for casting in the 17th and 18th centuries.

Cast iron is made by reducing iron ore in a blast furnace, drawing it off in the molten state, and cooling it in the form of crude ingots called pigs. The elimination of the need for intensive working with hammers required for wrought iron made cast iron much the less expensive product, though it was more brittle and inferior in tensile strength. Its compressive, or load-bearing, strength made it the first important structural metal, and it was put to such use throughout the 19th century and included in some of the earliest skyscrapers. In the 20th century, cast iron has been replaced by steel for construction, but it continues to have a great many industrial applications, as in automobile engine blocks, agricultural and machine parts, pipes, hollow ware, stoves, and furnaces.

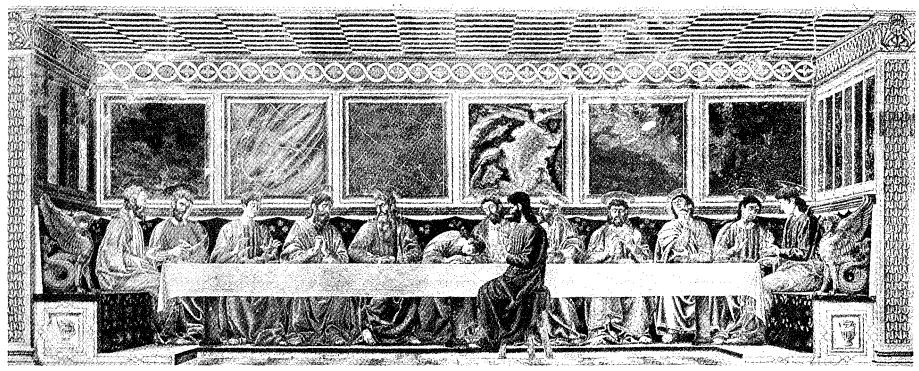
Most cast iron is either so-called gray iron or white iron, the colours shown by fracture. Gray iron contains more silicon and is less hard and more machinable than is white iron. Both are brittle, but a malleable cast iron produced by a prolonged heat treatment was developed in France in the 18th century, and a cast iron that is ductile as cast was invented in the United States and Britain in 1948. Such ductile irons now constitute a major family of metals that are widely used for gears, dies, automobile crankshafts, and many other machine parts.

Castagna, Giambattista (pope): *see* Urban VII.

Castagno, Andrea del, pseudonym of ANDREA DI BARTOLO DE BARGILLA (b. *c.* 1421, San Martino a Corella, near Castagno San Godenzo, Republic of Florence—d. Aug. 19, 1457, Florence), one of the most influential 15th-century Italian Renaissance painters, who is perhaps best known for the emotional power and naturalistic treatment of figures in his work.

Little is known of Castagno's early life, and it is also difficult to ascertain the stages of his artistic development owing to the loss of many of his paintings. As a youth, he was precocious. He executed a mural of Cosimo de' Medici's adversaries (rebels hanging by their heels) at the Palazzo del Podestà in Florence, earning the byname Andreino degli Impiccati (Little Andrea of the Hanged Men). It is known that he went to Venice in 1442, and frescoes in S. Zaccaria are signed and dated by both him and Francesco da Faenza.

His first notable works were a "Last Supper" and three scenes from the "Passion of Christ," all for the former Convento di Sant' Apollonia in Florence, now called the Cenacolo di Sant' Apollonia and also known as the Castagno Museum. These monumental frescoes, revealing the influence of Masaccio's pictorial illusionism and Castagno's own use of scientific perspective, received wide acclaim. In his altarpiece painting of the "Assumption of the Virgin" for S. Miniato fra le Torri in Florence, Castagno's style more closely resembled International Gothic.



"The Last Supper," fresco by Andrea del Castagno; in the Sant'Apollonia, Florence
SCALA—Art Resource/EB Inc.

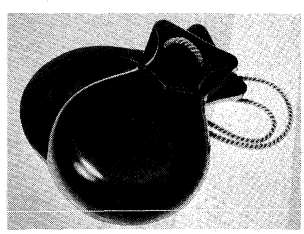
In 1451 Castagno continued the frescoes at S. Egidio begun earlier by Domenico Veneziano. The light tones that Castagno adopted for his outstanding "St. Julian" (1454–55) show Veneziano's influence.

In a work for a loggia of the Villa Carducci Pandalfini at Legnaia, Castagno broke with earlier styles and painted a larger than life-size series of "Famous Men and Women," within a painted frame (now in the Castagno Museum, Florence). In this work, Castagno displayed more than mere craftsmanship; he portrayed movement of body and facial expression, creating dramatic tension. Castagno set the figures in painted architectural niches, thus giving the impression that they are actual sculptural forms. He achieved similar force in his "Youthful David" (National Gallery, Washington, D.C.), painted on a shield. His last dated work (Florence Cathedral) is an equestrian portrait of Niccolò da Tolentino. Castagno's emotionally expressive realism was strongly influenced by Donato Donatello, and Castagno's work in turn influenced succeeding generations of Florentine and Paduan painters.

Castamon (Turkey): *see* Kastamonu.

castanea: *see* Brazil nut.

castanets (from Spanish *castaño,* "chestnut"), musical instrument, a clapper consisting of two hollowed-out pieces of hardwood, ivory, or other substance, usually held in the hand and struck together. As a folk instrument played by dancers in Spain, the Balearic Islands, and southern Italy, they are pear-shaped, hinged together by a cord firmly secured to the thumb, and clapped with the fingers. Typically, a simple rhythm is performed on a pair held by the left hand, while the smaller, right-hand pair plays a more complicated rhythm.



Castanets
By courtesy of Boosey & Hawkes Ltd.

Orchestral castanets are attached to handles and shaken or fastened to a block of wood and played with the fingers or drumsticks. Similar instruments—often boot-shaped—were played by the ancient Greeks (*krotala*), Romans (*crotala*), and Egyptians and may have been introduced to Spain through ancient Phoenician colonization or, in their pear-shaped form, by the Moors.

caste, group of people having a specific social rank, defined generally by descent, marriage, and occupation. Caste, most common in South Asia, is rooted in distant antiquity and dictates to every orthodox person the rules and restrictions of all social intercourse and occupation.

A brief treatment of caste follows. For a full treatment, *see* MACROPAEDIA: Social Differentiation.

The caste system in its most developed form is found in India, but the word is applied to similar hierarchically ranked groups in other societies. The word caste (from the Portuguese and Spanish *casta,* meaning "race," "breed," or "lineage") was first applied to Indian society by Portuguese travelers in the 16th century. The word used in most Indian languages is *jāti* (meaning "race," or any group sharing generic characteristics), which is the smallest endogamous social unit, usually a regional population. There are about 3,000 castes and more than 25,000 subcastes in India, some with several hundred members and others with millions.

In the traditional lawbooks, and in popular usage, *jātis,* or castes, are grouped loosely into four *varṇas* (from the Sanskrit, "colour"), or classes. At the top of the hierarchy are the Brahmans (priests), then the Kshatriyas (barons or warriors), the Vaiśyas (commoners or merchants), and lastly the Sūdras (artisans and labourers). Members of each class are considered to be ritually polluted by varying degrees as a result of defilements brought about by their occupations, dietary habits, and customs. Those who had the most defiling jobs were ranked beneath the Sūdras and were "untouchables" (now known as Harijans, or "children of God," the name given them by M.K. Gandhi; *see* untouchable).

There is some social mobility among castes. This usually takes the form of a *jāti* trying to associate itself with a higher ranked varṇa by, for example, changing its dietary habits or by hiring another less fortunate group to do personal work of a polluting nature, such as washing clothes. Although there are many movements for caste reform and offenses against "untouchables" are now banned by law, caste alliances remain a powerful political and social force in India, and new castes continue to be formed.

caste, in biology, a group of social insects distinct from other groups, or castes, by the function they perform within their society (*e.g.,* the queen bee reproduces, the worker bees gather food, the soldiers defend the colony from attack, and the drones, or males, mate with the queen).

Castes may be distinguished by anatomical differences as well as by behavioral differences (*e.g.,* the pollen basket on the legs of the worker honeybee do not exist on the queen). Ants, bees, termites, and wasps are the main caste insects.

caste, Christian: *see* Christian caste.

caste, Islāmic: *see* Islāmic caste.

Castel, Charles-Irénée: *see* Saint-Pierre, Charles-Irénée Castel, abbé de.

Castel Durante ware, maiolica, or tin-glazed earthenware, that was produced at Castel Durante in the duchy of Urbino, Italy, from *c.* 1508 to the 18th century. A native of the town, Cipriano Piccolpasso, wrote the only known contemporary treatise on maiolica. The earliest known signed piece of Castel Durante is a basin, with the arms of Pope Julius II, richly ornamented with trophies and grotesques on a dark-blue ground, dated 1508. Authentic ware marked *in Castel Durante,* with classical figure compositions, some after Raphael, appeared from 1524 to 1526. The so-called Correr service of 17 plates (1515) and the Gonzaga service (*c.* 1520)—a series of plates, ewers, and dishes including the arms of Gonzaga and Este impaled—are both attributed to Nicola Pellipario, who along with Giovanni Maria was considered the supreme master of narrative painting. Pellipario is credited with several typical Castel Durante shallow bowls with large portrait heads and scroll backgrounds. The Gonzaga service, a set of full and brilliant compositions, and the Correr service, which is remarkable for the beauty of its colouring, are among the masterpieces of Italian maiolica.

By 1528 Pellipario was working in the neighbouring city of Urbino, which drew heavily on Castel Durante for style and craftsmen; and attribution of pieces between the two centres is sometimes in doubt. Almost nothing is known of 17th–18th-century maiolica from Castel Durante, but dated works prove continued production.

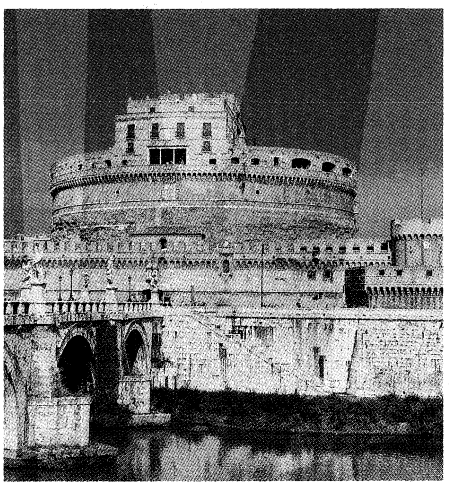
Castel Durante maiolica dish, *istoriato* painting by Giovanni Maria, *c.* 1510; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

Castel Gandolfo, village and castle, Roma province, Lazio (Latium) region, central Italy, on the edge of Lake Albano, in the Alban Hills (Colli Albani) just south of Rome. Castel Gandolfo probably occupies the site of ancient Alba Longa (*q.v.*). Its name is derived from a castle belonging to the ducal Gandolfi family in the 12th century. It became the inalienable domain of the Holy See in 1608 and, after the construction of the Apostolic, or Papal, Palace, the summer residence of the pontiff. The palace was begun by Urban VIII (pope from 1623 to 1644) and later enlarged by Alexander VII, Clement XIII, and Pius IX. With its magnificent terraced park and the former Villa Barberini, built on the ruins of a villa of the Roman emperor Domitian, it enjoys extraterritorial privileges as part of the Vatican state. Since 1936 the Villa Barberini has housed the famous Vatican observatory (Specola Vaticana), founded by Pope Gregory XIII (1572–85). In the square opposite the castle is the church of S. Tommaso di Villanova, the work of Gian Lorenzo Bernini, who also collaborated with Carlo Maderno in the construction of the palace.

The village, the site for rowing events in the 1960 Olympic Games, is known for its peaches, wine, and fish from the lake. Pop. (1984 est.) mun., 6,508.

Castel Sant'Angelo, also called HADRIANEUM, or SEPULCRUM ANTONINORUM, originally the mausoleum of the Roman emperor Hadrian and, until Caracalla, the burial place of the Antonine emperors. It was built AD 135–139 and converted into a fortress in the 5th century. It is on the right bank of the Tiber and guards the Ponte Sant'Angelo, one of the principal ancient Roman bridges. In plan, the fort is a circle surrounded by a square; each corner of the square is protected by an individually designed barbican, or outwork, while the central circle is a lofty cylinder containing halls, chapels, apartments, courtyard, and prison cells.



Castel Sant'Angelo, Rome

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In 590 Pope Gregory the Great, conducting a penitential procession to pray for the end of a plague, had a vision of the archangel Michael sheathing his sword over the castle, signifying the end of the plague; from that incident came the structure's modern name and the marble statue of the archangel that surmounts the building. Throughout the Middle Ages the castle served as a refuge in times of trouble, especially for the popes, who could reach it from the Lateran through a protected passage. Among its many illustrious prisoners was the artist Benvenuto Cellini, who on another occasion allegedly also played a role in the castle's history; during the siege of 1527, according to his memoirs, he fired the arrow that killed the Constable de Bourbon, commander of the besieging army.

Castelar y Ripoll, Emilio (b. Sept. 7, 1832, Cádiz, Spain—d. May 25, 1899, San Pedro del Pinatar), statesman and author who was one of the most powerful champions of Spanish Republicanism in the latter half of the 19th century, and who served as president of the first Spanish republic from September 1873 to January 1874.

Castelar was educated at the University of Madrid, where he became professor of history and took an active role in politics. He achieved fame as an orator and notoriety for his speeches against the monarchy; this latter activity lost him his chair in April 1865. After the abortive Republican rising of 1866, Castelar was sentenced to death, but he escaped to France. After the successful Revolution of 1868, he returned and entered Parliament as an energetic and effective defender of Republican ideals.

When Castelar assumed leadership of the republic (1873–74), Spain was at the height of disturbance and turmoil. He strengthened the army and resolutely undertook to crush rebellion. He also embarked on a policy of conciliation with the Roman Catholic Church. His tactful and statesmanlike stance prevented rupture with the United States over the "Virginius" affair (Oct. 31, 1873), in which U.S. seamen were executed as pirates by Spain during a Cuban insurrection.

Castelar was ousted from office by Republican opposition to his conservative and conciliatory policies. A military coup followed, and he went into exile. After the accession of King Alfonso XII (1874–85), Castelar returned and was elected to Parliament. Although he became reconciled to the monarchy, he continued to champion a unitary and conservative republic that would be established and run by legal and peaceful means. As leader of the opposition, he found himself increasingly estranged from the revolutionary and federalistic doctrines espoused by the extreme Republicans; yet he favoured religious toleration, universal suffrage, and the abolition of slavery in Puerto Rico.

Castelar also found time for literary and journalistic efforts and left behind him more than 90 works, including novels, histories, and political speeches.

Castelfranco Veneto, town, Treviso province, Veneto region, northern Italy, west of Treviso. Founded in 1199 by Treviso city as a bulwark against the Paduans, it is surrounded by medieval walls enclosing the remains of the 12th-century castle. The town was the birthplace of the painter Zorzi da Castelfranco (*c.* 1477–1510), called Giorgione. The 18th-century cathedral contains one of Giorgione's finest works, the "Madonna and Child with SS. Francis and Liberale" (1504), as well as frescoes by Paolo Veronese. The town's manufactures include textiles and electrical apparatus. Pop. (1984 est.) mun., 28,697.

Castell-Nedd (Wales): *see* Neath.

Castellamare di Stabia, city and episcopal see, Napoli province, Campania region, southern Italy, in the southeast angle of the Bay of Naples southeast of Naples. Its name is derived from the Roman resort of Stabiae (just northeast), destroyed by the eruption of Vesuvius in AD 79, and from a castle built by the Holy Roman emperor Frederick II, ruins of which remain. Noted for its hot mineral springs and baths, fine beaches, and scenic location, it is a popular summer resort and spa. The royal Villa Quisisana (1310) is now a hotel. Castellamare is also a commercial and industrial centre, with an arsenal and a large shipyard where the bathyscaphe used by the Swiss physicist Auguste Piccard for marine exploration was built. Pop. (1984 est.) mun., 68,928.

Castelli, Francesco (architect): *see* Borromini, Francesco.

Castelli ware, maiolica, or tin-glazed earthenware, chiefly of the 17th and 18th centuries, from Castelli and surrounding factories in the Abruzzi, in Italy. In its use of only four of the Renaissance colours—blue, yellow, green, and purple—and these in a pallid wash, Castelli ware is easily recognizable. Depth and luminosity are generally lacking in most pieces, in spite of the innovative use of real gold in the

gilding of finer examples. To traditional Renaissance decorative subjects, Castelli added pastoral scenes, landscapes with ruins, and

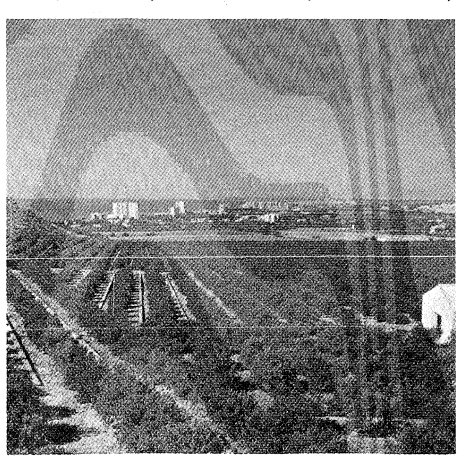
Castelli maiolica vessel painted and signed by Liborio Grue, *c.* 1750–60; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

subjects after such Baroque painters as Annibale Carracci. Decoration was more elaborate than that of earlier maiolica: the centre and the rim of dishes had different themes, the rim often consisting of a closely symmetrical pattern. Castelli ware made from the late 17th to the mid-18th century owes its characteristic style and popularity to the Grue and Gentili families. Subsequent wares, produced into the 19th century, were undistinguished.

Castello Sforzesco (Milan castle and museum): *see* Sforzesco, Castello.

Castellón, province in the autonomous community (region) of Valencia and northernmost of the three provinces corresponding to the ancient kingdom of Valencia. Its area of 2,579 sq mi (6,679 sq km) comprises three distinct regions: the inhospitable Maestrazgo in the mountainous northwest; the Míjares and Palancia river valleys, separated by the Sierra de Espadán; and the Mediterranean coastal plains. Lumbering, livestock (cattle, sheep) raising, grain cultivation, agriculture (olives, oranges, and grapes in the valleys, and almonds, figs, and pomegranates along the coast) are the main economic activities of the province. Light industry (textiles, sandals, ceramic tiles) is concentrated in the provincial capital, Castellón de la Plana (*q.v.*), and in the towns of Onda, Alcora, Villarreal, and Val de Uxó. Fisheries are based on the ports of Burriana, Vinaroz, and Benicarló; and tourism, centred on the Mediterranean beaches of the Costa del Azahar, is of growing economic importance. Pop. (1982 est.) 430,171.



Orange grove in Castellón province, Spain, just outside Castellón de la Plana

G. Mairani

Castellón de la Plana, city, capital of Castellón province, in the autonomous community (region) of Valencia, eastern Spain. Castellón de la Plana is situated north of Valencia city on a fertile plain near the Mediterranean coast. Founded originally on top of the nearby La Magdalena Hill, it was captured from the Moors by James I of Aragon in 1233 and, on petition of its inhabitants in 1251, was moved to its present site on a fertile plain near the Mediterranean. It was made the provincial capital in 1833 and in 1873 was given the status of a city. Historic landmarks include the 14th-century Gothic Santa María church, with a detached belfry 150 ft (46 m) high (1591–1604), and the 17th-century town hall.

Oranges, hemp, and coloured tiles are exported from the city's port, El Grao de Castellón. Tourism, based on the local beaches, is growing. Pop. (1982 est.) 129,602.

Castelnau, Michel de, SIEUR (sire) DE LA MAUVISSIÈRE (b. 1520?, La Mauvissière, Touraine—d. 1592, Joinville), French diplomat and soldier, noted for his *Mémoires* of the beginnings of the Wars of Religion (1562–98).

As a young man, Castelnau served under local commanders in Piedmont and in Picardy. After the Peace of Cateau-Cambrésis (1559),

Castelnau, engraving by G. Isaac

By courtesy of the Bibliotheque Nationale, Paris

he entered the king's service and was sent on diplomatic missions in 1560 to England, Germany, Savoy, and Rome. After the death of King Francis II he was charged with accompanying the widowed queen, Mary Stuart, back to Scotland.

In 1562 Castelnau returned to France to fight against the Huguenots in Brittany and Normandy. In 1572, however, King Charles IX sent him to England, Germany, and Switzerland to appease the anger aroused by the massacre of French Protestants on St. Bartholomew's Day. From 1575 he was Henry III's ambassador to Elizabeth I of England, but he was unable to consummate one of his primary missions, the negotiation of a marriage between Elizabeth and Henry III's brother François, duc d'Alençon. During his years in England, he wrote his *Mémoires,* with an eye to the moral instruction of his son; they were published posthumously in 1621.

He returned to France in 1585, when the Catholic League was about to dominate Paris. Because he refused to join the league, he was excluded from official appointments. Although Henry IV gave him a military command, he died in poverty.

Castelnuovo-Tedesco, Mario (b. April 3, 1895, Florence—d. March 15, 1968, Hollywood), composer in the Neoromantic style. He studied under Ildebrando Pizzetti and became widely known during the 1920s. In 1939 Mussolini's anti-Semitic policies led him to emigrate to the U.S., where he settled in Hollywood. He appeared as soloist in his *Piano Concerto No. 2* and also wrote three violin concerti, a cello concerto, and a concerto for guitar. His orchestral works include overtures to 12 plays by Shakespeare, many of whose sonnets and poems he set to music. He composed two Shakespearean operas, *The Merchant of Venice* (1961) and *All's Well That Ends Well* (1957). His chamber music is scored for a variety of combinations; his piano pieces are conceived as miniature symphonic poems; his songs retain the melodiousness of the Italian school; and his harmonies are opulent and often complex.

Castelo Branco, city, capital, and *concelho* (municipality), Castelo Branco district, central Portugal, near the border with Spain. The surrounding region was occupied by Roman legions and has many Roman ruins, but the city itself originated as an old frontier fortress and is partially enclosed by walls; it was not officially founded until 1209 by the Knights Templar, whose restored castle is a notable landmark. The cathedral and the episcopal palace are also noteworthy. Castelo Branco, famous for its hand-embroidered linen bedspreads, is an important road junction and has a flourishing local trade in cork, wine, olive oil, and cheese.

Castelo Branco district has an area of 2,588 sq mi (6,704 sq km). To the northwest it is dominated by the mountain blocks of Estrela (6,539 ft [1,993 m]) and Guardunha (4,026 ft). Between the mountains, in the upper Zêzere Valley, Cova de Beira is a rich agricultural basin, watered by irrigation. The southern plateaus are poorer, rolling hills, able only to support cork oak and olive groves. The economy also includes stock raising, growing of cereals, mining, and manufacturing. The Idanha project irrigates about 35,000 ac (14,000 ha) from the Carmona Dam on the Rio Ponsul. There are important textile plants at Covilhã. Tin, zinc, and titanium are mined. Pop. (1981) city, 21,256; *concelho,* 55,049; district, 232,967.

Castelo Branco, Camilo (b. March 16, 1825, Lisbon—d. June 1, 1890, Seide, Port.), Portuguese novelist whose 58 novels range from Romantic melodramas to works of Realism. He is sometimes called the Portuguese Balzac.

Born illegitimately into a family believed to have had a hereditary tendency to insanity, Camilo was orphaned in childhood and brought up by relatives in the austere and primitive Trás-os-Montes region of northern Portugal. Allowed to grow up undisciplined and proud, he studied irregularly at Porto, first medicine and later for the priesthood, but eventually abandoned these professions for a literary career. For a time he wrote Gothic tales such as *Mysterios de Lisboa* (1854; "Mysteries of Lisbon") and *Livro Negro do Padre Diniz* (1855; "Black Book of Father Dennis"), until he arrived at his mature style with *Onde Está a Felicidade?* (1856; "Where Is Happiness?") and *Vingança* (1858; "Revenge"). Living as intensely as he wrote, he engaged in a series of love affairs, culminating in his elopement with Ana Plácido, the wife of a Porto businessman. The two lovers were imprisoned for adultery (1861), during which time Camilo wrote in two weeks his best known work, *Amor de Perdição* (1862; "Fatal Love"), the story of a love thwarted by family opposition that eventually led the hero to crime and exile. It is the typical expression of the view of life with which Castelo Branco came to be identified—a view in which passion is the irresistible force and social prejudice the immovable object, their collision often resulting in tragedy, sin, and redemption through suffering.

In 1864, after his release from prison and the death of Ana Plácido's husband, Castelo Branco settled with Ana in the village of Seide in the Minho region, where he supported himself by writing unceasingly, producing verse of indifferent quality, plays, works of erudition, and hard-hitting polemical writings. He con-

tinued to pour out novels of unequal merit, many written to order for publishers. In 1885 he was awarded the title of viscount of Correia Botelho for his writing. Despondent over his son's insanity and his own ill health and impending blindness, he committed suicide.

Camilo Castelo Branco, lithograph, 1857
By courtesy of the Casa de Portugal, London

Though many of Castelo Branco's works are on the level of popular serials, others, such as *Amor de Perdição, O Romance d'um Homem Rico* (1861; "The Love Story of a Rich Man"), and *O Retrato de Ricardina* (1868; "Portrait of Ricardina"), have a tragic quality and are narrated with conciseness and vigour.

Outliving the Romantic era, Castelo Branco remained a Romantic by temperament and conviction. Though the objective pictures of Minho rural life in his *Novellas do Minho* (1875–77) approach Naturalism, he engaged in a literary quarrel with the emergent Naturalist school and parodied their style and subjects in *Eusébio Macário* (1879) and *A Corja* (1880; "The Rabble"). Nevertheless, while continuing to express vehement opposition to Naturalism, he more and more closely assimilated its descriptive objectivity and verisimilitude.

Castelo Melhor, Luiz de Vasconcelos e Sousa, 3º conde de (3rd count of), 6º CONDE (6th count) DA CALHETA (b. 1636—d. Aug. 15, 1720), Portuguese royal favourite who, as effective governor of Portugal from 1662 to 1667 during the reign of Afonso VI, was responsible for the successful prosecution of the war against Spain, which led, in 1668, to Spanish recognition of Portugal's independence.

Shortly after Afonso VI's coming-of-age in 1662, the King appointed Castelo Melhor his secret notary (*escrivão da puridade*), a position in which the favourite was able to exercise the functions of first minister. Castelo Melhor overcame the difficulties which had hitherto beset Portugal in the war against Spain, reorganizing the troops (now reinforced by an English contingent by virtue of the English king Charles II's marriage to Catherine of Braganza) and entrusting their command to competent generals. Consequently the war entered a victorious phase for Portugal (1663–65) and Spain began peace negotiations. Agreement proved difficult to attain and meanwhile the internal political situation in Portugal deteriorated. The King was obliged to dismiss Castelo Melhor on Sept. 9, 1667, shortly before he himself was deprived of power.

Castelo Melhor went into exile in Paris and then London, but in 1685 he was permitted to return to Portugal and, two years after that, to court. On the accession of John V (1706), he was appointed a councillor of state and he continued to occupy a position of distinction until his death.

Castelrosso (Greece): *see* Kastellórizon.

Castelvetrano, town, Trapani province, western Sicily, Italy, southeast of Marsala. Historic monuments include the churches of S. Domenico (1470) and of the Madre (16th century). In the town hall there is a 5th-century bronze statue of the Ephebus of Selinus (Selinonte). Castelvetrano serves a wine-producing region and has a furniture industry. Pop. (1981 prelim.) mun., 30,577.

Castelvetro, Lodovico (b. *c.* 1505, Modena, Duchy of Modena—d. Feb. 21, 1571, Chiavenna, Swiss Confederation), a dominant literary critic of the Italian Renaissance, particularly noted for his translation of and independently rendered conclusions from Aristotle's *Poetics,* in which he defended the dramatic unities of time, place, and action, as well as the use of poetry for pleasure alone; he thereby helped set the critical norms for drama in the Renaissance and the French Neoclassical period.

Nobly born, Castelvetro was a law student in Bologna, Ferrara, and Padua, then began studies of literature in Siena. After living for a time in Rome, Castelvetro returned to Modena and became prominent in literary circles and as a teacher of law. A quarrel with the poet Annibale Caro, initiated by Castelvetro's criticism of one of Caro's *canzoni,* erupted into a major literary feud that led in 1560 to Castelvetro's summons to Rome by the Inquisition, his subsequent flight from Italy, and his excommunication.

Castelvetro then lived in France and in Vienna, where his work on the *Poetics* of Aristotle, called *La poetica di Aristotele vulgarizzata* ("Aristotle's *Poetics* Popularized"), was published in 1570. Though often erroneous in transmitting Aristotle's ideas, *La poetica* was extremely influential in the history of drama and of criticism. Castelvetro emphasized realism in drama, clarified the distinction between rhetoric and poetry, and defended poetry as a means of pleasure alone—as opposed to the earlier opinion that poetry should instruct as well as delight. Another critical notion that Castelvetro took issue with was the Platonic concept that poets are possessed with a divine sort of madness (*see* furor poeticus). Castelvetro asserted that this was a myth perpetuated by the ignorant masses and by poets themselves.

Casti, Giovanni Battista (b. Aug. 29, 1724, Acquapendente, Papal States—d. Feb. 5, 1803, Paris), Italian poet, satirist, and author of comic opera librettos, chiefly remembered for the verse satires *Poema tartaro* (1787; "Tartar Poem") and *Gli animali parlanti* (1802, "The Talking Animals"; Eng. trans. *The Court and Parliament of Beasts,* 1819).

Casti took holy orders at the seminary of Montefiascone but soon abandoned the church to be a pleasure-seeking poet at the courts of Germany, Austria, and Russia. Already widely travelled, Casti left Florence for Vienna with his patron, the emperor Joseph II, in 1769. He then accompanied a minister of Maria Theresa to many European cities. Between 1778 and 1802 he wrote his witty society verse *Novelle galanti* ("Amatory Tales"), first published in a critical edition in 1925. In 1778 Casti visited the court of Catherine the Great in St. Petersburg; though he was treated well, his *Poema tartaro* mocked the adulation shown the Empress. Returning to Vienna, he was named poet laureate in 1790. After a time in Italy, he settled in Paris, where he lived for the rest of his life. There he wrote his other major work, *Gli animali parlanti,* which personifies the European nations as animals in order to contrast the monarchical concept with the republican spirit generated by the French Revolution. In addition to his society verse and his satires, he wrote comic opera librettos to the music of Antonio Salieri and Giovanni Paisiello.

Castiglione, Baldassare (b. Dec. 6, 1478, Casatico, near Mantua, Italy—d. Feb. 2, 1529, Toledo, Spain), Italian diplomat and courtier, whose *Il cortegiano* (*The Courtier*) made him the arbiter of aristocratic manners during the Renaissance. Although he denied that he had drawn a portrait of himself, his life and accomplishments matched those of the cultured nobleman whom he considered the ideal courtier.

Baldassare Castiglione, detail of a portrait by Raphael, 1516; in the Louvre, Paris
Giraudon—Art Resource/EB Inc.

Educated in Milan at the humanist school of Girgio Merula and Demetrius Chalcondyles, he learned the art of chivalry at the court of Ludovico Sforza and entered the service of Francesco Gonzaga, marquis of Mantua, in 1499 and that of Guidobaldo da Montefeltro, duke of Urbino, in 1507. He remained at the court of Urbino until 1513, serving Guidobaldo's successor, Francesco Maria della Rovere.

In Urbino he met Pietro Bembo, Bernardo Bibbiena, Guiliano de' Medici, l'Unico Aretino (Bernardo Accolti), Ludovico di Canossa, Ottaviano and Federico Fregoso, who became the interlocutors of his *Cortegiano.* There he also composed most of his minor works, including, besides Latin and Italian verse, the eclogue *Tirsi* (1506), in which members of the court were thinly disguised beneath the pastoral conventions, and the prologue to Bibbiena's play, *Calandria.*

He was sent to England in 1506 to receive the order of the garter for Guidobaldo. In 1509 he followed Della Rovere, commander of the papal army, in the war against Venice; in 1511 he took part with Julius II in the siege of Mirandola. For his services, he was made count of Novilara, near Pesaro. As ambassador of the duke of Urbino, he went to the court of Leo X in Rome (1513). In 1524 he was appointed apostolic prothonotary (a position with the curia concerned chiefly with record keeping) and sent to Spain as papal nuncio to Emperor Charles V in 1525.

The *Cortegiano* (written 1513–18; published 1528), in dialogue form, deals with the perfect courtier, the noble lady, and the relationships between the courtier and the prince.

The *Cortegiano,* one of the outstanding books of the century, found immediate favour outside Italy and was translated into many languages. Sir Thomas Hoby's English version, *The Courtyer* (1561), was one of the most influential prose works of its day.

Castiglione, Giovanni Benedetto, byname IL GRECHETTO, French LE BENÉDETTE (b. *c.* 1616, Genoa—d. 1670, Mantua, Papal States), Italian painter and one of the most important technical innovators in the history of printmaking. Beginning in the highly artificial style of Mannerism, Castiglione was a productive painter who left portraits, historical pieces, and landscapes but who excelled in depicting fairs, markets, and rural scenes with animals. In his etchings he was influenced by the

Dutch school: he admired the prints of Van Dyck and Rembrandt. He was the first known practitioner of the monotype, or single-print technique, and was one of the earliest to make chiaroscuro woodcuts. In his closing years he lived in Mantua, painting for the court in a flamboyant but naturalistic Baroque style. His brother Salvatore and his son Francesco studied with him and perpetuated his manner.

Castiglione, Pierre-François-Charles Augereau, duc de (duke of): *see* Augereau, Pierre-François-Charles.

Castiglioni, Francesco Saverio (pope): *see* Pius VIII.

Castiglioni, Goffredo (pope): *see* Celestine IV.

Castile, Spanish CASTILLA, traditional central region constituting more than one-quarter of the area of peninsular Spain. Castile's northern part is called Old Castile and the southern part is called New Castile. The region formed the core of the Kingdom of Castile, under which Spain was united in the late 15th and early 16th centuries.

The name Castile—meaning "land of castles"—is first known to have been used in about AD 800, when it was applied to a small district at the foot of the Cantabrian Mountains in the extreme north of the modern province of Burgos. Castile expanded during the 9th century but remained a fragmented collection of petty counties, whose rulers were nominated by the kings of Asturias and Leon, until the counties were united by Fernán González (d. 970), the first count of all Castile. With him the political history of Castile begins. He made the new county hereditary in his family and thus secured it a measure of autonomy under the kings of Leon. In his time the capital of the county was established at Burgos and there was expansion southward into Moorish territory. Under the counts García Fernández (d. 1005) and Sancho García (d. 1017), Castilian territory reached to the Douro (Duero) River. Relations with the kings of Leon, still nominally the suzerains of Castile, were frequently bad.

In 1029 Sancho III the Great of Navarre, the son of a Castilian mother, detached Castile from Leon and on his death (1035) awarded it to his second son, who was the first to assume the title of king of Castile, as Ferdinand I (1037–65). Later, Castile was again united with Leon (1072–1157), but thereafter the two kingdoms again separated. The political and military hegemony of Castile over Leon was established by Alfonso VIII of Castile, who forced the king of Leon to do homage to him (1188). By then Castilian rule extended far south of the Tagus River and eastward to the modern frontiers of Aragon. The Leonese kings, however, never accepted Castile's suzerainty, and Alfonso IX of Leon consequently refused to support the Castilian king Alfonso in his wars against the Islāmic Berber dynasty of the Almohads. Thus, Castilian pursuit of its political hegemony over Leon served to weaken the Christian front against the Muslims. In 1230 Ferdinand III, already king of Castile, succeeded to the Leonese throne and both crowns were finally united under Castilian leadership. Meanwhile, the Muslim kingdom of Toledo in Spain had been annexed by Castile in 1085, and, by the middle of the 12th century, Castilian political hegemony in Spain was an accomplished fact. European courts in the later Middle Ages frequently identified Castile with Hispania (Spain). The final Christian conquest of most of Moorish-held Andalusia, in the extreme south, was carried out in the time of Ferdinand III.

An attempt in 1383–85 by Castile to annex Portugal by force failed, but in 1412 a Castilian prince, Ferdinand I, was successfully placed on the Aragonese throne, partly as a result of Castilian financial support and military force. This move foreshadowed the personal union of the two crowns under Ferdinand and Isabella (1479). The Spanish part of the Kingdom of Navarre was annexed by Castile in 1512, thus completing the formation of modern Spain.

The literary language of Spain after its unification was the Castilian vernacular, and the centre of political and administrative power in Spain has since always been Castile. The Spanish culture transmitted to Latin America was also largely Castilian. Nevertheless, opposition to Castile's political hegemony from the other regions, which enjoyed complete or partial independence in the Middle Ages, remains strong. It continues to be a live issue, especially since Spain's centres of industrial strength lie largely outside Castile, whose geography has made it an economically backward area. It has been claimed, with some exaggeration, that medieval Castile was a more progressive kingdom than its neighbours, with a more developed sense of unity and national destiny. Its dominant role in Spanish history may well have stemmed from the superior martial spirit and military organization of its people.

Castile, New (Spain): *see* New Castile.

Castile, Old (Spain): *see* Old Castile.

Castile-La Mancha, Spanish CASTILLA-LA MANCHA, *comunidad autónoma* ("autonomous community") and historic region of Spain, encompassing the central Spanish provinces of Toledo, Ciudad Real, Cuenca, Guadalajara, and Albacete.

The autonomous community, established in 1982, is bounded by the provinces of Cáceres and Badajoz to the west, Córdoba, Jaén, and Murcia to the south, Alicante, Valencia, and Teruel to the east, and Zaragoza, Soria, Segovia, Madrid, and Ávila to the north. The watershed of the low-lying Toledo Mountains bisects the region, with tablelands of La Alcarria to the north being drained by the Tagus (Tajo) and the plains of La Mancha to the south being drained by the Guadiana. La Alcarria merges with the Central mountain system to the north and the Iberian range to the east; the plains of La Mancha extend southeastward into the province of Albacete, terminating in the Baetic range. The Morena mountain range rises in the south. A Mediterranean climate, modified by continental influences, prevails: temperatures rise east to west and north to south. Annual precipitation is relatively low, exceeding 20 inches (500 mm) only in the province of Cuenca, and is concentrated in the autumn and spring.

Emigration to the job market of Madrid, the national capital, just to the north, has depleted the population of Castile-La Mancha. This effect has been much more severe in the mountainous zones of the provinces of Cuenca and Guadalajara than in the provincial capitals, where the population has doubled since 1900. Emigration has been especially high among young men, with the result that the median age has increased sharply while the birth rate has plummeted. Emigration to the countries of the European Economic Community has generally been low, though large numbers of migrants work in France. The population tends to be dispersed in the Iberian mountains and concentrated in the plains of La Mancha, where large agricultural towns predominate. The population density increases in lower La Mancha, where the water table is close to the surface and supports a diversified agriculture. Farmland in La Mancha tends to be partitioned into latifundios, or large estates, while *minifundios,* or small landholdings, predominate north of the Tagus.

Agriculture dominates the economy. Most of the land under cultivation is dry-farmed, producing wheat, grapes, and olives. The region also produces sunflower, saffron, sumac, and cotton. Mechanization of agriculture has been impeded by the fragmentation of holdings in the mountains and lags behind the national average. Animal husbandry accounts for approximately one-third of the region's agricultural output and is concentrated in the province of Guadalajara; the preferred animals are sheep, pigs, and goats. Forests cover one-third of the land but have yet to be fully exploited.

The industrial sector is underdeveloped outside the province of Ciudad Real, where a large petroleum refinery has established Puertollano as a major petrochemical centre. The mines of Almadén produce mercury. Mining is of relatively little importance outside Ciudad Real, though there are important deposits of iron in Guadalajara province and kaolin is mined in Cuenca. Manufacturing is small-scale and centres on the processing of primary materials. The region produces about one-half of Spain's wine and mills a large portion of the nation's flour.

The provincial capitals are the leading commercial centres of the region. The provinces of Toledo and Guadalajara also have strong commercial ties to Madrid, while Talavera de la Reina in Toledo province is the commercial centre of some 80 communities. Energy resources are poor, the general dryness of the region precluding the development of hydroelectricity. A nuclear reactor is located in Zorita de los Canes.

The National Museum of Abstract Art was established in the city of Cuenca in 1966. The polychromatic ceramics produced in the province of Toledo have been widely marketed since the 14th century; colours are clearly delineated, and designs show Mudejar (Moorish), Gothic, and Renaissance influences. The ceramics of Talavera de la Reina were especially popular during the Renaissance but were in decline by the second quarter of the 18th century. The town of Atienza in the province of Guadalajara features a Caballada every Pentecost, in which townsmen ride to the hermitage of Nuestra Señora de la Estrella outside Atienza and reenact the rescue of Alfonso VII by townsmen in 1163. Pop. (1986 est.) 1,670,091.

Consult the INDEX *first*

Castile-León, Spanish CASTILLA-LEÓN, *comunidad autónoma* ("autonomous community") and historic region of Spain, encompassing the north-central Spanish provinces of Valladolid, Burgos, León, Salamanca, Zamora, Palencia, and Segovia.

The autonomous community, established in 1983, is bounded by the provinces of Orense and Lugo to the northwest, Oviedo and Santander to the north, Vizcaya and Álava to the northeast, Logroño and Soria to the east, Guadalajara and Madrid to the southeast, and Ávila and Cáceres to the south. Portugal adjoins the provinces of Salamanca and Zamora to the west. Castile-León belongs to the elevated Central Plateau and is drained by the Douro (Spanish Duero) River, which flows east to west and bisects the region. The Cantabrian Mountains rise to the north and are separated from the Ibérico Mountains to the northeast by an important topographic and communication corridor, La Bureba. The Central range rises to the south, while the highlands of Ancares, Caurel, and Eje decline gradually into Portugal. A continental climate, modified by oceanic influences, prevails. Annual precipitation is low, ranging from 16 to

24 in. (400 to 600 mm), and is concentrated in the autumn and spring. Precipitation is higher in the mountains, where snow is common.

Castile-León's population as a percentage of Spain's has declined sharply since 1900. Emigration from the countryside has been especially high, with the result that the population is increasingly concentrated in the towns and especially in the provincial capitals. The towns of the peneplains are ordinarily more nucleated than the villages bordering the Cantabrian Mountains and Sistema Ibérico. *Minifundios,* or small landholdings, predominate in the countryside and are cultivated by their owners. Pastures and woodland continue to be communal in the mountainous borderland of Zamora and León.

The fragmentation of farmland has hindered the mechanization of agriculture and a disproportionately high percentage of the work force continues to be employed in agriculture. Most land is dry farmed and wheat is the leading crop. Grapes are largely restricted to marginal farmland and are of declining importance. Irrigation is widespread in the provinces of Valladolid and León; crops include sugar beets, potatoes, and French beans. Animal husbandry accounts for a large percentage of the region's agricultural output. The leading animals are sheep and dairy and beef cattle, while the number of horses and mules is declining. Chickens are raised in the province of Valladolid. Forestry is a major industry in the mountainous zones.

The development of industry did not begin until 1945 and remains modest. The Instituto Nacional de Industria has fostered the industrialization of Valladolid through long-term loans and tax incentives; that city's manufactures are diversified and include automobiles, fertilizers, and paper. The industrial development of Burgos was initiated in 1964 and has established the city as a leading industrial centre of the region. The provinces of León, Zamora, and Salamanca produce about one-fourth of Spain's anthracite, and the mountains of Puebla de Lillo in the province of León have extensive deposits of talc.

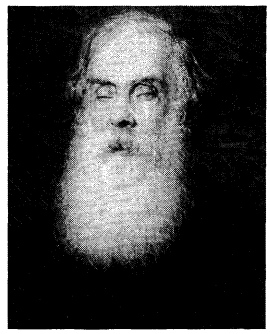
Dams in the provinces of Salamanca and Zamora generate a quarter of Spain's hydroelectricity; installed capacity exceeds 2,000,000 kilowatts. Most of the electricity generated in the region is exported to the industrial centres of the Basque provinces and Madrid.

The Leonese dialect heard in parts of the region derives from the vernacular of the Visigothic period; it is spoken in León, Zamora, Salamanca, and Valladolid provinces. Farmsteads in the mountains are ordinarily multistoried and built of stone and wood, while those in the centre of the region are built of adobe. Endogamy was prevalent in the Leonese town of Maragatería well into the 19th century. The social order of the town of Maragatería was matriarchal until the late 19th century: women worked in the fields while the men were muleteers. Marti Teleno, a variant of the god Jupiter, was associated with the nearby hills. Pop. (1982 est.) 2,543,856.

Castilho, António Feliciano de (b. Jan. 28, 1800, Lisbon—d. June 18, 1875, Lisbon), poet and translator, a central figure in the Portuguese Romantic movement.

Although blind from childhood, he became a classical scholar and at the age of 16 published a series of poems, translations, and pedagogical works. Castilho's literary life may be divided into two phases, the midpoint occurring during the revolutionary period of the late 1840s. During the first he published a series of poems in which he tried to assimilate current Romantic trends while continuing to be guided by a basically Neoclassical spirit.

With the publication of his *Obras Completas* in 1837, Castilho gained recognition and became a literary figure in Lisbon. In the same year he was offered the directorship of an



Castilho, portrait by an unknown artist
By courtesy of the Portuguese National Tourist Office

important journal, *O Panorama,* and in 1838 he began to collaborate with Almeida Garrett, the leading Portuguese Romantic poet, in the revival of national theatre. His romantic narratives of the lives of Portuguese medieval heroes, *Quadros Históricos de Portugal,* were begun in 1838, and in 1842 he took charge of the *Revista Universal Lisbonense,* a major cultural review.

The second phase of Castilho's career began after his return from a two-year residence in the Azores (approximately 1848–50), where he had promoted agriculture as a means of social reform. His acceptance of Romanticism was never wholehearted. Scholarly rather than imaginative, he began to return to a genteel traditionalism having much in common with the earlier generation of Portuguese arcadian poets. His personal prestige was at its height, however, and his lifeless style so dominated literary taste that it brought about a rebellion from the younger generation of writers. The attack against Castilho came from the young poet Antero de Quental, who wrote the pamphlet *Bom-senso e Bom-gosto* (1865; "Good Sense and Good Taste") in reply to Castilho's criticism of certain younger writers. This riposte gave rise to one of the most celebrated polemics in Portuguese literature, the *questão Coimbrã* ("Coimbra question"), which eventually dethroned Castilho as literary dictator.

Castilian dialect, Spanish CASTELLANO, a dialect of the Spanish language (*q.v.*), the basis of modern standard Spanish. Originally the local dialect of Cantabria in north central Spain, Castilian spread to Castile. After the merger of the kingdoms of Castile, Leon, and Aragon in the late 15th century, it became the standard language of all Spain and in the following centuries the language also of Spanish America.

Castilla (region, Spain): *see* Castile.

Castilla, Ramón (b. Aug. 27, 1797, Tarapacá, Peru—d. May 25, 1867, Arica, Chile), soldier and statesman who, as president or as the power behind the scene, dominated Peruvian politics for nearly 20 years. A conservative himself, he wisely offered concessions to all sectors of Peruvian society and provided the nation with a long period of political stability and economic progress.

As a young man he fought for the Spaniards until he was captured by the Chilean patriots. He then fought against the Spaniards in Peru, performing heroically with José de San Martín and Simón Bolívar. In the anarchy that followed the death of Pres. Agustín Gamarra in 1841, Castilla assumed power and was elected president the following year (1845). He served until 1851 and then overthrew the next president, José Rufino Echenique, in 1855, to rule until 1862.

When Castilla seized power, Peru had been racked by disorder and rebellions for almost 20 years. A strong and skillful leader, he had the good fortune to be in power when Peru's huge supplies of guano and sodium nitrate were discovered. The income from these resources helped him bring about economic improvements, reduce the nation's debt, build schools, improve transportation, and foster domestic business. He also abolished Negro slavery and the head tax on Indians, and, although he was a strong supporter of the church, he eliminated the church courts and the compulsory tithe. In 1860 he supported Peru's new constitution, which narrowed the franchise, gave wide powers to the president, and recognized the Roman Catholic Church exclusively; it remained in force until 1920.

When Castilla's paternal despotism ended in 1862, the nation once again lapsed into 20 years of chaos and rebellion.

Castilla la Nueva (Spain): *see* New Castile.

Castilla la Vieja (Spain): *see* Old Castile.

Castillejo, Cristóbal de (b. 1490?, Ciudad Rodrigo, Spain—d. probably June 12, 1550, Vienna), poet who was the foremost critic of the Italianate innovations of the Spanish poet Garcilaso de la Vega and the Catalan poet Juan Boscán.

While very young, Castillejo entered a monastery, but in 1525 he became the personal secretary to Ferdinand, brother of Charles I of Spain (Charles V of the Holy Roman Empire), and went to Vienna when Ferdinand became king of Austria.

One of the last Spanish poets to use the medieval octosyllabic line exclusively, he ruthlessly attacked the new Italianate metres introduced by his contemporaries, writing *Contra los que dejan los metros castellanos y siguen los italianos* (*c.* 1540; "Against Those Who Abandon Castilian Metres for Italian Ones") in rhymed couplets. He championed the superiority of the traditional Spanish metre. He is also known for his erotic poetry, *Sermón de amores* (1542), which was suppressed in part by the Inquisition because of the levity with which it treated sacred texts.

Castillo, Michel del, in full MICHEL-XAVIER JANICOT DEL CASTILLO (b. Aug. 2, 1933, Madrid), Spanish-born novelist writing in French, who became famous at 24 for a short novel, *Tanguy* (1957; *A Child of Our Time,* 1958). Though written as fiction, it is the actual story of his experiences as a political refugee and a prisoner in concentration camps; and, like *The Diary of Anne Frank,* it has the poignancy of a child's witness to cruel historical events.

Del Castillo fled Spain for France as a boy in 1939 with the exodus of refugees at the end of the Civil War. Shortly after, with his mother, who was a political radical, he was sent to Nazi concentration camps.

Tanguy and *Le Colleur d'affiches* (1958; *The Disinherited,* 1959) deal with these two traumatic experiences. They show the disarray of a young mind prematurely falling prey to political skepticism and religious doubt, without losing faith in mankind. They reflect his anguish at social injustice and his need for solace in brotherhood.

Deeply attached to Spain, he returned to its strife-torn soil in *La Guitare* (1957; *The Guitar,* 1959) and in *Le Manège espagnol* (1960; *Through the Hoop,* 1962), a colourful but heavy-handed satire of religion. Later works include *Les Louves de l'Escurial* (1964; "The She-Wolves of the Escorial"), *Gerardo Laïn* (1967; *The Seminarian,* 1969), *Le Silence des pierres* (1975; "The Silence of Stones"), *Le Sortilege espagnol* (1977; "Spanish Sorcery"), and *Les Cyprès meurent en Italie* (1979; "The Cypresses Die in Italy").

Briefly an actor, he played the role of a Spanish Loyalist in the film taken from Sartre's short story *Le Mur* (1939; "The Wall").

Castillo de San Marcos National Monument, site of the oldest masonry fort in the U.S., built by the Spaniards on Matanzas In-

let between 1672 and 1696 to protect the city of St. Augustine, in northeastern Florida, U.S. Established as Fort Marion National Monument in 1924, it was renamed in 1942. It has an area of 20 ac (8 ha). The fort is a bastioned structure of coquina (shell stone) with walls 30 ft (9 m) high and 12 ft thick, surrounded by a moat. It played an important role in the Spanish–English struggle for the Southeast (1650–1750) and was later held by the English (1763–83). After the U.S. acquired Florida in 1819, it served as a military prison.

Castillo Solorzano, Alonso de (b. 1584, Tordesillas, Spain—d. 1648), Spanish novelist and playwright whose ingenuity expressed itself best in his short stories.

His father served in the court of the Duke of Alba and the son with the Marqués del Villar and two marqueses de los Vélez. His stories are usually of adventure but treated with wit and sophistication. Many of his tales are strung together by an artifice or are arranged, in indirect imitation of the *Decameron,* within a framework. Examples are: *Jornadas alegres* (1626; "Gay Trips") and *Noches de placer* (1631; "Nights of Pleasure"). His picaresque novels make much of the female *pícara* ("rogue") as protagonist or adjutant.

Castillon, Battle of (July 17, 1453), the concluding battle of the Hundred Years' War between France and England.

The French had won Guyenne and Gascony back from English rule in 1451, but their long-unfamiliar regime soon proved objectionable to many of the inhabitants, who therefore welcomed the arrival at Bordeaux of an English army under the Earl of Shrewsbury (John Talbot) in October 1452. In the following summer French forces, powerfully armed with Jean Bureau's recently introduced field artillery, approached for a second reconquest of Guyenne—to start with the siege of the pro-English stronghold of Castillon, on the lower Dordogne River upstream from Libourne. They fortified their camp outside Castillon very strongly; and Shrewsbury, having advanced against them with 1,000 horsemen some way ahead of his 5,000 footsoldiers, attacked the camp prematurely in the mistaken belief that it was being abandoned. The French cannon inflicted heavy losses on the dismounted cavalry; and though some of Shrewsbury's infantry came up during the hour of battle, the English troops were finally routed by a sortie. Shrewsbury was killed, the garrison in Castillon surrendered the next day, and the capitulation of Bordeaux in October restored Guyenne and Gascony to France and ended the war.

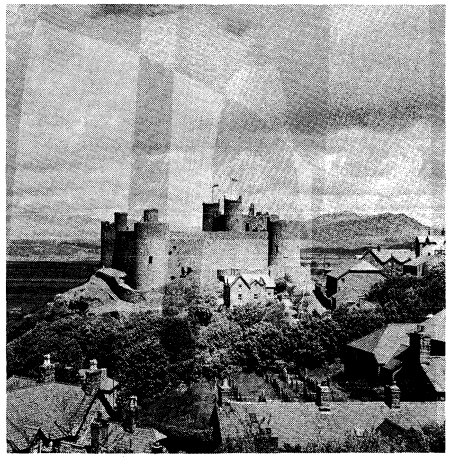
Castine, historic resort town, Hancock County, southern Maine, U.S., on a promontory in Penobscot Bay, across the water from Belfast (west). For 200 years the place held a key position in the struggle between England and France, and to a lesser extent the Netherlands, for control of the Acadian seaboard. In 1613 the French constructed a trading post (later Ft. Pentagoet) at the site. A Plymouth Colony trading post was also built there in 1626 but was attacked by French buccaneers in 1632. French Capuchin and Jesuit missions were established in the vicinity in the 1640s. The Frenchman Jean-Vincent d'Abbadie, Baron St. Castin (for whom the town was named), lived there (1667–97); he married the daughter of a local (Tarratine) Indian chief and played a prominent role in conflicts with the British and Dutch. The site was permanently settled by English colonists in 1760. During the Revolutionary War, a naval expedition in which Paul Revere participated, unsuccessfully tried to take Castine in 1779 from the British who held it until 1783. The much harassed settlement was finally incorporated in 1796 only to be again occupied by the British for nearly a year during the War of 1812.

The town has more than 100 historic markers. Landmarks include Ft. George (built by the British in 1779 and partially restored as a state memorial) and earthwork remnants of Ft. Madison (built by the Americans in the War of 1812 and reconstructed during the Civil War). The Wilson Museum displays colonial, Revolutionary, and Indian artifacts. The "State of Maine" (the former USNS "Upshur") is a 7,000-ton training ship anchored at the dock of the Maine Maritime Academy (founded 1941 in Castine). Pop. (1980) 1,304.

casting, in the metal and plastics industry, the process whereby molten material is poured or forced into a mold and allowed to harden. *See* founding.

castle, medieval European stronghold, generally the residence of the king or lord of the territory in which it stands. The word is sometimes applied to prehistoric earthworks, such as Maiden Castle, England; and the word is also applied, in various linguistic forms (*e.g.*, *château, castello,* or *Burg*), to princely mansions or country seats.

The castle developed rapidly in western Europe from the 9th century. Fortifications built in France in the 10th century often included



Harlech Castle, Merioneth, Gwynedd, Wales, founded by Edward I in 1285
A.F. Kersting

a high mound encircled by a ditch and surmounted by the leader's particular stronghold, as in the castles at Blois and Saumur. Later, one or more baileys or wards (grounds between encircling walls), were enclosed at the foot of the mound. During the 11th century this type of private fortress, known as the "motte [mound] and bailey" castle, spread over western Europe.

The thickness of castle walls varied according to the natural strength of the sites they occupied, often varying greatly at different points of the site. The defense of the *enceinte,* or outer wall, of the castle was generally by means of one or more lines of moats, the moats being crossed in front of the gateways by drawbridges—*i.e.*, bridges that could be drawn back or raised from the inner side in order to prevent the moats from being crossed. The gateway was often protected by a barbican, a walled outwork in front of the gate; and the passage through the gateway was defended by portcullises, doors, and machicolations. Portcullises were generally made of oak, plated and shod with iron, and were moved up and down in stone grooves, clearing or blocking the passage. Machicolations were of two kinds, some being openings in the roof of the passage through which missiles were thrown on enemies forcing their way through, and others extending between the corbels of the parapets of walls and gates through which lethal missiles could be shot or dropped on the enemy below.

The baileys at the foot of the mound were enclosed by palisades and later by walls and towers of masonry. Almost at the same time that the shell keep was being erected in western Europe, the rectangular keep, a more compact form of citadel, was also being built. Examples are the donjon at Loches, Fr. (*c.* 1020), and the keep at Rochester, Eng. (*c.* 1130).

The keep, or donjon, was the focal point of the castle, to which, in time of siege, the whole garrison retired when the outer works had fallen; it was therefore the strongest and most carefully fortified part of the defenses. It had a well; contained the private apartments, offices, and service rooms; and held all the appointments necessary to sustain a long siege. Often the keep stood in line with the outer line of defenses, so that while one side looked toward the bailey (or succession of baileys) commanding the operations of the defense there, the other side commanded the field and the approaches to the castle. The side of the keep exposed to the field also presented a line of escape.

After the Third Crusade (1189–92), the site chosen for a new castle, where such choice was possible, was the summit of a precipitous hill, the citadel being backed against the cliff. The main defense was concentrated in the direction of approach, and here there were often two or three lines of advance fortifications. The living quarters—with the hall, domestic offices, and chapel—were then all built in the court of the inner bailey. The keep (often no longer the residence but the last line of defense) was smaller than those built previously but of more powerful design.

Development in the use of firearms was so rapid during the 15th and 16th centuries as to require a radical change in military architecture. French troops marched through Italy in 1494 and, with their guns, reduced castle after castle with astonishing rapidity. The age of the medieval castle came to an end and the era of modern military fortification opened. The principle governing the design of the new forts constructed all over Europe was that the whole building should be concentrated in one compact block. Its low walls could be defended all around by artillery, the guns being mounted on bastions and redans.

Although the break with the past did not occur suddenly, but extended over many years, there came to be from the time of the Renaissance a complete separation between military and domestic architecture; the former being a fort under military control of the monarch, the latter an unfortified palace, mansion, manor house (*q.v.*), or *hôtel.*

castle, in ship construction, structure or area raised above the main deck for combat or work purposes. The name was derived from early similarities to fortress turrets. The forecastle and aftercastle (or sterncastle) are at the bow and stern of the vessel. A top castle was perched on masts of some ships about the 13th century. The first known castles are shown amidships or astern on Roman ships, to afford vantage points in sea skirmishes. Forecastles were constructed on Viking ships as early as the 8th century. By the 14th century, the forecastles and aftercastles had become a part of the hull, rather than an added tower. The aftercastle on 15th-century galleys was used by officers, and naval enlisted men have traditionally been quartered in the area of the forecastle. The forecastle remained the designation for the area around the foremast in 19th-century men-of-war, although the deck was flush from bow to stern. Many cargo vessels have a forecastle (deck). The aftercastle was superseded by the quarterdeck.

Castle, Vernon and Irene, original names VERNON BLYTHE and IRENE FOOTE (respectively b. May 2, 1887, Norwich, Norfolk, Eng.—d. Feb. 15, 1918, Fort Worth, Texas, U.S.; b. 1893, New Rochelle, N.Y., U.S.—d. Jan. 25, 1969, Eureka Springs, Ark.), U.S.

Vernon and Irene Castle
Arthur Todd

husband-and-wife dancing team, famous as the originators of the one-step and the turkey trot.

Vernon and Irene were married in 1911 and as dance partners became famous worldwide. They popularized such dances as the glide, the castle polka, the castle walk, the hesitation waltz, the maxixe, the tango, and the bunny hug.

They wrote *Modern Dancing* (1914) together, and after Vernon was killed in an aviation accident while training cadets to pilot planes during World War I, Irene wrote *My Husband* (1919). In 1939 a motion picture starring Ginger Rogers and Fred Astaire, *The Story of Vernon and Irene Castle*, was released, and in 1958 Irene published *Castles in the Air.*

castle guard, in the European feudal tenure, an arrangement by which some tenants of the king or of a lesser lord were bound to provide garrisons for royal or other castles. The obligation would in practice be discharged by subtenants, individual knights who held their fiefs by virtue of performing such service for a fixed period each year. Because the castle concerned might be far from the fiefs charged to guard it (*e.g.,* knights of Northamptonshire in the English Midlands had to garrison Dover Castle on the south coast), the duty was early commuted for money payments. Some castle guards, or ward rents, survived into modern times.

Castle Hill Rising (March 4–5, 1804), the first rebellion in Australian history. Involving Irish convicts (for the most part, political offenders), the uprising began with the rebels' seizure of the New South Wales convict station at Parramatta on March 4 and culminated in a clash between the rebels and government troops on the following day. The actual scene of this clash was Vinegar Hill (now called Rouse Hill), about 10 miles (16 kilometres) from Castle Hill.

By the night of March 4, the Sydney authorities had learned of the uprising and placed the troops of the New South Wales Corps and the settlers' Loyal Associations (two companies of militia formed in 1800) on alert. On March 5, however, only 57 troops and a few settlers were sent to face the 400 convicts who had taken up positions on Vinegar Hill. After two unsuccessful attempts to negotiate with the rebels, the troops opened fire. The convicts fled under the barrage, leaving 15 dead and many wounded. The rebellion was broken.

The rebel leader, Philip Cunningham, was captured on March 5 and immediately hanged (martial law was in effect for the area from March 5 until March 10). Later, eight other convicts were tried and hanged as well.

Castle Morpeth, district (borough), county of Northumberland, extreme northern England, occupying an area of 239 sq mi (619 sq km) in the southeastern part of the county. It adjoins on its northwestern border the heavily industrialized metropolitan county of Tyne and Wear and borders the North Sea on the northeast; it is separated from Scotland by its neighbouring district of Alnwick (north). Castle Morpeth district lies on a coarse sandstone upland, where highest elevations reach about 700 ft (215 m), that descends to the east in a series of scarps to a coastal plain with low cliffs backed by sand dunes; on the west it borders the Cheviot Hills and associated moorlands. The district is generally covered by fertile unstratified glacial drift, and the onshore and offshore coastal areas are underlain by coal deposits. Mixed farming (including cattle, sheep, cereals, potatoes, and clover) prevails throughout.

Population in the district is concentrated in the southeast at Ponteland, a residential suburb of Tyne and Wear, and at Morpeth and Lynemouth, two mining centres of the declining Northumberland coalfields. An undersea coal bed mined with modern technology and one of Great Britain's first aluminum smelters (constructed 1974) have contributed to the local economic resurgence of Lynemouth. Morpeth, the district seat, has light engineering industries.

Numerous fortified manors and peel towers (small, massive, fortified towers built to protect livestock and commoners) bear witness to the English-Scots warfare in the area during the Middle Ages. A section of the east–west trending Hadrian's Wall, built by the Romans in the 2nd century AD, crosses the district near the village of Heddon-on-the-Wall in the extreme south. Pop. (1982 est.) 50,200.

Castle Point, district, county of Essex, southeastern England, occupying an area of 17 sq mi (44 sq km) on the north side of the Thames near its mouth. Castle Point is a low-lying district of tidal inlets and reclaimed land protected by embankments and dikes. The parishes (towns) of Canvey Island to the south and Benfleet on the mainland to the north experienced rapid residential growth in the 1960s and 1970s. Canvey Island, the nearest seaside resort to London, has a great many summer cottages and camper hookup sites. Boating is especially popular in the vicinity.

Printing, engraving, and furniture-making industries and some market gardening are based in Castle Point. Canvey Island has facilities for the storage of liquefied natural gas and for refining petroleum. The district derives its name from the local medieval Hadleigh Castle, which the artist John Constable made the subject of a powerful landscape. The district seat is at Thundersley within Benfleet town. Pop. (1982 est.) 85,900.

Castle Rising, parish, West Norfolk district, county of Norfolk, England. A great Norman castle, with a square, massive keep, stands within a 12-ac (5-ha) enclosure formed by artificial ramparts of earth and a ditch, which is crossed by an ancient bridge. The incorporated town that grew in its shelter in the Middle Ages, with important fairs and markets, later decayed and was disfranchised in 1832; it is now a mere village with a late-Norman church. Pop. (1971) 154.

Castlebar, Irish CAISLEÁN AN BHARRAIGH, market and county town, County Mayo, Ireland, at the head of Lough (lake) Castlebar. The town was founded early in the 17th century and was incorporated in 1613. It is now an active angling centre and has a small airport and bacon-curing and hat-making factories. Pop. (1981) 6,409.

Castlemaine, city in southern Victoria, Australia, located 8 mi (13 km) east of the Lodlen River and 78 mi northwest of Melbourne. In 1836 the area was crossed by Maj. Thomas Mitchell, and in 1851 gold was found in Specimen Valley. The mining settlement employed about 30,000 miners and was called alternatively Forest Creek and Mount Alexander. Capt. William Wright, the chief goldfields commissioner, later named the settlement after his uncle, Viscount Castlemaine. By the 1880s the gold deposits were depleted. Today Castlemaine is the centre of a farming and fruit-growing district and has light manufacturing. The city has a botanical garden, a provincial art gallery, and a restored market (built 1861–62) that serves as a museum. Inc. town, 1950. Pop. (1981) 7,583.

Castlemaine, Barbara Palmer, countess of, *née* VILLIERS: *see* Cleveland, Barbara Villiers, duchess of.

Castlemainian Stage, time division of the Ordovician Period in Australia and New Zealand (the Ordovician Period began about 500,000,000 years ago and lasted about 70,000,000 years). The Castlemainian Stage precedes the Yapeenian Stage and follows the Chewtonian Stage. Several graptolite fossil zones, shorter divisions of time within the stage, are recognized in the Castlemainian and are based on various subspecies of *Isograptus caduceus.* Castlemainian faunas show affinities with North American and European faunas.

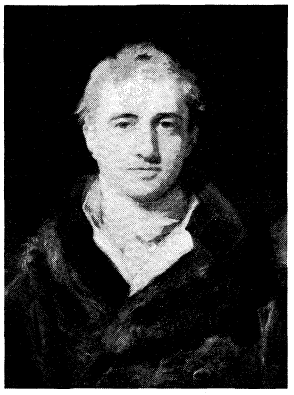
Castlereagh, Irish AN CAISLEÁN RIABHACH, district, Northern Ireland, located directly southeast of Belfast, from where it is administered. Formerly astride Down and Antrim counties, in 1973 Castlereagh was established as a district covering 33 sq mi (84 sq km) of rolling lowlands bordering the districts of Lisburn to the southwest, North Down to the north, Ards to the east, and Down to the south. What is now Castlereagh district was settled in the 14th century by the O'Neill clan of Ulster, whose main stronghold was Grey Castle (no longer extant) from which the district takes its name. Composed largely of post-World War II residential developments and having substantial agricultural land, Castlereagh is closely linked to eastern Belfast, where many of its residents are employed in shipbuilding, aircraft manufacturing, and related industries. There is an industrial park at the planned suburb of Newtownbreda. Castlereagh district is traversed by several roads extending southeast from Belfast. Pop. (1981) 60,757.

Castlereagh, Robert Stewart, Viscount, also called (from 1821) 2ND MARQUESS OF LONDONDERRY (b. June 18, 1769, Dublin—d. Aug. 12, 1822, London), British foreign secretary (1812–22), who helped guide the Grand Alliance against Napoleon and was a major participant in the Congress of Vienna, which redrew the map of Europe in 1815.

Castlereagh was one of the most distinguished foreign secretaries in British history. He is equalled only by Marlborough in the personal ascendancy that he gained as British representative in the European diplomacy of his time. He took a leading part in bringing together the alliance of great powers that finally overthrew Napoleon and in deciding the form of the peace settlement of Vienna. The concept of a Concert of Europe was largely his creation, and his influence did much to promote the practice of diplomacy by conference.

Stewart was the son of Robert Stewart, an Anglo-Irish landowner, who was elevated to the peerage in 1789 and later promoted earl (1796) and ultimately marquess (1816) of Londonderry. On his father's death Castlereagh became the 2nd marquess of Londonderry. Educated at Armagh and St. John's College, Cambridge, he was elected to the Irish Parliament of 1790 as an independent member. In 1794 he married Emily Anne Hobart, a beautiful if slightly eccentric woman to whom he remained devotedly attached throughout their long and childless marriage. From March 1798 he served as acting chief secretary to his relative Earl Camden, then lord lieutenant of Ireland. In November 1798 he was formally appointed to that office by Camden's successor, Lord Cornwallis.

Castlereagh's tenure as chief secretary coincided with the two most important events of



Castlereagh, detail of a painting by Sir Thomas Lawrence; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Irish history in the late 18th century: the 1798 rebellion and the union with Great Britain. While taking severe and successful measures to quell the revolt in 1798, Castlereagh shared the view of Cornwallis that a policy of clemency was essential to end the disturbances. The threat of French invasion and the 1798 rebellion convinced Castlereagh of the need for a parliamentary union with Britain. The passage of the Act of Union through the Dublin Parliament in June 1800 provided the first great demonstration of Castlereagh's abilities as he singlehandedly forced the measure in the Irish Commons against bitter Protestant opposition. He believed that the union with Britain must be accompanied by the political emancipation of Roman Catholics. When, in February 1801, Pitt failed to obtain George III's consent to emancipation, Cornwallis and Castlereagh at once sent in their resignations.

Though out of office after May 1801, Castlereagh continued to advise Henry Addington's ministry on Irish questions, and in July 1802 he was appointed president of the Board of Control responsible for Indian affairs. His energy and intellectual powers gained him an immediate influence in the Cabinet, and, after Pitt's return as prime minister (May 1804), he also became in July 1805 secretary of state for war. His first important task, the dispatch of a British expeditionary force to Hanover, was rendered ineffectual by Napoleon's victory at Austerlitz (December 1805); but the move convinced Castlereagh of the strategic value of the British Army in continental warfare. On Pitt's death in January 1806 he left office and became the chief opposition spokesman on foreign and military affairs. He returned to the War Department in the Duke of Portland's ministry in 1807 and showed his determination to engage in major warfare against a continent now completely dominated by Napoleon. The adoption in 1808 of his plan for reorganizing the regular, reserve, and militia forces provided the country with adequate home defenses and a larger and more efficient army for overseas operations. When the Spanish revolt against Napoleon broke out the same year, it was decided at once to send a major expedition to the peninsula. Castlereagh was influential in securing the command for Sir Arthur Wellesley (later duke of Wellington) in 1809. In 1809 a British expedition sent by Castlereagh against Napoleon's naval base at Antwerp was allowed to waste away of disease on the island of Waheren. The disaster was in no way Castlereagh's fault, but it brought to a head the long-standing divisions and intrigues in the Cabinet. Since March 1809, George Canning, the foreign secretary, had been pressing for a change of policy, and even before the Walcheren expedition he had secured secret agreement to the replacement of Castlereagh by the marquess Wellesley. When Castlereagh learned of the ignominious position in which Canning had placed him, he challenged him to a duel that was fought September 21. Canning was slightly wounded and both men later resigned office. Castlereagh remained out of office for the next two and a half years.

In 1812 he rejoined the government as secretary for foreign affairs, and after Prime Minister Perceval's assassination in May he became leader of the House of Commons. British foreign policy then passed for a decade under unified control. Castlereagh's first task was to hold together the shaky and distrustful elements in the general European opposition to Napoleon; but as the end of the war drew near he worked increasingly to obtain preliminary agreement among the allies for the resettlement of Europe. In talks in Châtillon in 1814, he secured acceptance in principle of his plans for a peace settlement under the control of the great powers. By the Treaty of Chaumont (March 1814), he obtained provision for allied cooperation for 20 years after the war. On the fall of Napoleon the Treaty of Paris (May 1814) secured immediate British requirements (the restoration of the Bourbon monarchy and the separation of the Low Countries as an independent kingdom) and set Castlereagh free to play a commanding and mediatory role at the peace conference at Vienna. His main European objectives were to prevent the aggrandizement of Russia and to strengthen the weak central European areas of Germany and Italy. He and Metternich, the Austrian minister for foreign affairs, dominated the inner negotiations, though it was Castlereagh who took the lead in resisting the territorial demands of Russia and Prussia. The final settlement, with some compromises, was a practical embodiment of his principle of the "just equilibrium."

Castlereagh also attached fundamental importance to regular consultation by the great powers on matters of common concern; and the peace treaty contained specific provision for periodic meetings of the contracting parties. Though the practice of holding such meetings became known as the "congress system," Castlereagh's aim was to make possible diplomacy by conference rather than to establish any system of international regulation or interference in the internal affairs of other states. The distinction became increasingly apparent in the remaining seven years of his career. The Congress of Aix-la-Chapelle in 1818 readmitted France to the concert of powers. Castlereagh firmly resisted, however, a Russian attempt to institute a league of European powers to guarantee the existing order under sanction of military force. When the liberal movement in Germany after 1818 and the revolutions in Spain and in the Kingdom of the Two Sicilies in 1820 brought Austria and Russia closer together, he refused to treat their meeting at Troppau in October 1820 as a full European congress, and after the Congress of Laibach (1821) he openly repudiated the Troppau principle of intervention and coercion. His classic state paper of May 1820 emphasized the difference between the despotic states of eastern Europe and the constitutional structures of Britain and France and made it clear that the British government could only act on the expediency of any given issue and within the limits of its parliamentary system. With the emergence in 1821 of the questions of Greek independence and the fate of the Spanish colonies, however, British political and commercial interests became directly affected, and Castlereagh decided to attend in person the Congress of Verona in 1822. The instructions he drew up for himself showed plainly that he would not sanction forcible interference in either Greece or Spain and that Britain would ultimately be prepared to recognize de facto governments resulting from successful revolutions. It is clear that Castlereagh was preparing for that detachment of Britain from the reactionary policy of the continental powers that was accomplished after his death.

This development was largely hidden from the British public by the personal nature of Castlereagh's diplomacy and his aloofness from public opinion. His apparent involvement with the eastern autocracies was disliked at home, and his role as spokesman for the government in the violent domestic politics of the postwar era kept him in a position of unpopular prominence. As leader of the House of Commons he was identified with the repressive policies of the years 1815–19 and with the Cabinet's unsuccessful introduction in 1820 of a bill to dissolve George IV's marriage with Queen Caroline. He was savagely attacked by such liberal Romantics as Lord Byron, Thomas Moore, and Shelley. After the abortive Thistlewood plot to assassinate the Cabinet in 1820, he always carried pistols in self-defense, and during the trial of Queen Caroline he was obliged to take up his residence in the Foreign Office for greater safety. The burden imposed on him by the royal divorce affair of 1820, in addition to his duties at the Foreign Office and in the House of Commons, probably hastened his final collapse. In 1821 he showed signs of abnormal suspiciousness, which by 1822 became outright paranoia. He was, or thought he was, being blackmailed on charges of homosexual acts, and on Aug. 12, 1822, he committed suicide shortly before he was due to set out for Verona. (N.G.)

BIBLIOGRAPHY. H. Montgomery Hyde, *The Rise of Castlereagh* (1933), is a fine account of Castlereagh. The *Memoirs and Correspondence of Viscount Castlereagh, Second Marquess of Londonderry,* ed. by Charles Vane, 12 vol. (1850–53), correspondence from Castlereagh to members of his family, provides source documents for historians.

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Castletown, town district and ancient capital of the Isle of Man, one of the British Isles, on Castletown Bay, which is formed by the River Silver Burn. Castle Rushen, perhaps founded in 947–960 by Godred the Dane, is essentially Norman, largely rebuilt in the 14th century, with 16th-century additions. It was the residence of the lords of Man until the 18th century. The massive, square keep, or strongest part, is surrounded by an outer wall with towers and moat. Nearby is the old House of Keys, seat of the Manx parliament until its removal to Douglas in 1862. King William College (endowed 1668) is 1 mi northeast. Beyond Derby Haven is the Isle of Man Airport at Ronaldsway. Tourist attractions include a nautical museum and the Witches Mill museum of witchcraft. Pop. (1981) 3,141.

Castor, also called ALPHA GEMINORUM, multiple star having at least six component stars, in the zodiacal constellation Gemini. The stars Castor and Pollux are named for the twins of Greek mythology. Castor's combined apparent visual magnitude is 1.58. It appears as a bright visual binary, of which both members are spectroscopic binaries. An additional two component stars form an eclipsing binary system of red dwarfs revolving around each other in less than a day and orbiting the four main stars in a period of millions of years.

Castor and Pollux (Roman deities): *see* Dioscuri.

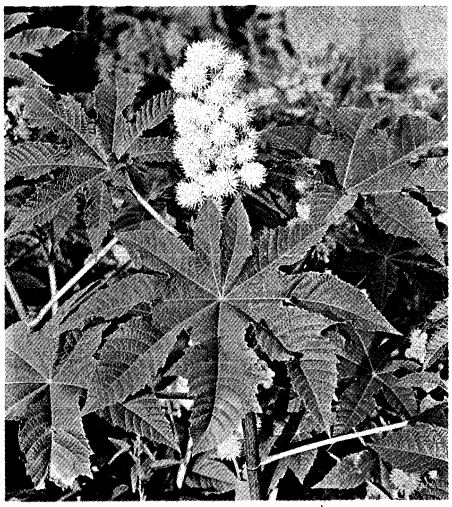
castor oil, also called RICINUS OIL, nonvolatile fatty oil obtained from the seeds of the castor bean, *Ricinus communis,* of the spurge family (Euphorbiaceae), and used in the production of synthetic resins, plastics, fibres, paints, varnishes and various chemicals including drying oils and plasticizers. Castor oil is viscous, has a clear and colourless to amber or greenish appearance, a faint characteristic odour, and bland but slightly acrid taste, with usually nauseating aftertaste.

Castor oil is obtained from castor beans either by pressing or by solvent extraction. Both beans and oil are produced principally by India and Brazil and consumed primarily in the United States, largely in industry.

In addition to the uses mentioned previously, castor oil and its derivatives are used in cosmetics, hair oils, fungistatic (fungus-growth-inhibiting) compounds, embalming fluid, printing inks, soap, lubricants, greases and hydraulic fluids, dyeing aids, and textile finishing materials. Turkey-red oil, long used as a dyeing aid, is produced by reaction of castor oil with sulfuric acid.

Castor oil consists almost entirely of the triglycerides ricinoleic acid; and although castor oil has been taken internally as a cathartic, its use can be harmful.

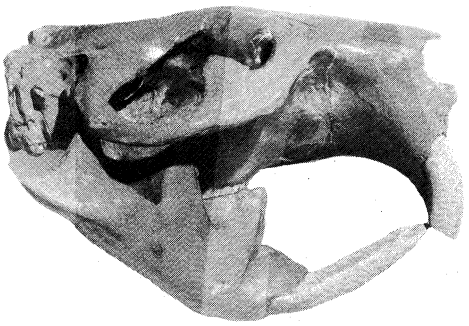
castor-oil plant (*Ricinus communis*), large plant, of the spurge family (Euphorbiaceae),



Castor-oil plant (*Ricinus communis*)
Kenneth and Brenda Formanek—EB Inc.

grown commercially for the pharmaceutical and industrial uses of its oil and for use in landscaping because of its handsome, giant, 12-lobed, palmate (fanlike) leaves. The bristly, spined, bronze-to-red clusters of fruits are attractive but often are removed before they mature because of the poison ricinine concentrated in their mottled, beanlike seeds. Probably native to Africa, this species has become naturalized throughout the tropical world. The plants are chiefly cultivated in India and Brazil, largely for their oil. In the tropics the plants reach about 10 to 13 metres (30 to 40 feet) in height. In temperate climates they are raised as annuals and grow 1.5 to 2.4 m in a single season. Although *R. communis* is the only species in its genus, there are hundreds of natural forms and many horticultural varieties.

Castoroides, extinct genus of giant beavers found as fossils in Pleistocene deposits in North America (the Pleistocene Epoch began 2,500,000 years ago and ended 10,000 years ago). *Castoroides* attained a length of about



Skull of *Castoroides*
By courtesy of the trustees of the British Museum (Natural History); photograph, Imitor

2½ metres (7½ feet). The skull was large and the gnawing teeth strongly developed. In Europe, a similar form of giant beaver, *Trogontherium,* paralleled the development of *Castoroides.*

Castracani, Castruccio (b. 1281, Castruccio, Tuscany—d. Sept. 3, 1328, Lucca), condottiere, or captain of mercenaries, who ruled Lucca from 1316 to 1328.

When the Guelfs gained power in Lucca in 1300, Castruccio's family, the wealthy Antelminelli, were exiled from Lucca. Castruccio served successively as condottiere for the French, the English, and the Lombards. When the German king Henry VII (1275–1313) entered Italy to be crowned emperor, Castruccio supported him by allying himself with the powerful Uguccione della Faggiuola, lord of Pisa (*c.* 1250–1319), and led the pro-imperial Ghibelline forces back to Lucca (1314), over which Uguccione was given power. The rivalry between the two leaders was settled when Uguccione was overthrown in 1316, and the victorious Castruccio was made lord and protector of Lucca.

In 1320 the emperor Frederick III appointed Castruccio imperial vicar of Lucca, Versilia, and Lunigiana. When the emperor Louis IV (1283?–1347) entered Italy to be crowned in Rome, Castruccio became one of his most active counsellors. In 1324 Louis appointed him count of Latran, duke of Lucca, with rights of succession for his heirs, and senator—*i.e.,* governor—of Rome. His victory over the Florentines at Altopascio in 1325 brought almost all Tuscany under his sway, and he became one of the most powerful men in Italy.

Castruccio's long fight against the papalist Guelfs brought him, however, into conflict with the papacy, and he was twice excommunicated by John XXII (pope from 1316 to 1334). Castruccio's sudden death, in 1328, left his empire disorganized, an easy prey for the Florentines, who soon recaptured most of his holdings.

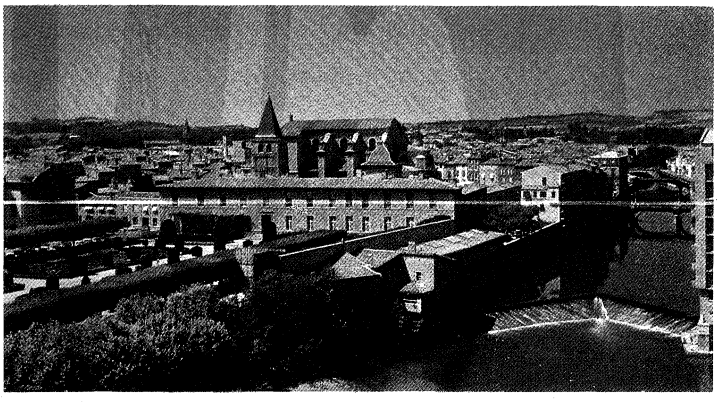
castrato, also called EVIRATO, male soprano or contralto voice of great range, flexibility, and power, produced as a result of castration before puberty. The castrato voice was introduced in the 16th century, when women were banned from church choirs and the stage. It reached its greatest prominence in 17th- and 18th-century opera. The practice of castration, illegal and inhumane, produced an adult voice of extraordinary power attributable to the greater lung capacity and physical bulk of the adult male.

The unique tone quality of the voice, coupled with the ability of the intensively trained singers to execute extremely difficult florid vocal passages, made the castrati the rage of opera audiences and contributed to the spread of Italian opera. In 18th-century opera the majority of male singers were castrati. The most famous of the Italian castrati was Carlo Broschi, known as Farinelli.

Castrén, Matthias Alexander (b. Dec. 2, 1813, Tervola, Fin., Russian Empire—d. May 7, 1852, Helsinki), Finnish nationalist and pioneer in the study of the Ural-Altaic language grouping who championed the ideology of Pan-Turianism—the belief in the racial unity and future greatness of the Ural-Altaic peoples.

After many years of field research in Siberia, Castrén made important contributions to the comparative study of the Ural-Altaic languages, the most dramatic being his assertion that Finnish was a member of this family. From this belief he concluded that the Finns originated in central Asia and that, far from being a small, isolated people, they were part of a larger polity that included such groups as the Magyars, the Turks, and the Mongols. This belief was accepted by the Finnish nationalists after Castrén, himself a zealous nationalist, made his views public in 1849 and lent great impetus to the advancement of Finnish language study in Finland. Castrén occupied the first chair in Finnish at the University of Helsinki (1851) and became university chancellor the following year. While strongly challenged by later research, Castrén's views on the original home of the Finns and on their Turanian affiliation are still widely held in Finland.

Castres, town, Tarn *département,* Midi-Pyrénées region, southern France, on the Agout River, east of Toulouse. The site of

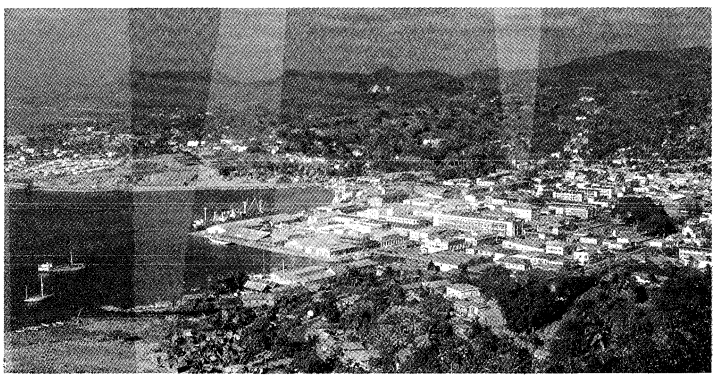


The Musée Goya-Jaurès and gardens on the Agout River, Castres, Fr.; the cathedral is in the background
Club Iris

a Gallo-Roman camp, the town developed around a Benedictine monastery founded about 647. Guy de Montfort, brother of Simon de Montfort, handed down the seigneury in the 13th century; but from the mid-16th century the town embraced the Reformation, and historians even styled it a Protestant republic. Louis XIII subdued Castres, which later suffered economically when leading Protestants fled the country at the revocation of the Edict of Nantes (1685). Under Louis XIV, Castres again became prosperous; the town hall (designed by Jules Hardouin-Mansart), Baroque churches, and other public buildings are legacies of this flourishing period. The textile industry has thrived there since the 13th century. Castres machine tools have a world market and pharmaceuticals are produced there as well. Pop. (1982) 39,216.

Castres, Jacques d'Armagnac, comte de (count of): *see* Nemours, Jacques d'Armagnac, duc de.

Castries, chief town of St. Lucia island in the eastern Caribbean Sea, lying 40 mi (65 km) south of Fort-de-France, Martinique. Its fine landlocked deepwater harbour on the northwestern coast is St. Lucia's chief port, shipping mainly bananas but also exporting sugarcane, rum, molasses, cacao, coconuts, copra, limes and lime juice, essential oils, bay rum, and various tropical fruits and vegetables. A fortress on Mt. Fortune (852 ft [260 m]) overlooks the town. There is a botanical station, and Vigie Beach and an airport are nearby. Pop. (1980 est.) 48,800.



Castries and its harbour on St. Lucia
Kurt Schohz—Shostal/EB Inc.

Castriota, George: *see* Skanderbeg.

Castro (y Quesada), Américo (b. 1885, Cantagalo, Brazil—d. 1972, Lloret de Mar, Spain), linguist and cultural historian who explored the distinction of Spain and Spanish America from the rest of the West.

Castro was born in Brazil of Spanish parents who returned with him to Spain in 1890. He graduated from the University of Granada in 1904 and studied at the University of Paris (1905–08). He joined the Institución Libre de Enseñanza in Madrid, heading its department of lexicography, in 1910. He remained at the Institución, even after becoming professor at the University of Madrid in 1915. He published several scholarly works, notably *Vida de Lope de Vega* (1919), *Lengua, enseñanza y literatura* (1924), and *El pensamiento de Cervantes* (1925), and lectured abroad. In Berlin in 1931 when the Spanish Republic was declared, he became its first ambassador there. He went to the United States when the Spanish Civil War broke out in 1936 and there taught literature at the University of Wisconsin (1937–39), the University of Texas (1939–40), and Princeton University (1940–53).

Castro believed that Spaniards became a distinct group, with a sense of *ipsiedad* ("selfhood"), only after the Moorish conquest, when they became a Christian caste—an explanation of later attitudes which he treated in his *Iberoamérica, su presente y su pasada* (1941), *España y su historia* (1948), and *De la edad conflictiva* (1961).

Castro, Cipriano (b. Oct. 14, 1858, Capacho, Táchira, Venezuela—d. Dec. 4, 1924, San Juan, P.R.), Venezuelan soldier and dictator, called the Lion of the Andes, who was the first mountaineer to rule a nation that until the 20th century had been dominated by plainsmen and city dwellers from Caracas. Virtually without moral scruples, he ruled for nine remarkably corrupt years, embezzling vast sums of money and living as an extraordinary libertine, only to be deposed by his more ruthless lieutenant, Juan Vicente Gómez.

Receiving no formal education, Castro worked as a cowboy in the Andean region. Enlisting the support of a powerful Venezuelan general, he entered politics and became the governor of his province of Táchira but was exiled to Colombia when the government in Caracas was overthrown in 1892. He lived in Colombia for seven years, amassing a fortune in illegal cattle trading and recruiting a private army, with which he successfully attacked Caracas in 1899. Installed as the supreme military commander and later as president of Venezuela, Castro inaugurated a period of plunder and political disorder.

Castro's rule was marked by frequent rebellions, the murder or exile of his opponents, his own extravagant living, and trouble with other nations. When he refused to make payments on foreign debts, British, German, and Italian ships set up a blockade in 1902 to force payment. The issue was eventually resolved through arbitration.

Seriously ill and exhausted by his excesses, he left for Paris in 1908 to seek medical aid, leaving the government in the hands of his lieutenant Gómez, the man who was instrumental in his victory of 1899. Gómez seized the government for himself, and Castro remained an exile for the last 16 years of his life, mostly in Puerto Rico unsuccessfully plotting his return to Venezuela.

Castro, Eugénio de (b. March 4, 1869, Coimbra, Port.—d. Aug. 17, 1944, Coimbra), leading Portuguese Symbolist and Decadent poet. His best known collection of poetry, *Oaristos* (1890; "Intimate Chats"), which launched Symbolism in Portugal, employs an imagism akin to that later developed by the U.S. poets Ezra Pound and Amy Lowell. His Symbolism maintains the essential doctrines of the French theorists of the movement, in contrast with the nostalgic nationalism that characterized the poetry of his contemporaries in Portugal. Among his numerous published collections, the best known include *Horas* (1891; "Hours"), *Sagramor* (1895), *Salomé e Outros Poemas* (1896; "Salome and Other Poems"), *Saudades do Céu* (1899; "Longings for Heaven"), and *Constança* (1900), a sensitive interpretation of the personal drama of the wife of Pedro I, whose mistress, Inês de Castro, figures prominently in Portuguese history and literature.

Castro (Ruz), Fidel (b. Aug. 13, 1926, near Birán, Cuba), Cuban revolutionary and leader of Cuba from 1959, who became a symbol of Communist revolution in Latin America and a contributor to revolution elsewhere, especially in Africa. He held the title of premier until 1976, when he became president of the Council of State and the Council of Ministers.

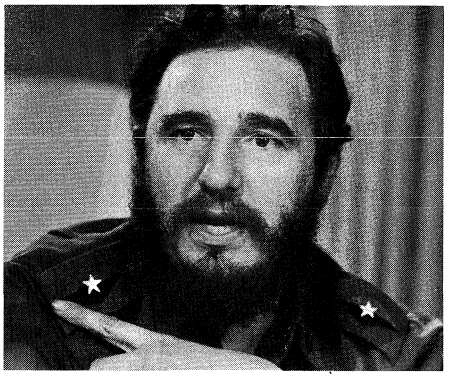
Castro was born in the Mayarí municipality of Oriente province, the easternmost in Cuba. His father, Angel Castro y Argiz, an immigrant from Galicia in northwestern Spain, had seven children, two by his first wife. While still married to her, he had five more illegitimate children from his cook, Lina Ruz González. Fidel was the second of these; Raúl, later to become, too, a major figure in Cuban affairs, was the youngest. Fidel's father cultivated sugarcane and some other crops. Although the Mayarí region was poor, Angel Castro was financially well off, though not a wealthy man, in an area long dominated by the United Fruit Company.

Fidel Castro attended Roman Catholic boarding schools in Santiago, the capital of Oriente province, and later attended the country's leading Jesuit-run boarding school, Belén, in Havana. He was graduated from the School of Law of the University of Havana after five years. Although he probably began reading Marxist works at the university, he did not become a Communist until the late 1950s.

His main activity at the university—where organized violent gangs sought to advance a mixture of romantic goals, political aims, and personal careers—was politics. In a minor way he participated in an attempted invasion of the Dominican Republic organized in Cuba in 1947 and in urban riots that broke out in Bogotá in April 1948. He was charged with the assassination of another prominent student leader, but the charge was never proved.

Castro became a member of the Cuban People's Party (called Ortodoxos) in 1947 and was their candidate for a seat in the House of Representatives (from a city of Havana district) in the elections scheduled for 1952. On March 10, 1952, however, the former Cuban president, Gen. Fulgencio Batista, overthrew the government of Pres. Carlos Prío Socarrás and cancelled the elections.

Castro began to organize a revolution early in 1953. On July 26 he led a small group against the Moncada military barracks in the city of Santiago, but it failed and Castro himself was arrested. A subsequently edited version of his self-defense at his trial was to become his major statement during the 1950s. Known by its concluding words, "History Will Absolve Me" (*La Historia Me Absolverá*), the document at-



Fidel Castro, 1964
Elliott Erwitt—Magnum

tacked the anticonstitutional, repressive, and corrupt practices of the Batista government, calling for political and civil liberties. He also called for a land reform and other rural improvement programs along with programs for industrialization, the partial sharing of profits between shareholders and workers, and a pledge not to introduce new taxes.

As the need to build up a large coalition to overthrow the Batista government became more evident, his statements became less specific: the more sweeping reforms were no longer mentioned, and some, such as the expropriation of foreign-owned public utilities, were explicitly repudiated. Many of these views were changed drastically after he came into power.

Upon his release from prison in 1955, Castro went to Mexico to organize the next step in the revolution, heading an organization called the 26th of July Movement. On Dec. 2, 1956, he led a group that landed in Oriente province, Cuba, aboard the yacht "Granma." Meeting initial setbacks, Castro, his brother Raúl, Ernesto (Che) Guevara, and a few others retreated into the Sierra Maestra of southwestern Oriente province to wage guerrilla warfare against the demoralized, ill-equipped, and badly led armed forces of Batista. Independently of Castro, many other efforts were made to overthrow the Batista government, but none of them succeeded. As internal political support waned and military defeats multiplied, Batista fled the country on Dec. 31, 1958.

Fidel Castro has always remained the commander in chief of the Cuban armed forces. In February 1959 he became prime minister and thus head of the Cuban government. In December 1976 he became president of the State Council of the Cuban National Assembly. He is also the chief executive officer, called the secretary general, of the Communist Party of Cuba (Partido Comunista de Cuba, with which Castro's movement was merged in 1961)—the only political party operating legally in Cuba under the constitution of 1976. He is also a member of the party's principal organ, the Political Bureau (Politburo), and of the Central Committee.

Fidel Castro's political style has emphasized active engagement and self-discipline. Moderately tall, athletic, and bearded, he believes that individuals can overcome most obstacles if they have the will to do so and that revolution, at home and abroad, is the important mission worth pursuing. As he said, "The duty of every revolutionary is to make the revolution."

He is a man of extraordinary personal energy, keen intelligence, and a fine political sense in domestic affairs and foreign policy. He is a spellbinding orator who can speak often and at great length. He has had the support of many, but he also provoked revolt and exile among hundreds of thousands of Cubans (many of whom left for the U.S.).

His policies have been far reaching. His government has vastly expanded educational opportunities and institutions. It has redistributed economic wealth, income, and access to health facilities. All education and health services in Cuba are free of charge. Every citizen is guaranteed employment and also has the obligation to work. The Cuban economy under the Castro regime, however, has barely kept up with population growth and has become inefficient in many respects. The government owns most of the means of production.

Castro's government has also established authoritarian political rule. There is no political competition among parties; no national elections were held until 1976, and then only local government officials were directly elected. All mass media are controlled by the government and express its views. The government reserves for itself wide powers to deal with opponents. Power is concentrated in a centralized bureaucracy—notwithstanding some trends toward decentralization in the late 1970s—headed by Castro, which plans for the economy and the society. Most of Castro's associates in the party's Political Bureau and in the State Council have been with him since the fight in the 1950s against Batista. His brother Raúl, minister of the armed forces, ranks second to him in all government and party posts.

Castro's government on gaining power took over property owned by U.S.-based enterprises in 1959 and 1960. By the early 1960s, all economic ties between Cuba and the United States were broken, and the U.S. government was equipping thousands of Cuban exiles to overthrow Castro's government; their landing at the Bay of Pigs in April 1961, however, failed.

In 1962 the Soviet Union stationed ballistic missiles in Cuba, and the world came close to nuclear war. The crisis ended when the Soviet Union agreed to withdraw its nuclear weapons from Cuba in exchange for a pledge that the U.S. would no longer seek to overthrow the Cuban government. Nevertheless, operatives of the U.S. Central Intelligence Agency continued for some time to plot to assassinate Castro.

Castro has supported violent revolution abroad, especially in South and Central America. In 1975 the Cuban government (with Soviet support) decided to enter the Angolan civil war on the side of the Popular Movement for the Liberation of Angola that won the war. Again with Soviet support in 1978 the Cuban government assisted Ethiopia in defeating an invasion by Somalia. Castro's government entered the 1980s with as many combat troops—about 40,000—posted abroad (relative to Cuba's population) as the U.S. had in Vietnam at the height of the war. (J.I.D.)

BIBLIOGRAPHY. Rolando E. Bonachea and Nelson P. Valdes (eds.), *Revolutionary Struggle, 1947–1958,* vol. 1 of *Selected Works of Fidel Castro* (1972), includes most of Castro's statements for those years, along with a biographical introductory essay; Jorge I. Dominguez, *Cuba: Order and Revolution* (1978), analysis of Cuban politics before and after the revolution, with special attention to postrevolutionary political institutions, decisions, and participation; Edward Gonzalez, *Cuba Under Castro, The Limits of Charisma* (1974), analysis of Cuban politics, mostly since the revolution, with special attention to the role of Castro; Lee Lockwood, *Castro's Cuba, Cuba's Fidel* (1969), long and wide-ranging interview of Fidel Castro conducted in the mid-1960s, with many good photographs; Frank Mankiewicz and Kirby Jones, *With Fidel* (1975), long interview with Castro conducted in the early 1970s, with a focus on politics and relations with the U.S.; Hugh Thomas, *Cuba: The Pursuit of Freedom* (1971; British title *Cuba; or, Pursuit of Freedom*), monumental history of Cuba from the late 18th century to the early 1960s; U.S. Congress, Senate Select Committee to Study Governmental Operations with Respect to Intelligence Activities, "Alleged Assassination Plots Involving Foreign Leaders," *An Interim Report,* 94th Congress, 1st Session (1975); Carlos Alberto Montaner, *Secret Report on the Cuban Revolution* (1981).

Castro, Inês de (b. 1323?—d. Jan. 7, 1355, Coimbra, Port.), mistress, before his accession, of Peter I of Portugal, famous because of her tragic death, related by such writers and poets as Luís de Camões, Luís Vélez de Guevara, and Henri de Montherlant.

The illegitimate daughter of Pedro Fernández de Castro, a Galician noble, she went to Portugal about 1340 with her cousin Constanza, who shortly afterward married King Afonso IV's eldest son and heir Dom Pedro (the future Peter I). But Pedro was soon attracted to the beautiful Inês, and a violent passion sprang up between them. After the death of Constanza (1345), they lived together and had several children. However, the influence of Inês and her two brothers over Dom Pedro aroused hostility at court and when, in 1354, Pedro declared himself pretender to the throne of Castile, Afonso IV decided to have Inês executed. On Jan. 7, 1355, after a dramatic interview at Coimbra, the King abandoned her to the assassins.

After Pedro's accession (1357), her body was moved to a magnificent mausoleum in the abbey church at Alcobaça. Legend has it that the King caused the corpse to be crowned and made the courtiers kiss the hand of the dead Inês.

Castro, João de (b. Feb. 7, 1500, Lisbon—d. June 6, 1548, Goa, Portuguese India), naval officer who helped preserve the Portuguese commercial settlement in India and contributed to the science of navigation with three *roteiros* (pilot books). He was also the first to note the deviation of the ship's compass needle created by the magnetic effect of iron objects.

The son of Alvaro de Castro, governor of Lisbon, and a student of the celebrated Portuguese mathematician and geographer Pedro Nunes, he spent 20 years in North Africa before sailing to western India in 1538. There he helped to end the Ottoman–Indian siege of the Portuguese fort at Diu. He sailed up the Red Sea to Suez (1540–41) and returned to Portugal in 1543. In 1545 he commanded the Portuguese fleet that helped end another siege of Diu. He served as viceroy of Portuguese India for only a few months before his death in the arms of the missionary St. Francis Xavier. Castro's pilot books, remarkable for their scientific observations, were published in Paris (1833), Oporto, Port. (1843), and Lisbon (1882).

Castro, Rosalía de (b. February 1837, Santiago de Compostela, Spain—d. July 15, 1885, Padrón, near Santiago), the most outstanding modern writer in the Galician language whose work is of both regional and universal significance.

In 1858 she married the historian Manuel Murguía (1833–1923), a champion of the Galician Renaissance. Although she was the author of a number of novels, she is best known for her poetry, contained in *Cantares gallegos* (1863; "Galician Songs") and *Follas novas* (1880; "New Medleys"), both written in her own language, and *En las orillas del Sar* (1884; *Beside the River Sar,* 1937), written in Castilian. Part of her work (the *Cantares* and some of the poems in *Follas novas*) expresses with sympathetic power the spirit of the Galician people: their gaiety, wisdom and folklore, their resentment of Castilian domination, their love of their homeland, and the sorrows of poverty and emigration. About 1867, however, Castro began to write more personally, describing in verse her own deepest feelings—remorse, repressed desire, the anguish of living, the desolation of spiritual loneliness, fear of death, the transience of affection, the feeling that everything is in vain. Her complete works appeared in 1973.

Castro Alves, Antônio de (b. March 14, 1847, Muritiba, Braz.—d. July 6, 1871, Salvador), Romantic poet whose sympathy for the Brazilian abolitionist cause won him the name "poet of the slaves."

While still a student he produced a play that brought him to the attention of José de Alencar and Machado, Brazilian literary leaders. Having studied for the law, he soon became a dominant figure among the Condoreira (Condor) school of poets, likened, for their dedication to lofty causes and for their preference for elevated style, to the highest

flying birds in the Americas. His romantic image was heightened by his sense of being foredoomed by a wound incurred in a hunting accident. He lived and wrote at fever pitch while the wound worsened and eventually led to amputation of his foot. Tuberculosis set in, and he died at 24. *Espumas Flutuantes* (1870; "Floating Foam") contains some of his finest love lyrics. "A Cachoeira de Paulo Afonso" (1876; "The Paulo Afonso Falls"), a fragment of *Os Escravos,* tells the story of a slave girl who is raped by her master's son. This and Castro Alves' other abolitionist poems were collected in a posthumous book, *Os Escravos* (1882; "The Slaves").

Castro y Bellvís, Guillén de (b. 1569, Valencia, Spain—d. July 28, 1631, Madrid), the most important and representative of a group of Spanish dramatists that flourished in Valencia. He is remembered chiefly for his work *Las mocedades del Cid* (1599?), upon which the French playwright Pierre Corneille based his famous drama *Le Cid* (1637). Castro's play clearly shows his strength in the use of natural dialogue. After an active military and civil service career in Valencia and Italy, he settled in Madrid, where his friend the playwright Lope de Vega helped him to find outlets for his work. Castro is considered the first playwright to have dealt with the seamier aspects of marriage, as in *Los mal casados de Valencia* ("The Unhappy Marriages of Valencia"). Attracted to the culture of Castile, he drew heavily upon the traditional ballads of the region, and three of his plays are based upon novels by Miguel de Cervantes. A haughty man, he antagonized his patrons and lived his last years in penury.

Castrop-Rauxel, city, Nordrhein-Westfalen *Land* (North Rhine-Westphalia state), northwestern West Germany, near the Rhine-Herne-Kanal, in the eastern part of the Ruhr industrial district. Castrop, first mentioned in 834, was chartered in 1484. It belonged to the duchy of Cleves (Kleve)-Mark until 1609, when it came under Prussian rule. It amalgamated with 12 country districts (including Rauxel) to form Castrop-Rauxel in 1926. Historic buildings include the moated castle of Bladenhorst and Goldschmieding House, both from the 16th century, and the 13th-century Church of St. Lambert. Principal industries are coal mining and chemical works. Other products include textiles, armatures, and handicrafts. The town has extensive open spaces, including a racecourse. Pop. (1983 est.) 77,659.

casual labour, in economics, irregular employment or the work force subject to or generally accepting such employment. If employment is discontinuous but has a recurring seasonal, weekly, or monthly pattern, it is likely to be called seasonal rather than casual. Seasonally variable and even continuous employment may be filled by casual workers, in which instance the term clearly refers to the nature of the labour force or to the unstable character of employer–employee relations.

casualty insurance, provision against loss to persons and property, covering legal hazards as well as those of accident and sickness. Major classes of casualty insurance include liability, theft, aviation, workmen's compensation, credit, and title.

Liability insurance contracts may cover liability arising out of the use of an automobile, the operation of a business, professional negligence (malpractice insurance), or the ownership of property. The insurer agrees to pay on behalf of the insured all sums that the insured becomes legally obligated to pay as damages. The insurer also agrees to conduct a court defense of the insured.

Theft-insurance contracts cover losses from burglary, robbery, and other theft. Aviation insurance usually covers physical damage to the aircraft and legal liability arising out of its ownership and operation. Workmen's compensation insurance, financed by employers' contributions, compensates workers for losses suffered as a result of work-related injuries; compensation may include medical benefits, temporary incapacity benefits, permanent disability benefits, and, in an increasing number of countries, retraining benefits.

The numerous forms of credit insurance include coverage of the risk of bad debts from insolvency, death, and disability; the risk of loss of savings from bank failure; and the risk of loss of export credit from commercial or political causes. Title insurance guarantees the purchaser of real estate against loss from undiscovered defects in the title to property purchased.

casuariiform, order (Casuariiformes) of large, flightless birds that contains the cassowary (*Casuarius*) and the emu (*Dromaius novaehollandiae*) as well as several extinct birds known only by fossil evidence.

A brief treatment of casuariiforms follows. For full treatment, *see* MACROPAEDIA: Birds.

The emu was not seen by Europeans until 1788, more than a century after the first cassowaries had been seen by Europeans. At that time there were four living species of emu, but the Kangaroo Island, King Island, and Tasmanian emus were exterminated shortly after colonization of their respective islands.

The emu, a native of Australia, is the world's second largest bird; only the ostrich (*Struthio camelus*) is larger. Very large emus can reach 120 pounds (55 kilograms), although the average weight for males is 80 lb, and for the females 90 lb; they may stand up to 6 feet (1.8 metres) in height. The three species of cassowary, found only in northern Australia, New Guinea, and adjacent islands, are the Australian, or double-wattled cassowary (*C. casuarius*), the single-wattled cassowary (*C. unappendiculatus*), and the dwarf cassowary (*C. bennetti*).

All the casuariiforms are running (cursorial) birds and show various adaptations to this life-style. As in many cursorial birds the hind toe has disappeared and the birds move on three sturdy front toes. On the inner toe of the cassowary the claw has evolved into a long, spurlike structure, quite effective when the cassowary defends itself by kicking. Emus and cassowaries are good swimmers as well as fast runners.

The plumage of the casuariiforms has a hairlike look different from that of most birds, as the feathers lack the barbules that interlock to create the wide flat surface of most bird feathers. These feathers are less likely to become damaged or tangled in the dense, thorny underbrush most casuariiforms inhabit. There is no differentiated tail. The plumage of the emus is brown, while that of the cassowaries is black. In addition, the cassowaries have a flattened horny helmet or casque on the head; this is believed to protect the bird from injury while running through dense forests. The casque may reach 6 inches (15 centimetres) in *C. casuarius*. Bright red or orange fleshy wattles on the head and neck are characteristic of *C. casuarius* and *C. unappendiculatus*.

Cassowaries are solely rain forest inhabitants while emus are found in a wide variety of habitats, in arid scrub country and open plains as well as in forested areas. Members of this order eat mostly vegetation, including leaves, fruits, and seeds, but emus are known to feed on insects such as grasshoppers when these are abundant.

More information is known about the breeding habits of emus than cassowaries. The emus are winter breeders, nesting from late April through August. Emu eggs are laid in a nest of flattened vegetation which is situated so that the sitting bird has a clear view of the surrounding area. Cassowary clutches range from 3 to 8 eggs; those of the emu are larger, averaging 9 and sometimes reaching 16 eggs. The greenish eggs are about 5 in. long and weigh between 16 and 28 ounces (450 and 800 grams). The incubation period lasts 58 to 61 days for the emus and 49 to 52 days for the cassowaries. Unlike most bird species, only the male incubates the egg in the casuariiforms. When the chicks hatch they are patterned with alternating dark and light longitudinal stripes. They mature in about two years. Cassowaries live year round in pairs or family parties. During the nonbreeding season emus may gather in large flocks and sometimes travel long distances.

These birds have long been important as food to the native peoples of the Australasian region. Cassowary chicks are frequently captured and raised in a pen until they are large enough to eat. The plumage of these birds is used for personal decoration, particularly the feathers of the emu.

The emu is much less common than formerly throughout much of its range, but in western Australia it is still abundant. It is an agricultural pest around wheat farms, where it breaks fences and crushes and eats the crop. Western Australia pays a bounty on emus, and between 5,000 and 40,000 of the birds are taken each year.

Casuarinales, the beefwood order of dicotyledonous flowering plants comprising the family Casuarinaceae, with two genera (*Casuarina*, 30 species; *Gymnostoma*, 20 species) of trees and shrubs, many of which have a distinctly pinelike aspect when seen from afar. They are naturally distributed in tropical eastern Africa, the Mascarene Islands, Southeast Asia, Malaysia, Australia, and Polynesia.

She-oak or beefwood (*Casuarina equisetifolia*) showing (left) form and (right) leaves and fruit

(Left) Walter Chandoha; (right) E.R. Degginger—EB Inc.

Some, especially the beefwood (*C. equisetifolia*, also called she-oak, ironwood, Australian pine, whistling pine, and swamp oak), also are used ornamentally in warm-climate countries, where they have often escaped cultivation and become established in the wild.

The plants are characterized by slender, green, often drooping branches that are deeply grooved and that bear, at intervals, whorls of tiny, scalelike leaves similar to those of the unrelated scouring rush or horsetail (*Equisetum*). The tissues on both sides of the grooves in the branches contain green photosynthetic cells, and the centres of the ridges consist of thick-walled structural cells. Long plant hairs that protrude from the grooves are thought to function as protective structures for the stomates (microscopic pores to the internal tissues), which are located along the side walls of the grooves. These structural features serve as adaptations to the dry conditions of the coastal strands and poor soils where these plants often grow. The structurally reduced flowers are separately male and female; both sexes may occur on the same plant (monoecious condition) or on separate plants (dioecious condition). Male flowers occur in elongated, slender, erect clusters (catkins or spikes), usually at branchlet tips, and each consists of a single pollen-producing stamen, together with two small, scalelike floral leaves (sepals or bracts) and two smaller scalelike structures called bracteoles. The female flowers occur in dense globular clusters that become woody and conelike at maturity, the woody segments enclosing the seeds. Each female flower is a petalless, two-chambered structure (pistil) with two ovules, both in the same chamber. Two long style branches or stigmas extend from the upper end of the pistil beyond the flower cluster. Pollination is by wind.

Older classification systems held this group to be the most primitive of dicotyledonous plants, but the flowers and other primitive-appearing characteristics are now considered to be reduced rather than primitive. Phylogenetically, the order is thought to be derived from the witch hazel order (Hamamelidales) or an earlier ancestor of that order. Several species of *Casuarina*, especially *C. equisetifolia*, are valued for their hard, dense, yellowish to reddish-brown wood, which is strong and reputed to be resistant to termite attack. Beefwood and ironwood are common names that reflect the colour and hardness of this wood.

casuistry, a system of rules for distinguishing right from wrong in everyday situations, usually associated with a concept of morality that sees right conduct in terms of obedience to a set of closely defined laws. Casuistry was used by the Roman Stoics, Chinese Confucians, the Jewish compilers of the Talmud, Muslim commentators on the Qur'ān, the scholastic philosophers of medieval Europe, and later Roman Catholic theologians. The fine distinctions employed by some Jesuit casuists caused their opponents to equate casuistry with specious reasoning.

cat, any carnivorous mammal of the family Felidae, including the true cats—lion, tiger, jaguar, leopard, puma, and domestic cat—and the cheetah (*qq.v.*). Cats typically have soft fur, often strikingly patterned. Their legs are short in proportion to their bodies. *See also* domestic cat.

The history of the cat family can be traced through the fossil record about 40,000,000 years into Lower Oligocene times. The "cat pattern" seems to have been established very early in the evolution of modern mammals, for the early cats were already typical cats at a time when the ancestors of most other modern mammalian types were scarcely recognizable. Typical cats (subfamily Felinae) appeared in the Lower Pliocene, about 10,000,000 years ago, and have continued almost unchanged into modern times.

In 1916 R. I. Pocock, of the London zoo, divided the living cats into two groups on the basis of the structure of the hyoid apparatus, a series of connected bones at the base of the tongue. In one group of cats one of the hyoid bones (the epihyal) fails to develop and is represented only by a threadlike ligament, so that tongue and larynx are loosely attached to the base of the skull. This group incudes the large cats—lion, tiger, leopard, jaguar—which are placed together in the genus *Panthera*. These cats are unable to purr; their voice is a roar and the pupils of their eyes are round. In the second group, the genus *Felis*, the hyoid develops normally; all such cats can purr but do not roar. The pupil is usually vertical but may be round in a few species. The genus *Felis* includes the mountain lion and the numerous kinds of smaller cats including the domestic cat. The Canada lynx and bobcat are often placed in a separate genus, *Lynx*. The cheetah, or hunting leopard, has a normal hyoid but has nonretractile claws and differs from all other cats in other ways; it is placed alone in the genus *Acinonyx*. The cats are the most highly specialized of the flesh-eating mammals. They are powerfully built animals, so well coordinated that they almost always land on their feet when they fall or are dropped. The brain is large and highly developed. In keeping with a carnivorous habit the cat has a simple gut; the small intestine is only about three times the length of the body. The tongue in all cats has a patch of sharp, backward-directed spines near the tip, which has the appearance and feel of a coarse file; these spines help the cat lap up liquids and groom itself.

The most characteristic and specialized features are in the teeth and claws. The teeth are adapted to three functions; stabbing (canines), anchoring (canines), and cutting (molars). Cats have no flat-crowned crushing teeth and thus cannot chew their food but instead cut it up. Some teeth are nonfunctional; most of the cheek teeth do not even meet when the mouth is closed. All cats (except for the cheetah) have strong, sharp, retractile claws.

Although the lion, tiger, and cheetah are mainly terrestrial in habit, they are agile climbers, while smaller cats, like the leopard, jaguar, and ocelot, are very much at home in trees, where they bound from limb to limb and sometimes sleep. The larger cats range over large areas. Big cats in the wild often rove alone or with a companion; occasionally one may become a member of a family group, as among lions where a pride may consist of as many as 23 individuals. These loosely bound groups lack the rigid dominance order found in dog and wolf packs. While the majority of cats are night hunters, a few are more active during the day, like the cheetah.

Typically a solitary hunting animal, a cat steals up on prey on padded feet and overwhelms it in a short, quick rush or leap. It can move very fast in a short dash but is not built for sustained speed. The cheetah, for example, generally is credited with being the speediest of mammals, capable of speeds of 65–70 mph (with rare reports of up to 95 mph), but it has little endurance.

Cats generally are nocturnal in habit. The retina of the cat's eye is made extra sensitive to light by a layer of guanine, which causes the eye to shine at night in a strong light. The cat's sense of smell, well developed particularly in the adult, is crucial to its evaluation of food, so that a cat whose nasal passages become clogged in illness may appear to lose its appetite completely.

Domestic cats do best on a diet that suits their wild relatives. All cats are adapted by nature to be strict flesh eaters, an assumption made on the basis of their alimentary tract and their dentition primarily.

The disposition to cleanliness is well established among cats; they groom themselves with their rasplike tongues, preening at length after a meal. Cats differ in their reaction to water: the lion and the leopard are reluctant to enter it (they can swim when they must). House cats do not dislike water but react adversely to being chilled or doused with cold water. Nervous tail wagging is common to all cats, from the lion to the house cat; it is learned from the mother and is associated with early play, a prelude to adult habits of predation.

CAT (computerized axial tomography): *see* tomography.

cat shark, any of the more than 50 species of sharks in the family Scyliorhinidae (order Lamniformes). Although many species are rare and poorly known ecologically, representatives have been found in all major marine environments of the tropical and temperate regions. Most cat sharks are small (less than 60 centimetres [2 feet]), and many have bold body markings. They have slender bodies and eyes that are elongate, giving them a stealthy, catlike appearance. No species is known to be aggressive toward humans.

cat snake (*Telescopus*), any of about 15 species belonging to the family Colubridae. Cat snakes have vertical pupils, like a cat, and are nocturnal, preying chiefly on lizards.

Most cat snakes are about 70 centimetres (28 inches) long. Cat snakes occur in Africa and southwestern Asia; one, *Telescopus fallax*, ranges to Europe. A number of snakes of other genera have vertical pupils and are sometimes called cat, or cat-eyed, snakes.

catabolism, the sequences of enzyme-catalyzed reactions by which relatively large molecules in living cells are broken down, or degraded. Part of the chemical energy released during catabolic processes is conserved in the form of energy-rich compounds (*e.g.*, adenosine triphosphate, ATP).

Energy is released in three phases. In the first, such large molecules as those of proteins, polysaccharides, and lipids are broken down; small amounts of energy are released in the form of heat in these processes. In the second phase, the small molecules are oxidized, liberating chemical energy to form ATP as well as heat energy, to form one of the three compounds: acetate, oxaloacetate, or α-oxoglutarate. These are oxidized to carbon dioxide during the third phase, a cyclic reaction sequence called the tricarboxylic acid cycle (*q.v.*). Hydrogen atoms or electrons from the intermediate compounds formed during the cycle are transferred (through a succession of carrier molecules) ultimately to oxygen, forming water. These events, the most important means for generating ATP in cells, are known as terminal respiration and oxidative phosphorylation. *See also* respiration, cellular.

cataclastite, any rock produced by dynamic metamorphism during which faulting, granulation, and flowage may occur in previously crystalline parent rocks. When stress exceeds breaking strength, a rock yields by rupture. The rock may break as a unit, or individual minerals may be selectively granulated. The stress is generally not the same in all directions, so that movement in a preferred direction occurs, with slippage planes, granulation, or partial flowage being oriented preferentially.

Some cataclastites are derived from igneous parent rocks, such as granite; in these, streaks of partially destroyed rock swirl around still intact rock. Many cataclastites are derived from sedimentary rocks, including limestones and dolomites.

Mylonites are the products of extreme cataclastic deformation. The rocks are chemically unchanged but are ground to a powder by the movement of rock masses along a fault

zone. They are extremely fine-grained, but mineral fragments of the parent rock can be seen under the microscope. Most mylonites are laminated, the layers formed by different grain sizes of crushed material.

Phyllonites are like mylonites in that they are fine-grained and are shaped by deformation; in phyllonites, however, there has been a reconstitution of the minerals. Some of the parent-rock minerals are re-formed with a different orientation, and new minerals are formed in response to the metamorphic conditions.

catacomb, subterranean cemetery composed of galleries or passages with side recesses for tombs. The term, of unknown origin, seems to have been applied first to the subterranean cemetery under the basilica of San Sebastiano (located on the Appian Way near Rome), which was reputed to have been the temporary resting place of the bodies of Saints Peter and Paul in the last half of the 3rd century. By extension, the word eventually came to refer to all the subterranean cemeteries around Rome. By a further extension of meaning, catacomb is used loosely to describe any underground complex of tunnels and chambers, whether originally designed for burials or not; the so-called catacombs of Paris, for example, are really abandoned stone quarries, first used for burials in 1787.

Uses. In the early Christian community, catacombs served a variety of functions in addition to burial. Funeral feasts were celebrated in family vaults on the day of burial and on anniversaries. The Eucharist, which always accompanied funerals in the early Christian Church, was celebrated there. In some of the catacombs, larger halls and connected suites of chapels functioned in effect as shrines for devotions to saints and martyrs. A famous example is the Triclia in the catacomb of St. Sebastian, to which countless pilgrims came to partake of memorial meals (*refrigeria*) in honour of Saints Peter and Paul and to scratch prayers to them on the walls.

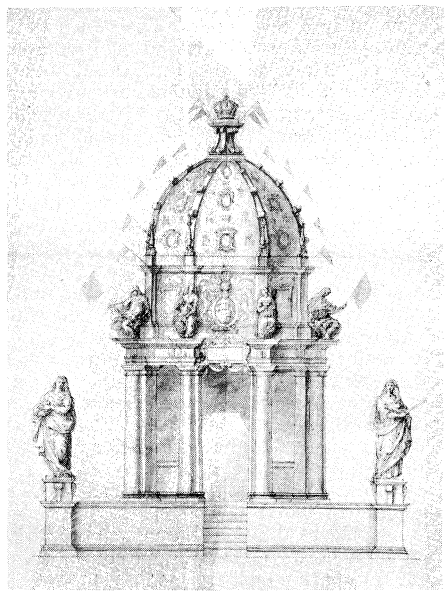
The catacombs also, because of their intricate layout and access by secret passages to sand quarries and open country, could be used as hiding places during times of persecution and civil commotion. Pope Sixtus II and four deacons, for example, are said to have been captured and killed in the catacomb of St. Sebastian during Valerian's persecution (AD 258); later, Christians took refuge there during the barbarian invasions.

There seems no truth in the widespread belief that early Christians used the catacombs as secret meeting places for worship. By the 3rd century AD there were more than 50,000 Christians in Rome, and 50,000 persons could hardly go out to the catacombs every Sunday morning in secret. Furthermore, worship of any kind would seem out of the question in the long, narrow corridors of the catacombs, and even the largest of the tomb chambers, such as the Chapel of the Popes in the catacomb of St. Calixtus, hardly holds 40 persons. Finally, Christians and pagans alike regarded death as unclean, so that while memorial meals or masses for the dead might be celebrated in the tombs on appropriate occasions, regular public worship in such a place would be unlikely.

Locations. Catacombs were by no means a Christian or an exclusively Roman invention. The custom of burying the dead in underground rock chambers goes far back into antiquity. Catacombs are found all over the Mediterranean world: in Malta, near the ancient capital of the island; in Sicily, near Taormina, Syracuse, and elsewhere; in Egypt, near Alexandria and Cairo; in Lebanon, near Sidon (now Ṣaydā); in Tunisia, near Hadrumetum (now Sūsah); and at many places in Italy, especially around Naples and in ancient Etruria.

The early Christian catacombs of Rome are located in a rough circle about three miles from the centre of the city. About 40 chambers are known, and most are found near the main roads leading into the city. They are the most extensive of all known catacombs, and portions are open to visitors.

catafalque, ornate, often theatrical, usually movable funereal structure mounted on a stage to support a coffin for a lying-in-state. It is used for royalty and personages of distinction and is normally set up in a historic public hall, such as Westminster Hall, London, and the Capitol Rotunda in Washington, D.C. The reputation of the Spanish architect José Churriguera, known for his exuberant and fantastic Baroque style, was established overnight in 1689 by his design for the catafalque for Queen Maria Louisa, first wife of Charles II. Certain European shrines of saints in which the body is visible are sometimes regarded as catafalques.



Design for the catafalque of King James I in Westminster Abbey, London, by Inigo Jones, 1625; in Worcester College Library, Oxford

By courtesy of Worcester College Library, Oxford; photograph, by courtesy of the Courtauld Institute of Art, London

Catalan language, Catalan CATALÀ, Romance language spoken in the Roussillon region of France, in Andorra, in northeastern Spain (primarily in Catalonia), and in the Balearic Isles. The official language of the kingdom of Aragon in the 12th century, Catalan has a literary tradition dating from that period. The earliest written materials extant are a charter and six sermons of the 12th century. Ramon Llull, a famous Catalan poet of the 13th century, wrote in a dialect still generally intelligible to the modern reader.

There are two main dialect groups in modern Catalan: Occidental, subdivided into West Catalan and Valencian; and Oriental, subdivided into East Catalan, Balearic, and Roussillonnais and including the dialect spoken in Alghero, Sardinia, where Catalan was introduced in the 14th century. These various dialects differ only in minor respects (details of pronunciation, vocabulary, and verb conjugation) and are easily mutually intelligible. The dialectal differences are not usually reflected in the written language.

Catalan is most closely related to the Occitan language of southern France and to Spanish, but it is clearly distinct from both. It differs from Spanish in the following characteristics: a lack of rising diphthongs (such as *ie* and *ue;* compare Catalan *be* and Spanish *bien* "well," Catalan *bo* and Spanish *bueno* "good") and an abundance of falling diphthongs (such as *eu, au, ou;* compare Catalan *peu* and Spanish *pie* "foot," Catalan *bou* and Spanish *buey* "ox"). Catalan also retains the sounds *j* (pronounced like French *j* or the *z* in English "azure"), *z, tj* (pronounced like English *j*), *tz,* and *x* (pronounced like English *sh*), none of which occur in modern Spanish. Catalan stresses certain verbs on the root rather than on the infinitive ending, as in Spanish (Catalan *VENdre,* Spanish *venDER* "to sell"). Catalan differs from Occitan less than from Spanish but often uses different vowel sounds and diphthongs and also has somewhat different grammatical conventions.

Catalão, city, southeastern Goiás state, south-central Brazil. Situated in rolling uplands near the Paranaíba River, Catalão is a small commercial and manufacturing centre. Cattle and hogs raised in the region supply the city's tanneries and meat-processing plants, which produce *xarque* (jerked beef), lard, and sausages. Dairying and distilling are also important. Additional income is derived from nearby deposits of iron and manganese. Rice, coffee, alcohol, and cotton are shipped from the city, which has important rail and highway links. Pop. (1980 prelim.) 30,516.

catalase, an enzyme that brings about (catalyzes) the reaction by which hydrogen peroxide is decomposed to water and oxygen. Found extensively in mammalian tissues, catalase prevents the accumulation of and protects the body tissues from damage by peroxide, which is continuously produced by numerous metabolic reactions.

Çatalhüyük, major Neolithic site in the Middle East, located near Konya in south-central Turkey. Excavations (1961–65) by the British archaeologist James Mellaart have shown that Anatolia in Neolithic times was the centre of an advanced culture. The earliest building period at Çatalhüyük is tentatively dated to about 6700 BC and the latest to about 5650 BC. The inhabitants lived in rectangular mud-brick houses probably entered from roof level, presumably by a wooden ladder. In addition to a hearth and an oven, houses had platforms for sleeping, sitting, or working.

Edible grains and oil-producing seeds and nuts were extensively cultivated, and animal husbandry was probably practiced.

Excavation of the religious quarter produced a series of shrines with wall paintings of exceptional brilliance. These are of interest for their link with Upper Paleolithic art.

Catalina (Spanish personal name): *see under* Catherine.

Catalina Island (California, U.S.): *see* Santa Catalina Island.

Catalonia, Spanish CATALUÑA, Catalan CATALUNYA, *comunidad autónoma* (autonomous region) of Spain encompassing the northeastern Spanish provinces of Gerona, Barcelona, Tarragona, and Lérida and ratified by the regional plebiscite of Oct. 25, 1979.

The following article summarizes the history, geography, demographic patterns, economy, and culture of modern Catalonia; for fuller treatment of its geography and history, *see* MACROPAEDIA: Spain.

Catalonia was one of the first Roman possessions in Spain. Occupied during the 5th century by the Goths, it was taken by the Moors in 712 and at the end of the 8th century by Charlemagne, who incorporated it into his realm as the Spanish March, ruled by a count. Frankish suzerainty over Catalonia was merely nominal and was completely rejected during the reign of Count Borrell (d. 991).

Catalonia and Aragon were united under the same king in 1137. The *Generalitat de*

Catalunya, which was established in 1289, defended traditional Catalan liberties and privileges against royal encroachments. Catalan interests dominated the union with Aragon until 1410 when the male line of the counts of Barcelona became extinct. Dissatisfaction in Catalonia with the new Trastámara dynasty of Aragon increased after 1412; during the reign of John II it developed into a full-scale but unsuccessful rebellion (1462–72).

After the marriage of John II's son Ferdinand with Isabella of Castile (1469) had brought about the unification of Spain, Catalonia became of secondary importance in Spanish affairs. Catalonia asserted independence from Spain between 1640 and 1653 and rejoined the Habsburg state only after autonomy had been guaranteed. The royal decree of 1716 (*Decreto de Nueva Planta*) abolished Catalan autonomy.

Catalan separatism reemerged in the early 19th century both in rural areas, which supported the anti-Castilian pretender Don Carlos, and in the towns, whose manufacturers were demanding high tariffs against British and French competition. Catalan nationalism became a serious force after 1876 when the defeat of the Carlists led the church to transfer its support to the movement for autonomy, which then became predominantly right-wing.

The victory won in 1901 by the new Lliga Regionalista party showed that Catalan nationalism was a force of political consequence, and the struggle for autonomy resumed in earnest. By 1913 a slight degree of home rule had been obtained, but the legislation conferring it was repealed 10 years later by Primo de Rivera, whose policy discredited the right-wing Lliga, attracted support for the nationalist movement from the hitherto uninterested lower middle classes, and led to the formation of a left-wing coalition party, the Esquerra Republicana. The Esquerra won a sweeping victory in the municipal elections of 1931, and two days later its leader proclaimed a Catalan Republic. A compromise was worked out with the central government, and in September 1932 the statue of autonomy for Catalonia became law. Gen. Francisco Franco effectively abolished the Republic of Catalonia in 1938, although a Catalan government in exile operated in Paris (1945–47) and later in Mexico. The government established in 1979 consists of a Generalitat (an executive council headed by a president) and a unicameral parliament. The capital is Barcelona.

The Pyrenees separate Catalonia from France to the north; to the west the pre-Pyrenees and Ebro Basin mark the border with the region of Aragón; to the south the Ebro Basin gives way to the coastal hills separating the province of Tarragona from the Valencian province of Castellón. The provinces of Tarragona, Barcelona, and Gerona have a Mediterranean shoreline, with coastal plains ringed by the low-lying Catalanides ranges. The Catalanides have historically separated the industrial towns of the coast from the predominantly agricultural settlements of the hinterlands. They also represent, therefore, sharp demographic and economic boundaries in the development of Catalonia. Their relief presents sharp extremes, with more than one-fifth of the land lying at altitudes lower than 650 ft (200 m) or higher than 6,500 ft. Annual precipitation shows similar contrasts, exceeding 35 in. (900 mm) in the humid Pyrenees and ranging downward to 11 in. in the arid Ebro Basin. A Mediterranean climate prevails throughout most of Catalonia, while the central Pyrenees are subject to Atlantic influences.

The towns of the Catalan coast have dominated the development of the region, with the result that the population is heavily concentrated along the Mediterranean, increasingly depopulating the hinterland. In the 14th century, nearly half of Catalonia's population lived along the Mediterranean, with slightly more than one-third in the Ebro Basin and only one-seventh in the Pyrenees. By 1720, 57 percent of the population lived on the coast, and steady growth along the coast since then has been accompanied by an additional concentration of that population in the city of Barcelona and its satellite towns (Hospitalet, Badalona, Santa Coloma, Cornellá, Esplugas, San Adrián, and San Justo Desvern). Meanwhile, the Catalan hinterland stagnated by comparison.

During the 18th century, agriculture typically included wine, almonds, and olive oil for export to the rest of Spain and the Americas, and the introduction of potatoes and corn (maize) after the discovery of the New World encouraged the cultivation of marginal and mountainous land. Slightly more than one-third of Catalonia remains under cultivation, and the traditional crops of olives and grapes are being supplanted by fruits and vegetables for consumption in the cities. Agriculture employs roughly one-tenth of the work force, with sharp regional variations between industrial and predominantly rural areas. Agriculture accounts for only one-tenth of Catalonia's domestic product, with the remainder evenly distributed between the industrial and service sectors.

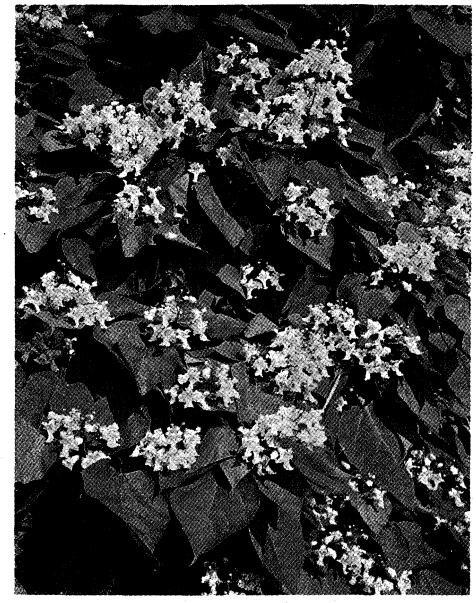
The Catalan textile industry first achieved prominence between 1283 and 1313 and has remained the region's premier industry. Barcelona, Sabadell, and Tarrasa are leading textile centres. The industrial sector has undergone rapid expansion and diversification since the 1950s, and the metalworking, alimentary, and chemical industries are steadily overtaking textiles in importance. The industries of Catalonia are unevenly distributed, with textiles, paper and graphic arts, chemicals, and metalwork concentrated in Barcelona. The city's SEAT plant produces one-fourth of Spain's industrial motor vehicles. Catalonia's growing demand for petroleum products, which amounts to one-fourth of the national demand, has led to the expansion of Barcelona's petroleum refineries. Services, particularly those of tourism and transportation, are highly developed, employing well over a third of the work force.

The chronicle of Bernat Desclot (second half of the 13th century), a document basic to Catalan political sensibility, described the rise of Catalan economic and military power in the western Mediterranean and delineated the political freedoms enjoyed under the Crown of Aragon. Similar regard is held by Catalans for the works of Francesc Eiximenis (1327?–1409), who in his *Lo Crestià* and the *Regiment de la cosa pública* postulated a pact between the king and his subjects by which the king swore to uphold traditional liberties and privileges of the subjects or forfeit their fealty. This theory, *pactisme,* rallied the Catalans against the Trastámara dynasty of Castile during the 15th century and influenced their subsequent attempts at autonomy.

The traditional farmstead of Catalonia is the *masia,* a building two stories high topped by a garret and having a quadrangular, sloping roof; the ground floor has a single room that serves as kitchen, dining room, and living room. Defensive towers formerly marked the corners of the *masia.* The movies of such Catalan producers as Pere Portabella and Vicent Lluch have attained wide acclaim. Pop. (1981) 5,958,208.

catalpa, any of 11 species of trees in the genus *Catalpa* (family Bignoniaceae), native to eastern Asia, eastern North America, and the West Indies. Catalpas have large, attractive leaves and showy, white, yellowish, or purplish flowers.

Catalpa fruit is a long cylindrical pod bearing numerous seeds with white tufts of hair at each end. The common catalpa is *C. bignonioides,* which yields a durable timber and is



Common catalpa (*Catalpa bignonioides*)
Richard Parker

one of the most widely planted ornamental species.

catalufa, any of certain fishes of the big-eye (*q.v.*) group.

catalysis, in chemistry, the modification of the rate of a chemical reaction, usually an acceleration, by addition of a substance not consumed during the reaction.

A brief treatment of catalysis follows. For full treatment, *see* MACROPAEDIA: Chemical Reactions.

The term catalysis was first used in 1835 by the Swedish chemist Jons Jacob Berzelius to characterize phenomena observed by chemists in the late 18th and early 19th centuries. Examples of catalysis were, however, known much earlier. Such ancient techniques as fermenting wine to acetic acid and manufacturing soap from fats and bases are both achieved through catalytic reactions.

In a catalyzed reaction the catalyst generally enters into chemical combination with the reactants but is ultimately regenerated so that the amount of catalyst remains unchanged. Since the catalyst is not consumed, each catalyst molecule may induce the transformation of many molecules of reactant. For an active catalyst, the number of molecules transformed per minute by one molecule of catalyst may be as high as several million.

Where a given substance or a combination of substances undergoes two or more simultaneous reactions that yield different products, the distribution of products may be influenced by the use of a catalyst which selectively accelerates one reaction relative to the other(s). By choosing the appropriate catalyst, a particular reaction can be made to occur to the extent of practically excluding another. Many important applications of catalysis are based on selectivity of this kind.

Since a reverse chemical reaction may proceed by reversal of the steps comprising the mechanism of the forward reaction, the catalyst for a given reaction accelerates the reaction in both directions equally. Therefore, a catalyst does not affect the position of equilibrium of a chemical reaction; it affects only the rate at which equilibrium is attained. Apparent exceptions to this generalization are those reactions in which one of the products is also a catalyst for the reaction. Such reactions are termed autocatalytic.

Cases are also known in which the addition

of a foreign substance, called an inhibitor, decreases the rate of a chemical reaction. This phenomenon, properly termed inhibition or retardation, is sometimes called negative catalysis. Concentrations of the inhibitor may, in some cases, be much lower than those of the reactants. Inhibition may result from (1) decrease in the concentration of one of the reactants because of complex formation between the reactant and the inhibitor; (2) decrease in the concentration of an active catalyst ("poisoning" of the catalyst) because of complex formation between the catalyst and the inhibitor; or (3) termination of a chain reaction because of destruction of the chain carriers by the inhibitor.

Classification of catalysts. Catalysts may be classified generally according to their physical state, their chemical nature, or by the nature of the reactions that they catalyze.

Catalysts may be gases, liquids, or solids. In homogeneous catalysis, the catalyst is molecularly dispersed in the same phase (usually gaseous or liquid) as the reactants. In heterogeneous catalysis the reactants and the catalyst are in different phases, separated by a phase boundary. Most commonly heterogeneous catalysts are solids and the reactants are gases or liquids.

Heterogeneous catalysis. Heterogeneous (multiphase) catalysis most commonly proceeds through chemisorption (adsorption by chemical bonding to the surface) of at least one of the reactants on the surface of the catalyst, the site of the catalyzed reaction being the adsorbed layer. Since heterogeneously catalyzed reactions occur on the surface of the catalyst, the rates of such reactions are proportional to the accessible surface area of the catalyst. Active catalysts thus are usually highly porous solids with total surface areas as high as several hundred square metres per gram.

Theories of heterogeneous catalysis have emphasized the relation of catalytic activity to the geometrical arrangement of atoms in the catalyst surface, as well as to the electronic properties (electronic band structure, semiconductivity, etc.) of the solid catalyst.

Poisoning of a catalyst may result from adverse modification of the electronic properties of the catalyst by the poison or from blocking of the catalytic sites on the surface by adsorption of the poison in preference to adsorption of the reactant.

Enzymes. A special and important class of catalysts is comprised of the naturally occurring biological substances known as enzymes. More than a thousand enzymes have been identified, each specific to a particular chemical reaction occurring in living organisms. Enzymes include some of the most active and selective of known catalysts.

catalyst, in chemistry, any substance that increases the rate of a reaction without itself being consumed. Enzymes are naturally occurring catalysts responsible for many essential biochemical reactions.

Most solid catalysts are metals or the oxides, sulfides, and halides of metallic elements and of the semimetallic elements boron, aluminum, and silicon. Gaseous and liquid catalysts are commonly used in their pure form or in combination with suitable carriers or solvents; solid catalysts are commonly dispersed in other substances known as catalyst supports.

In general, catalytic action is a chemical reaction between the catalyst and a reactant, forming chemical intermediates that are able to react more readily with each other or with another reactant, to form the desired end product. During the reaction between the chemical intermediates and the reactants, the catalyst is regenerated. The modes of reactions between the catalysts and the reactants vary widely and in solid catalysts are often complex. Typical of these reactions are acid–base reactions, oxidation–reduction reactions, formation of coordination complexes, and formation of free radicals. With solid catalysts the reaction mechanism is strongly influenced by surface properties and electronic or crystal structures. Certain solid catalysts, called polyfunctional catalysts, are capable of more than one mode of interaction with the reactants; bifunctional catalysts are used extensively for reforming reactions in the petroleum industry.

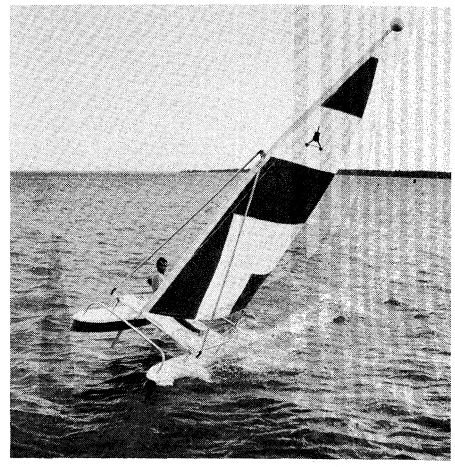
Catalyzed reactions form the basis of many industrial chemical processes. Catalyst manufacture is itself a rapidly growing industrial process. Some typical catalytic processes with their corresponding catalysts are given below:

process	catalyst
ammonia synthesis	iron
sulfuric acid manufacture	nitrogen(II) oxide, platinum
cracking of petroleum	silica–alumina
hydrogenation of unsaturated hydrocarbons	nickel, platinum, or palladium
oxidation of hydrocarbons in automobile exhausts	copper(II) oxide, vanadium(V) oxide, platinum, palladium
isomerization of *n*-butane to isobutane	sulfuric acid, aluminum chloride, hydrogen fluoride

catalyst poison, substance that reduces the effectiveness of a catalyst in a chemical reaction. In theory, because catalysts are not consumed in chemical reactions, they can be used repeatedly over an indefinite period of time. In practice, however, poisons, which come from the reacting substances or products of the reaction itself, accumulate on the surface of solid catalysts and cause their effectiveness to decrease. For this reason, when the effectiveness of a catalyst has reached a certain low level, steps are taken to remove the poison or replenish the active catalyst component that may have reacted with the poison. Commonly encountered poisons include carbon on the silica–alumina catalyst in the cracking of petroleum; sulfur, arsenic, or lead on metal catalysts in hydrogenation or dehydrogenation reactions; and oxygen and water on iron catalysts used in ammonia synthesis.

catamaran, twin-hulled sailing and powered boat developed for sport and recreation in the second half of the 20th century. Its design is based on a raft of two logs bridged by planks that had earlier been used by peoples in the Indonesian archipelago and throughout Polynesia and Micronesia. Early catamarans were up to 21.3 m (70 ft) long, originally paddled by many men, and used for visiting, in war, and in exploration. Especially after the sail was added, voyages of more than 3,704 km (2,000 mi) were made.

The U.S. designer of America's Cup boats Nathanael Herreshoff designed and built catamarans in the 1870s that sailed so successfully against monohulled boats that they were barred from organized racing. Production of the current form of catamaran, which averages about 12.2 m (40 ft) in length, began in the 1950s. The early catamarans tended to have difficulty coming about when sailing to windward, but later designs overcame this. The catamaran remained difficult to right after capsizing, however. Smaller catamarans raced successfully against monohulled boats in 1959, and international competition began in 1961 between the United States and Great Britain, the latter winning through 1968. Thereafter, Danish and Australian boats also competed, the Australians dominating. Catamarans are very fast boats, achieving speeds of 32.19 kph



Catamaran
By courtesy of the American Fiberglass Corp.

(20 mph). The addition of engines also made the catamaran a popular motor-cruising boat.

Catamarca, province, northwestern Argentina, separated from Chile by the cordillera of the Andes. The province, with an area of 38,540 sq mi (99,818 sq km), is generally mountainous with intermontane tablelands and valleys (some fertile, others completely arid). The sandy desert on the west side of the Sierra del Aconquija is referred to as the Argentine Sahara.

The region constituted part of the Inca Empire after the 12th century, and pottery relics are still found. Spaniards, who settled the area in the 16th century, were subjects of the viceroyalty of Peru. For many years after liberation from Spain (1816), the caudillos (military strong men) of the Catamarca region and their gaucho armies resisted the Buenos Aires government. Wealthy landowners continued to have an independent spirit, and in 1946 Pres. Juan Perón, to suppress local criticism, deposed the provincial governor and installed a nominee of his own. In 1943, when the northern national territory of Los Andes was divided, the department of Antofagasta de la Sierra was incorporated into Catamarca.

Scarcity of water has hindered agricultural development; irrigation, supporting mainly alfalfa, vineyards, olive and walnut groves, and cattle, provides only a partial remedy. Tungsten and mica are mined. The province's virtual isolation accounts for a retention of traditions and has encouraged tourism. The provincial capital, Catamarca (*q.v.*), has rail and bus transportation facilities. Pop. (1983 est.) 221,000.

Catamarca, also called SAN FERNANDO DEL VALLE DE CATAMARCA, city, capital of Catamarca province, northwestern Argentina, on the Río del Valle de Catamarca, a river between the two south-pointing spurs of the Andean sierras of Ambato and Ancasti. Originally named Londres, it was founded by the explorer Juan Pérez de Zurita (1559) in the Valle de Quinmivil. Following various moves

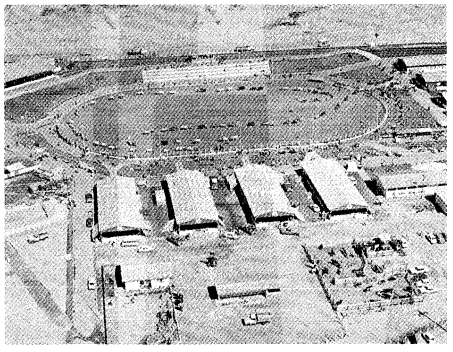
The Church of the Virgin of the Valley, Catamarca city, Arg.
Juan Carlos Franceschini

due to hostile Indians, Catamarca was established in 1694 on its present site (a sheltered, fertile valley) by the provincial governor, Bartolomé de Castro. The economy is basically agricultural and includes the production and processing of grapes, alfalfa, cotton, cereals, hides, and meat. Tourism has increased because of a mild winter climate, outstanding scenery, and hot springs in the nearby sierras. The city is known for its handwoven woollen ponchos. Several colonial buildings survive, including the Church of the Virgin of the Valley (1694; a pilgrimage centre declared a national monument in 1941) and a Franciscan convent (1694). The city has an art gallery and a museum of fine arts. Pop. (1980 prelim.) 77,931.

catamount (mammal): *see* puma.

Catanduanes, island and province, southeastern Luzon, Philippines, in the Philippine Sea, separated from southeastern Luzon (Rungus Point) by the shallow Maqueda Channel. The island has an area of 550 sq mi (1,425 sq km). Farming is diversified (rice, corn [maize], copra, abaca) on the hilly, rolling land. Virac, the provincial capital and chief port, is on the southern coast in a lowland area. The island is known for its stone churches. Catanduanes province has an area of 584 sq mi and includes several offshore islands, the largest of which is the small Panay Island. Pop. (1960) island, 154,698; (1980) province, 175,247.

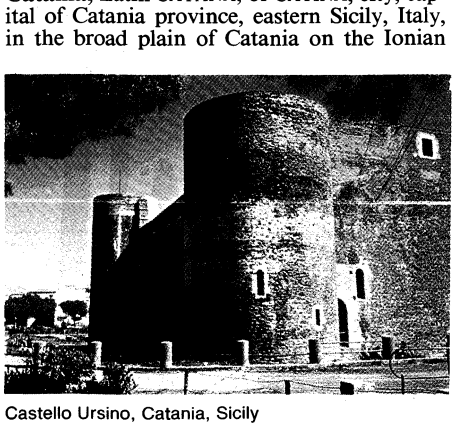
Catanduva, city, in the highlands of north central São Paulo state, Brazil, on the Rio São Domingos at 1,630 ft (497 m) above sea level. Originally called Vila Adolfo, the settlement was given town status in 1909 and was made



Cattle fair at Catanduva, Braz.
Plessner International

the seat of a municipality in 1917. Coffee is the principal crop of the region, which also raises cotton, corn (maize), rice, *feijão* (beans), and peanuts (groundnuts). Catanduva's industries process these products as well as hides and skins. The city is linked to the state capital, São Paulo, 210 mi (340 km) southeast, and to neighbouring urban centres by railroads, highways, and air. Pop. (1980 prelim.) 64,813.

Catania, Latin CATANA, or CATINA, city, capital of Catania province, eastern Sicily, Italy, in the broad plain of Catania on the Ionian seacoast, south of Mt. Etna. The city was founded in 729 BC by Chalcidians (settlers from Chalcis in the Greek island of Euboea) from Naxos, 50 mi north. It acquired importance in the 5th century BC with Hieron I, tyrant of Syracuse, and his son Deinomenes, who conquered it and renamed it Aetna after the volcano. The inhabitants restored the old name after driving out Deinomenes' followers. One of the first Sicilian towns to fall to the Romans (263 BC), Catania was made a colony by Octavian (later the emperor Augustus). The Christians there suffered under the persecutions of the emperors Decius and Diocletian, and the Catanian martyrs included St. Agatha, patron saint of the city. After the barbarian invasions, Catania fell successively to the Byzantines, the Arabs, and the Normans. It was hostile to the Swabian emperors and was sacked by Henry VI and Frederick II. The Aragonese sovereigns of the Kingdom of Sicily often resided there. During the 16th and 17th centuries the city was afflicted by civil disorders, pirate incursions, epidemics, famines, and natural disasters, including an eruption of Etna in 1669 and an earthquake in 1693. Later it became subject to the Bourbon Kingdom of Naples. Civil disturbances occurring during an outbreak of cholera in 1837 were vigorously suppressed and when, in 1848, Catania joined the other cities of the island in claiming autonomy for Sicily, this movement was also put down by force. In World War II it suffered severe damage from bombing and heavy fighting in 1943.



Castello Ursino, Catania, Sicily
V. Dia—SCALA from Art Resource

Standing almost entirely on the lava left by various eruptions, the city slopes slightly downward from north to south. The use of volcanic tufa for building has given the older part of the city its prevailing dark-gray colour. Almost completely rebuilt after the 1693 earthquake, the centre of the city has a distinctly 18th-century appearance. Ancient remains include the ruins of Greek and Roman theatres, and a Roman amphitheatre, basilica, baths, and aqueducts. The Castello Ursino with its four angular towers, constructed (1239–50) for Frederick II, long served as a model of military architecture. It now houses the civic museum with rich collections of art and archaeological relics. The centre of modern civic life is the Piazza del Duomo, surrounded by 18th-century palaces and opening onto wide streets. Of the original structure of the cathedral founded by the Norman count Roger I in 1091, three apses of dark lava and part of the transept remain. After the 1693 earthquake it was rebuilt by the architects Fra Fiolamo Palazotto and Giovanni Battista Vaccarini (1702–68). The cathedral contains relics of St. Agatha and the tomb of the composer Vincenzo Bellini, a native of Catania. The church of S. Nicolo (1693–1735), the largest in Sicily, is connected with the former Benedictine monastery of the same name; it was begun in the 14th century and completed in the 17th century. The university, the first in Sicily, was founded in 1434 by Alfonso of Aragon, and its library (1755) possesses many important medieval manuscripts. Other notable landmarks include the Baroque church of Sta. Agata, the town hall by Vaccarini, the elephant fountain (1736) in the Piazza del Duomo, the Collegiata or royal chapel, the astronomical observatory, and the birthplace of Bellini, now a museum.

Modern Catania, the second largest city in Sicily, is an industrial and transportation centre, connected by rail with Palermo, Messina, and Syracuse, with one of the busiest ports in Italy. Industries include a variety of mechanical and chemical manufactures, food processing, and fishing. Half of Sicily's refined sulfur comes from the factories of Catania. The marketing centre for the surrounding agricultural region, it exports almonds and oranges, as well as handwork in metal, wood, and amber. It is also a popular winter resort with fine beaches nearby. Pop. (1981 prelim.) mun., 378,521.

Catania, Gulf of, Italian GOLFO DI CATANIA, inlet of the Ionian Sea on the eastern coast of Sicily. About 20 mi (32 km) long and 5 mi wide, it lies between Capo (cape) Campolato (south) and Capo Molini (north). The gulf receives the Fiume (river) Simeto below Catania, its chief port.

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Catanzaro, city, capital of Catanzaro province and of Calabria region, southern Italy, at an altitude of 1,125 ft (343 m) overlooking the Golfo (gulf) di Squillace, southeast of Cosenza. Founded about the 10th century as Catasarion, a Byzantine town, it was taken in 1059 by the Norman leader Robert Guiscard. Invading peoples from the Saracens to the Swiss, Normans, and Angevins (House of Anjou) recognized its strategic and military importance. In 1528 it resisted a four-month siege by the French. It also played an important part in the Napoleonic Wars and the Risorgimento (movement for Italian unity). The seat of an archbishop from 1928, it became the regional capital in 1971. Catanzaro suffered severely from earthquakes in 1783, 1905, and 1907 and was bombed by the Allies in World War II. The provincial museum contains collections of antiquities and paintings, and in the Baroque church of S. Domenico is a Madonna del Rosario (17th-century Neapolitan school).

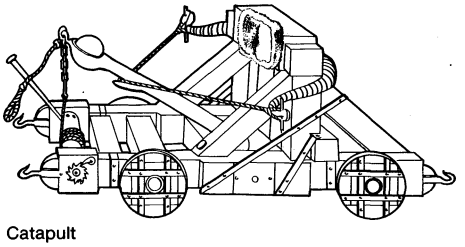
Silk weaving won the town a worldwide reputation during the 17th and 18th centuries. A rail junction with a port (Marina di Catanzaro) on the Golfo di Squillace, Catanzaro is a trade centre for olive oil and manufactures fertilizer. Pop. (1981 prelim.) mun., 100,637.

cataphoresis (physical chemistry): *see* electrophoresis.

Cataphrygian heresy: *see* Montanism.

catapult, mechanism for forcefully propelling stones, spears, or other projectiles; in use since ancient times. The Romans used the word *ballista* to designate an engine used to hurl stones and *catapulta* for one that shot arrows and darts, although the larger catapults mounted a single long arm, which hurled stones and other objects.

Nearly all catapults employed in ancient and



Catapult
Document Larousse

medieval artillery operated by a sudden release of tension on wooden beams or twisted cords of horsehair, gut, sinew, or other fibres. An exception was the medieval trebuchet, which was powered by a counterweight. Modern mechanisms using hydraulic pressure, tension, or other force to launch gliders, aircraft, or missiles are also called catapults.

cataract, in medicine, opacity of the crystalline lens of the eye. If the opaque areas are minute, scattered dots (a condition known as blue dot cataract, or punctate cataract), or if only the periphery of the lens is affected (this type, called coronary cataract, is said to affect 25 percent of the population), there may be no appreciable diminution of vision. In instances

of cataracts that do seriously impair vision, the standard treatment is surgical removal of the lens.

Cataracts that seriously affect vision may be present at birth. Congenital cataract may be among the defects that originate in the mother's infection with German measles (rubella) during the first three months of pregnancy. Cataracts may form in infants with galactosemia (*q.v.*), a hereditary metabolic disease in which there is inability to utilize galactose, a derivative of milk sugar. Babies with rickets may have cataracts, as may Mongoloid or hypothyroid infants. Cataracts in infants are usually not progressive. If the opacity is severe, these cataracts are known as white eye, from the appearance of the pupil.

Diabetes mellitus, particularly in young persons whose diabetes is not well controlled, may cause cataracts. The disease may also impair vision by its effect upon the retina.

Cataracts may result from prolonged exposure to heat, as in glassblowing or iron puddling, to X-rays, or to bombardment with subatomic particles, especially neutrons.

The best known form of cataract is the type that develops with advancing age. Such cataracts result from the continuing growth of the lens throughout life and its concomitant increase in density. If the opaque area is in the central area of the lens the eventual loss of vision is greater than that produced by peripheral cataracts. In the early stages of the growth of the cataract, near vision may temporarily improve to the point that the affected person finds it possible to read without glasses.

cataract, a waterfall (*q.v.*), especially one containing great volumes of water rushing over a precipice.

Catargiu, Lascăr (b. Nov. 13, 1823—d. April 11, 1899, Bucharest), Romanian statesman, four times prime minister (1866, 1871–76, 1889, 1891–95), who played a leading role in national affairs through the country's early years of independence.

In 1858 Catargiu served on the Moldavian *divan ad hoc* (representative commission) formed to determine the future political organization of the Danubian principalities—Moldavia and Walachia—and in 1859 was the Conservative candidate for the throne of Moldavia. After the unification of the principalities, he joined the secret committee that successfully planned the overthrow of the first prince of united Romania, Alexandru Cuza, and his replacement by Prince Karl of Hohenzollern-Sigmaringen (1866), thereafter prince, and later (1881) King Carol I. From February 1866 until the accession of Carol in May, he served on the three-member governing regency and, from May to July 1866, headed his first cabinet. During the antidynastic agitation of 1871, he was called to form another government, which lasted until 1876. Subsequently in opposition, he led his Conservative Party in violent attacks against the ruling Liberals. After the fall of the Liberals in 1888, he twice more served as premier—briefly in 1889 and later from 1891 to 1895. His last administrations were marked by certain land and financial reforms and a generally creditable domestic record.

Catarina (Portuguese personal name): *see under* Catherine.

catarrhine: *see* Old World monkey.

catastrophism, doctrine that explains the differences in fossil forms encountered in successive stratigraphic levels as being the product of repeated cataclysmic occurrences and repeated new creations. This doctrine generally is associated with the great French naturalist Baron Georges Cuvier (1769–1832). One 20th-century expansion on Cuvier's views, in effect, a neocatastrophic school, attempts to explain geologic history as a sequence of rhythms or pulsations of mountain building, transgression and regression of the seas, and evolution and extinction of living organisms.

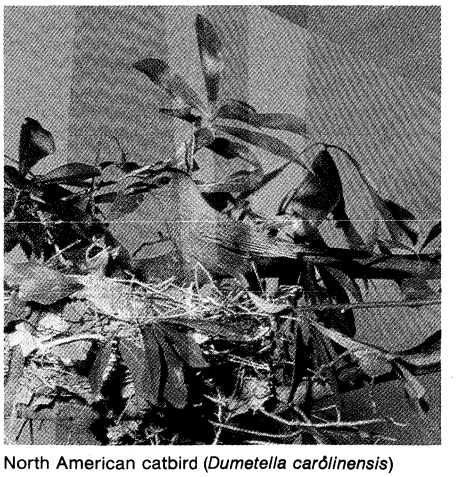
Catatumbo River, Spanish RÍO CATATUMBO, river rising in northern Colombia. It flows northeast across the Venezuelan border, crosses rich oil-bearing regions in the Maracaibo Lowland, and empties into Lake Maracaibo after a course of about 210 mi (338 km). It is navigable in its lower course and receives the Río Zulia 4 mi (6 km) west of Encontrados, Venez., in the Maracaibo Lowland.

Catawba, North American Indian tribe of Siouan language stock who inhabited the territory around the Catawba River in the Carolinas. Their principal village was on the west side of the river in what is now York County, S.C. They were known among white traders as flatheads because, like a number of other tribes of the Southeast, they practiced ritual deformation of the head on male infants.

Catawba villages consisted of bark-covered cabins and a temple for public gatherings and religious ceremonies. Each village was governed by a council presided over by a chief. They subsisted principally by farming, harvesting two or more crops of corn (maize) in the same year and growing several varieties of beans, squash, and gourds in one field. In some Southeast tribes the farming was done by the women, but among the Catawba it was the men who farmed. A plentiful supply of passenger pigeons served as winter food. The Catawba made bowls, baskets, and mats, which they traded to other tribes and to white colonists for meat and skins. Fish was also a staple of their diet; they caught sturgeon and herring using weirs, snares, and long poles.

In the 17th century the Catawba numbered about 5,000. After white contact they became virtual satellites of the various colonial factions. Their numbers fell off rapidly (in 1738 half the tribe was wiped out in a smallpox epidemic) so that by 1780 there were only about 500 Catawba left. They were allies of the English in the Tuscarora War (1711–13) and in the French and Indian War (1754–63), and they aided the colonists in the American Revolution. In the late 20th century about 1,200 descendants of the Catawba were living around Rock Hill in South Carolina.

catbird, any of several bird species named for their mewing calls, which are used in addition to song. The North American catbird (*Dumetella carolinensis*), of the family Mimidae (order Passeriformes), is 23 centimetres (9 inches) long and is gray, with a black cap. It frequents gardens and thickets. The black catbird (*Melanoptila glabrirostris*) is found in coastal Yucatán.



North American catbird (*Dumetella carolinensis*)
Thase Daniel—Bruce Coleman Inc.

The three species of the genus *Ailuroedus,* of the bowerbird family (Ptilonorhynchidae), are called catbirds. These green birds occur in Australia, New Guinea, and nearby islands. The male does not build a bower but holds territory in the forest by loud singing. For the related tooth-billed catbird, *see* bowerbird.

catch, also called ROUND, perpetual canon designed to be sung by three or more voices, especially popular in 17th- and 18th-century England. Like all rounds, catches are indefinitely repeatable pieces in which all voices begin the same melody on the same pitch, but enter at different time intervals. The name may derive from caccia, a 14th-century canonic form, or may refer to each singer's "catching" the tune in turn. Catch texts were often humorous or ribald, and in some instances a pause in the melody in one voice was filled in by the notes and text of another, creating a pun or change of meaning.

Literary evidence shows that catch singing was a popular social activity in the 16th century, although the first published collection was Thomas Ravenscroft's very successful *Pammelia* (1609). Two other publications of his also contained catches: *Deuteromelia* (1609), which included "Three Blind Mice," and *Melismata* (1611). Perhaps the most famous of such publications was John Hilton's *Catch That Catch Can* (1652).

The zenith of the catch came after the restoration of the monarchy in 1660, when the finest composers vied with one another in lavishing ingenuity and indecency on the form. Henry Purcell ranks supreme on the first account and very high on the second.

During the 18th century, catch clubs became popular (*e.g.,* the Noblemen's and Gentlemen's Catch Club, founded 1761). The genre became textually more polite and musically insipid, although it remained popular. Most later editions of Restoration catches were bowdlerized, but since the 1950s occasional unexpurgated editions have appeared.

catch-as-catch-can wrestling, basic wrestling style in which nearly all holds and tactics are permitted in both upright and ground wrestling. Rules usually forbid only actions which may injure an opponent, such as strangling, kicking, gouging, and hitting with a closed fist. The object is to force the opponent into a position in which both his shoulders touch the ground at the same time. Formerly known as the Lancashire style in England, catch-as-catch-can became the most popular form of wrestling in Great Britain and the United States and, with slight modifications, was introduced into Olympic and international competition as freestyle wrestling (*q.v.*). *See also* Sporting Record: *Wrestling.*

catcher boat: *see* whale catcher.

catchfly (plant): *see* campion.

catchment area: *see* drainage basin.

Cateau-Cambrésis, Peace of (April 3, 1559), agreement marking the end of the 65-year (1494–1559) struggle between France and Spain for the control of Italy, leaving Habsburg Spain the dominant power there for the next 150 years. In the last phase of the war, fought mostly outside of Italy, France was beaten at the battles of Saint-Quentin (1557) and Gravelines (1558). These defeats, coupled with the beginning of the religious struggle between Catholics and Huguenots in France, and the financial difficulties of both powers, led to the peace. Henry II of France restored Savoy and Piedmont to Spain's ally, Emmanuel-Philibert of Savoy; Henry also restored Corsica to Genoa and renounced his hereditary claim to Milan. Although France finally gave up its claims to Italian territory and Spain retained the predominant position in Italy that it had secured in the Treaty of Cambrai (*see* Cambrai, Treaty of) in 1529, France managed to

retain five fortresses, including Turin, Saluzzo, and Pignerol. Elsewhere, France also retained the three bishoprics of Toul, Metz, and Verdun, which it had captured from the Habsburg emperor Charles V in 1552, and Calais, which it had taken from Spain's allies the English in 1558.

catechesis (theology): *see* kerygma and catechesis.

catechetical school, a type of educational institution in early Christianity, such as at Alexandria, with a curriculum directed toward inquirers (especially those trained in the Greek *paideia,* or educational system) whose aim was to gain a greater knowledge of Christianity and eventually, perhaps, Baptism into the Christian community. The catechetical schools became prototypes for later Christian institutions of higher learning.

catechism, a manual of religious instruction usually arranged in the form of questions and answers used to instruct the young, to win converts, and to testify to the faith. Although many religions give instruction in the faith by means of oral questions and answers, the written catechism is primarily a product of Christianity. Some early handbooks of instruction were prepared by the church fathers (including Augustine of Hippo, John Chrysostom, and Cyril of Jerusalem), and many were prepared throughout medieval times. The term catechism, however, was evidently first used for written handbooks in the 16th century.

After the invention of printing in the 15th century and the 16th-century Reformation, catechisms became much more important, both in Protestantism and Roman Catholicism. These catechisms were influenced by the medieval catechism, which had imitated the works of the church fathers. The medieval catechisms concentrated upon the meaning of faith (the Apostles' Creed), hope (the Lord's Prayer), and charity (the Ten Commandments). The later catechisms usually included discussions of these three subjects and added others.

Perhaps the most influential book produced by any Reformer was Luther's Small Catechism (1529), which added discussions of Baptism and the Eucharist to the usual three subjects. Luther's Large Catechism (1529) was intended for use by the clergy.

John Calvin published a catechism in 1537 that was intended for the instruction of children. It proved too difficult, so he prepared an easier version in 1542. The Heidelberg Catechism (1563) of Caspar Olevianus and Zacharias Ursinus (revised by the Synod of Dort in 1619) became the most widely used catechism in the Reformed churches. The standard Presbyterian catechisms have been the Westminster Larger and Shorter catechisms, completed by the Westminster Assembly in 1647.

The Anglican catechism is included in *The Book of Common Prayer.* The first part was probably prepared by Thomas Cranmer and Nicholas Ridley in 1549 and was modified several times before 1661. A second part, discussing the meaning of the two sacraments, was prepared in 1604 in response to a suggestion of the Puritan faction of the Hampton Court Conference.

The most famous Roman Catholic catechism was one by Peter Canisius, a Jesuit, first published in 1555, which went through 400 editions in 150 years. One that had a large circulation and greatly influenced later works was that of Robert Bellarmine (1597); in France, those of Edmond Auger (1563) and Jacques-Bénigne Bossuet (1687) were outstanding. In more recent times, well-known Roman Catholic catechisms have included the Baltimore Catechism (1885) in the United States, *A Catechism of Christian Doctrine* ("Penny Catechism") in England (1898), and that of Joseph Deharbe (1847) in Germany. The Dutch catechism of the 1960s attempted to integrate into the traditional catechism the various changes advocated by the second Vatican Council.

In reaction to the work of the Jesuits and the Reformed Church among the Orthodox, Peter Mogila composed the *Orthodox Confession of the Catholic and Apostolic Eastern Church.* It was approved at a provincial synod in 1640 and standardized by the synod of Jerusalem in 1672. By order of Tsar Peter I the Great, a smaller Orthodox Catechism was prepared in 1723.

Many other Christian groups also have catechisms. In the United States, however, the Sunday-school movement in the 19th century lessened the dependence on catechisms as a means of instruction.

catecholamine, any of a group of neurotransmitters or hormones that are derived from the precursor amino acid known as L-tyrosine, which undergoes a sequence of enzyme-mediated changes to L-dopa, to dopamine, to norepinephrine, and finally to epinephrine. The catecholamine dopamine is a widely distributed neurotransmitter of the central nervous system.

Catecholamines are produced by the adrenal medulla and act with the sympathetic nervous system to initiate the body's quick responses to stressful organic and psychological stimuli (the "fight or flight" response). Catecholamines have a role in the generation of body heat through their actions in stimulating heat- and energy-producing reactions such as those that break down glycogen to glucose in the liver and muscle and that break down triglycerides (stored fat) to free fatty acids. Catecholamines regulate hormone secretion through their neurotransmitter role in the hypothalamus. They stimulate the release of glucagon and somatostatin from the islets of Langerhans of the pancreas.

catechu, also called CUTCH, or CASHOO, extract used in dyeing and tanning. Obtained from several plants, its chief sources are the wood of two species of *Acacia, A. catechu* and *A. suma,* both natives of India. This extract is known as black catechu. A similar extract, known in pharmacy as pale catechu and in commerce as gambier or terra japonica, is produced from the leaves of *Uncaria gambir* and *U. acida,* plants of the Indonesian archipelago. These extracts, which have a sweetish taste, are used in medicine as astringents. They consist chiefly of mixtures of catechutannic acid and catechin or catechuic acid.

The name catechu also is applied to an extract obtained from areca nuts, or betel nuts, the seeds of the fruit of *Areca catechu,* a palm of southeastern Asia. It consists of the alkaloid arecoline, which is used as a worming agent in animals.

catechumen, a person who receives instruction in the Christian religion in order to be baptized. According to the New Testament, the apostles instructed converts after baptism (Acts 2:41–42), and Christian instruction was evidently given to all converts (Luke 1:4, Acts 18:25, Galatians 6:6). As the number of Gentiles in the church increased, instruction became more definite. In the 4th century, with the rise of heresy, detailed doctrinal teaching was given. But by this time the postponement of baptism had become general (Constantine was not baptized until he was at the point of death), and, therefore, a large proportion of Christians belonged to the catechumenate. Most of them were merely "adherents" of the church, while others were under definite instruction for baptism.

As infant baptism became general, the catechumenate decreased. The baptismal rites now used are adaptations of rites intended for the reception of adult catechumens. In modern times, the institution of the catechumenate has been revived in the mission field.

Catechumens, Liturgy of the, the instructional part of the Christian worship service, consisting of hymns, prayers, scriptural readings, and homilies, which precedes the Eucharist (*i.e.,* the Liturgy of the Faithful). In the early church the catechumens, or hearers who had not yet been baptized, were dismissed at the conclusion of the Liturgy of the Catechumens; and the faithful, or baptized Christians, remained to celebrate the mystery of the Eucharist, also called Holy Communion.

categorical imperative, in the ethics of the 18th-century German philosopher Immanuel Kant, founder of critical philosophy, a moral law that is unconditional or absolute for all agents, the validity or claim of which does not depend on any ulterior motive or end. "Thou shalt not steal," for example, is categorical as distinct from the hypothetical imperatives associated with desire, such as "Do not steal if you want to be popular." For Kant there was only one such categorical imperative, which he formulated in various ways. "Act only according to that maxim by which you can at the same time will that it should become a universal law" is a purely formal or logical statement and expresses the condition of the rationality of conduct rather than that of its morality, which is expressed in another Kantian formula: "So act as to treat humanity, whether in your own person or in another, always as an end, and never as only a means."

categorical proposition, in syllogistic or traditional logic, a proposition or statement, in which the predicate is, without qualification, affirmed or denied of all or part of the subject. Thus, categorical propositions are of four basic forms: "Every *S* is *P,*" "No *S* is *P,*" "Some *S* is *P,*" and "Some *S* is not *P.*" These forms are designated by the letters *A, E, I,* and *O,* respectively; so that "Every man is mortal," for example, is an *A*-proposition. Categorical propositions are to be distinguished from compound and complex propositions, into which they enter as integral terms; in particular, being assertions of fact rather than of logical connections, they contrast especially with hypothetical propositions, such as "If every man is mortal, then Socrates is mortal." Inferences involving categorical propositions are made in terms of a predicate calculus (*q.v.*), whereas those involving complex propositions employ a propositional calculus (*q.v.*). *See also* opposition, square of.

category, in logic, a term used to denote the several most general or highest types of thought forms or entities, or to denote any distinction such that, if a form or entity belonging to one category is substituted into a statement in place of one belonging to another, a nonsensical assertion must result.

The term was used by Aristotle to denote a predicate type; *i.e.,* the many things that may be said (or predicated) of a given subject fall into classes—such as quantities, substances, relations, and states—which Aristotle called categories. To the Greeks, the clarification of predicate categories helped to resolve questions that appeared to be paradoxes. In the course of a year or so, for example, Socrates could cease to be taller and come to be shorter than Alcibiades; so he is not now what he was at an earlier date. Yet he does not cease to be a human being. One may wonder how he can not be what he used to be (taller) and still be what he used to be (a human being). The answer is that the categories are different: a change of relation is not a change of substance.

Though the Stoics, philosophers of ancient Greece, had recognized only 4 "most generic"

notions, Aristotle's 10 categories were treated throughout the Middle Ages as though they were definitive. In a commentary on Aristotle's *Categoriae* (*Categories*), the Neoplatonist Porphyry set the stage for the entire medieval controversy over universals, or general abstract terms (*see* Nominalism), and he thus posed the issues that any theory of categories must resolve.

In the 18th century Immanuel Kant revived the term category to designate the different types of judgments or ways in which logical propositions function. It should thus be clear that, whereas Kant retained the Aristotelian term "category" and even some of the subterms, such as "quality," "quantity," and "relation," his distinctions were different from those of Aristotle. For Aristotle, for example, "quality" referred to such predicates as "white" or "sweet," whereas for Kant it designated the distinction between affirmative and negative.

After Kant, G.W.F. Hegel arranged many categories in a dialectical structure of ascending triads and thus initiated the modern tendency to regard them as many and as comprising the basic principles of a logical and/or metaphysical system; thus, for Hegel the categories encompassed both form and content. Early in the 20th century Bertrand Russell, faced with a "contradiction" in the foundations of mathematics, developed the theory of types, which distinguished different levels of language and held that the levels should not be intermixed.

Meanwhile, Charles Sanders Peirce, an American logician and Pragmatist, arguing from Kant's categories, proposed a reduced list of categories. He defended the view that there can be three and only three types of predicates: "firstness," that of "pure possibility"; "secondness," that of "actual existence"; and "thirdness," that of "real generality." Clearly, if universals belong to the category of thirdness, then the Nominalist, who urges that universals have no existence (the secondness category) is confusing categories and, by the definition of "category," is making a nonsensical statement. Such misjudgments, made famous as "category-mistakes" by Gilbert Ryle, a mid-20th-century Oxford Analytical philosopher, have played an important role in recent linguistic philosophy, which, with its proliferation of categories, has applied this critique, with powerful therapeutic effect, to philosophical discourse.

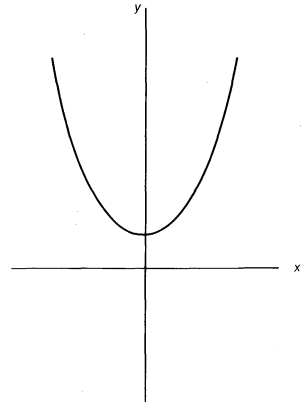
Stanisław Leśniewski (1886–1939), a Polish logician, and Rudolf Carnap (1891–1970), a German-American semanticist, distinguished between syntactical categories (dealing with the interrelations of concepts) and semantical categories (dealing with concepts and referents). Distinctions akin to those of Aristotle are thus apt to be described today as semantical, as distinctions between kinds or modes of significance rather than kinds of linguistic expressions or of things or happenings. P.F. Strawson, another Oxford philosopher, discussed the implications of category theory for a descriptive metaphysics.

Catelinus: *see* John III *under* John (papacy).

catenary, the curve describing the shape taken by a homogeneous cable that is suspended by its endpoints. Any freely hanging cable or string assumes this shape, also called a chainette, if the body is of uniform mass per unit of length and is acted upon solely by gravity.

The general equation of a catenary is $y = a \cosh(x/a)$, in which a is a constant, the distance between the lowest point of the curve and a reference axis. If $a = 1$, the equation is that of the hyperbolic cosine (cosh).

The approximate curve may be observed in the cables of suspension bridges. The catenary



Catenary curve

can be generated as the locus of the focus of a parabola rolling along a straight line.

catenation, chemical linkage into chains of atoms of the same element, occurring only among the atoms of an element that has a valence of at least two and that forms relatively strong bonds with itself. The property is predominant among carbon atoms, significant among sulfur and silicon atoms, and slightly present among germanium, nitrogen, selenium, and tellurium atoms. *See also* polymerization.

Caterina (Italian personal name): *see under* Catherine.

caterpillar, larva of a butterfly or moth (Lepidoptera). Caterpillars have cylindrical bodies consisting of 13 segments, with three pairs of legs on the thorax and several on the abdomen. The head has six eyes on each side, short antennae, and strong jaws. Many caterpillars within the Lepidoptera are called worms, such as the measuring worm, silkworm, and army worm.

Caterpillar-like, or eruciform, larvae also occur in other insect groups, namely the scorpionflies (Mecoptera) and the sawflies (Hymenoptera).

Caterpillar Inc., formerly (1925–86) CATERPILLAR TRACTOR COMPANY, major American manufacturer of earth-moving, construction, and materials-handling equipment. Caterpillar also makes diesel and natural gas engines for industrial and marine use. Headquarters are in Peoria, Ill.

Benjamin Holt, the owner of a California heavy equipment company, invented the familiar "caterpillar" tractor a few years before World War I. The tractors ran on continuous metal-belted tracks instead of wheels. The tracks kept the heavy tractors from sinking in mud or dirt, and during the war British and American forces successfully used such treads on their armoured tanks.

In 1925 Holt's firm, Holt Manufacturing Company, was merged with another equipment company, the C.L. Best Tractor Company. The new company was incorporated as the Caterpillar Tractor Company and headquarters were moved to Illinois.

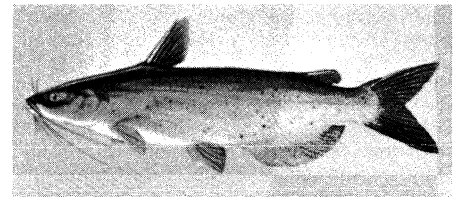
Caterpillar now manufactures a wide variety of machines used in agriculture, construction, logging, mining, petroleum, industrial warehousing, and public service markets. The company has a long history of trade with the Soviet Union, going back to the 1920s when Caterpillar sold the Soviet Union $18,000,000 worth of construction equipment to facilitate the country's first Five Year Plan (1929–1933).

Catesby, Robert (b. 1573, Lapworth, Warwickshire, Eng.—d. Nov. 8, 1605, Holbeche House, Staffordshire), chief instigator of the Gunpowder Plot, a Roman Catholic conspiracy to blow up King James I and the English Parliament on Nov. 5, 1605.

A member of a staunchly Roman Catholic family, Catesby became embittered against the government of Queen Elizabeth I as he saw his father, Sir William, persecuted for refusing to conform to the Church of England. In 1601 Robert Catesby was imprisoned and fined for joining the abortive uprising of Robert Devereux, 2nd earl of Essex. Upon his release he set about promoting a Spanish invasion of England, and as a result he was again briefly imprisoned shortly before Elizabeth's death in March 1603.

Catesby placed little faith in the promises of religious toleration made by Elizabeth's successor, King James I (reigned 1603–25). As early as May 1603 he conceived the idea of destroying both King and Parliament by exploding gunpowder under the Parliament building, and in January 1604 he began to assemble a group of zealous Catholics to carry out his scheme, including the soldier Guy Fawkes and Thomas Percy, a relative of the Earl of Northumberland. But the government learned of the plot, and on Nov. 4, 1605, Fawkes was arrested. Catesby fled from London and took refuge in Holbeche House, Staffordshire, where he was killed while resisting government troops. The plot intensified anti-Catholic feelings in England.

catfish, any of the fishes of the order Siluriformes. Catfishes are related to the characins, carp, and minnows (order Cypriniformes) and may be placed with them in the superorder Ostariophysi. Some authorities, however, consider these groups suborders, rather than a



Channel catfish (*Ictalurus punctatus*)

single order, and classify them as the suborders Siluroidea (catfishes) and Cyprinoidea (characins, carp, and minnows) of the order Cypriniformes or Ostariophysi.

The name catfish refers to the long barbels, or feelers, which are present about the mouth of the fish and resemble cat whiskers. All catfishes have at least one pair of barbels, on the upper jaw; they may also have a pair on the snout and additional pairs on the chin. Many catfishes possess spines in front of the dorsal and pectoral fins. These spines may be associated with venom glands and can cause painful injuries to the unsuspecting. All catfishes are either naked or armoured with bony plates; none has scales.

Living catfishes constitute about 2,500 species placed in about 30 families. The majority of species inhabit fresh water, but a few, belonging to the families Ariidae and Plotosidae, are marine. Freshwater catfishes are almost worldwide in distribution and live in a variety of habitats from slow or stagnant waters to fast mountain streams; marine catfishes are found in the shore waters of the tropics. Catfishes are generally bottom dwellers, more active by night than by day. Most are scavengers and feed on almost any kind of animal or vegetable matter. All species are egg layers and may exhibit various types of parental care. The brown bullhead (*Ictalurus nebulosus*), for example, builds and guards a nest and protects its young, while male sea catfishes (Ariidae) carry the marble-sized eggs, and later the young, in their mouths.

Catfishes vary considerably in size. Small species, such as the dwarf *Corydoras,* or micro cat (*C. hastatus*), may be as little as 4 or 5 centimetres (1½–2 inches) long, while the wels (*Silurus glanis*), a large, European species, may be 4.5 metres (15 feet) in length and 300

kilograms (660 pounds) in weight. A number of the smaller species, especially those of the genus *Corydoras,* are popular aquarium fishes, while many of the larger catfishes are edible and used as food. Notable examples of the latter are the many North American food and sport fishes of the family Ictaluridae, among them the blue catfish (*Ictalurus furcatus*), with a maximum length and weight of 1.5 metres and 68 kilograms, and the channel catfish (*I. punctatus*), growing to about 1 metre and 12 kilograms.

The ictalurids are more or less typical catfishes; others, however, may be distinctive in appearance or behaviour. The glass catfish (*Kryptopterus bicirrhus*), for example, is a popular aquarium fish of the family Siluridae noted for its slender, highly transparent body; the banjo catfishes (Aspredinidae) of South America are slim fishes with rough, flattened heads and from above somewhat resemble banjos; the electric catfish (*Malapterurus electricus*) of Africa can generate up to 450 volts of electricity; the parasitic catfish, or candiru (*Vandellia cirrhosa*), of South America sometimes invades the urogenital openings of bathers; the talking catfish (*Acanthodoras spinosissimus*) is an armoured, Amazonian species that makes grunting sounds; the upside-down catfishes (*Synodontis batensoda* and others) of the family Mochokidae habitually swim upside down; the walking catfish (*Clarias batrachus*) is an air breather of the family Clariidae that can travel overland.

For more information about catfish species and groups, *see* bullhead; candiru; corydoras; electric catfish; madtom; wels. The catfish is also important in fish farming (*q.v.*).

catgut, tough cord made from the intestines of certain animals, particularly sheep, and used for surgical ligatures and sutures, for the strings of violins and related instruments, and for the strings of tennis rackets and archery bows. The ancient Egyptians and Babylonians and the later Greeks and Romans used the intestines of herbivorous animals for much the same purposes. The origin of the term catgut is obscure; it is not known if the intestines of cats were ever put to such uses.

The intestinal tubes (called runners) of sheep are washed, cut in ribbons, and scraped free of mucous membrane and circular muscle tissue. The ribbons are placed in an alkaline bath for several hours and then stretched on frames. While still moist they are removed, sorted by size, and twisted into cords of varying thickness. A smoothing and polishing operation completes the process.

Italian catgut is considered the best for stringing musical instruments. Surgical catgut is sterilized by heat applied in progressive steps and maintained for several hours; it is often treated with an impregnating agent.

Cathari (from Greek *katharos,* "pure"), also spelled CATHARS, heretical Christian sect that flourished in western Europe in the 12th and 13th centuries. The Cathari professed a neo-Manichaean dualism—that there are two principles, one good and the other evil, and that the material world is evil. Similar views were held in the Balkans and the Middle East by the medieval religious sects of the Paulicians and the Bogomils; the Cathari were closely connected with these sects.

In the first half of the 11th century isolated groups of such heretics appeared in western Germany, Flanders, and northern Italy. In the late 11th century no more was heard of them; then in the 12th century they reappeared. A period of rapid growth came in the 30 years following 1140. At about this time the Bogomil Church was reorganizing itself, and Bogomil missionaries, as well as Western dualists returning from the Second Crusade (1147–49), were at work in the West in the middle of the century. From the 1140s the Cathari were an organized church with a hierarchy, a liturgy, and a system of doctrine. About 1149 the first bishop established himself in the north of France; a few years later he established colleagues at Albi and in Lombardy. The status of these bishops was confirmed and the prestige of the Cathar Church enhanced by the visit of the Bogomil bishop Nicetas in 1167. In the following years more bishops were set up, until by the turn of the century there were 11 bishoprics in all, 1 in the north of France, 4 in the south, and 6 in Italy.

Although the various groups emphasized different doctrines, they all agreed that matter was evil. Man was an alien and a sojourner in an evil world; his aim must be to free his spirit, which was in its nature good, and restore it to communion with God. There were strict rules for fasting, including the total prohibition of meat. Sexual intercourse was forbidden; complete ascetic renunciation of the world was called for.

The extreme asceticism made the Cathari a church of the elect, and yet in France and northern Italy it became a popular religion. This success was achieved by the division of the faithful into two bodies: the "perfect" and the "believers." The perfect were set apart from the mass of believers by a ceremony of initiation, the *consolamentum.* They devoted themselves to contemplation and were expected to maintain the highest moral standards. The believers were not expected to attain the standards of the perfect.

The Cathar doctrines of creation led them to rewrite the biblical story; they devised an elaborate mythology to replace it. They viewed much of the Old Testament with reserve; some of them rejected it altogether. The orthodox doctrine of the Incarnation was rejected. Jesus was merely an angel; his human sufferings and death were an illusion. They also severely criticized the worldliness and corruption of the Catholic Church.

The Cathar doctrines struck at the roots of orthodox Christianity and of the political institutions of Christendom, and the authorities of church and state united to attack them. Pope Innocent III (1198–1216) attempted to force Raymond VI, count of Toulouse, to join him in putting down the heresy, but this ended in disaster; the papal legate was murdered in January 1208, and the Count was generally thought to have been an accessory to the crime. A crusade—the Albigensian Crusade—was proclaimed against the heretics, and an army led by a group of barons from northern France proceeded to ravage Toulouse and Provence and massacre the inhabitants, both Cathar and Catholic (*see* Albigenses). A more orderly persecution sanctioned by St. Louis IX, in alliance with the nascent Inquisition, was more effective in breaking the power of the Cathari. In 1244 the great fortress of Montségur near the Pyrenees, a stronghold of the perfect, was captured and destroyed. The Cathari had to go underground, and many of the French Cathari fled to Italy, where persecution was more intermittent. The hierarchy faded out in the 1270s; the heresy lingered through the 14th century and finally disappeared early in the 15th.

catharsis, in criticism, metaphor used by Aristotle in the *Poetics* to describe the effects of true tragedy on the spectator. The use is derived from the medical term *katharsis* (Greek: "purgation" or "purification"). Aristotle states that the purpose of tragedy is to arouse "terror and pity" and thereby effect the catharsis of these emotions. His exact meaning has been the subject of critical debate over the centuries. The German dramatist and literary critic Gotthold Lessing (1729–81) held that catharsis converts excess emotions into virtuous dispositions. Other critics see tragedy as a moral lesson in which the fear and pity excited by the tragic hero's fate serve to warn the spectator not to similarly tempt providence. The interpretation generally accepted is that through experiencing fear vicariously in a controlled situation, the spectator's own anxieties are directed outward, and, through sympathetic identification with the tragic protagonist, his insight and outlook are enlarged. Tragedy then has a healthful and humanizing effect on the spectator or reader.

Cathay, name by which North China was known in medieval Europe. The word is derived from Khitay (or Khitan), the name of a seminomadic people who left southeastern Mongolia in the 10th century AD to conquer part of Manchuria and northern China, which they held for about 200 years. By the time of Genghis Khan (died 1227), the Mongols had begun referring to North China as Kitai and South China as Mangi. Kitai is still the Russian word for China.

Either Muslim merchants or two Franciscan friars who visited the ancient Mongol capital of Karakorum in 1246 and 1254 are thought to have introduced the name Cathay to Europe. But Marco Polo (1254–1324), who journeyed to China almost 50 years later, was the one who really put the image of Cathay before the European public. His descriptions of a Cathay that possessed a far more sophisticated culture and technology than the contemporary West were circulated throughout medieval Europe. Following the collapse of Mongol power in the 14th century, European contact with China was lost, but stories of the country persisted. Christopher Columbus and John Cabot thought they were heading toward Cathay in their voyages to the New World. In fact Columbus, who had a copy of Marco Polo's book with him, believed he had reached Mangi, which he described as contiguous to Cathay. It was not ascertained that China and Cathay were the same place until the Spanish Augustinian friar Marin de Rade, in 1575, and the Jesuit Matteo Ricci, in 1607, recorded the fact when they proved that China could be reached by following Marco Polo's land route across Central Asia.

Cathaya, genus of evergreen coniferous trees of the family Pinaceae, containing two living species native to China and one fossil species found in Germany. Both living forms are about 20 metres (65 feet) tall and have two types of branchlets: long terminal shoots and short secondary shoots. The margins of the long, narrow leaves are fringed with tiny hairs. Both male and female cones are borne on one tree.

cathedra (Latin: "chair," or "seat"), Roman chair of heavy structure derived from the *klismos*—a lighter, more delicate chair developed by the ancient Greeks.

The cathedra was used in the early Christian basilica as a raised bishop's throne placed near the wall of the apse, behind the altar. Later, a bishop's principal church, or seat, within his diocese was designated a cathedral. The term *ex cathedra* ("from the seat, or throne") was used in Roman Catholicism to distinguish solemn pronouncements by the Pope on matters of faith or morals and therefore binding on the faithful.

cathedral, in Christian churches that have an episcopal form of church government, the church in which a residential bishop has his official seat or throne, the cathedra. Cathedral churches are of different degrees of dignity. There are cathedral churches of simple diocesan bishops, of archbishops or metropolitans, of primates, patriarchs, and, in the Roman Catholic Church, of the pope. A cathedral church is not necessarily large and magnificent, although most cathedrals have become so. Since the territorial organization of the early church followed that of the Roman Em-

pire, cathedrals from the first were established wherever possible in towns, not in villages. In the early Middle Ages in the West, the town in which a cathedral church was situated became known as the cathedral city.

In the Roman Catholic Church, canon law makes no architectural conditions for a cathedral, although a spacious sanctuary is desirable for the adequate performance of special rites. The only canonical requirement is that a cathedral should be consecrated and adequately endowed. The pope has the right to designate a cathedral, although the choice of the bishop of the diocese or his decision to build a cathedral is normally approved by the pope. The bishop must be present in his cathedral in Advent and Lent and on the feasts of Christmas, Easter, Pentecost, and Corpus Christi, and he must normally perform ordinations there.

In the Eastern Orthodox Church the cathedral is the main church in a city where the bishop resides and where he celebrates the liturgy on festival occasions. In Russia, where the dioceses have always been few and have covered a vast area, the main church in any large town became known as a cathedral (*sobor*), even though no bishop was in residence there. The principal church of a big monastery also assumed the same name.

After the 16th-century Protestant Reformation, cathedrals where bishops were rejected became simple churches. In Sweden the cathedral continued to be the seat of the Lutheran bishop. In the Church of England, where the order of bishops was retained, the cathedrals remained as the seat of the bishop.

cathedral school, medieval European school run by cathedral clergy. Originally the function of such schools was to train priests, but later they taught lay students as well—usually boys of noble families being prepared for high positions in church, state, or commercial affairs. Every cathedral had such a school; there were generally fewer than 100 students in a school.

Notable cathedral schools during the early Middle Ages (late 8th and early 9th centuries) were at York, Orléans, and Reims. The school of the cathedral of Chartres, in which the French Scholastic philosopher Bernard specialized in Greek and Roman classics as well as the Bible, was preeminent during the 12th century.

Cather, Willa (Sibert) (b. Dec. 7, 1873, Winchester, Va., U.S.—d. April 24, 1947, New York City), U.S. novelist noted for her portrayals of the settlers and frontier life on the American plains.

Willa Cather
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At nine she moved with her family from Virginia to the Nebraska village of Red Cloud. There she grew up among the immigrants from Europe—Swedes, Bohemians, Russians, Germans—who were breaking the land on the Great Plains.

At the University of Nebraska she showed a marked talent for journalism and story writing, and on graduating in 1895 she obtained a position on a Pittsburgh "family" magazine. Later she worked as copy editor and music and drama editor of the *Pittsburgh Leader.* She turned to teaching in 1901 and in 1903 published her first book of verses, *April Twilights.* In 1905 her first collection of short stories, *The Troll Garden,* led to her appointment as managing editor of *McClure's,* the New York muckraking monthly. After building up its declining circulation, she left in 1912 to devote herself wholly to writing novels.

Her first novel, *Alexander's Bridge* (1912), was a factitious story of cosmopolitan life. Under the influence of Sarah Orne Jewett's regionalism, however, she turned to her familiar Nebraska material. With *O Pioneers!* (1913) and *My Ántonia* (1918), which has frequently been adjudged her finest achievement, she found her characteristic themes—the spirit and courage of the frontier she had known in her youth. *One of Ours* (1922), which won the Pulitzer Prize, and *A Lost Lady* (1923) mourned the passing of the pioneer spirit.

In her earlier *Song of the Lark* (1915), as well as in the tales assembled in *Youth and the Bright Medusa* (1920), with its story of a neurotic boy in "Paul's Case," and *Lucy Gayheart* (1935) she reflected the other side of her experience—the struggle of a talent to emerge from the constricting life of the prairies and the stifling effects of small-town life.

A mature statement of both themes can be found in three long tales included in *Obscure Destinies* (1932). With success and middle age, however, Cather experienced a strong disillusionment, which was reflected in *The Professor's House* (1925) and her essays *Not Under Forty* (1936).

Her solution was to write of the pioneer spirit of another age, that of the French Catholic missionaries in the Southwest in *Death Comes for the Archbishop* (1927) and of the French Canadians at Quebec in *Shadows on the Rock* (1931). Her last novel, *Sapphira and the Slave Girl* (1940), marked a return to the Virginia of her ancestors and her childhood.

Catherine I, Russian in full YEKATERINA ALEKSEYEVNA, original name MARTA SKOWRONSKA (b. April 15 [April 5, old style], 1684—d. May 17 [May 6, O.S.], 1727, St. Petersburg), peasant woman of Baltic (probably Lithuanian) birth who became the second wife of Peter I the Great (ruled 1682–1725) and empress of Russia (1725–27).

Orphaned at the age of three, Marta Skowronska was raised by a Lutheran pastor in Marienburg (modern Alūksne, Latvian S.S.R.). When the Russians seized Marienburg (1702) during the Great Northern War, Marta was taken prisoner. She later was handed over to a close adviser of Peter I. A short time later she and the Tsar became lovers.

In 1703, after the birth of their first child, she was received into the Orthodox Church and rechristened Catherine (Yekaterina) Alekseyevna. Subsequently, Catherine became Peter's inseparable companion, and, in February 1712, his wife. On May 18 (May 7, O.S.), 1724, she was crowned empress-consort of Russia.

When Peter died (Feb. 8 [Jan. 28, O.S.], 1725) without naming an heir, Catherine's candidacy for the throne was supported by the guards and by several powerful and important individuals. As a result, the Holy Synod, the Senate, and the high officials of the land almost immediately proclaimed Catherine empress of Russia. In February 1726, however, she created the Supreme Privy Council, named six of Peter's former advisers as its members, and effectively transferred control of government affairs to it, thereby undermining the authority of the Senate and the Synod, which had been Peter's main administrative instruments.

Catherine I, detail of an oil painting by J.-M. Nattier; in the Hermitage
By courtesy of the State Hermitage Museum, Leningrad

Shortly before her death, Catherine appointed Peter's grandson Pyotr Alekseyevich (ruled as Peter II; 1727–30) as her heir. Later, her daughter Elizabeth (ruled 1741–62) and her grandson Pyotr Fyodorovich (ruled as Peter III; 1762), the son of her daughter Anna, became Russia's sovereigns.

Catherine II, Russian in full YEKATERINA ALEKSEYEVNA, byname CATHERINE THE GREAT, Russian YEKATERINA VELIKAYA, original name SOPHIE FRIEDERIKE AUGUSTE, PRINZESSIN (princess) VON ANHALT-ZERBST (b. May 2 [April 21, old style], 1729, Stettin, Prussia—d. Nov. 17 [Nov. 6, O.S.], 1796, Tsarskoye Selo, near St. Petersburg, Russia), German-born empress of Russia (1762–96),

Catherine II, detail of a portrait by A. Roslin; in the collection of Mrs. Merriweather Post, Hillwood, Washington, D.C.
By courtesy of Hillwood, Washington, D.C.

who led her country into full participation in the political and cultural life of Europe, carrying on the work begun by Peter the Great. With her ministers she reorganized the administration and law of the Russian Empire and extended Russian territory by adding the Crimea and much of Poland.

Origins and early experience. Sophie Friederike Auguste von Anhalt-Zerbst was the daughter of an obscure German prince, Christian August von Anhalt-Zerbst, but she was related through her mother to the dukes of Holstein. At the age of 14 she was chosen to be the wife of Karl Ulrich, duke of Holstein-Gottorp, grandson of Peter the Great and heir to the throne of Russia as the Grand Duke Peter. In 1744 Catherine arrived in Russia, assumed the title of Grand Duchess Catherine Alekseyevna, and married her young cousin the following year. The marriage was a complete failure; the following 18 years were filled with deception and humiliation for her.

Russia at the time was ruled by Peter the Great's daughter, the empress Elizabeth, whose 20-year reign greatly stabilized the monarchy. Devoted to much pleasure and luxury and

greatly desirous of giving her court the brilliancy of a European court, Elizabeth prepared the way for Catherine.

Catherine, however, would not have become empress if her husband had been at all normal. He was extremely neurotic, rebellious, obstinate, perhaps impotent, nearly alcoholic, and, most seriously, a fanatical worshipper of Frederick II of Prussia, the foe of the empress Elizabeth. Catherine, by contrast, was clearheaded and ambitious. Her intelligence, flexibility of character, and love of Russia gained her much support.

She was humiliated, bored, and regarded with suspicion while at court, but she found comfort in reading extensively and in preparing herself for her future role as sovereign. Although a woman of little beauty, Catherine possessed considerable charm, a lively intelligence, and extraordinary energy. During her husband's lifetime alone, she had at least three lovers; if her hints are to be believed, none of her three children, not even the heir apparent Paul, was fathered by her husband. Her true passion, however, was ambition; since Peter was incapable of ruling, she saw quite early the possibility of eliminating him and governing Russia herself.

The empress Elizabeth died on Jan. 5, 1762 (Dec. 25, 1761, O.S.), while Russia, allied with Austria and France, was engaged in the Seven Years' War against Prussia. Shortly after Elizabeth's death, Peter, now emperor, ended Russia's participation in the war and concluded an alliance with Frederick II of Prussia. He made no attempt to hide his hatred of Russia and his love of his native Germany; discrediting himself endlessly by his foolish actions, he also prepared to rid himself of his wife. Catherine had only to strike: she had the support of the army, especially the regiments at St. Petersburg, where Grigory Orlov, her lover, was stationed; the court; and public opinion in both capitals (Moscow and St. Petersburg). She was also supported by the "enlightened" elements of aristocratic society, since she was known for her liberal opinions and admired as one of the most cultivated persons in Russia. On July 9 (June 28, O.S.), 1762, she led the regiments that had rallied to her cause into St. Petersburg and had herself proclaimed empress and autocrat in the Kazan Cathedral. Peter III abdicated and was assassinated eight days later. Although Catherine probably did not order the murder of Peter, it was committed by her supporters, and public opinion held her responsible. In September 1762, she was crowned with great ceremony in Moscow, the ancient capital of the tsars, and began a reign that was to span 34 years as empress of Russia under the title of Catherine II.

Early years as empress. Despite Catherine's personal weaknesses, she was above all a ruler. Truly dedicated to her adopted country, she intended to make Russia a prosperous and powerful state. Since her early days in Russia she had dreamed of establishing a reign of order and justice, of spreading education, creating a court to rival Versailles, and developing a national culture that would be more than an imitation of French models. Her projects obviously were too numerous to carry out, even if she could have given her full attention to them.

Her most pressing practical problem, however, was to replenish the state treasury, which was empty when Elizabeth died; this she did in 1762 by secularizing the property of the clergy, who owned one-third of the land and serfs in Russia. The Russian clergy was reduced to a group of state-paid functionaries, losing what little power had been left to it by the reforms of Peter the Great. Since her coup d'etat and Peter's suspicious death demanded both discretion and stability in her dealings with other nations, she continued to preserve friendly relations with Prussia, Russia's old enemy, as well as with the country's traditional allies, France and Austria. In 1764 she resolved the problem of Poland, a kingdom lacking definite boundaries and coveted by three neighbouring powers, by installing one of her old lovers, Stanisław Poniatowski, a weak man entirely devoted to her, as king of Poland.

Her attempts at reform, however, were less than satisfying. A disciple of the English and French liberal philosophers, she saw very quickly that the reforms advocated by Montesquieu or Jean-Jacques Rousseau, which were difficult enough to put into practice in Europe, did not at all correspond to the realities of an anarchic and backward Russia. In 1767 she convened a commission composed of delegates from all the provinces and from all social classes (except the serfs) for the purpose of ascertaining the true wishes of her people and framing a constitution. The debates went on for months and came to nothing. Catherine's Instruction to the commission was a draft of a constitution and a code of laws. It was considered too liberal for publication in France and remained a dead letter in Russia.

Frustrated in her attempts at reform, Catherine seized the pretext of war with Turkey in 1768 to change her policy; henceforth, emphasis would be placed above all on national grandeur. Since the reign of Peter the Great, the Ottoman Empire had been the traditional enemy of Russia; inevitably, the war fired the patriotism and zeal of Catherine's subjects. Although the naval victory at Çeşme in 1770 brought military glory to the Empress, Turkey had not yet been defeated and continued fighting. At that point, Russia encountered unforeseen difficulties.

First, a terrible plague broke out in Moscow; along with the hardships imposed by the war, it created a climate of disaffection and popular agitation. In 1773 Yemelyan Pugachov, a former officer of the Don Cossacks, pretending to be the dead emperor Peter III, incited the greatest uprising of Russian history prior to the revolution of 1917. Starting in the Ural region, the movement spread rapidly through the vast southeastern provinces, and in June 1774 Pugachov's Cossack troops prepared to march on Moscow. At this point, the war with Turkey ended in a Russian victory, and Catherine sent her crack troops to crush the rebellion. Defeated and captured, Pugachov was beheaded in 1775, but the terror and chaos he inspired were not soon forgotten. Catherine now realized that for her the people were more to be feared than pitied, and that, rather than freeing them, she must tighten their bonds.

Before her accession to power, Catherine had planned to emancipate the serfs, on whom the economy of Russia, which was 95 percent agricultural, was based. The serf was the property of the master, and the fortune of a noble was evaluated not in lands but in the "souls" he owned. When confronted with the realities of power, however, Catherine saw very quickly that emancipation of the serfs would never be tolerated by the owners, whom she depended upon for support, and who would throw the country into disorder once they lost their own means of support. Reconciling herself to an unavoidable evil without much difficulty, Catherine turned her attention to organizing and strengthening a system that she herself had condemned as inhuman. She imposed serfdom on the Ukrainians who had until then been free. By distributing the so-called crown lands to her favourites and ministers, she worsened the lot of the peasants, who had enjoyed a certain autonomy. At the end of her reign, there was scarcely a free peasant left in Russia, and, because of more systematized control, the condition of the serf was worse than it had been before Catherine's rule.

Thus, 95 percent of the Russian people did not in any way benefit directly from the achievements of Catherine's reign. Rather, their forced labour financed the immense expenditures required for her ever-growing economic, military, and cultural projects. In these undertakings, at least, she proved herself to be a good administrator and could claim that the blood and sweat of the people had not been wasted.

Influence of Potemkin. In 1774, the year of Russia's defeat of Turkey, Grigory Potemkin, who had distinguished himself in the war, became Catherine's lover, and a brilliant career began for this official of the minor nobility, whose intelligence and abilities were equalled only by his ambition. He was to be the only one of Catherine's favourites to play an extensive political role. Ordinarily, the Empress did not mix business and pleasure; her ministers were almost always selected for their abilities. In Potemkin she found an extraordinary man whom she could love and respect and with whom she could share her power. As minister he had unlimited powers, even after the end of their liaison, which lasted only two years. Potemkin must be given part of the credit for the somewhat extravagant splendour of Catherine's reign. He had a conception of grandeur that escaped the rather pedestrian German princess, and he understood the effect it produced on the people. A great dreamer, he was avid for territories to conquer and provinces to populate; an experienced diplomat with a knowledge of Russia that Catherine had not yet acquired and as audacious as Catherine was methodical, Potemkin was treated as an equal by the Empress up to the time of his death in 1791. They complemented and understood each other, and the ambitious minister expressed his respect for his sovereign through complete devotion to her interests.

The annexation of the Crimea from the Turks in 1783 was Potemkin's work. Through that annexation and the acquisition of the territories of the Crimean khanate, which extended from the Caucasus Mountains to the Bug River in southwestern Russia, Russia held the north shore of the Black Sea and was in a position to threaten the existence of the Ottoman Empire and to establish a foothold in the Mediterranean. Catherine also sought to renew the alliance with Austria, Turkey's neighbour and enemy, and renounced the alliance with Prussia and England, who were alarmed by Russian ambitions. Yet, during Catherine's reign, the country did not become involved in a European war, because the Empress scrupulously adhered to the territorial agreements she had concluded with several western European nations.

Catherine's glorification reached its climax in a voyage to the Crimea arranged by Potemkin in 1787. In a festive Arabian Nights atmosphere, the Empress crossed the country to take possession of her new provinces; the Emperor of Austria, the King of Poland, and innumerable diplomats came to honour her and to enjoy the splendours of what became known as "Cleopatra's fleet," because Catherine and her court travelled partly by water. She dedicated new towns bearing her name and announced that she ultimately intended to proceed to Constantinople.

Effects of the French Revolution. Catherine, like all the crowned heads of Europe, felt seriously threatened by the French Revolution. The divine right of royalty and the aristocracy was being questioned, and Catherine, although a "friend of the Enlightenment," had no intention of relinquishing her own privileges: "I am an aristocrat, it is my profession." In 1790 the writer A.N. Radishchev, who attempted to publish a work openly critical of the abuses of serfdom, was tried, condemned to death, then pardoned and exiled. Ironically, the sentiments Radishchev expressed were very sim-

ilar to Catherine's Instruction of 1767. Next, Poland, encouraged by the example of France, began agitating for a liberal constitution. In 1792, under the pretext of forestalling the threat of revolution, Catherine sent in troops and the next year annexed most of the western Ukraine, while Prussia helped itself to large territories of western Poland. After the national uprising led by Tadeusz Kościuszko in 1794, Catherine wiped Poland off the map of Europe by dividing it between Russia, Prussia, and Austria in 1795.

Catherine's last years were darkened by the execution of Louis XVI, the advance of the revolutionary armies, and the spread of radical ideas. The Empress realized, moreover, that she had no suitable successor. She considered her son Paul an incompetent and unbalanced man; her grandson Alexander was too young yet to rule.

Assessment. Russians, even Soviet Russians, continue to admire Catherine, the German, the usurper and profligate, and regard her as a source of national pride. Non-Russian opinion of Catherine is less favourable. Because Russia under her rule grew strong enough to threaten the other great powers, and because she was in fact a harsh and unscrupulous ruler, she figured in the Western imagination as the incarnation of the immense, backward, yet forbidding country she ruled. One of Catherine's principal glories is to have been a woman who, just as Elizabeth I of England and Queen Victoria gave their names to periods of history, became synonymous with a decisive epoch in the development of her country.

At the end of Catherine's reign, Russia had expanded westward and southward over an area of more than 200,000 square miles, and the Russian rulers' ancient dream of access to the Bosporus Strait (connecting the Black Sea with the Aegean) had become an attainable goal. At the end of her reign Catherine claimed that she had reorganized 29 provinces under her administrative reform plan. An uninhibited spender, she invested funds in many projects. More than a hundred new towns were built; old ones were expanded and renovated. As commodities were plentiful, trade expanded and communications developed. These achievements, together with the glory of military victories and the fame of a brilliant court, to which the greatest minds of Europe were drawn, have won her a distinguished place in history.

Catherine's critics acknowledge her energy and administrative ability but point out that the achievements of her reign were as much due to her associates and to the unaided, historical development of Russian society as to the merits of the Empress. And when they judge Catherine the woman, they treat her severely.

Her private life was admittedly not exemplary. She had young lovers up to the time of her unexpected death from a stroke at the age of 67. After the end of her liaison with Potemkin, who perhaps was her morganatic husband, the official favourite changed at least a dozen times; she chose handsome and insignificant young men, who were only, as one of them himself said, "kept girls." Although in reality devoted to power above all else, she dreamed endlessly of the joys of a shared love, but her position isolated her. She did not love her son Paul, the legitimate heir, whose throne she occupied. On the other hand, she adored her grandsons, particularly the eldest, Alexander, whom she wished to succeed her. In her friendships she was loyal and generous and usually showed mercy toward her enemies.

Yet it cannot be denied that she was also egotistical, pretentious, and extremely domineering, above all a woman of action, capable of being ruthless when her own interest or that of the state was at stake. As she grew older she also became extremely vain: there was some excuse, as the most distinguished minds of Europe heaped flatteries on her that even she ultimately found exaggerated.

A friend of Voltaire and Diderot, she carried on an extensive correspondence with most of the important personages of her time. She was a patron of literature and a promoter of Russian culture; she herself wrote, established literary reviews, encouraged the sciences, and founded schools. Her interests and enthusiasms ranged from construction projects to lawmaking and the collection of art objects; she touched on everything, not always happily but always passionately. She was a woman of elemental energy and intellectual curiosity, desiring to create as well as to control.

(Z.O.)

BIBLIOGRAPHY. *Primary sources. Mémoires de Catherine II,* ed. by Dominique Maroger (1953; Eng. trans. 1955), is of great importance for the history of Catherine's beginnings and for an analysis of her character. This edition is not complete, but it constitutes a choice made among the various versions of the autobiography begun by Catherine; all versions stop very near to the date of her accession to power. Equally important are the *Correspondance* of Catherine II with Voltaire (published in various editions of the complete works of Voltaire, as well as in the Evdokimov edition of the complete works of Catherine II, 1893); the *Correspondance avec le Baron F.M. Grimm (1774–1796),* Grot edition (1878), is interesting for its autobiographical character; Grimm was Catherine's confidant. See also *Lettres d'amour de Catherine II à Potemkine,* Georges Oudard edition (1934), which unfortunately is edited without chronological order.

Works about Catherine II and her reign. V.A. Bilbassov, *Geschichte Katharina II,* 3 vol. (1891–93; also published in French as *Histoire de Catherine II,* 1900), is the most important work written about Catherine II, with quotations from many documents of the period; the last volume was banned in Russia under the tsarist regime. Ian Grey, *Catherine the Great: Autocrat and Empress of All Russia* (1961), a remarkable work, is a penetrating analysis of Catherine's character and notably of her relationships with Potemkin. Olga Wormser, *Catherine II* (1957; in French), is particularly interesting for its analysis of the social and cultural situation in Russia. Z. Oldenbourg, *Catherine de Russie* (1964; in French), is a work devoted primarily to the first half of Catherine's life.

Catherine, SAINT, also called SAINT CATHERINE DEI RICCI, original name ALESSANDRA DEI RICCI (b. April 23, 1522, Florence—d. Feb. 2, 1590, Prato, Rep. of Florence; canonized 1746; feast day February 13), Italian Dominican mystic. At the age of 13 she entered the Dominican convent at Prato, becoming prioress from 1560 to 1590. Famous for her visions of the Passion and her stigmatization, she was the author of letters (ed. by Fr. Sisto of Pisa, 1912) and other minor works.

Articles are alphabetized word by word, not letter by letter

Catherine DE MÉDICIS, Italian CATERINA DE' MEDICI (b. April 13, 1519, Florence—d. Jan. 5, 1589, Blois, Fr.), queen consort of Henry II of France (reigned 1547–59) and subsequently regent of France (1560–74), who was one of the most influential personalities of the Catholic–Huguenot wars. Three of her sons were kings of France: Francis II, Charles IX, and Henry III.

Early life. Catherine was the daughter of Lorenzo de' Medici, duke of Urbino, and Madeleine de La Tour d'Auvergne, a Bourbon princess related to many of the French nobility. Orphaned within days, Catherine was highly educated, trained, and disciplined by nuns in Florence and Rome and married in 1533 by her uncle, Pope Clement VII, to Henry, duc d'Orléans, who inherited the French crown from his father, Francis I, in April 1547. Artistic, energetic, and extroverted, as well as discreet, courageous, and gay, Catherine was greatly esteemed at the dazzling court of Francis I, from which she derived both her political attitudes and her passion for building. Of the chateaus she designed herself—including the Tuileries—Chenonceaux was her unfinished masterpiece.

Catherine de Médicis, portrait by an unknown artist, 1561; in the Bibliothèque Nationale, Paris

Giraudon—Art Resource/EB Inc.

In spite of Henry's abiding attachment to his mistress Diane de Poitiers, Catherine's marriage was not unsuccessful and, after 10 anxious years, she bore him 10 children, of whom 4 boys and 3 girls survived. She herself supervised their education. Thus occupied, Catherine lived privately though she was appointed regent in 1552 during Henry's absence at the siege of Metz. Her ability and eloquence were acclaimed after the Spanish victory of Saint-Quentin in Picardy in 1557, possibly the origin of her perpetual fear of Spain, which remained, through changing circumstances, the touchstone of her judgments. It is essential to understand this in order to discern the coherence of her career.

Political crises. Catherine's first great political crisis came in July 1559 upon the accidental death of Henry II, a traumatic bereavement from which it is doubtful that she ever recovered. Under her son, Francis II, power was retained by the Guise brothers. Thus began her lifelong struggle—explicit in her correspondence—with these extremists who, supported by Spain and the papacy, sought to dominate the crown and extinguish its independence in the commingled interests of European Catholicism and personal aggrandizement. It is also necessary to understand this political struggle of the Catholic crown with its own ultramontane extremists and to perceive its fluctuations in changing circumstances, in order to realize the fundamental consistency of Catherine's career. Her essentially moderate influence was first perceptible during the Conspiracy of Amboise (March 1560), an instance of tumultuous petitioning by the Huguenot gentry, primarily against Guisard persecution in the name of the King. Her merciful Edict of Amboise (March 1560) was followed in May by that of Romorantin, which distinguished heresy from sedition, thereby detaching faith from allegiance.

Catherine's second great political crisis came with the premature death on Dec. 5, 1560, of Francis II, whose royal authority the Guises had monopolized. Catherine succeeded in obtaining the regency for Charles IX, with Antoine de Bourbon, king of Navarre and first prince of the blood, as lieutenant general, to whom the Protestants vainly looked for leadership.

Civil wars. The 10 years from 1560 to 1570 were, politically, the most important of

Catherine's life. They witnessed the first three civil wars and her desperate struggle against the Catholic extremists for the independence of the crown, the maintenance of peace, and the enforcement of limited toleration. In 1561, with the support of the distinguished chancellor Michel de L'Hospital, she began by trying to propitiate the leaders of both religious factions, to effect reforms and economies by unassailably traditional methods, and to settle the religious conflict. Religious reconciliation was the conveners' purpose of the Colloquy of Poissy (September–November 1561). Catherine appointed a mixed commission of moderates that devised two formulas of consummate ambiguity, by which they hoped to resolve the basic, Eucharist controversy. Possibly Catherine's most concrete achievement was the Edict of January 1562, which followed the failure of reconciliation. This afforded the Calvinists licensed coexistence with specific safeguards. Unlike the proposals of Poissy, the edict was law, which the Protestants accepted and the Catholics rejected. This rejection was one basic element in the outbreak of civil war in 1562, in which—as she had predicted—Catherine fell, politically, into the clutches of the extremists, because the Catholic crown might protect its Protestant subjects in law but could not defend them in arms. Thenceforth the problem of religion was one of power, public order, and administration.

Catherine ended the first civil war in March 1563 by the Edict of Amboise, an attenuated version of the Edict of January. In August 1563 she declared the King of age in the Parlement of Rouen and, from April 1564 to January 1566, conducted him on a marathon itinerary round France. Its principal purpose was to execute the edict and, through a meeting at Bayonne in June 1565, to seek to strengthen peaceful relations between the crown and Spain and to negotiate for Charles's marriage to Elizabeth of Austria. During the period 1564–68, Catherine was unable, for complex reasons, to withstand the cardinal Lorraine, statesman of the Guises, who largely provoked the second and third civil wars. She quickly terminated the second (September 1567–March 1568) with the Peace of Longjumeau, a renewal of Amboise. But she was unable to avert its revocation (August 1568), which heralded the third civil war. She was not primarily responsible for the more far-reaching Treaty of Saint-Germain (August 1570), but she succeeded in disgracing the Guises.

For the next two years Catherine's policy was one of peace and general reconciliation. This she envisaged in terms of the marriage of her daughter Marguerite to the young Protestant leader, Henry of Navarre (later Henry IV of France), and alliance with England through the marriage of her son Henry, duc d'Anjou, or, failing him, his younger brother François, duc d'Alençon, to Queen Elizabeth. The complexity of Catherine's position during these years cannot be briefly explained. To some extent she was eclipsed by Louis of Nassau and a group of Flemish exiles and youthful Protestants who surrounded the King and urged him to make war upon Spain in the Netherlands, which Catherine inevitably resisted.

The Massacre of St. Bartholomew's Day. The issue of war or peace in the Netherlands was closely linked with the Massacre of St. Bartholomew's Day in Paris on Aug. 23–24, 1572. Upon this occasion, following an abortive attempt against the life of the admiral Gaspard de Coligny, he and a number of his principal lieutenants, together with several thousand Huguenots, were killed. Catherine traditionally has been blamed for these events, which have therefore fashioned the interpretation not only of her subsequent, but frequently also of her previous, career, resulting in the familiar myth of the wicked Italian queen. There are two principal reasons for this. First, after some hesitation and inconsistency, the King assumed the responsibility by a declaration of August 26 in the Parlement of Paris, and "the crown" has been taken to mean Catherine. The second reason for the traditional inculpation of Catherine is the work of the pamphleteers and the polemical nature of the historiography of the event. It is impossible to establish the origin of the assault upon Coligny, but, as a member of the court—the royal family and the council—Catherine was among those who appear to have authorized not the massacre itself but the death of the admiral and his principal followers. This and the subsequent royal declaration of August 26 are both explained by the danger of the situation—after the unsuccessful assault upon Coligny—in which the infuriated Huguenots allegedly threatened the court with extinction and the kingdom with war.

Last years. After the Massacre of St. Bartholomew's Day, Catherine was more concerned with the election of Anjou to the throne of Poland (May 1573) than the prosecution of the fourth civil war. Upon the death of Charles IX a year later, she assumed the regency with the support of the Parlement until the return from Poland of Henry III in August. Catherine placed high hopes in her favourite, Henry, for the regeneration of France, for which she longed, but not without simultaneous misgivings, knowing his weakness of character and his previous subjection to the Catholics. For these reasons Catherine neither sought to dominate Henry nor to rule in his place but rather suffered him to exploit her and strove with unremitting pains to supply his deficiencies. Until the death of Alençon in 1584, much of her attention was devoted to restraining his dangerous ambitions, which again threatened to involve France in hostilities with Spain. After the Treaty of Joinville (December 1584) between the Guises and Spain, at Henry's bidding, Catherine, though gravely ill, returned to this dual threat. But after three months of continuous effort, in order to avert a public breach between the crown and the Guises, she was obliged, by the Treaty of Nemours (July 1585), to commit the King to making war against the Huguenots. Having failed with the Guises, the crown turned to Navarre, the Protestant leader who, as heir presumptive, had an interest in the preservation of the throne. In July 1586 Catherine undertook the arduous journey to see him at Saint-Brice near Cognac. But there was nothing to which Navarre could safely commit himself. Thus, despite the heroic efforts of Catherine's old age, France was sinking into chaos when she died at Blois eight months before the murder of Henry III. Nevertheless, her ultimate achievement was to have saved the kingdom just long enough to ensure the succession of the Bourbon Henry IV, by whom the royal authority was restored. (N.M.Su.)

BIBLIOGRAPHY. H. de la Ferriere and Baguenault de Puchesse, *Lettres de Catherine de Médicis,* 10 vol. (1880–1909), with valuable introductions; Lucien Romier, *Le Royaume de Catherine de Médicis,* 2nd ed., 2 vol. (1922), for background analysis; N.M. Sutherland, *The Massacre of St. Bartholomew and the European Conflict 1559–1572* (1972), distinguishes the role of Catherine from that of the King and the Cardinal of Lorraine; Paul Van Dyke, *Catherine de Médicis,* 2 vol. (1922), an old-fashioned account of Catherine's life and times.

Catherine HOWARD (d. Feb. 13, 1542, London), fifth wife of King Henry VIII of England. Her downfall came when Henry learned of her premarital affairs.

Catherine was one of 10 children of Lord Edmund Howard (died 1539), a poverty-stricken younger son of Thomas Howard, 2nd duke of Norfolk. Henry VIII first became attracted to the young girl in 1540, when he was seeking to end his politically motivated marriage to Anne of Cleves, to whom Catherine was a maid of honour. He had his marriage to Anne annulled on July 9, and on July 28 Henry and Catherine were privately married. He publicly acknowledged her as queen on August 8.

For the next 14 months Henry appeared to be much enamoured of his bride. But in November 1541, he learned that before their marriage Catherine had had affairs: Henry Mannock, a music teacher; Francis Dereham, who had called her his wife; and her cousin, Thomas Culpepper, to whom she had been engaged. After her marriage to Henry, Catherine had made Dereham her secretary, and it is probable—though still unproved—that she had committed adultery with Culpepper.

The King, initially incredulous, became incensed with these revelations. On Feb. 11, 1542, Parliament passed a bill of attainder declaring it treason for an unchaste woman to marry the king. Two days later Catherine was beheaded in the Tower of London. Her life is recounted in Lacey Baldwin Smith's *A Tudor Tragedy* (1961).

Catherine OF ALEXANDRIA, SAINT (d. *c.* early 4th century, Alexandria, Egypt; feast day November 25), one of the most popular early Christian martyrs. She is not mentioned before the 9th century, and her historicity is doubtful. According to the legend, she was an extremely learned young girl of noble birth who protested the persecution of Christians under the Roman emperor Maxentius—whose wife and several soldiers she converted—and defeated the most eminent scholars summoned by Maxentius to oppose her. The spiked wheel (whence the term catherine wheel) by which she was sentenced to be killed broke, and she was then beheaded.

St. Catherine of Alexandria, detail from "The Mystic Marriage of St. Catherine," by Filippino Lippi; in the Church of S. Domenico, Bologna, Italy

Alinari—Art Resource/EB Inc.

After her death angels allegedly took her body to Mt. Sinai, where it was discovered *c.* 800. In the Middle Ages, when the story of her mystical marriage to Christ was widely circulated, she was one of the most popular saints. She is the patron of philosophers and scholars. St. Joan of Arc claimed that Catherine's was among the heavenly voices that spoke to her. In 1969 her feast day was removed from the church calendar.

Catherine OF ARAGON (b. Dec. 16, 1485, Alcalá de Henares, Spain—d. Jan. 7, 1536, Kimbolton, Huntingdon, Eng.), first wife of King Henry VIII of England (reigned 1509–47). The refusal of Pope Clement VII to annul Henry's marriage to Catherine triggered the break between Henry and Rome and led to the English Reformation.

Catherine was the youngest daughter of the Spanish rulers Ferdinand II of Aragon and Isabella I of Castile. In 1501 she married Prince Arthur, eldest son of King Henry VII of England. Arthur died the following year, and

shortly afterward she was betrothed to Prince Henry, the second son of Henry VII. But subsequent rivalry between England and Spain and Ferdinand's refusal to pay the full dowry prevented the marriage from taking place until her fiancé assumed the throne as Henry VIII in 1509. For some years the couple lived happily. Catherine matched the breadth of her husband's intellectual interests, and she was a competent regent while he was campaigning against the French (1512–14).

Catherine of Aragon, detail of an oil painting by an unknown artist; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Between 1510 and 1518 Catherine gave birth to six children, including two sons, but all except Mary (later queen of England, 1553–58) either were stillborn or died in early infancy. Henry's desire for a legitimate male heir prompted him in 1527 to appeal to Rome for an annulment on the grounds that the marriage had violated the biblical prohibition against a union between a man and his brother's widow. Catherine appealed to Pope Clement VII, contending that her marriage to Henry was valid because the previous marriage to Arthur had never been consummated.

For seven years the Pope avoided issuing the annulment because he could not alienate Catherine's nephew, the Holy Roman emperor Charles V. Finally Henry separated from Catherine in July 1531. On May 23, 1533—five months after he married Anne Boleyn—he had his own archbishop of Canterbury, Thomas Cranmer, annul the marriage to Catherine. Parliament passed the Act of Supremacy repudiating all papal jurisdiction in England and making the king head of the English church. Although Catherine had always been loved by the English people, Henry forced her to spend her last years isolated from all public life. Garrett Mattingly's *Catherine of Aragon* (1942) is the standard biography.

Catherine OF BOLOGNA, SAINT, original name CATERINA VIGRI (b. Sept. 8, 1413, Bologna, Papal States—d. March 9, 1463, Bologna; canonized 1712; feast day March 9), Italian mystic and writer whose spiritual writings were popular in Italy until the end of the 18th century.

Of noble birth, Catherine was educated at the Este court at Ferrara and entered the order in 1432. In 1456 she founded in Bologna a convent of Poor Clares, serving as abbess until her death. Throughout her life Catherine claimed to have visions and revelations. Her chief work is considered to be *Le sette arme necessarie alla battaglia spirituale* (composed in 1438; Eng. trans. by A.G. McDougall, *The Spiritual Armour,* 1926).

Catherine OF BRAGANZA (b. Nov. 25, 1638, Vila Viçosa, Port.—d. Dec. 31, 1705, Lisbon), Portuguese Roman Catholic wife of King Charles II of England (ruled 1660–85). A pawn in diplomatic dealings and anti-papal intrigues, she was married to Charles as part of an important alliance between England and Portugal.

Catherine's father became King John IV of Portugal in 1640. Her marriage, which took place in May 1662, brought England valuable trading privileges and the port cities of Tangier (in Morocco) and Bombay. In return, England pledged to help Portugal maintain its independence from Spain.

The young queen had little personal charm, and, despite her deep affection for Charles, he paid less attention to her than to his mistresses. When it became apparent that she would bear the King no children, opponents of his brother, James, duke of York, urged him to divorce her in the hope that Charles could then be induced to wed a Protestant. In 1678 they accused Catherine of scheming to poison the King and place his Roman Catholic brother James on the throne. But Charles, who never doubted his wife's innocence, stood by her until she was cleared of the charges. Catherine helped convert Charles to the Roman Catholic Church shortly before he died in 1685, and in 1692 she returned to Portugal. In 1704 she became regent of Portugal for her ailing brother, King Pedro II.

Catherine OF GENOA, SAINT, original name CATERINA FIESCHI (b. 1447, Genoa—d. Sept. 15, 1510; canonized 1737; feast day September 15), Italian mystic admired for her work among the sick and the poor.

Catherine was born into a distinguished family and received a careful education. Her early aspirations to become a nun were frustrated by an arranged marriage to Giuliano Adorno. After several years of unhappiness she led a life of pleasure for a time but was converted by a mystical experience in 1473, which marked the beginning of her life of close union with God. This she combined with assiduous service to the sick in a hospital at Genoa, in which her husband joined her after he, too, had been converted.

St. Catherine's two works, the *Trattato del Purgatorio* and the *Dialogo,* are the outcome of her mystical life. Her authorship of these has been denied, but according to Umile Bonzi a large part of both works is her own, though they received their final form only after her death. They were first printed, together with her biography, in 1551.

Catherine OF SIENA, SAINT, original name CATERINA BENINCASA (b. March 25, 1347, Siena, Tuscany—d. April 29, 1380, Rome; canonized 1461; feast day April 29), Dominican tertiary, mystic, and patron saint of Italy who played a major role in returning the papacy from Avignon to Rome (1377). She was declared a doctor of the church in 1970.

Catherine became a tertiary (a member of a monastic third order who takes simple vows and may remain outside a convent or monastery) of the Dominican order (1363), joining the Sisters of Penitence of St. Dominic in Siena. She rapidly gained a wide reputation for her holiness and her severe asceticism. When the rebellious city of Florence was placed under an interdict by Pope Gregory XI (1376), Catherine determined to take public action for peace within the church and Italy and to encourage a crusade against the Muslims. She went as an unofficial mediator to Avignon with her confessor and biographer Raymond of Capua. Her mission failed, and she was virtually ignored by the Pope, but while at Avignon she promoted her plans for a crusade.

It became clear to her that the return of Pope Gregory XI to Rome—an idea that she did not initiate and had not strongly encouraged—was the only way to bring peace to Italy and thus facilitate a crusade. Catherine left for Tuscany the day after Gregory set out for Rome (1376). At his request she went to Florence (1378) and was there during the Ciompi Revolt in June. After a short final stay in Siena, during which she completed her *Dialogo* (begun the previous year), she went to Rome in November, probably at the invitation of Pope Urban VI, whom she helped in reorganizing the church. From Rome she sent out letters and exhortations to gain support for Urban; as one of her last efforts she tried to win back Queen Joan I of Naples to obedience to Urban, who had excommunicated the Queen for supporting the antipope Clement VII.

Catherine's writings, all of which were dictated, include about 380 letters, 26 prayers, and the four treatises of *Il libro della divina dottrina* ("The Dialogue of Saint Catherine"), better known as the *Dialogo* (*c.* 1475; Eng. trans. by A.L. Thorold, 1925). The record of her ecstatic experiences in the *Dialogo* illustrates her doctrine of the "inner cell" of the knowledge of God and of self into which she withdrew. A complete edition of Catherine's works together with her biography by Raymond was published in Siena (1707–21). Alice Curtayne's *Saint Catherine of Siena* appeared in 1929.

Catherine OF SWEDEN, SAINT, Swedish SANKTA KATARINA, original name KATARINA ULFSDOTTER (b. 1331/32, Sweden—d. March 24, 1381, Vadstena; feast day March 24), daughter of St. Bridget of Sweden, whom she succeeded as superior of the Brigittines.

Catherine was married to Egard Lydersson von Kyren, who died shortly after she left for Rome (1350) to join Bridget as her constant companion. She did not return to Sweden until after Bridget's death in 1373. She took part in the ecclesiastical controversies of her time, supported Pope Urban VI against the antipope Clement VII, and promoted the canonization of Bridget. She was abbess of Vadstena when she died. She was never formally canonized but is listed in the Roman martyrology.

Catherine PARR (b. 1512—d. Sept. 7, 1548), sixth and last wife of King Henry VIII of England (ruled 1509–47).

She was a daughter of Sir Thomas Parr of Kendall, an official of the royal household. Catherine had been widowed twice—in marriages to Edward Borough (died *c.* 1529) and to John Neville, Lord Latimer (died 1542 or 1543)—by the time she married Henry on July 12, 1543.

Catherine Parr, detail of a portrait panel attributed to W. Scrots, *c.* 1545; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Her tactfulness enabled her to exert a beneficial influence on the King during the last years of his reign. She developed close friendships with the three children Henry had by previous marriages and devoted herself to their education. A Humanist, she was friendly with Protestant reformers. Timely access to the King saved her from conservatives, especially Stephen Gardiner, who were bent on her destruction in 1546.

After Henry's death in January 1547 she married a former suitor, Thomas, Lord Seymour of Sudeley, who was admiral of England from 1547 to 1549, but she died shortly after giv-

ing birth to a daughter. A learned and deeply religious woman, she wrote *A Lamentacion or Complaynt of a Sinner* in the last year of her life.

Catherine THE GREAT: *see* Catherine II.

Catherine the Great, Instruction of, Russian NAKAZ YEKATERINY VELIKOY (Aug. 10 [July 30, old style], 1767), in Russian history, document prepared by Empress Catherine II that recommended liberal, humanitarian political theories for use as the basis of government reform and the formulation of a new legal code. The Instruction was written as a guide for a legislative commission that was intended to consider internal reforms and to devise a new code of laws.

The Instruction generally favoured the creation of a society of free individuals acting in accordance with the law. It maintained that all men should be considered equal before the law; that law should protect the populace, not oppress it; and that law should forbid only acts directly harmful to an individual or the community, leaving the people free to do anything not forbidden. It disapproved of capital punishment, torture, and the perpetuation of serfdom. But it also upheld the principle of absolutism in government, insisting that all political power was derived from the autocrat, who was subject to no law.

The Instruction had little impact within Russia. When the legislative commission adjourned (December 1768), it had neither prepared a legal code nor agreed upon measures for restructuring the government; and Catherine made no further efforts to create legislation to implement her principles. The Instruction did serve, however, as a major stimulus to Russian political thought.

cathode, negative terminal or electrode through which electrons enter a direct current load, such as an electrolytic cell or an electron tube, and the positive terminal of a battery or other source of electrical energy through which they return. This terminal corresponds in electrochemistry to the terminal at which reduction occurs. Within a gas discharge tube, electrons travel away from the cathode, but positive ions (current carriers) travel toward the cathode. *Compare* anode.

cathode ray, stream of electrons leaving the negative electrode (cathode) in a discharge tube containing a gas at low pressure, or electrons emitted by a heated filament in certain electron tubes. Cathode rays focused on a hard target (anticathode) produce X rays or focused on a small object in a vacuum generate very high temperatures (cathode-ray furnace). Cathode rays cause phosphors to luminesce. This effect, when coupled with the controlled deflection of a cathode ray by electric or magnetic fields, gives rise to the cathode-ray oscilloscope (cathode-ray tube) for monitoring variations and values of an alternating voltage or current and to the picture tube of television and radar. Electrons emitted by radioactive nuclei are known as β-rays.

cathode-ray oscilloscope, electronic display device containing a cathode-ray tube (CRT), used to produce visible patterns that are the graphical representations of electrical signals. The graphs plot the relationships between two or more variables, with the horizontal axis normally being a function of time and the vertical axis usually a function of the voltage generated by the input signal to the oscilloscope. Because almost any physical phenomenon can be converted into a corresponding electric voltage, the oscilloscope is a versatile tool in all forms of physical investigation.

Speed of response is the cathode-ray oscilloscope's chief advantage over other plotting devices. General-purpose oscilloscopes have plotting frequencies of up to 100 megahertz (mHz). Response times as rapid as 2,000 mHz are achievable with special-purpose, high-speed oscilloscopes.

The central component in this device, the cathode-ray tube, consists of an evacuated glass container with a phosphorescent coating at one end (similar to that of a television screen) and an electron gun and system for focusing and deflecting the beam of electrons at the other. The electron beam emerging from the electron gun passes between pairs of metal plates mounted in such a way that they deflect the beam horizontally and vertically to control the production of a luminous pattern on the screen. The screen image is a visual representation of the voltages applied to the deflection plates. Alternatively, the beam may be deflected magnetically by varying the currents through externally mounted deflection coils. Thus, almost any graph can be plotted on the screen by generating horizontal and vertical deflection voltages or currents proportional to the lengths, velocities, or other quantities being observed.

It is sometimes necessary or desirable to plot more than one waveform at the same time on the screen of an oscilloscope. Using a variety of techniques, four or more plots can be simultaneously shown. With a dual-trace amplifier and a single CRT gun, two signals may be shown at what appears to be the same time. Actually, the amplifier electronically switches rapidly between the two observed signals. In a split-beam CRT the electron beam from a single gun is split, with the two parts receiving different vertical deflections. A dual-gun CRT uses two separate electron guns, each having its own focus and brightness controls. By combining two dual-trace amplifiers with a dual-gun CRT, four individual plots can be obtained.

The cathode-ray oscilloscope is one of the most widely used test instruments; its commercial, engineering, and scientific applications include acoustic research, television-production engineering, and electronics design.

catholic (from Greek *katholikos,* "universal"), the characteristic that, according to ecclesiastical writers since the 2nd century, distinguished the Christian Church at large from local communities or from heretical and schismatic sects. A notable exposition of the term as it had developed during the first three centuries of Christianity was given by St. Cyril of Jerusalem in his *Catecheses* (348): the church is called catholic on the ground of its world-wide extension, its doctrinal completeness, its adaptation to the needs of men of every kind, and its moral and spiritual perfection.

The theory that what has been universally taught or practiced is true was first fully developed by St. Augustine in his controversy with the Donatists (a North African heretical Christian sect) concerning the nature of the church and its ministry. It received classic expression in a paragraph by St. Vincent of Lérins in his *Commonitoria* (434), from which is derived the formula: "What all men have at all times and everywhere believed must be regarded as true." St. Vincent maintained that the true faith was that which the church professed throughout the world in agreement with antiquity and the consensus of distinguished theological opinion in former generations. Thus, the term catholic tended to acquire the sense of orthodox.

Some confusion in the use of the term has been inevitable, because various groups that have been condemned by the Roman Catholic Church as heretical or schismatic never retreated from their own claim to catholicity. Not only the Roman Catholic Church but also the Eastern Orthodox Church, the Anglican Church, and a variety of national and other churches claim to be members of the holy catholic church, as do most of the major Protestant churches.

Catholic Action, the organized work of the laity that is performed under the direction or mandate of a bishop in the fields of dogma, morals, liturgy, education, and charity. In 1927 Pope Pius XI gave the term its classical definition as "the participation of the laity in the apostolate of the hierarchy."

A distinction is normally made between general and specialized Catholic Action. General Catholic Action organizations, such as the Holy Name Society or the Legion of Mary, are open to all Roman Catholics, or at least all of a given age. Specialized Catholic Action groups are limited to members of a given profession or interest group, such as workers, students, doctors, lawyers, or married couples. The most famous of the specialized groups is the Jocists (Jeunesse Ouvrière Chrétienne; in English-speaking nations called the Young Christian Workers), founded in Belgium after World War I as an organized association of factory workers by Father (later Cardinal) Joseph Cardijn.

Besides Catholic Action in the strict sense, in which it is conceived as an extension of the hierarchy, there is the broader notion of the lay apostolate, which involves the more autonomous activity of the laity in the temporal society to bring a Christian influence to their environment. It is this latter notion, which gives greater recognition to the responsibility of the laity, that has been emphasized since the second Vatican Council (1962–65).

Catholic Emancipation, in British history, the freedom from discrimination and civil disabilities granted to the Roman Catholics of Britain and Ireland in a series of laws during the late 18th and early 19th centuries. After the Reformation, Roman Catholics in Britain had been harassed by numerous restrictions. In Britain, Roman Catholics could not purchase land, hold civil or military offices or seats in Parliament, inherit property, or practice their religion freely without incurring civil penalties. A Roman Catholic in Ireland could not vote in Parliamentary elections and could be readily dispossessed of his land by his nearest Protestant relative.

By the late 18th century, however, Roman Catholics had ceased to be considered the social and political danger that they had represented at the beginning of the Hanoverian succession. The first Relief Act (1778) enabled Roman Catholics in Britain to acquire real property, such as land. Similar legislation was enacted in Ireland in a series of measures (1774, 1778, and 1782). In 1791 another bill was passed that enabled British Catholics to practice their religion without fear of civil penalties, a measure applied on a much wider scale by the Irish Parliament with the Relief Act of 1793, which granted Irish Roman Catholics the franchise and admission to most civil offices.

Further emancipatory measures following the Act of Union (1801), which united Great Britain with Ireland, foundered in the face of resistance from the bitterly anti-Catholic George III and from powerful Irish Protestants and British Tories who feared Roman Catholic participation in Britain's public life. In the next two decades, however, the charismatic Irish lawyer and orator Daniel O'Connell began to mobilize the Irish Roman Catholic peasantry and middle class to agitate for full emancipation. He formed the Catholic Association to this end in 1823, bringing into its ranks hundreds of thousands of members in Ireland. By 1828 the British government was faced with the threat of a nationwide rebellion in Ireland if action was not taken to conciliate this broad-based and energetic movement intent on the alleviation of Catholic grievances. O'Connell himself forced the issue when he

entered a Parliamentary by-election in County Clare in 1828, insisting that he would not take his seat until the anti-Roman Catholic oath required of members of Parliament was abolished. O'Connell's ensuing triumphant election compelled the British prime minister, the Duke of Wellington, and Sir Robert Peel to carry the Emancipation Act of 1829 in Parliament. This act admitted Irish and English Roman Catholics to Parliament and to all but a handful of public offices. With the Universities Tests Act of 1871, which opened the universities to Roman Catholics, Catholic Emancipation in the United Kingdom was virtually complete.

Catholic League, German KATHOLISCHE LIGA, a military alliance (1609–35) of the Catholic powers of Germany led by Maximilian I, duke of Bavaria, and designed to stem the growth of Protestantism in Germany. In alliance with the Habsburg emperors, the League's forces, led by Johann Tserclaes, Graf von Tilly, played a key role in the Thirty Years' War.

Plans for a league had long been discussed, but the formation of the Protestant Union in 1608 caused the Catholics to unite under Maximilian. The original League members on July 10, 1609, included Bavaria; the prince-bishops of Bavaria, Franconia, and Swabia; and the Rhenish ecclesiastical electors of Mainz, Trier, and Cologne. Maximilian reorganized the League in 1617, excluding the Rhenish members and making the League an exclusively southern German confederation.

When the Protestant elector Frederick V of the Palatinate accepted the Bohemian crown in 1619, the Holy Roman emperor Ferdinand II looked to the League for military support. Through negotiations in 1620, Maximilian undermined the Protestant Union's support of Frederick. In November 1620, the League's forces under Tilly crushed Frederick at the Battle of White Mountain near Prague. Tilly's troops then ravaged the Palatinate and other Protestant lands to the north; won several battles over King Christian IV of Denmark, who had come to the Protestants' defense; and helped carry out Catholic restitutions in conquered Protestant territories. The importance of the League began to decline after 1626, when the Emperor found his own general in Albrecht von Wallenstein. Tilly's defeat by Gustav II Adolf of Sweden at Breitenfeld in 1631, followed by his death the following year, accelerated the League's decline. It was abolished in 1635 by the Peace of Prague, which forbade military confederations in the Empire.

Catholic Monarchs, also called CATHOLIC KINGS, or CATHOLIC MAJESTIES, Spanish REYES CATÓLICOS, Ferdinand II of Aragon and Isabella I of Castile, whose marriage (1469) led to the unification of Spain, of which they were the first monarchs. Although employed earlier, the appellation *Católicos* was formally conferred on them in a bull published by Pope Alexander VI in 1494, in recognition of their reconquest of Granada from the Moors (1481–92), their New World discoveries (1492), and their strengthening of the church by such agencies as the Spanish Inquisition and such measures as compelling Jews to convert to Christianity or face exile (1492). The title of *Católicos* was afterward transmitted to the successors of Ferdinand and Isabella.

Catholic Reformation (church history): *see* Counter-Reformation.

Catholicism: *see* Roman Catholicism.

catholicos, Greek KATHOLIKOS ("universal" bishop), in Eastern Christian Churches, title of certain ecclesiastical superiors. In earlier times the designation had occasionally been used, like archimandrite and exarch, for a superior abbot; but the title eventually came to denote a bishop who, while head of a major church, was still in some way dependent on his patriarch. The titles catholicos and patriarch later became synonymous and were both applied to the heads of the Armenian, Nestorian (Assyrian), and Georgian churches. In the Armenian Church there are two catholicoi: the supreme catholicos of Echmiadzin and the catholicos of Sis. The title catholicos patriarch is also used by the primates of the Armenian Catholic Church and the Chaldean Church.

Catiline, Latin in full LUCIUS SERGIUS CATILINA (b. *c.* 108 BC—d. 62 BC, Pistoria, Etruria), in the late Roman Republic, an aristocrat who turned demagogue and made an unsuccessful attempt to overthrow the republic while Cicero was a consul (63).

Catiline served under Pompey's father in the Social War of 89 and acquired an unsavoury reputation as a zealous participant in Sulla's proscriptions, killing his own brother-in-law during them. He was acquitted of charges of fornication with a Vestal Virgin in 73 and afterward became praetor in 68 and governor of the province of Africa in 67–66. Because Catiline was then under prosecution for extortion, a charge of which he was eventually acquitted, he could not stand for the consular elections of 65 or 64. Later there was talk that he had planned to murder the consuls and seize power early in 65, but there is no solid evidence for this "first Catilinarian conspiracy." In 64 Catiline failed to be elected consul when Cicero was one of the successful candidates, and a year later he was again defeated for that office. Upon this last defeat, Catiline began to systematically enlist a body of supporters with which to stage an armed insurrection and seize control of the government. His proposals for the cancellation of debt and the proscription of wealthy citizens and his general championship of the poor and oppressed appealed to a variety of discontented elements within Roman society: victims of Sulla's proscriptions who had been dispossessed of their property, veterans of Sulla's forces who had failed to succeed as farmers on the land awarded to them, opportunists and desperadoes, and aristocratic malcontents.

Cicero, who was consul in 63, was kept fully informed of the growing conspiracy by his network of spies and informers, but he felt unable to act against the still-popular and well-connected Catiline. On October 21, however, Cicero denounced Catiline to the Senate in an impassioned speech, charging him with treason and obtaining from the Senate the "ultimate decree," in effect a proclamation of martial law. Catiline withdrew from Rome on November 8 and joined his army of destitute veterans and other supporters that had been collected at Faesulae in Etruria. Despite these events, the Senate remained only partly convinced of the immediate danger that Catiline represented. On December 3, however, some envoys of the Gallic tribe of the Allobroges, whose support had been imprudently solicited by important Catilinarian conspirators in Rome, provided Cicero with a number of signed documents that unmistakably proved the conspiracy's existence. These suspects were arrested by Cicero and were executed on December 5 by decree of the now-thoroughly alarmed Senate. The Senate also mobilized the republic's armies to take the field against Catiline's forces.

Catiline, assuming charge of the army at Faesulae, attempted to cross the Apennines into Gaul in January 62 but was engaged by a republican army under Gaius Antonius Hybrida at Pistoria. Fighting bravely against great odds, Catiline and most of his followers were killed.

cation, atom or group of atoms that bears a positive electric charge. *See* ion.

Catlin, George (b. July 26, 1796, Wilkes-Barre, Pa., U.S.—d. Dec. 23, 1872, Jersey City, N.J.), American artist and author, whose paintings of American Indian scenes constitute an invaluable record of those vanished cultures.

Catlin practiced law for a short time but in 1823 turned to portrait painting, in which he was self-taught. He had been interested in Indian life from his boyhood, and in 1829 he became determined to record their way of life before their heritage disappeared under the onslaught of the advancing American frontier. He began a series of visits to various tribes, chiefly in the Great Plains. He made more than 500 paintings and sketches based on his observations during his travels and exhibited these works in the United States and Europe from 1837 to 1845 as the "Gallery of Indians." In 1841 he published his best known book, the two-volume *Letters and Notes on the Manners, Customs, and Condition of the North American Indians,* which was illustrated with many engravings. Catlin traveled to Central and South America from 1852 to 1857, adding sketches to his collection, and then he lived in Europe between 1858 and 1870.

The bulk of the Catlin collection, which is mainly of ethnographic and historical interest,

"Comanche Mounted War Party," oil on canvas by George Catlin, 1834; in the National Museum of American Art, Washington, D.C.

By courtesy of the National Museum of American Art (formerly National Collection of Fine Arts), Smithsonian Institution, Washington, D.C., gift of Mrs. Sarah Harrison

was acquired by the Smithsonian Institution in 1879. His other published works include *Catlin's North American Indian Portfolio: Hunting Scenes and Amusements of the Rocky Mountains and Prairies of America* (1845); *Catlin's Notes of Eight Years' Travels and Residence in Europe* (1848); *Life Amongst the Indians* (1867); and *Last Rambles Amongst the Indians of the Rocky Mountains and the Andes* (1867).

catnip, also called CATMINT (*Nepeta cataria*), aromatic herb of the mint family (Lamiaceae, or Labiatae). The plant has spikes of small,

Catnip (*Nepeta cataria*)
Walter Chandoha

purple-dotted flowers. Catnip has been used variously as a seasoning and as a medicinal tea for colds and fever. As its mintlike flavour and aroma are particularly exciting to cats, it is often used as a stuffing for cat playthings.

Cato, Marcus Porcius, byname CATO THE CENSOR, or CATO THE ELDER (b. 234 BC, Tusculum, Latium—d. 149), Roman statesman, orator, and the first Latin prose writer of im-

Cato the Censor, with his wife, memorial sculpture; in the Palazzo Vaticano, Rome
Alinari—Art Resource/EB Inc.

portance. He was noted for his conservative and anti-Hellenic policies, in opposition to the phil-Hellenic ideals of the Scipio family.

Born of yeoman stock, he fought in the Second Punic War. His oratorical and legal skills and his rigid morality attracted the notice of the patrician Lucius Valerius Flaccus, who helped him begin a political career at Rome.

Cato became quaestor, aedile (199), and praetor in Sardinia, where he suppressed usury (198). As consul with Flaccus in 195 he unsuccessfully opposed repeal of a measure restricting female extravagance (Lex Oppia). He stamped out an insurrection in Spain and organized the province of Nearer Spain. In 191 Cato served with distinction under Manius Acilius Glabrio at Thermopylae in the war against the Seleucid king Antiochus III. Shortly thereafter he included Glabrio in his denunciation of the supporters of the Scipios. He then attacked and broke the political influence of Lucius Scipio and Scipio Africanus. In 184 Cato and Flaccus were elected censors.

As censor Cato aimed at preserving the *mos majorum* ("ancestral custom") and combatting all Greek influences, which he believed were undermining older Roman standards of morality. He passed measures taxing luxury and strictly revised the list of persons eligible for the Senate. Abuses by tax gatherers were checked, and public building was promoted. After his term as censor, Cato continued to preach his social doctrine and to fight political battles in the courts. He supported such measures as the Lex Orchia against luxury (181) and the Lex Voconia (169), which checked the financial freedom of women.

In the interest of having as few contacts with the Greek East as possible, Cato supported limited independence for Macedonia and opposed the proposal to declare war on Rhodes. His embassy to Carthage (probably 153) convinced him that the revived prosperity of Rome's old enemy constituted a new threat. Cato constantly repeated his admonition "Carthage must be destroyed" (Delenda est Carthago); he lived to see war declared on Carthage in 149.

Cato's influence on the growth of Latin literature was immense. His only surviving piece—the oldest remaining complete prose work in Latin—is a treatise on agriculture (*De agri cultura*) written about 160 BC. It describes old customs and superstitions and also serves as a practical handbook based on Cato's own experiences as a large-scale farmer. Of the seven books of Cato's *Origines*, the first Latin history of Rome, only a few fragments survive. Cato also compiled an encyclopaedia and *Praecepta* ("Maxims") for his son, in addition to works on medicine, jurisprudence, and military science. Of at least 150 speeches he published, only meagre fragments of about 80 survive.

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Cato, Marcus Porcius, byname CATO THE YOUNGER (b. 95 BC—d. 46, Utica, Africa), great-grandson of Cato the Censor and a leader of the Optimates (conservative senatorial aristocracy) who tried to preserve the Roman Republic against power seekers, in particular Julius Caesar.

On the death of his parents, Cato was brought up in the house of his uncle Marcus Livius Drusus (tribune in 91). He served in the ranks against the insurgent slave Spartacus in 72 and was military tribune in Macedonia (67) and quaestor (perhaps in 64) before obtaining a provincial appointment in Asia. As tribune-designate for 62, he incurred the resentment of Caesar by voting to execute the Catilinarian conspirators. Cato's opposition to Pompey, Caesar, and Marcus Licinius Crassus helped to bring about their coalition in the so-called First Triumvirate (60). With the Optimate Calpurnius Bibulus, Cato attempted unsuccessfully to obstruct Caesar's agrarian legislation. He was sent to annex Cyprus (58), but upon his return in 56 he continued to struggle against the Triumvirate.

Failing to obtain the consulship of 51, he had decided to retire from public life when civil war (Caesar against Pompey and the Optimates, 49–45) broke out. Cato realized that the sole chance to preserve the republic lay in supporting Pompey, whom he had formerly opposed. He was entrusted with the defense of Sicily but found it impossible to hold the island and joined Pompey at Dyrrhachium. After Pompey's defeat at Pharsalus (in Thessaly), Cato led a small remnant of troops to Africa. He shut himself up in Utica, and even after the decisive defeat of the republican forces at Thapsus (46) he was determined to keep the gates closed until he had evacuated his adherents by sea. When the last transports had left, Cato committed suicide.

Although Cato was a doctrinaire and obstructionist politician, he provided the Optimates with relatively honest leadership in a corrupt age. His only surviving composition is a letter to Cicero (preserved in Cicero's *Ad familiares*, xv, 5). Immediately after his death Cato's character became the subject of debate. Cicero's panegyric *Cato* was answered by Caesar's bitter *Anticato*. In the *Bellum civile* by the poet Lucan (1st century AD), Cato is represented as a model of virtue.

Cato, Publius Valerius (fl. 1st century BC), Roman poet and grammarian, the leader of the "new" school of poetry (*poetae novi*, as Cicero calls them). Its followers rejected the national epic and drama in favour of the short mythological epics (*epyllia*), elegies, and lyrics of the Alexandrian school. The compliments paid to Cato's verse by contemporary poets bear witness to his preeminence.

According to the biographer and antiquarian Suetonius, Cato was a native of Cisalpine Gaul who lost his property during a period of civil disturbances. He lived to a great age and at the end of his life was very poor. Nothing is known of his grammatical treatises. Of his poems, two titles survive: the "Lydia" and the "Diana."

Catoche, Cape, Spanish CABO CATOCHE, cape on the Caribbean Sea, on a bar off the Mexican state of Quintana Roo, in the northeastern part of the Yucatán Peninsula (*q.v.*). Cape Catoche is said to have been the first Mexican land visited by Spaniards, in 1517. It is separated from western Cuba, approximately 150 mi (240 km) to the east, by the Yucatán Channel.

Caton-Thompson, Gertrude (b. Feb. 1, 1889, London—d. April 18, 1985, Broadway, Hereford and Worcester, Eng.), English archaeologist who distinguished two prehistoric cultures in the al-Fayyūm depression of Upper Egypt, the older dating to *c.* 5000 BC and the younger to *c.* 4500 BC.

While a student at the British School of Archaeology in Egypt (1921–26), she and Elinor Wight Gardner began the first archaeological survey of the al-Fayyūm depression (1924–26 and 1927–28). In Southern Rhodesia (1928–29) she directed meticulous stratigraphic studies of the Zimbabwe architectural remains that pointed to indigenous African design and construction during the time of the European Middle Ages. Her findings, controverting a popular view that the ruins were the remains of biblical Ophir and of Phoenician origin, were reported in *The Zimbabwe Culture* (1931; reissued in 1969). Returning to Egypt (1930–33), Caton-Thompson conducted excavations in al-Wāḥāt al-Khārijah (the Kharga oasis). A fellow of Newnham College, Cambridge (1934–51), in 1948 she advanced the hypothesis that earliest civilization may have originated in Central Africa. Other publications included *The Desert Fayum* (1935) and *Kharga Oasis in Prehistory* (1952). She published her autobiography, *Mixed Memoirs,* in 1983.

Catonsville, village, Baltimore County, central Maryland, U.S., a southwestern suburb of Baltimore. It was founded before 1729 and was known as Johnnycake after a local inn specializing in cornbread. The present name, honouring Richard Caton, was adopted about 1800. A residential community with light industry, Catonsville is the seat of St. Charles College (1830), Catonsville Community College (1957), and the Baltimore County Campus of the University of Maryland. Patapsco State Park is nearby. In 1968 a group of citizens burned the records of the local draft

board in protest against the war in Vietnam and became known as the Catonsville Nine; their subsequent trial, imprisonment, and parole received worldwide publicity. Pop. (1980) 33,208.

Catron, John (b. 1786?, Wythe County, Va.?, U.S.—d. May 30, 1865, Nashville, Tenn.), associate justice of the United States Supreme Court (1837–65).

After moving from Kentucky to Tennessee in 1812 and serving under General Andrew Jackson in the War of 1812, Catron studied law and was admitted to the bar in 1815. Until 1818 he practiced on a "mountain circuit" in Tennessee and became its prosecuting attorney. He became highly versed in the land law, then the major source of litigation, and built up a lucrative practice in Nashville. In 1824 the state Supreme Court of Last Resort (later called the Supreme Court of Errors and Appeals) was enlarged, and Catron was elected to it by the legislature. In his most famous decision on this court he disbarred a lawyer for duelling and denounced the practice. In 1831, in a judicial reorganization, Catron became Tennessee's first chief justice.

After a new constitution abolished his court in 1834, Catron took up private practice and politics. An ardent supporter of President Andrew Jackson, Catron directed the Tennessee campaign of Jackson's protégé, Martin Van Buren, in 1836. The day before Jackson's retirement from the presidency, Congress passed an act enlarging the U.S. Supreme Court; and, on his last day in office, Jackson appointed Catron to one of the new vacancies. Although a capable justice, Catron decided no major cases and generally cast his vote with Chief Justice Roger B. Taney, also a Jacksonian politically.

In 1861 he strongly opposed secession and set out on his circuit duties in hopes of both maintaining the authority of the United States and using his influence to prevent his home state from seceding. Such action was too late. He was forced to leave Tennessee for his own safety and was able to hold his Kentucky court during the war only with military assistance.

Catroux, Georges (b. Jan. 29, 1877, Limoges, Fr.—d. Dec. 21, 1969, Paris), French general and diplomat, one of the highest-ranking officers in the Free French government of World War II.

A graduate of the military academy at Saint-Cyr, Catroux served in World War I and then in various posts in the French colonial empire. Appointed governor-general of Indochina in 1939, he was dismissed by the Vichy government in 1940 and joined General Charles de Gaulle's Free French movement. As representative of the Free French in the Middle East, he proclaimed the independence of Syria and Lebanon in 1941. In 1943–44 he was governor-general of Algeria and in 1944 minister for North Africa in the French provisional government. He served as French ambassador to the Soviet Union in 1945–48.

Cats, Jacob, Jacob also spelled JACOBUS (b. Nov. 10, 1577, Brouwershaven, Zeeland, Spanish Netherlands [now in The Netherlands]—d. Sept. 12, 1660, Zorgh-vliet, near The Hague), Dutch writer of emblem books and didactic verse whose place in the affections of his countrymen is shown by his nickname, "Father Cats."

Cats took his doctor's degree in law at Orléans, practiced at The Hague, and, after visits to Oxford and Cambridge, settled in Zeeland, where he accumulated wealth by land reclamation. Becoming a magistrate, he was successively pensionary of Middelburg and Dordrecht and, from 1636 to 1651, grand pensionary of Holland. He took part in diplomatic missions to England—in 1627 to Charles I and in 1651–52, unsuccessfully, to Cromwell. His background gave him an international outlook, and he was in sympathy with many of the English Puritan writers.

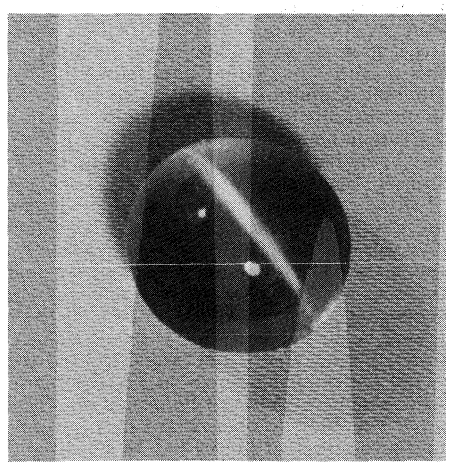
Cats was primarily a writer of poetic emblem books, a type of literature popular in the 17th century that consisted of woodcuts or engravings accompanied by verses pointing a moral. He used this form to express the major ethical concerns of early Dutch Calvinists, especially those dealing with love and marriage. By being the first to combine emblem literature with love poetry, and by his skill as a storyteller, he achieved enormous popularity. The sources on which he draws are chiefly the Bible and the classics and occasionally Boccaccio and Cervantes.

Cats, oil painting by M.J. van Mierevelt, 1634; in the Rijksmuseum, Amsterdam

By courtesy of the Rijksmuseum, Amsterdam

His first book, *Sinn'-en minne-beelden* (1618), contained engravings with text in Dutch, Latin, and French. Each picture has a threefold interpretation, expressing what were for Cats the three elements of human life: love, society, and religion. Perhaps his most famous emblem book is *Spieghel van den ouden ende nieuwen Tijdt* (1632), many quotations from which have become household sayings. It is written in a more homely style than his earlier works, in popular rather than classical Dutch. Two other works—*Houwelyck* (1625) and *Trou-Ringh* (1637)—are rhymed dissertations on marriage and conjugal fidelity. In one of his last books, *Ouderdom, Buytenleven en Hofgedachten op Zorgh-vliet* (1655), Cats wrote movingly about old age.

cat's-eye, any of several gemstones that, when cut *en cabochon* (in convex form, highly polished), display a luminous band reminiscent of the eye of a cat; this particular quality is termed chatoyancy. Precious, or oriental, cat's-eye, the rarest and most highly prized, is a greenish chatoyant variety of chrysoberyl called cymophane; the chatoyant effect is due to minute parallel cavities. Quartz cat's-eye, the commonest, owes its chatoyancy and grayish-green or greenish colour to parallel fibres of asbestos in the quartz; although it comes from the East, it is often called occidental cat's-eye to differentiate it from the more valuable oriental (chrysoberyl) cat's-eye. The two may be distinguished by their specific gravities; chrysoberyl is much denser. Crocidolite cat's-eye (African cat's-eye), more commonly known as tigereye (or tiger's-eye), is quartz that contains oriented fibres of crocidolite that have been replaced by silica. Corundum cat's-eye is an imperfect star sapphire or ruby in which the star is reduced to a luminous zone.



Chrysoberyl cat's-eye with yellow banding on a brown stone

John H. Gerard

Catskill Delta, structure that was deposited in the northeastern United States during the Middle and Late Devonian Period (the Devonian Period began about 395,000,000 years ago and lasted about 50,000,000 years); it is named for exposures studied in the Catskill Mountains of New York. During Middle and Late Devonian time, numerous streams flowing from the Appalachian Highlands constructed a large compound delta along the northeastern regions of the United States. Late in the Devonian Period, the shoreline was pushed back to western New York and northwestern Pennsylvania. A broad coastal lowland, extending more than 320 km (200 miles) across, was formed; at the same time, the submerged portion of the delta was growing and extended into Ohio.

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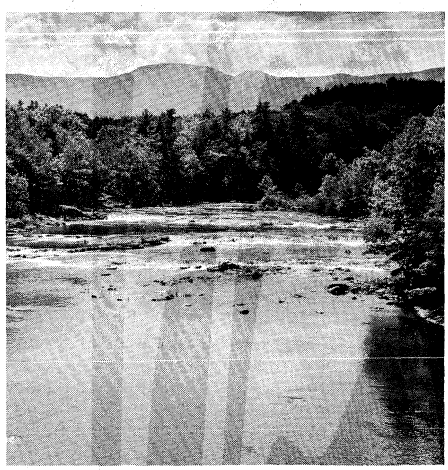
Catskill Game Farm, Inc., privately owned zoo opened in 1933 in Catskill, N.Y., U.S. It occupies more than 370 hectares (914 acres), of which 55 hectares (135 acres) are open to the public from April to October. The remainder of the zoo grounds is maintained as a breeding preserve. The Catskill Game Farm provides other zoos throughout the world with many varieties of captive-bred animals. The strength of its collection is a large breeding stock of rare ungulates, among which are scimitar-horned oryx, mountain zebra, and onager.

Catskill Mountains, dissected segment of the Allegheny Plateau, U.S., and part of the Appalachian system, lying mainly in Greene and Ulster counties of southeastern New York.



Catskill Mountains near Cairo, N.Y.

Pictorial Parade—EB Inc.

Bounded north and east by the valleys of the Mohawk and Hudson rivers, the mountains are drained by headstreams of the Delaware River and by numerous small creeks. Many

peaks rise more than 3,000 ft (900 m) abruptly above adjacent valley floors, with the highest being Slide Mountain (4,204 ft). The northern portion along the Mohawk is called the Helderberg Hills. The much higher elevations in the Catskills compared to the surrounding area are mainly due to the durability of the top layers of sandstone and conglomerate.

The unusually steep-sided valleys and massive, rounded uplands comprise a natural wilderness within easy reach of New York City. Heavily mantled with mixed broad-leaf and needle-leaf forests, the area's scenery is made more spectacular by deeply scored cloves (rocky glens). Tourism and outdoor recreation are popular in Catskill Park (688,660 ac [278,700 ha]), which includes the state-owned Catskill Forest Preserve (250,000 ac), and in the more accessible, privately owned parts of the mountains. The artificial lakes in the Catskills include Ashokan, Downsville, Neversink, Rondout, and Schoharie reservoirs, important to the water supply of metropolitan New York. The mountains were made famous through Washington Irving's short stories about the legendary Rip Van Winkle, who supposedly took his long nap near the town of Catskill on the Hudson River at the eastern entrance to the park. The name Catskill is derived from Kaaterskill (Dutch, meaning wildcat creek), as one of the nearby better known streams is called.

catsup, also spelled KETCHUP, spicy liquid condiment widely used in the United States and Great Britain. U.S. catsup is a sweet puree of tomatoes, onions, and green peppers flavoured with vinegar and pickling spice that is eaten with meats, especially beef, and frequently with french fried potatoes (British chips); it is the universal condiment of fast-food sandwiches. In Britain, as formerly in the United States, catsup signifies a spicy liquid based on mushrooms, unripe walnuts, or oysters; this catsup functions primarily as a seasoning for cooking. The word derives from the Chinese *ke-tsiap*, a fish brine, probably by way of the Malaysian *ketjap*.

Catt, Carrie Chapman, *née* LANE (b. Jan. 9, 1859, Ripon, Wis., U.S.—d. March 9, 1947, New Rochelle, N.Y.), U.S. feminist leader who led the women's rights movement for more than 25 years, culminating in the adoption of the 19th (suffrage) Amendment to the U.S. Constitution in 1920.

Carrie Chapman Catt
By courtesy of the League of Women Voters of Illinois

She was appointed high school principal in Mason City, Iowa, in 1881 and became one of the first woman school superintendents in the country two years later. Her first marriage (1884) to Leo Chapman, an editor, ended with his untimely death in 1886. From 1887 to 1890 she devoted herself to organizing the Iowa Woman Suffrage Association. Her marriage to George W. Catt, an engineer, in 1890, was unusual in its prenuptial legal contract providing Mrs. Catt with four months of free time each year to work exclusively for woman suffrage. Catt encouraged and supported his wife's dedication until his death, in 1905, at which time he left her financially independent to devote the rest of her life to reform activities.

Between 1905 and 1915 Mrs. Catt reorganized the National American Woman Suffrage Association along political-district lines. By then an accomplished public speaker, she served as the group's president from 1915 until her death. In the meantime, she trained women for direct political action and marshalled seasoned campaigners. After bitter opposition in the U.S. Senate, Congress at length submitted the 19th Amendment to the states in June 1919. After its adoption, Mrs. Catt reorganized her suffrage association—2,000,000 strong—into the League of Women Voters in order to work for continuing progressive legislation throughout the nation.

Meanwhile, in 1902 she had founded the International Woman Suffrage Alliance and served as its president until 1923. In 1911–12, accompanied by Aletta Henriette Jacobs of The Netherlands, she made a voyage around the world.

In the 1920s Mrs. Catt embraced the peace movement, enlisting the cooperation of 11 national women's organizations in the Committee on the Cause and Cure of War (1925) to urge U.S. participation in a world organization for peace. She was also a strong advocate of international disarmament and of Prohibition. Following World War II she was keenly interested in the United Nations and used her influence to have qualified women placed on certain commissions.

Mrs. Catt's works include *Woman Suffrage and Politics; The Inner Story of the Suffrage Movement* (1923, written with Nettie Rogers Shuler) and, with others, *Why Wars Must Cease* (1935).

Cattaneo, Carlo (b. June 15, 1801, Milan—d. Feb. 6, 1869, near Lugano, Switz.), Italian publicist and intellectual whose writings significantly shaped the Risorgimento and whose journal, *Il Politecnico* ("The Polytechnic"), not only served as a vehicle for his political views but also was influential in introducing new scientific and technical improvements into Italy.

During Cattaneo's early career as a schoolmaster and as a graduate in law at the University of Padua (1824), he acquired a tremendous scope of knowledge: his writings treat such diversified subjects as literature and fine arts, philosophy, language, mathematics, chemistry, geology, agriculture, and penal reform, as well as various other economic, social, and political problems of his time. Considered Italy's first proponent of positivism, he tried to clarify the complex relations between morality and economics. His important scholarly work *Notizie naturali e civili su la Lombardia* (1844; "Natural and Civil Reports on Lombardy") gained him election to the prestigious Lombard Institute.

Cattaneo was slow to enter the political sphere, in which he was considered a moderate, because he believed Italy was not ready for an armed revolt against Austria, which then controlled Milan. When the Milan rebellion, "the Five Days" (March 18–22, 1848), broke out, he became one of the leaders of the revolutionary council. On the reoccupation of Milan by the Austrians in August, Cattaneo left and settled in Switzerland. He wrote two books on the revolt: *L'insurrection de Milan en 1848* (1848; "The Milan Insurrection of 1848") and *Dell'insurrezione di Milano nel 1848 e della successiva guerra* (1849; "On the Milan Insurrection of 1848 and on the Succeeding War").

Cattaneo returned to Milan in 1859 to refound his journal. In 1867 he was elected to the Chamber of Deputies of the Kingdom of Italy but never took his seat because he was unwilling to take a required oath of loyalty to the ruling House of Savoy. He continued to oppose the monarchy from his home in Switzerland.

Cattaro (Yugoslavia): *see* Kotor.

Cattaro, Bocche di (Yugoslavia): *see* Kotor, Gulf of.

Cattell, James McKeen (b. May 25, 1860, Easton, Pa., U.S.—d. Jan. 20, 1944, Lancaster, Pa.), U.S. psychologist who oriented U.S. psychology toward use of objective experimental

James McKeen Cattell
By courtesy of Columbia University, Office of Public Information

methods, mental testing, and application of psychology to the fields of education, business, industry, and advertising. He originated two professional directories and published five scientific periodicals.

After graduation from Lafayette College in Easton (1880), he went to Germany and studied with philosopher Rudolf Hermann Lotze at the University of Göttingen and with psychologist Wilhelm Wundt at the University of Leipzig. Returning to the U.S., he spent 1882 and 1883 at Johns Hopkins University, Baltimore. Journeying again to Leipzig, he became Wundt's assistant and conducted investigations directed toward scientific objectivity.

After receiving his Ph.D. from Leipzig (1886), Cattell continued his research in the London laboratory of Sir Francis Galton. In 1888 he received a professorship in psychology, the first ever offered, at the University of Pennsylvania, Philadelphia. There he established a laboratory and developed a series of mental measurement tests for college students.

In 1891 Cattell became professor and administrative head of psychology at Columbia University and devoted much of his career there to the improvement and advancement of mental testing. In 1894 he cofounded the *Psychological Review* and acquired the weekly journal *Science,* which he edited from 1894 to 1944. In 1900 he established *Popular Science Monthly,* renamed *Scientific Monthly* in 1915, which he edited through 1943. His concern with scientific eminence led him to originate, edit, and publish the directory *American Men of Science* (1906–38). Cattell was dismissed from Columbia in 1917 when he publicly expressed criticism of the draft in World War I. The remainder of his professional life was devoted principally to editing, including *The American Naturalist* (1907–44) and *School and Society* (1915–39). In 1921 he founded the Psychological Corporation for the purpose of making research in applied psychology available to industry and business.

Cattell, Raymond B(ernard) (b. March 20, 1905, Staffordshire, Eng.), British-born U.S. psychologist, considered to be one of the world's leading personality theorists.

Cattell was educated at the University of London, receiving his B.S. in 1924 and his Ph.D. in 1929. He taught at the University of Exeter (1927–32), after which he served as director of the Leicester Child Guidance

Clinic (1932–37). Cattell then taught at Clark University, Worcester, Mass. (1939–41). After a brief stint as a lecturer at Harvard University (1941–43), Cattell was appointed research professor of psychology at the University of Illinois, Urbana (1945), a position he held until becoming emeritus professor in 1974.

Cattell was a prolific writer in his field, making substantial contributions to both the theory and methodology of psychological measurement. Among his many books are *The Meaning and Measurement of Neuroticism and Anxiety* (1961), *Handbook of Multivariate Experimental Psychology* (1966), *Prediction of Achievement and Creativity* (1968), and *Abilities: Their Structure, Growth, and Action* (1971).

Personality and Learning Theory, 2 vol. (1979–80), is considered his most important work. In it he proposed a theory of human development that integrates the intellectual, temperamental, and dynamic aspects of personality in the context of environmental and cultural influences. He was able to synthesize in this work many of the disparate hypotheses of both personality and learning theories.

Catterji, Bankim Chandra (Indian author): *see* Chatterjee, Bankim Chandra.

cattle, domesticated bovine farm animals raised for their meat or milk or for draft purposes. In the terminology used to describe the sex and age of cattle, the male is first a bull calf and if left intact becomes a bull; if castrated he becomes a steer and in about two or three years grows to an ox. The female is first a heifer calf, growing into a heifer and becoming a cow. Depending on the breed, mature bulls weigh 1,000–4,000 pounds (450–1,800 kg), and cows 800–2,400 pounds (360–1,100 kg). The males retained for beef production are usually castrated to make them more docile on the range or in feedlots; in the case of males intended for use as working oxen or bullocks, castration is practiced to make them more tractable at work.

All modern domestic cattle are believed to belong to *Bos taurus* (European breeds such as Shorthorn and Jersey), *Bos indicus* (zebu breeds such as Brahman), or crosses of these two species such as Santa Gertrudis. Many contemporary breeds are of recent origin. The definition of a breed is difficult and inexplicit, although the term is commonly used and, in practice, well understood. It may be used generally to connote animals that have been selectively bred for a long time so as to possess distinctive identity in colour, size, conformation, and function, and these or other distinguishing characteristics are perpetuated in their progeny. The most important meat and dairy breeds are described in the table below. For titles of entries on individual breeds, *see* INDEX.

cattle grub: *see* warble fly.

cattle plague: *see* rinderpest.

Cattle Raid of Cooley, The, Irish Gaelic TÁIN BÓ CUAILNGE, old Irish epic-like tale, the longest of the Ulster cycle of hero tales dealing with the conflict between Ulster and Connaught over possession of the brown bull of Cooley. Composed in prose with verse passages in the 7th and 8th centuries, it was probably by an author who was acquainted with epics such as the Latin *Aeneid.* It is partially preserved in *The Book of the Dun Cow* (*c.* 1100) and is also found in *The Book of Leinster* (*c.* 1160) and *The Yellow Book of Lecan* (late 14th century). Although it contains passages of lively narrative and witty dialogue, similar to the finest of early Irish shorter tales, it is not a coherent work of art, and its text has been marred by revisions and interpolations. It has particular value for the literary historian in that the reworkings provide a record of the degeneration of Irish style; *e.g.,* the bare prose of the earlier passages is later replaced by bombast and alliteration, and ruthless humour becomes sentimentality.

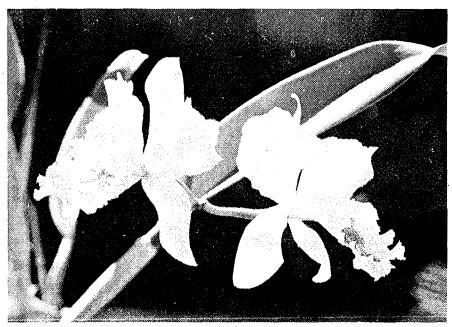
Medb (Maeve), warrior-queen of Connaught, disputes with her husband, Ailill, over their respective wealth. Because possession of the whitehorned bull guarantees Ailill's superiority, Medb resolves to secure the even more famous brown bull of Cooley from the Ulstermen. Although Medb is warned by a prophetess of impending doom, the Connaught army proceeds to Ulster. The Ulster warriors are temporarily disabled by a curse, but Cú Chulainn, the youthful Ulster champion, is exempt from the curse and singlehandedly holds off the Connaughtmen. The climax of the fighting is a three-day combat between Cú Chulainn and Fer Díad, his friend and foster-brother, who is in exile with the Connaught forces. Cú Chulainn is victorious, and, nearly dead from wounds and exhaustion, he is joined by the Ulster army, which routs the enemy. The brown bull, however, has been captured by Connaught and defeats Ailill's whitehorned bull, after which peace is made.

The tale's loose construction has preserved intact a few outstanding dramatic episodes, such as Medb's dialogue with the soothsayer and Cú Chulainn's dealings with the Connaught scouts. Undoubtedly the finest section is that in which Fergus, an exile from Ulster at the Connaught court, recalls for Medb and Ailill the heroic deeds of Cú Chulainn's youth.

Breeds of domesticated cattle

name and type	distribution	appearance	characteristics
Angus, or Aberdeen-Angus (beef)	originally Scotland, now U.S., U.K.	hornless, black, compact, low-set	adapts well to varied climates
Ayrshire (dairy)	throughout temperate lands	deep, fleshy body; red or brown colour	hardy
Beefmaster (beef)	developed 1908, Texas	red, usually with white spots	breed trademarked "Lansater Beefmaster"
Brahman, or Zebu (dairy and draft)	originally India, now widespread	grey with large shoulder hump	extensively crossbred
Brown Swiss (dairy)	North and South America, also Europe	brown wedge-shaped body	hardy
Brangus (beef)	developed in U.S., 1930s	large, black, hornless, straight back	⅜ Brahman, ⅝ Angus
Charbray (beef)	developed 1940s, Texas	large, horned, white	⅛–¼ Brahman, remainder Charolais
Charolais (beef)	originally France, now Mexico and U.S.	unusually large and white	much used for cross-breeding
Droughtmaster (beef)	developed in Australia	red colour, horned or hornless	excellent tick resistance
Galloway (beef)	originally Galloway, southwest Scotland	hornless black, compact, low-set	hardy; thrives in rigorous climate
Guernsey (dairy)	U.K., North America, Australia	fawn-coloured, white markings, short horns	excellent milk producer
Hereford, or white-face (beef)	U.K., North and South America, Australia, New Zealand	red and white; low-set and compact	popular beef breed
Highland (beef)	Scotland	small, heavy dewlap, wide horns	especially hardy
Holstein-Friesian (dairy)	North and South America, Australia, South Africa	black and white; horned or hornless	large production of milk
Jersey (dairy)	now in every cattle-raising country	small, short-horned, fawn or yellow brown	docile, uses feed efficiently
Red Poll (beef and dairy)	North and South America, New Zealand, Australia, South Africa	medium size, red colour with some white	satisfactory milk and butterfat
Santa Gertrudis (beef)	U.S., Cuba, South America, Australia	deep red colour, horned	⅜ Brahman, ⅝ Shorthorn
Shorthorn, or Durham (beef)	now in almost every cattle-raising area	horned or hornless; red or roan	calves mature rapidly for market

Cattleya, genus of orchids, family Orchidaceae, comprising about 65 species of air plants or rock plants that are commercially important as ornamentals and florists' plants. They are native to tropical America and are widely grown in greenhouses and other light, humid indoor environments. Cattleyas have large pseudo-bulbs (bulblike stems), 1 or 2 leaves, and 1 to 30 large, brightly coloured flowers.



Cattleya
Joyce R. Wilson

Cattleya labiata, one of the most commonly cultivated species, has been crossed with numerous other orchid genera to produce many showy hybrids.

Catton, (Charles) Bruce (b. Oct. 9, 1899, Petoskey, Mich., U.S.—d. Aug. 28, 1978, Frankfort, Mich.), American journalist and historian, noted for his books on the American Civil War.

As a child living in a small town in Michigan, Catton was stimulated by reminiscences of the Civil War by local veterans. His education at Oberlin College, Ohio, interrupted by two years of naval service in World War I, was then abandoned for a career in journalism. While he worked as a reporter for the *Boston American,* the *Cleveland News,* and the *Cleveland Plain Dealer* (1920–26), Catton continued his lifelong study of the Civil War period. He subsequently worked for the Newspaper Enterprise Service (1926–41) as an editorial writer, book reviewer, and Washington correspondent and for the U.S. War Production Board as director of information. In 1954 he joined the staff of *American Heritage* magazine and from 1959 was its senior editor.

A commission to write a Centennial History of the Civil War evolved into Catton's celebrated trilogy on the Army of the Potomac: *Mr. Lincoln's Army* (1951); *Glory Road* (1952); and *A Stillness at Appomattox* (1953). The latter earned Catton both a Pulitzer Prize and the National Book Award in 1954.

Catton's brilliance as a historian lay in his

ability to bring to historical narrative the immediacy of reportage.

Other works by Catton include *The War Lords of Washington* (1948); *U.S. Grant and the American Military Tradition* (1954); and a second trilogy, *The Coming Fury* (1961); *Terrible Swift Sword* (1963); and *Never Call Retreat* (1965).

Caṭṭopadhyay, Baṅkim Candra (Indian author): *see* Chatterjee, Bankim Chandra.

Catullus, Gaius Valerius (b. *c.* 84 BC, Verona, Cisalpine Gaul—d. *c.* 54 BC, Rome), Roman poet whose expressions of love and hatred are generally considered the finest lyric poetry of ancient Rome. In 25 of his poems he speaks of his love for a woman he calls Lesbia, whose identity is uncertain. Other poems by Catullus are scurrilous outbursts of contempt or hatred for Julius Caesar and lesser personages.

Life. No ancient biography of Catullus survives. A few facts can be pieced together from external sources, in the works of his contemporaries or of later writers, supplemented by inferences drawn from his poems, some of which are certain, some only possible. The unembroidered, certain facts are scanty. Catullus was alive 55–54 BC on the evidence of four of his poems and died young according to the poet Ovid—at the age of 30 as stated by St. Jerome (writing about the end of the 4th century), who nevertheless dated his life erroneously 87–57 BC. Catullus was thus a contemporary of the statesmen Cicero, Pompey, and Caesar, who are variously addressed by him in his poems. He preceded the poets of the immediately succeeding age of the emperor Augustus, among whom Horace, Sextus Propertius, Tibullus, and Ovid name him as a poet whose work is familiar to them. On his own evidence and that of Jerome, he was born at Verona in northern Italy and was therefore a native of Cisalpine Gaul (Gaul This Side of the Alps); he owned property at Sirmio, the modern Sirmione, on Lake Garda, though he preferred to live in Rome and owned a villa near the Roman suburb of Tibur, in an unfashionable neighbourhood. According to an anecdote in the Roman biographer Suetonius' *Life of Julius Caesar,* Catullus' father was Caesar's friend and host, but the son nevertheless lampooned not only the future dictator but also his son-in-law Pompey and his agent and military engineer Mamurra with a scurrility that Caesar admitted was personally damaging and would leave its mark on history; the receipt of an apology was followed by an invitation to dinner "the same day," and Caesar's relations with the father continued uninterrupted. (Suetonius cites the episode as an example of Caesar's clemency.)

Catullus' poetry reports one event, externally datable to *c.* 57–56 BC, a journey to Bithynia in Asia Minor in the retinue of Gaius Memmius, the Roman governor of the province, from which he returned to Sirmio. It also records two emotional crises, the death of a brother whose grave he visited in the Troad, also in Asia Minor, and an intense and unhappy love affair, portrayed variously in 25 poems, with a woman who was married and whom he names Lesbia, a pseudonym (Ovid states) for Clodia, according to the 2nd-century writer Apuleius. His poems also record, directly or indirectly, a homosexual affair with a youth named Juventius.

Such are the stated facts. The conjectural possibilities to be gleaned mostly from the internal evidence of Catullus' poetry extend a little further. It is accepted that Catullus was born *c.* 84 BC and that he died *c.* 54 BC. His father's hospitality to Caesar may have been exercised in Cisalpine Gaul when Caesar was governor of the province, but equally well at Rome—Suetonius does not indicate time or place. Catullus' Roman villa may have been heavily mortgaged (depending on the choice of manuscript reading of one poem). A yacht retired from active service and celebrated in an iambic poem may have been his own, built in Bithynia, in northwestern Asia Minor, and therefore available to convey him on his way home to Sirmio after his tour of duty. His fellow poet Cinna may have accompanied him to Bithynia. For the governor Memmius, himself a litterateur (to whom the Roman philosophic poet Lucretius dedicated his poem on the nature of things, *De rerum natura*), such company might be congenial, and it is possible to speculate that Cinna was on board the yacht. The brother's grave could have been visited en route to or from Bithynia.

The poet's Clodia may have been a patrician, one of the three Clodia sisters of Cicero's foe Publius Clodius Pulcher, all three the subject of scandalous rumour, according to Plutarch. If so, she was most probably the one who married the aristocrat Metellus Celer (consul 60 BC, died 59 BC), who in 62 BC was governor of Cisalpine Gaul. It may have been at that time that the youthful poet first met her and possibly fell under her spell. She is accorded a vivid if unflattering portrait in Cicero's *Pro Caelio,* in which the orator had occasion to blacken her character in order to defend his client against Clodia's charge that as her lover after her husband's death he had tried to poison her. The client was Marcus Caelius Rufus, conceivably the Rufus reproached by Catullus in poem LXXVII as a trusted friend who had destroyed his happiness (but if so, the Caelius of poem C is a different person). This identification of Clodia, suggested by an Italian scholar of the 16th century, has found support in some uncertain inferences from the Lesbia poems: the poet's mistress besides being married perhaps moved in society, enjoyed fashionable amusements, was cultivated and witty, and was licentious enough to justify Cicero's attack. On the other hand, the poet twice appears to have included the protection of his own rank among the gifts he had laid at her feet.

The poetry. A consideration of the text of Catullus' poems and of its arrangement is of unusual interest. Its survival has been as precarious as his biography is brief. Not being part of the school syllabus, from roughly the end of the 2nd century to the end of the 12th century, it passed out of circulation. Knowledge of it depends on a single manuscript discovered *c.* 1300, copied twice, and then lost. Of the two copies, one in turn was copied twice, and then it was lost. From the three survivors—in the Bodleian Library at Oxford, the Bibliothèque Nationale in Paris, and the Vatican Library in Rome—scholars have been able to reconstruct the lost "archetype." Incorrect transcription in the preceding centuries (some 14 instances are beyond repair), however, has invited frequent and often uncertain emendation. Depending on whether one poem is divided or not, 113 or 114 poems survive. In the printed total of 116, numbers XVIII to XX were inserted by early editors without proof that they were written by Catullus. In 14 instances gaps are visible (eight of these of one or more lines), and in possibly six poems fragments of lost poems have been left attached to existing ones. Ancient citations indicate the existence of at least five more poems. The surviving body of work is therefore mutilated and incomplete and (in contrast to the *Odes* of Horace) cannot in its present published form represent the intentions of either author or executors, despite the elegant dedication to the historian Cornelius Nepos that heads it. With these qualifications, it permits the reconstruction of a poetic personality and art unique in Latin letters.

The collection is headed by 57 "short poems," ranging in length between 5 and 25 lines (number X, an exception, has 34) in assorted metres, of which, however, 51 are either hendecasyllabic—that is, having a verse line of 11 syllables (40 such)—or iambic—basically of alternate short and long syllables (11). These rhythms, though tightly structured, can be characterized as occasional or conversational. There follow eight "longer poems," ranging from 48 lines to 408 (number LXV, of 24 lines, is prefatory to number LXVI) in four different metres. The collection is completed by 48 "epigrams" written in the elegiac distich, or pair of verse lines, and extending between 2 and 12 lines, a limit exceeded only by two poems, one of 26 lines and the other of 16.

This mechanical arrangement, by indirectly recognizing the poet's metrical virtuosity and proposing three kinds of composition, justly calls attention to a versatility disproportionate to the slim size of the extant work. The occasional-verse metres and the elegiac distich had be introduced into Latin before his day. Traditionally both forms, as practiced by Greek writers after the 4th century BC and their Roman imitators, had served for inscriptions and dedications and as verse of light occasions, satirical comment, and elegant sentiment. Catullus and his contemporaries continued this tradition; but in some 37 instances the poet uniquely converts these verse forms to serve as vehicles of feelings and observations expressed with such beauty and wit, on the one hand, or such passion, on the other, as to rank him, in modern terms, among the masters of the European lyric—the peer of Sappho and Shelley, of Burns and Heine—but exhibiting a degree of complexity and contradiction that the centuries-later Romantic temperament would scarcely have understood. The conversational rhythms in particular, as he managed them for lyric purposes, achieved an immediacy that no other classic poet can rival.

In his longer poems Catullus produced studies that deeply influenced the writers and poets of the Augustan Age: two charming marriage hymns; one frenzied cult hymn of emasculation; one romantic narrative in hexameters (lines of six feet) on the marriage of Peleus with the sea goddess Thetis; and four elegiac pieces, consisting of an epistle introducing a translation of an elegant conceit by the Alexandrian poet Callimachus, followed by a pasquinade, or scurrilous conversation, between the poet and a door (of poor quality, perhaps a youthful effort), and lastly a soliloquy (unless indeed this be two poems) addressed to a friend and cast in the form of an encomium, or poem of praise. The Augustan poet Virgil is content to imitate Catullus without naming him, even going so far, in the *Aeneid,* as thrice to borrow whole lines from him. Horace both imitated Catullus and criticized him. Tibullus, Propertius, Ovid, and later Martial both imitate and affectionately commemorate him.

Assessment. In his lifetime, Catullus was a poet's poet, addressing himself to fellow craftsmen (*docti,* or scholarly poets), especially to his friend Licinius Calvus, who is often posthumously commemorated along with him. It is now fashionable to identify this coterie as the *poetae novi,* or "Neoterics" (the modern term for these new poets), who preferred the learned allusiveness and mannered and meticulous art of the Alexandrian poets to the grander but archaic fashion of Ennius, the father of Roman poetry. The school was criticized by Cicero and by Horace, who names Calvus and Catullus. To the degree that Catullus shared such conceptions of what might be called poetic scholarship, he is to be numbered in the company of Gerard Manley Hopkins, T.S. Eliot, and Ezra Pound rather than with the Romantics.

For the general reader, the 25 Lesbia poems are likely to remain the most memorable, recording as they do a love that could register ecstacy and despair and all the divided emotions that intervene. Two of them with

unusual metre recall Sappho, the poetess of the Aegean island of Lesbos, as also does his use of the pseudonym Lesbia. As read today, these two seem to evoke the first moment of adoring love (number LI, a poem that actually paraphrases its Sapphic model) and the last bitterness of disillusionment (number XI). On the other hand, the poems of invective, which spare neither Julius Caesar nor otherwise unknown personalities, male and female, may not have received the critical attention some of them deserve. Their quality is uneven, ranging from the high-spirited to the tedious, from the lapidary to the laboured, but their satiric humour is often effective, and their obscenity reflects a serious literary convention that the poet himself defends. Between these two poles of private feeling lie a handful of transcendent and unforgettable compositions: the lament at his brother's grave; the salute to Sirmio his beloved retreat; the exchange of vows between Acme and Septimius; his elegy for the wife of Calvus; and even that vivid mime of a moment's conversation in a leisured day, in which the gay insouciance of a few young persons of fashion, the poet included, going about their affairs in the last days of the Roman Republic, is caught and preserved for posterity. (E.A.Ha.)

MAJOR WORKS. Catullus' 116 extant poems may be classified under the headings lyric, epithalamium, miniature epic, elegy, and epigram. They were mostly written between 61 and 54 BC but cannot be dated exactly.

Apart from V, VII, VIII, XI, LVIII, and LXXVI, which, with many others, are all devoted to the theme of Lesbia, Catullus' mistress, whether in delight, sorrow, or anger, special mention may perhaps be made of XXX, to a false friend; of XXXI, on his home at Sirmio; and of CI, on his brother's death.

BIBLIOGRAPHY. The text of R.A.B. Mynors (1958), whose *Praefatio* succinctly explains the procedures essential for reconstruction of the text and summarizes the history of the first printed Renaissance editions, is standard. This text may be supplemented by the German edition of Mauritius Schuster (1949; rev. with additional bibliography by W. Eisenhut, 1958); and by the French Budé text of Georges Lafaye (1922; 3rd ed. rev. by M. Duchemin, 1949).

Commentaries. The second edition of Robinson Ellis (1889) remains a classic despite its age. The American text and commentary of E.T. Merrill (1893, reprinted 1951) was long the only unabridged edition available in English; it is now joined by Kenneth Quinn, *Catullus: The Poems, Edited with Commentary* (1970). The otherwise exhaustive edition of C.J. Fordyce (1961) omits certain poems of significant critical interest, either literary or biographical. The German commentary of Wilhelm Kroll (1923, reprinted 1968) is a standard and complete work. That in Italian by M.L. De Gubernatis, 2nd ed. (1933, reprinted 1953), stresses literary interpretation.

General. Estimates of Catullus' poetry and its place in Latin letters are offered by A.L. Wheeler, *Catullus and the Traditions of Ancient Poetry* (1934, reprinted 1964), who gives special attention to the longer poems; by E.A. Havelock, *The Lyric Genius of Catullus* (1939, reprinted 1967), who sees the secret of the poet's significance in the short poems; and by Kenneth Quinn, *The Catullan Revolution,* 2nd rev. ed. (1969), who stresses the poet's place within the Roman tradition; as does David O. Ross, Jr., *Style and Tradition in Catullus* (1969). The biographical approach to the poems, pervasive in Merrill's commentary and criticized by Havelock, has been revived by T.P. Wiseman, *Catullan Questions* (1969).

Translations. These, unabridged, responding to a new tolerance of the obscene in literature, have recently proliferated. Aside from the Loeb Library edition (text and translation by F.W. Cornish, 1912), versions in a more contemporary style include the following: F.O. Copley, *Complete Poetry of Catullus* (1957); R.A. Swanson, *Odi et Amo: Complete Poetry* (1959); Peter Whigham, *Poems of Catullus* (1966); Reney Myers and Robert J. Ormsby, *Catullus: The Complete Poems for American Readers* (1970); and Frederic Raphael and Kenneth McLeish, *The Poems of Catullus* (1979).

Catulus, Gaius Lutatius (fl. 3rd century BC), Roman commander, victor in the final battle of the First Punic War between Rome and Carthage (264–241). As consul in 242, he blockaded the Sicilian cities of Lilybaeum and Drepanum with a fleet of 200 ships. On March 10, 241, the Carthaginian relieving fleet was totally defeated near the Aegates Islands off western Sicily. Catulus, who had made the decision to attack, shared in the triumph, though a wound had prevented him from taking part in the operations.

Catulus, Quintus Lutatius (d. 86 BC), Roman general, at first a colleague and later a bitter enemy of the politically powerful commander Gaius Marius.

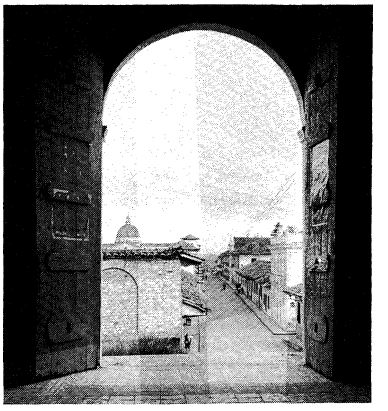
As consul with Marius in 102, Catulus was sent to hold the passage of the Alps from the invading Cimbri and Teutoni tribes, but he was forced back to the Po River. In 101 the Cimbri were defeated in the Raudian Fields, near modern Vercelli, Italy, by the united armies of Catulus and Marius. When the chief credit for this victory went to Marius, Catulus sided with Marius' political rival, Lucius Cornelius Sulla. After Marius' capture of Rome late in 87, Catulus was forced to commit suicide. Catulus was distinguished as an orator, poet, and prose writer.

Catulus, Quintus Lutatius (b. *c.* 120 BC—d. 61/60), Roman politician, a leader of the Optimates, the conservative faction in the Senate.

Catulus' father, Quintus Lutatius Catulus, had been forced to commit suicide after Gaius Marius' capture of Rome. The younger Catulus therefore became an adherent of Marius' opponent, the commander Lucius Cornelius Sulla, who was dictator of Rome from 82 to 80. In 78, when he was consul, Catulus defeated an army led by his colleague in the consulship, Aemilius Lepidus, who sought to overthrow Sulla's constitutional innovations. Catulus unsuccessfully opposed laws conferring extraordinary military powers upon the ambitious Pompey in 67 and 66; as censor in 65, Catulus fought the attempt of Marcus Licinius Crassus to enfranchise the Transpadane Gauls. A consistent opponent of Julius Caesar, Catulus suffered a bitter disappointment when Caesar was elected *pontifex maximus* ("high priest") in 63 over his own far stronger claim. The Optimate leader unsuccessfully attempted to implicate Caesar in Catiline's conspiracy to seize power (63), and in return Caesar in 62 accused Catulus of embezzling public funds—a charge that was later dropped.

Catuvellauni, probably the most powerful Belgic tribe in ancient Britain; it occupied the area directly north of the River Thames. The first capital of the Catuvellauni was located near Wheathampstead, but after their defeat by Julius Caesar in 54 BC, they expanded to the north and northwest, building a new capital at Verulamium, near St. Albans. The Catuvellauni practiced agriculture extensively and apparently had a prosperous economy.

Cauca, department, southwestern Colombia, stretching eastward from the Pacific Ocean across the Andean Cordilleras (mountains) Occidental and Central, which are separated by the fertile valley of the upper Río Cauca. The department, 11,316 sq mi (29,308 sq km), is rich in minerals and forests, but it has made little progress in agriculture because of inadequate transportation. Cattle raising and the cultivation of coffee, bananas, corn (maize), rice, and sugarcane are the main economic activities. A railroad connects Popayán (*q.v.*), the departmental capital, with Cali, in Valle del Cauca department. The Cali–Pasto section of the Pan-American Highway traverses the department from north to south. Pop. (1981 est.) 827,199.



Main street of Popayán, capital of Cauca, Colombia
Allyn Baum—Black Star/EB Inc.

Cauca River, Spanish RÍO CAUCA, river, western and northwestern Colombia, rising in the Andes near Popayán and flowing northward between the Cordilleras (mountains) Occidental and Oriental for 838 mi (1,349 km) to join the Río Magdalena north of Mompós. In its middle reaches, the Cauca flows through the broad, fertile intermontane depression of the Valle del Cauca (where sugarcane, cacao, bananas, corn [maize], and rice are grown, and cattle are raised) at an elevation of 3,100–3,300 ft (940–1,000 m). Together with the adjacent uplands, the valley has been organized under a regional authority to promote balanced agricultural, commercial, and industrial development. Food, paper, and textile industries are important. The volcanic uplands produce two-thirds of Colombia's coffee. The river is navigable by river steamers below Cáceres, Antioquia department.

The Cauca River in the Andes, Colombia
Carl Frank

Caucasian PEOPLES, various ethnic groups living in the Caucasus, a geographically complex area of mountain ranges, plateaus, foothills, plains, rivers, and lakes, with grasslands, forests, marshes, and dry steppes. The complex of regions harbours more than 50 separate peoples, ranging from language communities with only a few hundred speakers to large national groups numbering millions. This diversity is not of recent date. Pliny the Elder related that the Romans carried on their business there through 80 interpreters. Arab geographers called the Caucasus Jabal al-Alsine, Mountain of Languages.

The languages of the Caucasus belong to four different families: Caucasian (or Paleocaucasian), Indo-European, Turkic, and Semitic. Whereas speakers of the latter three groups are known to have migrated to the Caucasus in

historical times, Caucasian speakers inhabited the area at the dawn of history.

The Caucasian groups divide into two northern branches and a southern branch. The southerners, comprising the Georgians, the closely related Mingrelians and Laz, and the Svan, make up the Georgian nation (3,571,000 in 1979) and live in the western Transcaucasia (the Laz live in Turkish territory). The two smaller northern groups comprise many peoples, among the largest being the Kabardians (322,000), settled along the Kuban and upper Terek basins, and the Veinakh (Chechens, Ingushes, and Bats, numbering 940,000), in the central Greater Caucasus.

Of the Indo-European peoples, the ancestors of the Armenians (4,150,000) entered Transcaucasia from Anatolia in the early 1st millennium BC. A second ancient Indo-European group is the Ossetes, or Ossetians (542,000), in the central Greater Caucasus; they are a remnant of the eastern Iranian nomads who roamed in the south Russian Steppes from the 7th century BC until the 4th century AD (when they were dispelled by the Huns) and who were successively known as Scythians, Sarmatians, and Alans. Slavic groups account for more than one-third of the total population of the Caucasus; they live in the north and consist mainly of Russians and Ukrainians. Finally, there are such Indo-European groups as Kurds, Talysh, Tats, Greeks, and Gypsies distributed in various areas.

Among the Turkic peoples are the Azerbaijani (5,477,000 in the U.S.S.R.), in the southwest, and the Kipchak Turks (Kumyk, 228,000; Nogay, 60,000; Karachay, 131,000; and Balkar, 66,000), in the north.

The only Semitic peoples in the Caucasus are the Assyrians (25,000), who fled to Russian territory from Turkish persecution at the end of World War I and live mainly in the cities.

The traditional economy of the peoples of the Caucasus is based on agriculture, cattle and sheep herding, and homecrafts. The main crops are millet, barley, wheat, and corn (maize). Wine production is highly developed in Transcaucasia, especially in Georgia. Crafts, such as rug weaving, are developed in Dagestan, Armenia, and Azerbaijan.

In the treeless highlands the villages consist of stone houses clustered together and built into the mountain slope. In the western Caucasus the villages consist of individual homesteads surrounded by fences, the buildings being made of wood or of wattles coated with clay. In central and eastern Transcaucasia, houses have a cupola-shaped vault on pillars, with an opening at the top that serves as a window and smoke flue.

Everywhere in the Caucasus there are traces of a patriarchal clan system and a tribal organization of society. These features have been best preserved among the mountaineers. In general, however, the tribal system gradually gave way to a system of village communities. Feudal relations developed especially in Georgia, Armenia, and Azerbaijan and in some parts of the northern Caucasus. Since the Russian Revolution of 1917, all areas have come increasingly under Russian influence and have felt collectivization (though many ethnic traditions still survive).

Traditionally, the major religions in the Caucasus have been Islām (notably the Turkic groups), the Eastern Orthodox Church (chiefly Georgians), the Armenian Gregorian Church, and Judaism. There are also numerous minority sects, though official Soviet policy encourages atheism.

Caucasian languages, languages indigenous to the Caucasus region that have not been affiliated with larger language families such as Indo-European, Altaic, or Hamito-Semitic.

A brief treatment of Caucasian languages follows. For full treatment, *see* MACROPAEDIA: Languages of the World.

The 30 to 40 Caucasian languages surrounding the Great Caucasus mountain range divide into at least two, and perhaps as many as five, separate language families. Genetic relations with languages outside the region are highly speculative and as yet unproven. Several linguists have proposed an "Ibero-Caucasian" family comprising all of the Caucasian languages and Basque. Others have sought to link these languages with the as yet unaffiliated ergative languages of the ancient Middle East (*e.g.,* Sumerian and Hurrian-Urartian). Most scholars accept the following grouping of the Caucasian languages: South Caucasian (Kartvelian); Northwest Caucasian (Abkhazo-Adyghian); and Northeast Caucasian (Nakho-Dagestanian).

The Kartvelian (South Caucasian) language family includes Georgian, Mingrelian, Laz, and Svan. Georgian is the state language of the Georgian Soviet Socialist Republic. It is the only one of the Caucasian languages with an ancient literary tradition, which dates back to the 5th century AD. Its monuments were inscribed in an old Georgian script derived from Aramaic with influences from the Greek alphabet; the modern Georgian writing system, a round-form cursive, is an indirect descendant of the old one. The literature also divides into periods of Old Georgian and New Georgian. Mingrelian, Laz, and Svan are unwritten languages, with Mingrelian and Laz sometimes seen as dialects of a single language. Mingrelian and Laz are spoken along the Black Sea coast; Svan is spoken in the high mountain valleys south of Mt. Elbrus.

The Kartvelian languages are considered closely related and descended from a common language. The sound system in these languages is relatively uniform, although Svan dialects have additional vowels, and all of its vowels have short and long forms. Especially in Georgian, word roots may begin with clusters of up to six consonants. The Kartvelian languages have a highly developed system of word inflection, that is, of word endings and derivation. Verb categories are expressed mainly by prefixes and suffixes. Verb conjugation is multipersonal; that is, verb forms can indicate both the person of the subject and of the direct or indirect object. A developed system of preverbs—elements preceding the verb stem and attached to it—allows the location of the action in space, its direction, and its aspect. For nouns, pronouns, and adjectives, the six cases common to all the Kartvelian languages are nominative, genitive, ergative, dative, ablative, and adverbial. The ergative case marks the subject of a transitive verb and the nominative case expresses the direct object. It is possible to single out the basic vocabulary and grammatical elements of Caucasian origin and from them to reconstruct Proto-Kartvelian. One of its characteristic features is the ablaut: different forms of a word element appear either with or without a vowel, changing with the grammatical function of the word. These ablaut patterns, best preserved in Georgian and in Svan, are parallel to those of the Indo-European languages and may have arisen as a result of contacts with Indo-Europeans at an early date. The number of Indo-European loanwords in Proto-Kartvelian suggests this contact. The pronominal system of Proto-Kartvelian is preserved in Svan but has been lost in the other languages, indicating that Svan must have been separated from the rest of Proto-Kartvelian earlier than the Mingrelo-Laz and Georgian languages.

The Abkhazo-Adyghian (or Northwest Caucasian) group consists of the Abkhaz, Abaza, Adyghian, Kabardian, and Ubykh languages. Abkhaz occurs in the Abkhazian A.S.S.R., and the others appear in the northwest Caucasus region, in the U.S.S.R. The Abkhazo-Adyghian languages are not widely differentiated into dialects. Phonologically, they have a limited number of distinctive vowels but up to 80 distinctive consonant sounds. They are characterized by a simple noun system and a complicated system of verb conjugation. In Adyghian, Kabardian, and Ubykh, nouns have only two principal cases; the other languages have none. Abkhaz and Abaza distinguish the grammatical classes of person and thing. The verb in the Abkhazo-Adyghian languages is polysynthetic; that is, various words combine to form a composite word expressing a complete statement. Verbal categories, expressed by prefixes and suffixes, indicate not only person and number but also such forms as transitivity, version, and potentiality. "Version" denotes for whom the action is intended, "potentiality" the possibility of an action. The verb denotes up to four persons. The verb forms may thus contain as many as nine morphemes in a long string.

The Nakho-Dagestanian (or Northeast Caucasian) group consists of the Nakh and Dagestanian languages. The Nakh languages—Chechen and Ingush—are spoken principally in the Chechen–Ingush A.S.S.R. A third Nakh language, Bats, is spoken in the Georgian S.S.R. The Dagestan languages can be divided into the following groups and numbers of speakers: (1) the Avaro-Ando-Dido languages of central and western Dagestan and part of the Azerbaijan S.S.R.; (2) the Lakk-Dargwa languages, of central Dagestan; and (3) the Lezgian languages, principally of southern Dagestan.

Compared with the other two Caucasian families, the Nakho-Dagestanian is less clearly unified from a genetic standpoint. While some linguists would join Nakho-Dagestanian with Abkhazo-Adyghian into a single North Caucasian family, others would separate the Nakh languages (Central Caucasian) and the Dagestan languages (East Caucasian) into distinct families.

The sound systems of the Nakho-Dagestanian languages are diverse. There are up to five cardinal vowels (*a, e, i, o, u*); additional forms may increase the number of vowels to 30. The consonant systems of the Nakh languages resemble those of the South Caucasian languages. Most of the Dagestanian languages present a distinctive opposition of strong and weak voiceless consonants. All the Caucasian languages have stops of three types—voiced, voiceless aspirated, and glottalized (*i.e.,* pronounced respectively with vibrating vocal cords; with vocal cords not vibrating but with an audible puff of breath; and with accompanying closure of the glottis). In the Nakho-Dagestanian languages the grammatical category of classes (eight in Bats, six in Chechen) differentiates things from persons. Pronouns distinguish a category of inclusive-exclusive, for example, "we with you" and "we without you." Nakho-Dagestanian syntax, like Kartvelian, uses the ergative construction of the sentence.

The original vocabulary of the North Caucasian languages has been preserved in the modern languages. The written languages of the area are the state languages. Newspapers, radio, and television use the local languages; and children in primary schools are taught in their mother tongue. The North Caucasian alphabets are based on the Cyrillic alphabet, which was adopted in 1936–38.

Where the same name may denote a person, place, or thing, the articles will be found in that order

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Caucasoid geographical race, also called EUROPEAN GEOGRAPHICAL RACE, a group of human populations (local races and microraces) largely located, about AD 1500, in Eu-

rope, North Africa, and the Middle East. Since AD 1500 Caucasoids have undergone a particularly rapid expansion and have displaced the aboriginal populations of North and South America, Australia, and New Zealand and have established themselves to some extent in sub-Saharan Africa and some parts of Asia. They are characterized by minimal skin pigmentation; straight to curly hair; large, rather narrow, and high-bridged noses; heavy body hair and a high incidence of male pattern balding; high frequency of the Rh-negative (Rh blood group system) blood type and the presence of the A_2 blood type in the ABO series.

Caucasus, Russian KAVKAZ, region and mountain system in the southwestern corner of the European U.S.S.R., lying between the Black and Azov seas to the west and the Caspian Sea to the east.

The following article is a summary of salient detail about the Caucasus (Mountain) region; for fuller detail, *see* MACROPAEDIA: Union of Soviet Socialist Republics.

The Great Caucasus range extends for approximately 750 mi (1,210 km) southeastward along the breadth of the Caucasus region. The country north of the Great Caucasus range is called Ciscaucasia; the region south of the range is called Transcaucasia.

The Great Caucasus is a series of ranges running generally north–south, including the principal peaks of Mt. Elbrus (18,510 ft [5,642 m]), Mt. Dykh-Tau (17,073 ft), Mt. Koshtan-Tau (16,899 ft), Mt. Shkhara (16,627 ft), and Mt. Kazbek (16,512 ft). The Great Caucasus has 2,200 glaciers, which cover 552 sq mi. The Caucasus Mountains are crossed by several passes, notably the Mamison and the Daryal, and by the Georgian Military Road and the Ossetian Military Road, which connect Ciscaucasia with Transcaucasia to the south. Ciscaucasia north of the Great Caucasus consists of vast plains, much of them under cultivation for cereals. Transcaucasia is dominated by similar plains and by the Little Caucasus range of mountains.

Water power resources are considerable. The deepest and most powerful rivers are the Rioni, the Kura, and the Aragvi. Ozero Sevan is the largest lake of Caucasia. The mountain slopes of the Caucasus are covered with forests, which include oak, chestnut, beech and alder, Caucasian fir, ash, and linden. Animal life includes chamois, red deer, bear, lynx, fox, and two species of bison. The clear rivers and lakes are full of trout. The Caucasus is rich in deposits of various minerals, including coal, iron ore, lead, zinc, copper, molybdenum, and manganese. Petroleum is exploited in Azerbaijan and in Krasnodar and Stavropol *krays*, and natural gas deposits have acquired great importance. The Caucasus is also rich in various mineral waters, building materials, and other minerals.

Cauchon, Pierre (b. 1371, near Reims, Fr.—d. Dec. 18, 1442, Rouen), French bishop of Beauvais, an ecclesiastic memorable chiefly because he presided over the trial of Joan of Arc.

Cauchon was educated at the University of Paris, of which he became rector in 1403. He became associated with the Burgundian party and took part in the riots of the Cabochiens (radical reformers) during 1413. He was subsequently banished from Paris in 1414, taking service with John the Fearless, duke of Burgundy, thereafter. He became bishop of Beauvais in 1420. In 1422 Cauchon, as a counselor of Henry VI of England, became a servant of the King's regent in France, John, duke of Bedford. Cauchon aided the Anglo-Burgundian alliance in gaining control of much of northern France from the French king. An

Cauchon, drawing of his tomb sculpture, 15th century, by Roger de Gaignières; in the Bibliothèque Nationale, Paris

Giraudon—Art Resource/EB Inc.

excellent opportunity to serve the English arose when Joan of Arc was captured in Cauchon's diocese in 1430. Cauchon was careful to disguise the political motivations of Joan's trial by conducting it according to inquisitorial procedure and by attempting to obtain from Joan a confession that would save her life. He is held formally responsible for her condemnation and subsequent execution as a heretic. Cauchon became bishop of Lisieux in 1432.

Cauchy, Augustin-Louis, Baron (b. Aug. 21, 1789, Paris—d. May 23, 1857, Sceaux, Fr.), French mathematician who pioneered in analysis and the theory of substitution groups (groups whose elements are ordered sequences of a set of things). He was one of the greatest of modern mathematicians.

At the onset of the Reign of Terror (1793–94), his family fled from Paris to the village of Arcueil, where Cauchy first became acquainted with the mathematician Pierre-Simon Laplace and the chemist Claude-Louis Berthollet.

Cauchy became a military engineer and in 1810 went to Cherbourg to work on the harbours and fortifications for Napoleon's English invasion fleet. In spite of his work load he produced several mathematical papers of note, including the solution of a problem sent to him by Joseph-Louis Lagrange that established a relationship between the number of edges, the number of vertices, and the number of faces of a convex polyhedron, and the solution of Pierre de Fermat's problem on polygonal numbers.

Cauchy returned to Paris in 1813, and Lagrange and Laplace persuaded him to devote himself entirely to mathematics. The following year he published the memoir on definite integrals that became the basis of the theory of complex functions. From 1816 he held professorships in the Faculté des Sciences, the Collège de France, and the École Polytechnique, all in Paris. When Gaspard Monge was expelled for political reasons from the Académie des Sciences (1816), Cauchy was appointed to fill the vacancy. The same year he won the *grand prix* of the Institut de France for a paper on wave propagation, now accepted as a classic in hydrodynamics. In 1822 he laid the foundations of the mathematical theory of elasticity.

Cauchy's greatest contributions to mathematics, characterized by the clear and rigorous methods he introduced, are mainly embodied in his three great treatises: *Cours d'analyse de l'École Royale Polytechnique* (1821; "Courses on Analysis from the École Royale Polytechnique"); *Résumé des leçons sur le calcul infinitésimal* (1823; "Infinitesimal Calculus"); and *Leçons sur les applications du calcul infinitésimal à la géométrie* (1826–28; "Lessons on the Applications of Infinitesimal Calculus to Geometry"). The first phase of modern rigour in mathematics originated in his lectures and researches in analysis during the 1820s. He clarified the principles of calculus and put them on a satisfactory basis by developing them with the aid of limits and continuity, concepts now considered vital to analysis. To the same period belongs his development of the theory of functions of a complex variable (a variable involving a multiple of the square root of minus one), today indispensable in applied mathematics from physics to aeronautics.

Although acting only from the highest motives, Cauchy often made himself objectionable to his colleagues by a self-righteous obstinacy and an aggressive religious bigotry. Upon the exile of Charles X in 1830 and the ascension of Louis-Philippe to the throne, Cauchy went into exile, too, rather than take the oath of allegiance. A chair of mathematical physics was created for him at the University of Turin, but in 1833 he left to tutor the Duc de Bordeaux, grandson of Charles X. In 1838, with the suspension of the oath, he returned to France, resuming his chair at the École.

Cauchy made substantial contributions to the theory of numbers and wrote three important papers on error theory. In astronomy he gave a shorter account than Urbain-Jean-Joseph Leverrier of the motion of the asteroid Pallas. His work in optics provided a mathematical basis for the workable but somewhat unsatisfactory theory of the properties of the ether, a hypothetical, omnipresent medium once thought to be the conductor of light. His collected works, *Oeuvres complètes d'Augustin Cauchy* (1882–1970), were published in 27 volumes.

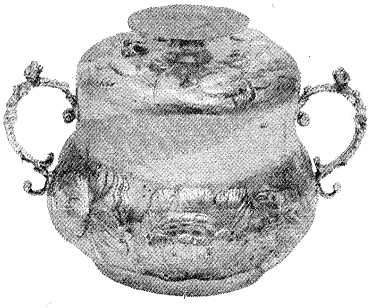
caucus, in politics in the United States, a special form of party meeting; in Great Britain, a system of party organization. The word caucus originated in Boston in the early part of the 18th century, when it was used as the name of a political club, the Caucus, or Caucus Club. In that club public matters were discussed and arrangements made for local elections and the choosing of candidates for offices. In its subsequent and current usage in the United States, the term caucus came to be used in a more restricted sense to denote a meeting either of party managers or of duty voters, as for instance a "nominating caucus," for nominating candidates for office or for selecting delegates for a nominating convention. The caucus of a party's members in Congress nominated its candidates for the office of president and vice president from 1796 until 1824. At the same time, the candidates for governor and lieutenant governor were nominated by the party members of the state legislatures in what was known as the legislative nominating caucus. Occasionally, districts unrepresented in the legislature sent in delegates to sit in with the members of the legislature when these nominations were made, and this was termed the mixed legislative nominating caucus. The use of the term caucus has also been extended to describe meetings of the members of a party in Congress or in a legislature or a city council to determine matters of party policy on proposed legislation or legislative offices.

In Great Britain, the term caucus first came

into use in 1878, when Joseph Chamberlain and Frank Schnadhorst organized the Liberal Association of Birmingham on strict disciplinary lines, particularly with a view toward managing elections and controlling voters. This type of organization became the model for other Liberal associations throughout the country; and, because it was a supposed imitation of the U.S. political "machine," Benjamin Disraeli gave it the name caucus. Thus, the name came to be used thereafter, not in the U.S. sense of a meeting but of a closely disciplined system of party organization, not infrequently as a term of abuse applied by politicians of one party to the controlling organization of its opponents.

Caudine Forks, Latin FURCULAE CAUDINAE, narrow mountain pass near Beneventum in ancient Samnium (near modern Montesarchio, Campania, southern Italy). In the Battle of Caudine Forks the Samnites under Gavius Pontius defeated and captured a Roman army in 321 BC, during the Second Samnite War. The Roman army surrendered, and acknowledged that they had been defeated by passing under a "yoke" of Samnite spears, a unique disgrace.

caudle cup, small, two-handled silver cup, usually with a cover, originally made in England during the second half of the 17th century and possibly used for caudle—warm ale or wine mixed with bread or gruel, eggs,

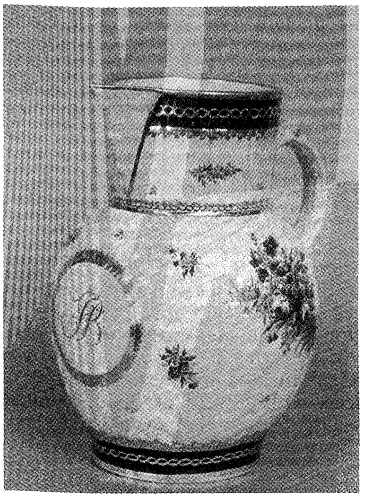


Silver-gilt caudle cup, English, 1660; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London

sugar, and spices—which was administered to women after childbirth and to convalescents. The cup is gourd shaped, without a foot, and of thinnish metal usually embossed (ornamented with relief work) with floral motifs. Caudle cup handles, which flare out on either side, are cast in various grotesque shapes. Sometimes the domed cover has a flat, spool-shaped finial that enables it to be reversed and used as a stand.

Caughley ware, porcelain produced by the Caughley China Works, a factory in Caughley, Shropshire, Eng. A local earthenware pottery was extended in 1772 by Thomas Turner to make soaprock porcelain; a close connection existed with Worcester, and from there Robert Hancock, the pioneer engraver of copper plates for transfer printing, joined Turner in 1775. The bulk of Caughley's so-called "Salopian" ware was blue-and-white, mostly blue-printed or powder-blue; in shade, an initial soft blue was succeeded *c.* 1780 by a stronger violet blue. Blue painting was without distinction, nor was it made in any quantity, and only one form—a mask jug copied from Worcester, molded in the cabbage-leaf style, and painted in enamels and gilt—is noteworthy. Turner's exploitation of blue-printing techniques brought him success; he issued a wide range of patterns, including sporting subjects, views, and commemorative pieces (such as that showing the world's first all-iron bridge built nearby in 1779) that were embellished with elaborate scrolled or brocaded borders. Caughley polychrome decoration is inferior in quality, but some flower painting is colourful.



Caughley porcelain mask jug molded in cabbage-leaf style and painted in underglaze colours and gilt, Shropshire, England, *c.* 1790; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

White porcelain was supplied to independent decorators. One distinction of the factory was its introduction of the perennial Willow pattern; the original, dated 1779, was intended for a teapot, and the best known version was developed by Turner in the late 1780s. Blue Willow ware remained, from many subsequent factories, perhaps the most widespread of domestic designs. The Caughley works was bought by John Rose in 1799.

Caulaincourt, Armand(-Augustin-Louis), marquis de, DUC (duke) DE VICENCE (b. Dec. 9, 1773, Caulaincourt, Fr.—d. Feb. 19, 1827, Paris), French general, diplomat, and ultimately foreign minister under Napoleon. As the Emperor's loyal master of horse from 1804, Caulaincourt was at Napoleon's side in his great battles, and his *Mémoires* provide an important source for the period 1812 to 1814.

In 1795 he became a cavalry conscript in western France and in 1799 was named a colonel of a crack cavalry regiment, which he led at the Battle of Hohenlinden (1800). Talleyrand, his father's friend, employed him in Russia (1801–02), where he impressed Alexander I. Napoleon took him as aide-de-camp on his return. In March 1804 he was sent to Baden to deal with royalist agents from beyond the Rhine; this led to the arrest and eventual execution of the Duc d'Enghien, an action that Caulaincourt did not wholly condone, though the orders were relayed through him.

From November 1807 to February 1811, Caulaincourt was ambassador to Russia, working incessantly for peace against Napoleon's arbitrary policy. Napoleon created him duc de Vicence (Vicenza) in 1808. Recalled in 1811,

Caulaincourt, lithograph by F.-S. Delpech after a portrait by J.-B. Belliard

By courtesy of the Bibliotheque Nationale, Paris

Caulaincourt was subjected to Napoleon's angry taunts that he was "Russian." After the invasion of Russia began (1812), Caulaincourt asked to be sent to Spain, as far away from the Emperor as possible. Yet he was part of the small entourage accompanying Napoleon on his return from Russia to Paris.

Caulaincourt negotiated the armistice in Silesia (June 1813) and went to the abortive congress at Prague. After the Battle of Leipzig, he became foreign minister as the "man of peace," but Napoleon was not peaceful, and by mid-March 1814 the congress of Châtillon had failed. Caulaincourt finally reached Alexander I and, on April 10, 1814, signed the treaty that sent Napoleon to Elba; he was with him in the last grim week at Fontainebleau. In 1815 he resumed the hopeless task of being Napoleon's foreign minister. After Waterloo Alexander's intervention saved him from the Bourbon proscription. Henceforth he lived in retirement, still trying to clear his name of complicity in the Enghien case.

Cauliaco, Guido de (medieval surgeon): *see* Chauliac, Guy de.

cauliflower (*Brassica oleracea,* Botrytis group), form of cabbage (*q.v.*), of the mustard family (Brassicaceae), consisting of a compact terminal mass of greatly thickened, modified, and partially developed flower structures, together with their subtending fleshy stalks.

Cauliflower (*Brassica oleracea,* Botrytis group)

Derek Fell

As desired for food, this terminal cluster forms a firm, white, succulent "curd." The broad, much-elongated leaves extend far above this curd. In most varieties the leaves must be tied together well above the curd, or broken over it, several days before harvest to prevent discoloration of the curd by sunlight.

Cauliflower is frequently served as a cooked vegetable, and the separated flower structures are also used in salads and as relishes in raw form.

cauliflower ear, distortion of the cartilage of the outer ear as the result of an injury. If the injury causes bleeding between the cartilage and the skin, it produces a smooth and rounded purplish swelling. Accumulated clotted blood, if not removed, is transformed into scar tissue, causing permanent, odd-shaped thickening of the outer ear. Because boxers' and wrestlers' ears are subjected to so much pounding abuse, cauliflower ear is often associated with those sports.

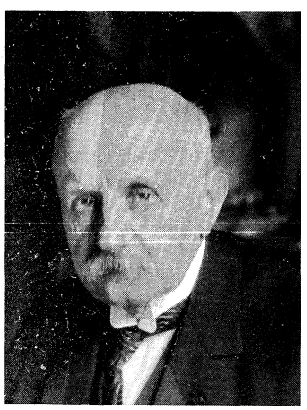
cauliflower ware, in pottery, creamware modelled and glazed in green and yellow to simulate a cauliflower, the term also applying to other fruit or vegetable forms. About 1760, William Greatbach undertook the potting and modelling, jobbed out to him by Josiah Wedg-

wood, of cauliflower tureens and stands, lettuce pots, and pineapple teapots, which were returned to Wedgwood for glazing. Production was lively and was imitated by other Staffordshire potters, yet it died out after 1769, when Wedgwood's new Etruria works was opened; the cabbage or cauliflower spout, however, was a molded detail still used by Wedgwood. The Rococo vogue for plant forms may be seen in the many Chelsea dishes and small tureens of the 1750s in the form of cauliflowers and cabbages, as well as melon, quince, cucumber, and lemon tureens, very rare in "Wedgwood-Greatbach" ware. Meissen was the origin of most of these designs, and tureens in faience were the specialty of some continental factories, notably Brussels and Holitsch. Particularly successful in this genre is a cauliflower teapot, small in scale and partially covered in Wedgwood's green glaze.

Cauliflower ware teapot, probably Wedgwood, Burslem, Staffordshire, Eng., c. 1763; in the Victoria and Albert Museum, London

By courtesy of the Victoria and Albert Museum, London; photograph, EB Inc.

Caullery, Maurice (-Jules-Gaston-Corneille) (b. Sept. 5, 1868, Bergues, Fr.—d. July 15, 1958, Paris), French biologist famous for his research on parasitic protozoans and marine invertebrates.



Caullery

H. Roger-Viollet

Caullery taught at the University of Marseille (1900) and the University of Paris (1903) and succeeded Alfred Giard as director of the zoological station at Wimereux (1909). He was particularly interested in how the morphology, reproduction, and ecology of tunicates (related to vertebrates) and annelid worms had a bearing on their evolution. He also described and named the marine worm *Siboglinum weberi,* which later became the basis for establishing the invertebrate phylum Pogonophora.

Among Caullery's more important works are *Le Parasitisme et la symbiose* (1922; *Parasitism and Symbiosis,* 1952), *Le problème de l'évolution* (1931; "The Problem of Evolution"), and *Organisme et sexualité* (1942; "Organism and Sexuality").

Caulonia, ancient Greek city in southern Italy, southernmost of the colonies founded in Italy by the Achaeans. Established perhaps in the first half of the 7th century BC, Caulonia was an outpost of Croton. Judging from its copious and beautiful coinage from the second half of the 6th century, it seems to have been of some importance despite its small size. After capture by Campanian troops during the invasion (280–275) by Pyrrhus, king of Epirus, and then submission to Hannibal in 215, the city withstood a siege (209) on Hannibal's side in the Second Punic War, but its fortunes declined soon after.

Excavations at the site, located on the eastern coast of modern Calabria, nine miles from modern Caulonia, have revealed remains of fortifications with towers of the Hellenistic period, a large Doric temple, a small temple, and terra-cotta fragments of architectural structures.

Silver stater from Caulonia, 540–510 BC; in the Bibliothèque Nationale, Paris

Giraudon—Art Resource/EB Inc.

Caunt, Benjamin (b. March 22, 1815, Hucknall-Torkard, Nottinghamshire, Eng.—d. Sept. 10, 1861, London), British prizefighter, one of the first to aspire to a world's championship in addition to national honours.

Caunt claimed the English title after winning from Bendigo (William Thompson) on a questionable foul in 75 rounds on April 3, 1838. When on Oct. 26, 1840, he beat John Leechman after 101 rounds, he was considered champion of England. In 1841 he went to the United States seeking opponents for the world's championship, but no match was ever made. Charles Freeman of Michigan, who stood 6 feet 10½ inches and weighed about 250 pounds, challenged Caunt, who, instead of fighting Freeman, became his manager and took him to England for a series of exhibition bouts there. Caunt was defeated by Bendigo on a foul in 93 rounds on Sept. 9, 1845, yielding his disputed claim to the title.

Caupolicán, also spelled QUEPOLICÁN (b. early 16th century, Palmaiquén, Chile—d. 1558, Cañete), Mapuche chief and a leader of the Indian resistance to the Spanish invaders of Chile.

With the assistance of Lautaro, another Mapuche, Caupolicán and his men captured the Spaniards' leader, Pedro de Valdivia, after a battle at Tucapel in December 1553. Reportedly, Caupolicán attempted but failed to save Valdivia from torture and execution (January 1554). In April 1557 Lautaro was defeated and executed by an army led by Francisco de Villagrán at Mataquito, leaving Caupolicán in sole command of the Indian resistance. After an initial victory against Villagrán, Caupolicán suffered three disastrous routs at the hands of forces led by Don García Hurtado de Mendoza, losing more than 6,000 men in one of the defeats. Caupolicán retreated to the mountains near Cañete, where he was finally captured by Capt. Alonso de Reinoso and barbarously murdered in 1558. Although Caupolicán was a man of great skill and valour, his fame rests primarily on the verses dedicated to him by the poet Alonso de Ercilla y Zúñiga in his long poem *La Araucana.* The poet was with the army of Mendoza and apparently witnessed firsthand the deeds of the Mapuche chief.

Causses, gorge-gouged limestone plateaus of southwestern France. The name is from *cau,* local form of *chaux,* meaning "lime." At elevations of from 3,000 to 4,000 ft (900 to 1,200 m), the Grands-Causses form part of the Massif Central and occupy parts of Aveyron and Lozère *départements.* Lower limestone plateaus farther west in Quercy and Périgord are called the Petits Causses.

About 60 mi (100 km) from north to south and about 30 mi wide, the plateaus are bare, karstlike, stony solitudes amid whose boulders scanty brush appears. The Tarn and Aveyron rivers have carved canyons with fantastic rock shapes, and it is in their sheltered valleys that settlement still clings.

The dramatic gorges and the eerie white plateaus attract an increasing number of tourists, mainstay of the economy. Glacial action and water erosion have opened potholes (locally called *avens*) in the surface that often lead down to grottoes. The caverns of the Causses du Quercy retain evidences of prehistoric man. The caves of Roquefort on the western edge of the Causses du Larzac are used for the manufacture of the celebrated cheese made from sheep milk. Production is controlled by a cooperative founded in 1880. Sheep rearing is the other prop, after tourism, of the regional economy. Millau, once a woolweaving centre, makes sheepskin gloves.

caustic, lunar: *see* silver nitrate.

caustic potash, potassium hydroxide, a potassium salt that readily dissolves in water to form a strongly alkaline and corrosive solution (*see* potassium).

caustic soda, sodium hydroxide, a white crystalline solid used extensively in the manufacture of soap, rayon, and paper (*see* sodium).

Cauto River, river in Granma and Santiago de Cuba provinces, eastern Cuba. The island's longest river, it flows for 230 mi (370 km) from its source in the Sierra Maestra westward through alluvial swamps into the Golfo (gulf) de Guacanayabo. Its tributaries include the Salado, Bayamo, and Contramaestre rivers. It is navigable for about 70 mi. Rice, sugarcane, tobacco, and cattle are raised along its course.

Cauvery River, also spelled KĀVERĪ, sacred river of southern India, rising on Brahmagiri Hill in the Western Ghāts in Coorg district of Karnātaka state, flowing in a southeasterly direction for 475 mi (765 km) through Karnātaka and Tamil Nādu states, and descending the Eastern Ghāts in a series of great falls. Before emptying into the Bay of Bengal south of Cuddalore, Tamil Nādu, it breaks into a large number of distributaries describing a wide delta called the "garden of southern India." Known to devout Hindus as Dakṣina Gaṅgā (Ganges of the South), it is celebrated for its scenery and sanctity in Tamil literature, and its entire course is considered holy ground. The river is also important for its irrigation-canal projects.

Its uppermost course is tortuous with a rocky bed and high banks under luxuriant vegetation. After passing through a narrow gorge and tumbling 60–80 ft (18–24 m) in the rapids of Chunchankatte, the river widens to 900–1,200 ft across the Karnātaka plateau. There, its flow is interrupted by a number of anicuts or weirs. At the Krishnarāja Sāgara, the Cauvery is joined by two tributaries, the Hemāvati and

Lakshmantīrtha, and dammed for irrigation, forming a 12-sq-mi (31-sq-km) reservoir.

In Karnātaka, the river bifurcates twice, forming the sacred islands of Srirangapatnam and Sivasamudram, 50 mi apart. Around Sivasamudram are the scenic Sivasamudram Falls, comprising two series of rapids, Bhar Chukki and Gagana Chukki, plunging 320 ft and reaching a width of 1,000 ft in the rainy season. The falls supply hydroelectric power to Mysore, Bangalore, and the Kolār Gold Fields, more than 100 mi away.

Upon entering Tamil Nādu, the Cauvery continues through a series of twisted wild gorges until it reaches Hogenakal Falls and flows through a straight, narrow gorge near Salem. There, the Mettūr Dam, 5,300 ft long and 176 ft high, impounds a lake (Stanley Reservoir) of 60 sq mi. The Mettūr Project, completed in 1934, created an important agricultural and industrial area by improving irrigation and providing hydropower.

After sweeping past the historic rock of Tiruchchirāppalli (Trichinopoly), the Cauvery breaks at Srirangam Island, a main pilgrimage centre. There in Thanjāvūr (Tanjore) district of Tamil Nādu state, its braided and extensively irrigated deltaic region of about 4,000 sq mi begins. The Grand Anicut was built in the 2nd century at the point where the river divides. A second anicut (1836–38) across the Coleroon, the northern and larger channel, saved the old system from silting and extended irrigation. The open roadsteads of Nāgappattinam and Kārikāl are on the seaward side of the delta. The only navigation on any part of the Cauvery course is in basketwork boats. Its main tributaries are the Kabbani, Amarāvati, Noyil, and Bhavāni rivers.

cava (ritual beverage): *see* kava.

Cava de' Tirreni, town and episcopal see, Salerno province, Campania region, southern Italy, in a rich cultivated valley surrounded by hills, just northwest of Salerno city. Cylindrical towers on the hills are used for shooting pigeons, a tradition derived from Lombardy. Just southwest is the village of Corpo di Cava, with the famous Benedictine abbey of Trinità della Cava, founded in a cave in 1011 by St. Alferius, who had come from Cluny, Fr. Although most of the buildings were modernized in 1796, the Gothic cloisters remain. The archives contain 8th-century parchments, and the library's valuable manuscripts include a 7th-century Visigothic Bible and the 11th-century Lombard Laws; there are also a museum and a picture gallery.

Cava de' Tirreni is a popular resort and centre for international sporting events. Manufactures include textiles, food products, and tobacco. Pop. (1981 prelim.) mun., 50,558.

Cavafy, Constantine, pseudonym of KONSTANTÍNOS PÉTROU KAVÁFIS (b. April 17, 1863, Alexandria—d. April 29, 1933, Alexandria), Greek poet who developed his own consciously individual style and thus became one of the most important figures not only in Greek poetry but in Western poetry as well. He lived most of his life in Alexandria, loved English and French literature, and generally spoke English; even his Greek had a British accent.

Cavafy
Dimitri Papadimos

Cavafy wrote much but was his own harshest critic, publishing only about 200 poems. His most important poetry was written after his 40th year, and with some justification he called himself a "poet of old age." A skeptic, he denied or ridiculed traditional values of Christianity, patriotism, and heterosexuality, though he was ill at ease with his own nonconformity. His language is a strange mixture of the refined and stilted Greek called Katharevusa, inherited from the Byzantines, and the Demotic, or spoken, tongue. His style and tone are intimate and realistic. The lyric treatment he gave to familiar historical themes made him popular and influential after his death. He is well-known to English readers from the many references to his work in Lawrence Durrell's *Alexandria Quartet.* Cavafy's poems were first published without date before World War II and reprinted in 1949. An English translation, *The Poems of C.P. Cavafy,* appeared in 1951.

Cavaignac, Louis-Eugène (b. Oct. 15, 1802, Paris—d. Oct. 28, 1857, Sarthe, Fr.), French general and chief executive during the Revolution of 1848, known for his harsh reprisals against rebelling Parisian workers in June of that year.

Louis-Eugène Cavaignac, detail from an engraving by Alphonse Martinet
By courtesy of the Bibliotheque Nationale, Paris

Cavaignac's father, Jean-Baptiste, was a Jacobin member of the Committee of General Security during the French Revolution (1789–92), and Louis retained his father's strong republican beliefs. His uncle, Jacques-Marie, served the Bourbons and the July Monarchy, which ruled France in 1830–48, and helped Cavaignac regain his appointment in the army, from which he had been dismissed in 1831 because of his republicanism. Nevertheless, he was sent to the relative isolation of Algeria.

Cavaignac performed with distinction during the French conquest of Algeria in the 1840s, and in 1848 he was appointed governor general. Amid the revolutionary activity of that year, he was elected to the legislature in France and appointed minister of war by the provisional government of the newly formed Second Republic. That June there was a large workers' revolt in Paris to protest the expulsion of Socialist leaders from the National Assembly and the closing of the national workshops (government-sponsored employment centres). Cavaignac directed the suppression of the revolt, for which he became known as "the butcher of June." On June 28 the National Assembly named him chief executive of France, but he lost the presidential election to Louis-Napoléon Bonaparte (later Emperor Napoleon III) that December.

Cavaignac remained a leader of the opposition to Bonaparte. He was arrested in 1851, but the next year he was elected to the Corps Législatif. He refused, however, to take an oath of allegiance to the new emperor and thus was denied his seat in the legislature both then and again in 1857.

In 1899 the memoirs and correspondence of Cavaignac and his uncle were published as *Les Deux Généraux Cavaignac. Souvenirs et correspondance (1808–1848).*

Cavaillé-Coll, Aristide (b. Feb. 4, 1811, Montpellier, Fr.—d. Oct. 13, 1899, Paris), distinguished French organ builder and initiator of the orchestral style of French organ building and composing.

Descended from a family of organ builders and a talented protégé of his father, Dominique, a well-known builder of Languedoc, he early became a competent and experienced engineer, winning at 22 a prize for the invention of a popular circular saw. At the suggestion of the composer Gioacchino Rossini, Cavaillé-Coll went to Paris in 1833. There he was awarded a contract for a large organ for the basilica of Saint-Denis; completed by 1841, this instrument became in tone and mechanism a model for many later French organs. Napoleon III put Cavaillé-Coll in charge of rebuilding a number of important cathedral organs, and thereafter his fame spread. Eventually over 600 instruments bore his name, a number of them in England, where he had considerable influence.

Among Cavaillé-Coll's contributions to organ building were a number of improvements in mechanism and pipework aimed at making the organ as expressive and versatile as a symphony orchestra. He largely standardized the layout of keyboards and stop controls and achieved excellent balance and uniformity of tone in each set of pipes through careful voicing, while maintaining the strong contrasts of tone colour characteristic of romantic, symphonic organs. Although Cavaillé-Coll successfully imitated the sound of several orchestral instruments, he sacrificed the transparency and clarity of tone that distinguished Baroque organs, so that his instruments are not well-suited, for example, to the music of J.S. Bach. Yet, he influenced a new school of organ composition, and 19th-century composers of the stature of César Franck, Camille Saint-Saëns, Charles-Marie Widor, and Louis Vierne wrote particularly with the Cavaillé-Coll sound in mind. Many of his instruments are still in regular use.

Cavalcanti, Alberto, original name ALBERTO DE ALMEIDA-CAVALCANTI (b. Feb. 6, 1897, Rio de Janeiro—d. Aug. 23, 1982, Paris), Brazilian-born director-producer, screenwriter, and art director of motion pictures in the mid-20th century who spent much of his career in Europe.

Cavalcanti established his reputation as a documentary filmmaker in Britain during the 1930s and went on to produce some notable films for Ealing Studios. In the 1950s he returned to Brazil and was a leading figure in the revival of Brazilian cinema. Cavalcanti studied architecture in Geneva, worked in French cinema as an art director, and in 1926 made the pioneering documentary *Rien que les heures* (1926; "Nothing But Time"), which portrayed the lives of Paris workers during a single day. In 1934 he went to Britain and joined John Grierson on the General Post Office (GPO) Film Unit to make *Pett and Pott* (1934), *Coalface* (1935; with Grierson and W.H. Auden), and *We Live in Two Worlds* (1937). The GPO's productions were important milestones in the development of documentaries. Moving to Ealing Studios in 1941, he produced such wartime propaganda films as *The Foreman Went to France* (1942) and, after 1943, directed the features *Champagne Charlie* (1944), *Nicholas Nickleby* (1947), and *They Made Me a Fugitive* (1947). After returning to Brazil, he made *O Canto do mar* (1952; "The Song of the Sea") and *Mulher de verdade* (1954; "Woman of Truth") with his own company; but he fell under official suspicion because of his left-wing stance and

in 1954 returned to Europe. Cavalcanti eventually settled in France, where he continued his work in television.

Cavalcanti, Guido (b. *c.* 1255, Florence—d. Aug. 27/28, 1300, Florence), Italian poet, a major figure among the Florentine poets who wrote in the *dolce stil nuovo* ("sweet new style") and is considered, next to Dante, the most striking poet and personality in 13th-century Italian literature.

Born into an influential Florentine family of the Guelf (papal) party, Cavalcanti studied under the philosopher and scholar Brunetto Latini, who earlier had been the teacher of Dante. Cavalcanti married the daughter of the rival Ghibelline (imperial) party leader Farinata degli Uberti but joined the White Guelf faction when, in 1300, that party split into Blacks and Whites. That same year, Dante, who had dedicated several poems to Cavalcanti and called him his "first friend," apparently was involved in banishing Cavalcanti from Florence. In exile in Sarzana, Cavalcanti contracted malaria and was permitted to return to Florence, where he died.

Cavalcanti's strong, temperamental, and brilliant personality and the poems that mirror it were admired by many contemporary poets and such important later ones as Dante Gabriel Rossetti and Ezra Pound. He left about 50 poems, many addressed to two women: Mandetta, whom he met in Toulouse in 1292, and Giovanna, whom he calls Primavera ("Springtime"). Cavalcanti's poems glow with the brilliance, grace, and directness of diction characteristic of the style at its best. Love is the poet's dominant theme, generally love that causes deep suffering.

Two of Cavalcanti's poems are canzoni, a type of lyric derived from Provençal poetry, of which the most famous is "Donna mi prega" ("A Lady Asks Me"), a beautiful and complex philosophical analysis of love, the subject of many later commentaries. Others are sonnets and ballate (ballads), the latter type usually considered his best. One of his best known ballate was also one of his last, written when he went into exile: "Perch'io non spero di tornar giamai" ("Because I hope not ever to return"), a line that some hear echoed in T.S. Eliot's refrain from "Ash Wednesday," "Because I do not hope to turn again."

Cavalcanti's poetry was first collected in 1527 and later in *Le rime de Guido Cavalcanti* (1902). Many poems were translated by Rossetti in *The Early Italian Poets* (1861; later retitled *Dante and His Circle*) and by Pound in *The Sonnets and Ballate of Guido Cavalcanti* (1912).

Cavalcaselle, Giovanni Battista (b. Jan. 22, 1820, Legnago, Kingdom of Lombardy and Venetia—d. Oct. 31, 1897, Legnago, Italy), writer on art and, with Giovanni Morelli (*q.v.*), founder of modern Italian art-historical studies.

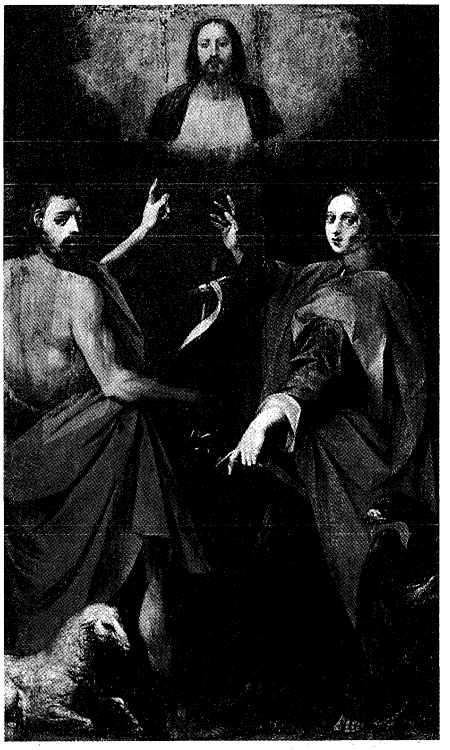
A student at the Accademia delle Belle Arti in Venice, from early youth Cavalcaselle studied the art treasures of Italy. In Germany (1846–47), he met another art enthusiast, the Englishman J.A. Crowe, and they studied together in Berlin. On his return to Venice Cavalcaselle took an active part in the Revolution of 1848 against Austrian rule. He was arrested by Austrian gendarmes and narrowly escaped being shot. He then joined the forces of Giuseppe Garibaldi and was taken prisoner by the French in 1849. He arrived in miserable plight in Paris, where by good fortune he again met Crowe, and with his help went to London. The two friends worked on a history of early Flemish painters (1857). In 1864 Crowe and Cavalcaselle published their great work, *A New History of Italian Painting,* which was followed by the *History of Painting in North Italy.* Other joint works were *Titian* (1877) and *Raphael* (1882–85). Cavalcaselle's sketchbooks and notes, preserved in the Marciana library in Venice, are evidence of his method and range of knowledge.

Cavalcaselle was for some time secretary to Giovanni Morelli and was his travelling companion when Morelli compiled the inventory of the works of art in the Marches of Ancona for the Italian government. Toward the end of his life Cavalcaselle was inspector of fine arts in the Ministry of Education in Rome.

cavalier (from Late Latin *caballarius*, "horseman"), originally a rider or cavalryman; the term had the same derivation as the French *chevalier.* In English the word knight was at first generally used to imply the qualities of chivalry associated with the *chevalier* in French and with the kindred *cavaliere* in Italian and *caballero* in Spanish. "Cavalier" in English, however, had the pejorative sense of "swashbuckling" or "overbearing."

In the English Civil Wars (1642–51), the name was adopted by Charles I's supporters, who contemptuously called their opponents Roundheads; at the Restoration, the court party preserved the name Cavalier, which survived until the rise of the term Tory.

Cavalier D'ARPINO, original name GIUSEPPE CESARI, also called IL GIUSEPPINO (b. *c.* 1568, Arpino, Kingdom of Naples—d. 1640, Rome), Italian painter of the post-Renaissance school known as Mannerist, who by his popularity helped to spread that school abroad.



"Christ with St. John the Baptist," painting from "Scenes from the Life of St. John the Baptist," by Cavalier d'Arpino, 1597–1601; in the church of S. Giovanni in Laterano, Rome

SCALA—Art Resource/EB Inc.

A major influence on Arpino's early work was Cristoforo Roncalli, the Mannerist fresco painter of the Vatican and the Quirinal Palace. In 1589–91 Arpino executed extensive decorations in the church of S. Martino, Naples, where, as at Rome, he was assisted by his brother Bernadino. He was greatly in demand in Rome as a fresco painter, having impressed Pope Clement VIII with his facility of execution. But his frescoes in the Palazzo dei Conservatori, begun in 1596, were never finished. Perhaps his best work is the four incidents from the life of St. John the Baptist in the church of S. Giovanni in Laterano, Rome. During his long career, he also created the designs for the mosaics of the cupola of St. Peter's; the frescoes of the Cappella Paolina of the church of S. Maria Maggiore; and the fine murals in the Ogliate chapel in the church of S. Prassede. Although of wide reputation, Arpino did not compare in originality to contemporaries such as Caravaggio, the Carracci, or even some of his own students.

Cavalier, Jean (b. Nov. 28, 1681, near Ribaute, Fr.—d. May 17, 1740, London), leader of the French Huguenot insurgents known as the Camisards from 1702 to 1704.

The son of a Huguenot shepherd from the Languedoc region of southern France, Cavalier sought refuge in Geneva in 1701 to escape a wave of severe persecution of Protestants by the government of King Louis XIV. He returned to his native area and found work as an apprentice baker shortly before the local Huguenots' Camisard revolt broke out at Le Pont-de-Montvert on July 24, 1702. Several months later Cavalier emerged as the leader of the uprising, which swept through Languedoc and the Cévennes. His genius at guerrilla warfare enabled him to defeat government forces at Vagnas on Feb. 10, 1703, and soon he was threatening Nîmes. On March 4, 1704, he defeated one of Louis XIV's finest regiments at Martignargues. A serious reverse at Nages (April 16, 1704) and the loss of his arsenal at Euzet (April 19) forced him to agree to a truce at Pont-d'Avesnes on May 12. He made his submission at Nîmes four days later, but his followers deserted him when he failed to secure religious liberty from the government. On August 26 he fled to Switzerland; by early 1705 the revolt had lost its force.

Cavalier fought with the British against the French in Portugal and Spain in 1707 and eventually retired to a Huguenot colony in Ireland. His *Memoirs of the Wars of the Cevennes* was published at Dublin in 1726. In 1735 he was made a brigadier in the British Army. Appointed lieutenant governor of Jersey in 1738, he became a major general the following year. Marcel Pin's *Jean Cavalier* appeared in 1936.

Cavalier Parliament (May 8, 1661—Jan. 24, 1679), the first English Parliament after the Restoration of Charles II to the throne. It was originally enthusiastically royalist in tone, but over the years its membership changed and it became increasingly critical of many of Charles's policies. The Cavalier Parliament is best known for the harsh laws it enacted against Roman Catholics and Protestant Dissenters.

Cavalier poet, any of a group of English gentlemen poets, called Cavaliers because of their loyalty to Charles I (1625–49) during the English Civil War, as opposed to Roundheads, who supported Parliament. They were also cavaliers in their style of life and counted the writing of polished and elegant lyrics as only one of their many accomplishments as soldiers, courtiers, gallants, and wits. The term embraces Richard Lovelace, Thomas Carew, Sir John Suckling, Edmund Waller, and Robert Herrick. Although Herrick, a clergyman, was detached from the court, his short, fluent, graceful lyrics on love and dalliance, and his carpe diem ("seize the day") philosophy ("Gather ye rose-buds while ye may") are typical of the Cavalier style. Besides writing love lyrics addressed to mistresses with fanciful names like Anthea, Althea, Lucasta, or Amarantha, the Cavaliers sometimes wrote of war, honour, and their duty to the King. Sometimes they deftly combined all these themes as in Richard Lovelace's well-known poem, "To Lucasta, Going to the Wars," which ends with the lines

> I could not love thee, dear, so much
> Loved I not honour more.

Cavaliere, Emilio del, also spelled EMILIO DEI CAVALIERI (b. *c.* 1550, Rome—d. March 11, 1602, Rome), Italian composer and one of the earliest to compose dramatic music.

A nobleman, he became supervisor of fine arts and entertainments at the court of the grand duke Ferdinand I of Tuscany. He was a member of the Camerata in Florence, a group whose theories gave rise to the first operas. He composed intermezzi and pastorals, which stood midway between the masquelike intermezzi and true operas. Historically, his most significant work is *La rappresentazione di anima e di corpo* (*Representation of Soul and Body*), an allegorical morality play. Important as a precursor of opera and of oratorio, it had characteristics of both. Published in 1600, it contained the earliest printed examples of figured bass. Although it was surpassed in musical and dramatic intensity by the first true operas (those of Jacopo Peri and Giulio Caccini), it was one of the earliest examples of the monodic recitative style that blossomed in early opera.

Consult the INDEX *first*

Cavaliere di Candia, Mario (singer): *see* Mario, Giovanni Matteo.

Cavalieri, (Francesco) Bonaventura (b. 1598, Milan—d. Nov. 30, 1647, Bologna, Papal States), Italian mathematician who made developments in geometry that were precursors to integral calculus.

As a boy he joined the Jesuati, a religious order (sometimes called "Apostolic Clerics of St. Jerome") that followed the rule of St. Augustine and was suppressed in 1668 by Pope Clement X. Euclid's works stimulated his interest in mathematics, and, after he met Galileo, Cavalieri considered himself a disciple of that great astronomer.

By 1629, when he was appointed professor of mathematics of the University of Bologna, he had completely developed his method of indivisibles, a means of determining the size of geometric figures similar to the methods of integral calculus. He delayed publishing his results six years in deference to Galileo, who planned a similar work. Cavalieri's work appeared in 1635, entitled *Geometria Indivisibilibus Continuorum Nova Quadam Ratione Promota* ("A Certain Method for the Development of a New Geometry of Continuous Indivisibles"). As stated in his *Geometria,* the method of indivisibles was unsatisfactory and fell under heavy criticism, notably by the contemporary Swiss mathematician Paul Guldin. In reply Cavalieri wrote *Exercitationes Geometricae Sex* (1647; "Six Geometrical Exercises"), stating the principle in the more satisfactory form that was widely used by 17th-century mathematicians.

Cavalieri was largely responsible for introducing the use of logarithms as a computational tool in Italy through his book *Directorium Generale Uranometricum* (1632; "A General Directory of Uranometry"). His other works include *Lo specchio ustorio ouero trattato delle settioni coniche* (1632; "The Burning Glass; or, A Treatise on Conic Sections") and *Trigonometria plana et sphaerica, linearis et logarithmica* (1643; "Plane, Spherical, Linear, and Logarithmic Trigonometry").

Cavalla River, also called CAVALLY, YOUBOU, or DIOUGOU, river in West Africa, rising north of the Nimba Range in Guinea and flowing south to form more than half of the Liberia–Ivory Coast border. It enters the Gulf of Guinea 13 mi (21 km) east of Harper, Liberia, after a course of 320 mi. With its major tributaries (the Duobe and the Hana), it drains an area of 11,670 sq mi (30,225 sq km). Named by 15th-century Portuguese navigators for the cavalla (horse mackerel) found at its mouth, it is navigable to Nyaake, 50 mi upstream.

Cavalli, (Pier) Francesco, original name PIER FRANCESCO CALETTI-BRUNI (b. Feb. 14, 1602, Crema, Rep. of Venice—d. Jan. 14, 1676, Venice), the most important Italian composer of opera in the mid-17th century.

The son of Gian Battista Caletti-Bruni, he assumed the name of his Venetian patron Federico Cavalli. In 1617 he became a singer in the choir of St. Mark's, Venice, under Claudio Monteverdi, whose opera *Orfeo* established opera as a permanent genre. Cavalli subsequently held various posts there, becoming *maestro di cappella* in 1668. During his lifetime he exercised a considerable influence on European taste. *Didone* (1641) is perhaps his most interesting work, but it was his *Egisto,* given in Paris in 1646, that initiated the rivalry between French and Italian styles. As a dramatic composer Cavalli wrote for a small string orchestra, and his operas require no trained chorus. He wrote few concerted numbers for soloists, but his works have signs of the beginnings of the formal recitative aria technique, sometimes even with a da capo section. Compensation for the level character of his operatic music was provided by the brilliant costumes and lavish sets, without which, in spite of their dramatic power and grotesque humour, Cavalli's works are incomplete. Although performed throughout Italy, these *dramma per musica* were generally written especially for the public opera houses that flourished in 17th-century Venice. Twenty-seven of his 42 operas are preserved in manuscript in the library of St. Mark's, and renewed interest in Cavalli has resulted in numerous revivals, recordings, and publications of his operas. *Erismena* and *L'Ormindo* have been recorded, and various others have been excerpted and recorded.

Cavallini, Pietro (b. *c.* 1250, Rome—d. *c.* 1330), Roman fresco painter and mosaicist whose work represents the earliest significant attempt in Italian art to break with Byzantine stylizations and move toward a plastic, illusionistic depiction of figures and space. He

St. Stephen and Guida Taddeo, detail from the fresco "Last Judgment," by Pietro Cavallini, *c.* 1291–93; in the church of Sta. Cecilia in Trastevere, Rome
SCALA—Art Resource/EB Inc.

was an important influence on the innovatory Florentine painter Giotto (died 1337).

Cavallini's first authenticated work is a series of fresco decorations of the nave of S. Paolo Fuori le Mura in Rome, done between 1277 and 1290. These were painted over the outlines of early Christian frescoes of the 5th century in an effort to "restore" them. Both Cavallini's works and the few earlier frescoes that he did not replace perished in a fire in 1823. Copies of both survive, however, and the spacious monumentality and classical affinities of the 5th-century works seem to have had a profound effect on forming Cavallini's style.

In 1291 he began his major series of mosaics, scenes from the life of the Virgin for Sta. Maria in Trastevere, Rome, which show a definite classical mood. The superficial conventions of Byzantine facial types and gesture persist, but Byzantine linear treatment of draperies is severely reduced in favour of rounded modelling, and the traditional linear definition of facial features is completely abandoned. There is a strikingly new spatial clarity and sculptural approach to the figures and a use of light that is unprecedented in Italian art; the light strikes the figures from one direction and serves to mold and reveal, rather than decorate, the form.

At some time in the early 1290s Cavallini executed his most famous works, a Last Judgment fresco, frescoes of Old Testament scenes (only fragments survive), and an Annunciation in Sta. Cecilia in Trastevere in Rome. Here the classicizing elements of his mosaics are consolidated in a powerful and grandly expressive style best illustrated by a beautiful and lively group of seated Apostles, highly individualized, whose solidity of form is completely successful in defining the space around them. A further important feature is the use of soft, rich colour harmonies and shading.

In 1308 Cavallini was invited to Naples by Charles of Anjou; there he came into contact with the graceful forms of Gothic art of the northern Anjou country. In about 1315 he returned briefly to Rome to decorate the facade of S. Paolo Fuori le Mura with frescoes (now destroyed). He had many pupils who carried on his tradition.

Cavallotti, Felice (Carlo Emmanuele) (b. Dec. 6, 1842, Milan—d. March 6, 1898, Rome), left-wing, anti-monarchist journalist and political leader, sometimes called Italy's "Poet of the Democracy."

In 1860 he joined the Expedition of the Thousand volunteers who fought with the patriot general Giuseppe Garibaldi in Sicily, and he volunteered again in 1866. More importantly, that year he founded the journal *Gazzettino rosa,* in which he gained fame with his articles lampooning the monarchists. He was also a serious scholar and translated the critical life of Jesus, *Das Leben Jesu kritisch bearbeitet* (1835–36), by the German theologian David F. Strauss.

Cavallotti's political activism led to his election (1873) to the Chamber of Deputies, where he continued to fight for democratic reform and to criticize his right-wing opponents, especially Agostino Depretis and Francesco Crispi, until his death. His fighting was not limited to parliamentary debates, however. His temper and zeal led him to participate in several duels, the last of which was fatal: he was killed by Ferruccio Macola, editor of the *Gazzetta di Venezia.*

Cavally River (western Africa): *see* Cavalla River.

cavalry, military force mounted on horseback, formerly an important element in the armies of all major powers. When employed as part of a combined military formation, its main duties included observing and reporting information about the enemy, screening movements of its own force, pursuing and demoralizing a defeated enemy, maintaining a constant threat to an enemy's rear area, striking suddenly at detected weak points, turning exposed flanks, and exploiting a penetration

or breakthrough. During the latter part of the 19th century, largely as a result of the introduction of repeating rifles and machine guns, cavalry lost much of its former value.

By the time of World War I, a cavalry charge against a line of entrenched troops armed with rapid-firing small arms was suicidal. Cavalry organizations soon abandoned horses for armoured fighting vehicles and became known as mechanized cavalry or armoured cavalry, but even the name was eventually dropped. By the 1950s there were no horse-mounted cavalry units in either the U.S. or British armies. In the early 1960s the United States converted its 1st Cavalry Division to an "air mobile" division, with helicopters and air-portable weapons and vehicles. The division saw extensive service in Vietnam.

Cavan, Irish AN CABHÁN (The Hollow Place), one of the three counties of the old province of Ulster, but now part of the Irish republic. With an area of 730 sq mi (1,891 sq km), it is bounded by Counties Monaghan (northeast), Meath, Westmeath, and Longford (south), and Leitrim (northwest). Northern Ireland lies to the north. Northwestern Cavan comprises uplands, intersected by valleys, declining toward the main valley of the River Erne, where the main features are the drumlins (long, oval mounds) that alternate with lakes, rivers, peat bogs, and pastures. East of the Erne Valley is a line of slate and shale hills.

The Cavan district is mentioned in accounts of the life of St. Patrick (flourished 5th century). Cavan formed part of the kingdom of Bréifne, which included Leitrim, of which the O'Rourkes were princes. In later times Cavan, or East Bréifne, became distinctively Bréifne O'Reilly; and West Bréifne, or Leitrim, became Bréifne O'Rourke. Bréifne long resisted colonization by the Anglo-Normans, and the O'Reilly's of Cavan were not brought under permanent English rule until the late 16th century. Cavan, previously part of Connacht, was designated a part of Ulster in the early 17th century and included in the Ulster plantation from 1608 onward, when it was settled by Scots and English colonists.

Only one-quarter of the people of Cavan live in villages and towns; Cavan, the county town (seat), Cootehill, and Belturbet are the largest. The Roman Catholic cathedral of Kilmore diocese is in Cavan, the Protestant cathedral in Kilmore. Farms in Cavan average 30–40 ac (12–16 ha); and one-tenth of the improved land is used for crops, one-fifth for hay, and the rest for pasture. Creameries are common, and the towns are market centres with industries such as plastics, food processing, synthetic fibres, and wallpaper manufacturing. Main roads converge on Cavan from Belfast, Dublin, and Athlone. Pop. (1981) 53,855.

cavatina, musical form appearing in operas and occasionally in cantatas and instrumental music. In early 18th-century cantatas, notably those of J.S. Bach, the cavatina was a short, epigrammatic piece sometimes sung between the speech-like recitative and the more lyric arioso. In opera the cavatina is an aria, generally of brilliant character, sung in one or two sections without repeats. It developed in the mid-18th century, coincident with the decline of the previously favoured da capo aria (in which the musical form is ABA, with the repeated A section given improvised variations). Examples occur in the operas of Mozart, Weber, and Rossini. "Cavatina" is also used as the title of songlike instrumental works, *e.g.,* in Beethoven's *String Quartet,* Opus 130.

cave, any naturally formed subterranean cavity, including lava tubes and marine grottos. In many cases, a cave consists of a number of underground chambers, constituting a series of caverns. An assemblage of such caverns interconnected by smaller passageways makes up a cave system.

A brief treatment of caves follows. For full treatment, *see* MACROPAEDIA: Continental Landforms.

Caves can be classified into two broad types according to origin: primary and secondary. Primary caves develop during the time when the host rock is solidifying. Those of the secondary variety originate after the host rock has been deposited or consolidated. Most caves are of the latter type. In certain instances, primary cavities are enlarged or further developed over geologic time by the mechanisms associated with secondary cave formation.

Primary caves. These are best exemplified by lava tubes, cylindrically shaped tunnels that extend along the path of a lava field. Most caves of this type consist of a single, unbranched tunnel, but a few divide at intervals to form interweaving side passages that either rejoin the main channel or end in rockfall. Lava tubes are thought to form when the surface of a lava flow cools and solidifies. As the still molten interior of the lava field drains off, it leaves behind the distinctive cylindrical cavity. The pressure required to sustain the ceiling of the cavity is provided by hot gases. In some cases, the pressure of these fluids produces high, domed ceilings, whereas in others excessive pressure causes the gases to break through the roof to form crater-like vents. Lava tubes have various other characteristic properties, as for example lava pendants resembling stalactites that result from the drippage of the cooling ceiling or from remelting by hot gases.

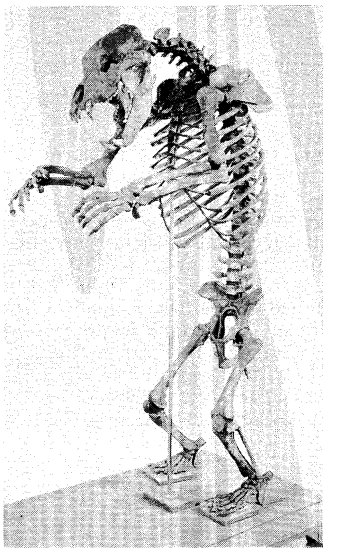
Another significant type of primary cave is the coral cave. Such cavities are formed when colonies of coral in shallow waters expand and unite, forming lacy or bulbous walls around a submarine void. When the shoreline rises or the sea level falls, a coral cave is exposed to wave action and weathering, which enlarges the void or obliterates it entirely.

Secondary caves. Cavities of this kind are produced by mechanical and chemical processes. Although both types of processes are generally involved, one or the other tends to predominate.

One common form of secondary cave of mechanical origin is the marine grotto. Such a cave develops where a sea cliff is exposed to wave action. Hydrodynamic pressure changes within the waves pull apart sections of the cliff face weakened by fracturing. Rock fragments and sand particles carried by the waves grind away soft rock material. Similar kinds of caves are quarried along the banks of streams and rivers by the mechanical action of water laden with silt and gravel.

The most common type of secondary cave and of caves in general are those created by the chemical dissolution of a soluble host rock that has been weakened by fracturing and mechanical erosion. Mammoth Cave, Kentucky, and Carlsbad Caverns, New Mexico, are typical examples of such solution caves. Enormous cavities of this kind result when groundwater containing certain natural acids (*e.g.,* those formed by the dissociation of water and carbonic acid) circulates along joints and faults in a calcareous rock such as limestone or dolomite and dissolves and corrodes it. This process, which occurs below the water table, gradually produces the honeycomb of passages and galleries characteristic of solution caves. As the water table drops and the cavities are drained, various kinds of speleothems, including stalactites, stalagmites, draperies, flowstones, and helictites are formed by the deposition of the carbonate minerals that had been dissolved from the surrounding limestone or dolomite.

cave bear, extinct species (*Ursus spelaeus*) of bear, notable for its habit of inhabiting caves, where its remains are frequently preserved; in European cave deposits, the remains of more than 100,000 cave bears have been found. The



European cave bear (*Ursus spelaeus*)
By courtesy of the American Museum of Natural History, New York

cave bear is best known from late Pleistocene cave deposits, although it can be traced back to earlier Pleistocene times (the Pleistocene Epoch began 2,500,000 years ago and ended 10,000 years ago). Remains have been found in England, Belgium, Germany, the Soviet Union, Spain, Italy, and Greece, and it may have reached North Africa. Several local varieties, or races, have been described; dwarf races are known from some regions. Stone Age peoples sometimes hunted the cave bear, but evidence of this hunting is very sporadic; it is highly unlikely that hunting by man caused its extinction. It appears likely that most cave bears died in the severe glacial winters during hibernation; the remains include a large proportion of very young or very old and many specimens showing unmistakable signs of illness or disease. Extinction of the cave bear seems to have been a gradual process that was complete at the close of the last glacial episode. The cave bear was probably as large as the Kodiak bears of Alaska, the largest bears of today. The head was very large, and the jaws bore distinctive teeth. It has been inferred that the animal was largely vegetarian.

cave cricket: *see* camel cricket.

cave deposit, also called SPELEOTHEM, any of the crystalline deposits that form in a solution cave after the creation of the cave itself. These deposits are generally composed of calcium carbonate dissolved from the surrounding limestone by groundwater. Carbon dioxide carried in the water is released as the water encounters the cave air; this reduces the water's capacity to hold calcite in solution and causes the calcite to be deposited. These deposits may accumulate to form stalactites, stalagmites, flowstone, helictites, cave pearls, and many other formations. Deposits formed along ceiling cracks may produce drip curtains or draperies that may then reach the floor to become walls. Speleothems may grow in pools to form the nodular encrustations of cave coral or the natural dams that continually elevate themselves through accretion of calcite. The pure white of the calcium carbonate is often tinted with hues of red, yellow, and gray and may even be translucent. The growth rate of speleothems is highly variable due to seasonal variations in the rate of flow, carbon dioxide content, and other factors. Caves owe most of their beauty and much of their interest to these secondary growths.

cave fish, any of the pale, blind, cave-dwelling fishes of the genera *Amblyopsis* and *Typhlichthys,* family Amblyopsidae. Cave fishes are small, growing to about 10 centimetres (4 inches) long, and are found in fresh water in dark limestone caves of the United States. There are three species: *Typhlichthys subterraneus, Amblyopsis rosae,* and *A. spelaea.* The first two lack pelvic fins; the third, the blind fish of Mammoth Cave, Kentucky, possesses these fins. All have small but nonfunctional eyes, and tactile organs that are sensitive to touch; these are arranged over the body, head, and tail and enable the fish to feel what it cannot see. Contrasting with these fishes are the swampfish (*Chologaster*), which belong to the same family. They are also small but are pigmented and have functional eyes. They live above ground in North American swamps and streams.

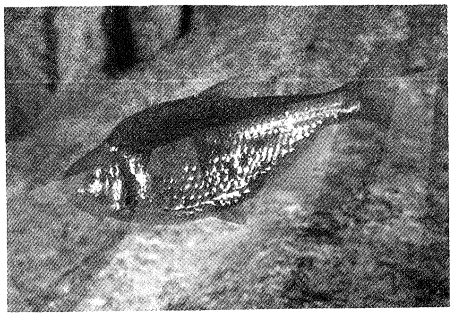
Other cave-dwelling fishes unrelated to the Amblyopsidae have, in adapting to their habitat, also tended toward blindness and pale colouring. In Cuba and Yucatán, there are

Major caves of the world

name and *location*	depth*		length†	
	ft	m	mi	km
Africa				
'Ain Tafna, *Algeria*	...	...	1.9	3.9
Annoū Būsūil, *Algeria*	1,657	505	...	...
Enkoftu Mohu, *Ethiopia*	630	192	...	...
Kef Toghobeit, *Morocco*	2,297	700	...	...
America, North				
Agua Lecarrizo, *Mexico*	2,782	848	...	...
Arctomys, *Canada*	1,716	523	...	...
Bigfoot, *United States*	1,191	363	...	...
Binkley's, *United States*	...	...	18.6	30.0
Blue Spring, *United States*	...	...	19.2	30.9
Butler Cave–Sinking Creek system, *United States*	...	...	17.9	28.8
Carlsbad, *United States*	1,037	316	20.6	33.2
Castleguard, *Canada*	...	...	8.1	13.0
Columbine Crawl, *United States*	1,486	453	...	...
Crevice, *United States*	...	...	22.4	36.0
Culverson Creek, *United States*	...	...	15.9	25.7
Cumberland Caverns, *United States*	...	...	24.6	39.6
Diamante, *Mexico*	2,037	621	...	...
Fern, *United States*	...	...	15.6	25.1
Friars Hole, *United States*	...	...	21.2	34.1
Gran Caverna de Santo Tomás, *Cuba*	...	...	15.5	25.0
Greenbrier–Organ, *United States*	...	...	44.7	72.0
Huautla, *Mexico*	4,067	1,240	...	...
Jewel, *United States*	334	102	72.9	117.4
La Grieta, *Mexico*	2,493	760	...	...
Los Pedidos, *Cuba*	...	...	16.2	26.0
Lucayan Caverns, *Bahamas*	...	...	5.3	8.5
Mammoth Cave–Flint Ridge system, *United States*	360	110	306.0	492.4
Morgans Pond Hole, *Jamaica*	610	186	...	...
Mystery, *United States*	...	...	15.9	25.7
Neffs Canyon, *United States*	1,171	357	...	...
Ojo Grande de Mal Pais, *Guatemala*	787	240	...	...
Peacock Springs, *United States*	200	61	4.3	7.0
Purificación, *Mexico*	2,999	914	12.5	20.1
San Agustín, *Mexico*	2,818	859	...	...
Sloan's Valley, *United States*	...	...	22.4	36.1
The Hole, *United States*	...	...	18.6	29.9
Wind, *United States*	699	213	43.0	69.2
America, South				
Angélica, *Brazil*	...	...	5.5	8.9
Corrego Fundo, *Brazil*	640	195	...	...
Guacharo, *Venezuela*	...	...	6.4	10.2
Haiton del Guarararo, *Venezuela*	1,001	305	...	...
Hoyo del Aire, *Colombia*	886	270	...	...
Huagapo, *Peru*	...	...	1.2	1.9
Milpu, *Peru*	1,335	407	1.3	2.1
Ouro Grosso, *Brazil*	630	192	...	...
São Mateus, *Brazil*	...	...	12.7	20.5
Sarisarinama, *Venezuela*	1,030	314	...	...
Antarctica: no significant caves				
Asia				
Akka-do, *Japan*	...	...	4.9	8.0
Byakuren-do, *Japan*	1,476	450	...	...
Cyrus, *Iran*	869	265	...	...
Dudencik, *Turkey*	1,083	330	...	...
Faouar Dara, *Lebanon*	2,034	620	...	...
Harpan River, *Nepal*	...	...	1.8	2.9
Parau, *Iran*	869	265	...	...
Europe				
Agen Allwedd, *Great Britain*	...	...	17.1	27.5
Ahnenschacht, *Austria*	1,991	607	...	...
Aiguilles, *France*	3,215	980	...	...
Antro del Corchia, *Italy*	3,117	950	...	...
Aranonera, *Spain*	2,034	620	...	...
Arphidia, *France*	2,182	665	...	...
Badalona, *Spain*	3,707	1,130	...	...
Baradla Barlang–Jaskyna Domica, *Hungary–Czechoslovakia*	...	...	15.5	25.0
Batmanhöhle, *Austria*	3,626	1,105	...	...
Berger, *France*	4,094	1,248	...	...
Bifurto, *Italy*	2,241	683	...	...
Buca di Monte Pelato, *Italy*	2,152	656	...	...
Buchaquera, *Spain*	2,342	714	...	...
Caladaire, *France*	2,188	667	...	...
Cambou de Liard, *France*	3,061	933	...	...
Cappa, *Italy*	2,172	662	...	...
Cesare Prez, *Italy*	2,116	654	...	...
Coltelli, *Italy*	2,395	730	...	...
Couey Lotge, *France*	2,051	625	...	...
Cueto, *Spain*	2,477	755	...	...
Dachstein-Mammuthöhle, *Austria*	3,852	1,174	16.1	25.9
Ded, *France*	2,559	780	...	...
Dent-de-Crolles, *France*	2,044	623	22.6	36.3
Easegill Cavern–Lancaster Hole, *Great Britain*	...	...	20.5	33.0
Eisriesenwelt, *Austria*	...	...	26.1	42.0
Emilio Comici, *Italy*	2,539	774	...	...
Enrico Davanzo, *Italy*	2,418	737	...	...
Estella, *Spain*	2,014	614	...	...
Eugenio Boegan, *Italy*	2,047	624	...	...
Faustloch, *Switzerland*	2,264	690	...	...
Félix Trombe, *France*	3,340	1,018	...	...
Feuertal, *Austria*	2,995	913	...	...
Ffynon Ddu, *Great Britain*	...	...	23.9	38.5
Francis, *France*	2,372	723	...	...
Garma Ciega-Sumidero de Cellagua, *Spain*	3,182	970	...	...
Georges, *France*	2,277	694	...	...
G.E.S. Malaga, *Spain*	3,510	1,070	...	...
Gruberhornhöhle, *Austria*	2,802	854	...	...
Hochlecken-Grosshöhle, *Austria*	3,353	1,022	...	...
Hölloch, *Switzerland*	2,717	828	82.7	133.0
Hosse de las Garças, *France*	2,159	658	...	...
Jaskini Snieznej, *Poland*	2,569	783	...	...
Jean Bernard, *France*	5,036	1,535	...	...
Kievskaya, *Soviet Union*	3,163	964	...	...
Kriska, *France*	2,559	780	...	...
Lamprechtsofen, *Austria*	3,360	1,024	...	...
Lonné Peyret, *France*	2,523	769	...	...
Michele Gortani, *Italy*	3,018	920	...	...
Mietusia, *Poland*	912	278	4.9	8.0
Monte Cucco, *Italy*	3,025	922	9.4	15.1
Neve, *Italy*	2,274	693	...	...
Ojo Guareña, *Spain*	...	...	51.6	83.0
Optimisticheskaya, *Soviet Union*	...	...	95.1	153.0
Ozyorhaya, *Soviet Union*	...	...	66.9	107.6
Peña Blanca, *Spain*	2,543	775	...	...
Pestera Tausoare, *Romania*	1,362	415	...	...
Piaggia Bella, *Italy*	2,100	640	...	...
Pierre Saint-Martin, *France–Spain*	4,403	1,342	22.1	35.5
Platteneck-Bergerhöhlensystem, *Austria*	2,936	895	...	...
Poloska Jama, *Yugoslavia*	2,247	685	...	...
Postojnska Jama, *Yugoslavia*	...	...	9.1	14.6
Puertas de Illamina, *Spain*	4,390	1,338	...	...
Raucherkarhöhle, *Austria*	2,379	725	...	...
Raytchova doupka, *Bulgaria*	1,221	372	...	...
Salzburgerschacht, *Austria*	1,988	606	...	...
Schneeloch, *Austria*	3,612	1,101	...	...
Scialet de Génieux, *France*	2,215	675	...	...
Simi, *Italy*	2,231	680	...	...
Snezhnaya, *Soviet Union*	4,823	1,470	...	...
Spluga della Preta, *Italy*	2,881	878	...	...
Straldi, *Italy*	2,014	614	...	...
Tanne du Tordu-Diau, *France*	2,290	698	...	...
Touya de Liet, *France*	2,972	906	...	...
Trunkenboldschacht, *Austria*	2,818	859	...	...
Uquerdi, *Spain*	3,921	1,195	...	...
Verneau, *France*	...	...	15.7	25.2
Zoluska, *Soviet Union*	...	...	49.7	80.0
Zitu, *Spain*	3,737	1,139	...	...
Oceania				
Bibima, *Papua New Guinea*	1,621	494	...	...
Harwood's Hole, *New Zealand*	1,171	357	...	...
Khazad-dum, *Australia*	1,079	329	...	...
Mamo Kanada (Hadea Yaneabugair), *Papua New Guinea*	1,706	520	32.3	52.0
Nettlebed, *New Zealand*	2,224	687	...	...
Nullarbor Plain, *Australia*	...	...	1.2	2.0

... Not available. *Below highest entrance. †Explored portion of cave.

three species of brotula (family Ophidiidae or Brotulidae) found in caves. Among the large superorder Ostariophysi (minnows, carps, and catfish), one of the best known is *Astyanax*



Cave fish (*Amblyopsis rosae*)
Ron Church—Tom Stack and Associates

(or *Anoptichthys*) *jordani,* an eyeless, 7.5-centimetre characin (family Characidae) found in Mexico and often kept in home aquariums. Others include *Caecobarbus geertsi,* an African member of the minnow family (Cyprinidae), and certain catfish belonging to several families and found in the United States, Mexico, South America, and Africa.

cave pearl, small, almost spherical concretion of calcite that is formed in a pool of water in a cave and is not attached to the surface on which it forms. Occasionally saturated water drips into small pools with such vigour that a stalagmite cannot form. A bit of foreign matter may become coated with calcite and slight movements of the water may keep the bit in motion while new layers of calcite are added. Concentric layers are added and polished in this way until the cave pearl becomes too large to remain in motion and becomes attached.

caveat emptor (Latin: "let the buyer beware"), in the law of commercial transactions, principle that the buyer purchases at his own risk in the absence of an express warranty in the contract.

As a maxim of the early common law, the rule was well suited to buying and selling carried on in the open marketplace or among close neighbours. The increasing complexity of modern commerce has placed the buyer at a disadvantage. He is forced to rely more and more upon the skill, judgment, and honesty of the seller and manufacturer.

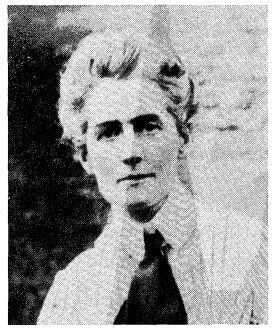
The modern law of commercial transactions recognizes this and protects the buyer by implying various exceptions to the principle of caveat emptor. Thus, in the case of a sale by sample, the law implies a condition in the contract that the bulk of the merchandise will correspond with the sample in quality and that the buyer will have a reasonable opportunity to examine the bulk of the merchandise. Likewise, when the buyer has made known to the seller the particular purpose for which the goods are required, the law implies a condition in the ensuing contract that the merchandise is of merchantable (average) quality and reasonably fit for the intended purpose.

Cavelier, René-Robert (French explorer): *see* La Salle, René-Robert Cavelier, sieur de.

Cavell, Edith (Louisa) (b. Dec. 4, 1865, Swardeston, Norfolk, Eng.—d. Oct. 12, 1915, Brussels), English nurse who became a popular heroine of World War I and was executed for assisting Allied soldiers to escape from German-occupied Belgium.

Cavell entered the nursing profession in 1895 and in 1907 was appointed the first matron of the Berkendael Institute, Brussels, where she greatly improved the standard of nursing. After the German occupation of Belgium, she became involved in an underground group formed to help British, French, and Belgian soldiers reach The Netherlands, a neutral country. The soldiers were sheltered at the Berkendael Institute, which had become a Red Cross hospital, and were provided with money and guides by Philippe Baucq, a Belgian. About 200 men had been aided when, in August 1915, Cavell and several others were arrested.

The group was brought before a court-martial on Oct. 7, 1915. On October 9, Cavell, after making a full confession, was sentenced to death. Three days later she and Baucq were shot, despite the efforts of the U.S. and Spanish ministers to secure a reprieve. Though legally justified, her execution on a charge that did not include espionage was considered



Edith Cavell
Syndication International Ltd.

outrageous and was widely publicized by the Allies.

A biography, *Edith Cavell* (1958), was written by A.A. Hoehling.

Cavendish: *see* Jones, Henry.

Cavendish, unincorporated rural community, Queens County, on the central northern coast of Prince Edward Island, Canada, 24 mi (39 km) northwest of Charlottetown. It lies near a sandy beach (called Penamkeak by the Micmac Indians and now a popular bathing place) at the western end of Prince Edward Island National Park (*q.v.*). Probably named *c.* 1772 for Field Marshal Lord Frederick Cavendish, the place was used by Lucy Maud Montgomery as the setting (Avonlea) for her novel *Anne of Green Gables* (1908) and its sequels. The Green Gables farmhouse (her girlhood home) is a tourist attraction, and Montgomery is buried nearby. Summer tourism is the basic economic activity. Pop. (1981) 93.

Cavendish, Lord Frederick Charles (b. Nov. 30, 1836, Eastbourne, Sussex, Eng.—d. May 6, 1882, Dublin), British statesman, protégé of William Ewart Gladstone, who was murdered by Irish nationalists the day after his arrival in Dublin as chief secretary to the lord lieutenant of Ireland and as a goodwill emissary from England, at the height of the Irish crisis in 1882.

The second son of the 7th Duke of Devonshire, Cavendish entered Parliament in 1865. The year before he had married Mrs. Gladstone's niece, Lucy, daughter of the 4th Baron Lyttelton. Gladstone came to admire and trust Lord Frederick, especially after taking him as private secretary in 1872, and looked to him as the future leader of the parliamentary Liberal Party. Lord Frederick was financial secretary to the Treasury from 1880, and as such was the right-hand man of Gladstone, chancellor of the Exchequer as well as prime minister.

Gladstone then asked him to undertake the thankless and dangerous office of chief secretary for Ireland. Lord Frederick crossed to Dublin on the night of May 5, 1882. The following evening he walked across Phoenix Park with Thomas H. Burke, the permanent under secretary for Ireland. Burke was attacked by a party of Irishmen armed with knives; Cavendish tried to defend him, and both were killed. Four of their assassins, members of a secret society, the Invincibles, were betrayed and hanged in 1883.

Cavendish, George (b. 1500—d. 1561/62), English courtier and writer who won a minor but lasting reputation through a single work, his *Life* of Cardinal Wolsey, a landmark in the development of English biography, an important document to the student of Tudor history, and a rare source of information on the character of the author himself. Cavendish applied to his subject methods of concrete observation in matters of behaviour, gesture, and speech, so that in his shapely and unaffected narrative the figure of the cardinal emerges with an air of life. Besides thus anticipating later biographical principles, Cavendish, though still close to medieval tragedy in conceiving Wolsey's rise and fall as governed by Fortune's wheel, moved away from the older idea that biographies should deal only with saints or royal personages.

About 1526 Cavendish entered Wolsey's service as a gentleman usher and remained loyal to him from the height of his power to his rapid fall under the disfavour of Henry VIII. This position of trust afforded Cavendish a valuable eyewitness impression of the cardinal, especially in his final days of crumbling magnificence. After Wolsey's death in 1530 Cavendish left public employment and retired to Suffolk, where in 1557 he completed his *Life,* undertaken in his later years partly with the intention of supplying a truthful report of the cardinal's career.

Although the fact that Cavendish was a Roman Catholic and his mention of dangerous political issues obstructed the printing of the complete *Life* during the reign of Elizabeth I, its factual and literary value caused it to circulate freely in manuscript, and it thus provided a source for chronicles such as those of John Stow and Raphael Holinshed, for poems, and for plays such as Shakespeare's *Henry VIII.* The first printed version, published in 1641, *The Negotiations of Thomas Woolsey,* was so mangled by party propagandists as to render it a polemical tract; and the reissue of this bad text throughout the rest of the 17th and 18th centuries fostered the idea that it was a controversial work. Not until 1810 did Christopher Wordsworth attempt to restore the original by issuing in his *Ecclesiastical Biography* a text based upon original manuscripts. In 1815 S.W. Singer published a more completely restored text. At this time also the authorship, long attributed to George Cavendish's brother William, was correctly assigned to George by internal evidence.

Cavendish, Henry (b. Oct. 10, 1731, Nice, Fr.—d. Feb. 24, 1810, London), English physicist and chemist who conducted experiments in diverse fields, discovering such phenomena as the composition of air, the nature and properties of hydrogen, the specific heat of certain substances, the composition of water, and various properties of electricity. He also measured the density and mass of the Earth by a method now known as the Cavendish experiment.

Education. Cavendish was a descendant of two great families, with the Duke of Devonshire and the Duke of Kent as his grandfathers. His mother died in 1733, after giving birth to his brother Frederick. In 1742 he entered the Hackney seminary near London, and during 1749–53 he was at Peterhouse College at the University of Cambridge, but he did not take a degree, possibly because he balked at the required declaration of adherence to the Church of England. After a tour of the Continent, he lived in London with his father until the latter's death in 1783. It was during this period that he carried out all of his electrical,

Henry Cavendish, drawing by William Alexander; in the British Museum

By courtesy of the trustees of the British Museum; photograph, J.R. Freeman & Co. Ltd.

and most of his chemical, researches, starting as an assistant to his father, whose own experimental skill was remarkable enough to draw the praise of Benjamin Franklin. Father and son lived in relatively modest circumstances at first, but when Henry Cavendish was 40 he became a millionaire through the inheritance of a fortune that made him, according to Jean-Baptiste Biot, a contemporary French scientist, "the richest of all learned men, and very likely also the most learned of all the rich."

His wealth made little difference to his style of living. As before, most of his expenditures went for scientific apparatus and books; in time he accumulated a large library, which he then made available to other scientists. To the outside world he appeared to be a shabby, eccentric man who spoke little and then only hesitantly in a shrill, thin voice. One aspect of his shyness is revealed in an incident later adapted by Aldous Huxley and ascribed to a character in the novel *Point Counter Point* (1928). It occurred when his banker called on Cavendish to suggest the investment of a portion of his funds and was ungraciously told by Cavendish never to plague him again about the growing balance: "If it is any trouble to you, I will take it out of your hands!" Except at meetings of fellow scientists, he almost never appeared in public and was so pronounced a misogynist that he communicated with his housekeeper by daily notes and ordered all female domestics to keep out of his sight. Not only did he not marry, he apparently never formed a sympathetic attachment with any person outside of his family. The costume he usually wore consisted of a faded, crumpled violet suit of an earlier time, with a high collar and frilled cuffs, and a three-cornered hat. Even among fellow scientists he was so taciturn as to lead Lord Brougham, who knew him, to remark that he

> probably uttered fewer words in the course of his life than any man who ever lived to fourscore years, not at all excepting the monks of La Trappe.

Cavendish's scientific intellect was of a calibre that appears rarely. For all that, he lacked popular acclaim. In part this lack was the result of his own disdain for public reputation, although he did accept such honours as being made fellow of the Royal Society (1760) and being elected one of the eight foreign associates of the Institut de France (1803). Though he did write for publication, beginning with a three-part paper on the preparation of various gases in 1766, he also completed many researches without publishing the details and sometimes baffled contemporaries by using the results of his own unpublished work in papers describing subsequent work.

Research in chemistry. Experiments on gases form the bulk of his chemical researches. In addition to being among the first to recognize hydrogen, which he called inflammable air, as a separate substance, and performing ingenious experiments with carbon dioxide, then called fixed air, he noted that a small residue remained when air was decomposed into oxygen and nitrogen; this finding was crucial in the discovery of argon and other inert gases more than a century later. He also made other contributions to chemical theory and anticipated later scientists in unpublished experiments with arsenic acid.

Cavendish's experiments on air, described in 1784–85, led to the discovery that water is not an element but a compound and to the discovery of nitric acid. Joseph Priestley, an English scientist, had noted that when a mixture of hydrogen and air is exploded by means of an electric spark—a method that had been proposed a few years before—the walls of the vessel are covered with moisture, a fact that Priestley disregarded. By a careful repetition of Priestley's experiment, Cavendish concluded that this moisture was mainly water. An analogous conclusion was reached at about the same time by James Watt, the Scottish engineer, and communicated to Priestley and to the Royal Society. The great controversy that ensued over priority of discovery was complicated by the fact that authors of papers, and editors, too, had the right to interpolate additions between the reading of the paper and its publication, and that during this particular interval the Royal Society elected a new secretary who had previously assisted Cavendish in some of his experiments. Much of the earliest biography of Cavendish by George Wilson (1851) is taken up with this controversy over who had discovered the fact that when hydrogen burned in air, water was formed. The principals themselves resolved their differences amicably after Watt was made fellow of the Royal Society in 1785.

Experiments with electricity. The electrical researches of Cavendish were equally remarkable and, had they been published, would alone have brought him fame. Cavendish discovered for himself that the force between a pair of electrical charges is inverse to the square of the distance between them, a basic law of electrostatics subsequently established by a French physicist, C.A. Coulomb, and known by his name. Cavendish anticipated Michael Faraday in demonstrating that the capacity of a condenser depends on the substance inserted between its plates. He freely used the concept of potential (then called degree of electrification, from the practice of measuring it by noting the angle formed between the two gold leaves of an electrometer when they become charged and repel one another), well known in mathematics but not previously used in connection with electrical experiments, in developing the idea that all points on the surface of a good conductor are at the same potential with respect to a common reference, the Earth. This concept, first made explicit by Cavendish, was of paramount importance for the further development of electrical theory. Finally, in a series of experiments on various conductors, he discovered that the potential across them was directly proportional to the current through them, thus anticipating the law enunciated by Georg Simon Ohm, a German physicist, in 1827. The last finding was the more remarkable since Cavendish had no means of measuring current and managed only by turning his own body into a meter, estimating the strength of the current by grasping the ends of the electrodes with his hands and noting whether he could feel the shock in his fingers, up to his wrists, or all the way up to the elbows. All these researches were subsequently repeated, after the discovery of his notebooks and manuscripts over a century later, by the great Scottish mathematical physicist, James Clerk Maxwell, who devoted the last five years of his life to the task and published an annotated version of the electrical papers of Cavendish in 1879.

Cavendish's researches on heat likewise remained largely unpublished during his lifetime. They anticipated later work by a Scottish chemist, Joseph Black, and there is some evidence that Cavendish deliberately delayed publication of this work so as not to appear to be competing with Black.

Other contributions. Not all of his work was in pure science. He also interested himself in meteorology and other applied sciences. On one occasion, he served as member of a committee charged with the practical task of devising the best method of protecting a powder magazine at Purfleet from lightning; on another, he helped to investigate the physical properties of gold alloys, in response to the government's concern over the loss of gold in coins, owing to wear.

His last research, performed when he was nearly 70, was the very difficult and exacting job, known as the Cavendish experiment (*q.v.*), of deducing the density of the Earth from measurements made by means of an intricate apparatus involving a highly sensitive torsional balance—a horizontal rod suspended from its centre by a thin wire or fibre that resists a twist. A British physicist, John Henry Poynting, who later developed an analogous method employing a common balance, said in his book *The Earth* (1913) that Cavendish made his experiment "in a manner so admirable that it marks the beginning of a new era in the measurement of small forces."

Cavendish died in his 78th year after what was very likely his first illness and was buried in what is now Derby cathedral, England. He left his considerable fortune to his relatives, most of it to Lord George Cavendish, the son of his first cousin. He left nothing to science, an omission that the Cavendish family repaired in 1871 by endowing the Cavendish Laboratory in Cambridge University where, under a succession of brilliant directors, much of the development of modern physics took place. (Ch.S./Ed.)

BIBLIOGRAPHY. A *Life* by George Wilson was published in 1851 (reprinted 1975). The previously unpublished *Electrical Researches,* edited and partially repeated by J.C. Maxwell, came out in 1879 (reprinted 1967). In 1921, a two-volume edition of previously published papers, together with some of the unpublished experiments, appeared as *The Scientific Papers of the Honourable Henry Cavendish, F.R.S.;* vol. 1 (rev. by Sir Joseph Larmor), contains the electrical researches, and vol. 2 (ed. by Sir Thomas Edward Thorpe, with additions by Charles Chree and others), the chemical and dynamical work. A more recent biography is A.J. Berry, *Henry Cavendish: His Life and Scientific Work* (1960).

Among articles dealing with specific aspects of the work of Cavendish are: C. Susskind, "Henry Cavendish, Electrician," *J. Franklin Inst.,* 249:181–188 (1950), which emphasizes his contributions to electrical theory; and R. McCormmach's concise biographical account in *Dictionary of Scientific Biography,* vol. 3 (1971), which also contains an extensive bibliography of original and secondary works.

Cavendish, Spencer Compton: *see* Devonshire, Spencer Compton Cavendish, 8th duke of.

Cavendish, Thomas, Cavendish also spelled CANDISH (baptized Sept. 19, 1560, Trimley St. Martin, Suffolk, Eng.—d. *c.* May 1592, in the North Atlantic), English navigator and freebooter, leader of the third circumnavigation of the Earth.

Thomas Cavendish, engraving
The Mansell Collection

Cavendish accompanied Sir Richard Grenville on his voyage to America (1585) and, upon returning to England, undertook an elaborate imitation of Sir Francis Drake's circumnavigation. On July 21, 1586, he sailed from Plymouth with 123 men in three vessels. He reached the Patagonian coast of South America, where he discovered Port Desire, now Puerto Deseado, Arg., his only significant contribution to geographical knowledge. After passing through the Strait of Magellan, he attacked Spanish settlements and shipping from South America to Mexico. Among his prizes was the treasure galleon "Santa Ana," seized off the coast of California (Nov. 14, 1587). After touching the Philippines, the Moluccas, and Java, he rounded the Cape of Good Hope and arrived at Plymouth on Sept. 9/10, 1588, with only one of his ships, the "Desire," and much plunder. On his second American-Pacific venture, undertaken in 1591, his fleet failed to traverse the Strait of Magellan, and Cavendish died trying to get back to England.

Cavendish, William: *see* Devonshire, William Cavendish, 4th duke of; Newcastle, William Cavendish, 1st duke of.

Cavendish experiment, measurement of the force of gravitational attraction between pairs of lead spheres, which thus allowed the first calculation of the value of the gravitational constant, *G*, the number expressing the proportionality between the attractive force exerted by two objects and the ratio of the product of their masses to the square of the distance between them (Newton's law of universal gravitation). The experiment was performed in 1797–98 by the English scientist Henry Cavendish. He followed a method prescribed and used apparatus built by his countryman, the geologist John Michell, who had died in 1793. The apparatus employed was a torsion balance, essentially a stretched wire supporting spherical weights. Attraction between pairs of weights caused the wire to twist slightly. The experiment was popularly known as weighing the Earth because determination of *G* permitted calculation of the Earth's mass.

caviar, the eggs, or roe, of sturgeon preserved with salt. It is prepared by removing the egg masses from freshly caught fish and passing them carefully through a fine-mesh screen to separate the eggs and remove any extraneous bits of tissue and fat. At the same time, 4–6 percent salt is added to preserve the eggs and bring out the flavour. In Iran, borax is used in addition to salt. The better grades of caviar are classified *malassol*, Russian for "lightly salted." Fresh caviar must be stored at between 32° and 45° F (0° and 7° C) or it deteriorates rapidly; for better storage it is pasteurized. Virtually all true caviar is produced in the U.S.S.R. and Iran, from fish taken from the Caspian and Black seas.

Caviar is graded according to the size of the eggs and the manner of processing. Grades are named for the types of sturgeon from which the eggs are taken: *beluga*, the largest, is black or gray; the smaller *osetrova* grayish, gray-green, or brown; *sevruga*, the smallest, is greenish black. The rarest caviar, made from the golden eggs of the sterlet, was formerly reserved for the table of the tsar; more recently it found its way to the tables of Soviet dignitaries and that of the shah of Iran. Lesser grades of caviar, made from broken or immature eggs, are more heavily salted and compressed. This *payusnaya* caviar is preferred by some because of its more intense flavour. The red roe of salmon and that of other fishes is sometimes sold under the name caviar. The roes of whitefish and lumpfish are dyed black with cuttlefish ink to resemble sturgeon eggs.

cavitation, formation of vapour bubbles within a liquid at low-pressure regions that occur in places where the liquid has been accelerated to high velocities, as in the operation of centrifugal pumps, water turbines, and marine propellers. Cavitation is undesirable because it produces extensive erosion of the rotating blades, additional noise from the resultant knocking and vibrations, and a significant reduction of efficiency because it distorts the flow pattern. The cavities form when the pressure of the liquid has been reduced to its vapour pressure; they expand as the pressure is further reduced along with the flow and suddenly collapse when they reach regions of higher pressure. The sudden growth and collapse of these vapour cavities cause the extreme pressures that pit the metal surfaces exposed to the cavitating liquid.

Cavite, province and chartered city, southern Luzon, Philippines. The province has an area of 497 sq mi (1,288 sq km). It extends south of Manila along Manila Bay (northwest) and includes Corregidor Island (*q.v.*). The proximity of Manila provides a job and agricultural market (rice, fish, fruits, vegetables, flowers), particularly for coastal residents. Binakayan is a centre of oyster cultivation. Long a revolutionary centre against the Spaniards, Cavite was the home province of Emilio Aguinaldo, the insurrectionist leader against both Spain and the United States. In addition to Cavite City, the province's chartered cities include Trece Martires (the provincial capital) and Tagaytay. Bacoor, Tanza, Naic, and Ternate are coastal towns; Carmona, Mendez-Nuñez, and Silang are inland population centres. Indang is the seat of Severino Agricultural College (1964).

Cavite City, located on a promontory in Manila Bay, is primarily a residential centre for Manila commuters. The city was chartered in 1940 and served for a time as the provincial capital. Sangley Point Naval Base, at the city's outer edge, was an old Spanish naval base that was captured by Commo. George Dewey (May 1, 1898); it functioned as the chief U.S. naval base and fuelling station in Asia until 1941. It continues as a Philippine and U.S. naval air facility and shipyard, and transport equipment is manufactured there. Pop. (1980) province, 771,320; city, 87,666.

Cavite Mutiny (Jan. 20, 1872), brief uprising of 200 Filipino troops and workers at the Cavite arsenal, which became the excuse for Spanish repression of the embryonic Philippine nationalist movement. Ironically, the harsh reaction of the Spanish authorities served ultimately to promote the nationalist cause.

The mutiny was quickly crushed, but the Spanish regime under the reactionary governor Rafael de Izquierdo magnified the incident and used it as an excuse to clamp down on those Filipinos who had been calling for governmental reform. A number of Filipino intellectuals were seized and accused of complicity with the mutineers. After a brief trial, three priests—José Burgos, Jacinto Zamora, and Mariano Gómez—were publicly executed. The three subsequently became martyrs to the cause of Philippine independence.

Cavour, Camillo Benso, conte di (count of) (b. Aug. 10, 1810, Turin, Piedmont, French

Cavour, detail of an oil painting by Francesco Hayez; in the Pinacoteca de Brera, Milan
Alinari—Anderson from Art Resource/EB Inc.

Empire—d. June 6, 1861, Turin, Italy), Piedmontese statesman, a conservative whose exploitation of international rivalries and of revolutionary movements brought about the unification of Italy (1861) under the House of Savoy, with himself as the first prime minister of the new kingdom.

Family and early life. The Cavours were an ancient family that had served the House of Savoy as soldiers and officials since the 16th century. Genevan by birth and Calvinist by religion, his mother brought into the Cavour family the influence of Geneva, a city open to all the political, religious, and social movements of the period. The French Revolution imperilled the fortunes of the Cavours because of their close ties with the ancien régime; but Cavour's father, Michele, reestablished the family in an eminent position in Napoleonic society. Camillo even had as godparents Prince Camillo Borghese—after whom he was named—and Pauline Bonaparte, the Prince's wife and Napoleon's favourite sister.

At the age of 10 he was enrolled at the Military Academy of Turin. As the younger son who could not hope for the economic and social position that would fall to his elder brother, Camillo saw a brilliant career open up before him under the protection of the court of Charles Albert, prince of Savoy and Piedmont. In 1826 he obtained a commission as lieutenant in the corps of engineers.

During his six years at the academy political ideas began to fascinate him; echoes of the constitutionalist Piedmontese revolution of 1821 reached the school, provoking in some of its members a flash of liberal and national spirit that was, however, immediately extinguished. Among his family, Camillo heard the great issues of the day being discussed: the internal politics of France under the restored Bourbons; the revolt against Turkish repression in Greece; the liberal Decembrist rising in Russia in 1825. He showed his sympathy, in his usual enthusiastic manner, with the liberals and with personalities such as Benjamin Franklin and Santorre di Santarosa, the famous ill-fated leader of the 1821 revolution in Piedmont, who was also a distant relative. A close friendship with a cadet three years

his senior, Baron Severino Cassio, seems to have had a particular influence on his political views. Cassio, suspected of republicanism, imbued Camillo with patriotic ideas.

The Cavour family, greatly disturbed by their son's association with a cadet holding compromising political views, ordered Camillo to terminate it—not without provoking his indignation and bitterness. This interference of the family was dictated by expediency, for in July 1824 the marchese Michele had obtained for Camillo the appointment as personal page to Charles Albert. His lack of enthusiasm for the court position and his open ridicule of the page-boy's uniform he was obliged to wear caused a scandal and confirmed the growing suspicions about the rebellious disposition of the young count Cavour. The insulted Charles Albert banished Camillo from court and—vainly—tried to persuade King Charles Felix to strip Camillo of his commission. The episode created an irreparable break between Camillo and the hereditary prince and for about 20 years made it impossible for Cavour to take any part in official political life.

Development of political ideals. His military career began in the engineers. He was first stationed in Turin, then in various frontier posts, where fortifications were being constructed; yet, wherever he was, Cavour remained dissatisfied. In 1830 he was sent to Genoa, where he met Anna Giustiniani Schiaffino, an ardent advocate of ultrademocratic and republican ideas, whose salon was frequented by many members of the Carbonari, the secret revolutionary society whose guiding force then was Giuseppe Mazzini. Cavour's fervent radicalism was inspired by his love for Anna Schiaffino and by his renewed friendship with Severino Cassio, now a fellow officer in the engineers at Genoa.

The French revolution of July 1830, which overthrew the last Bourbon, Charles X, and installed Louis-Philippe, "the citizen king," also played a great part in strengthening Cavour's revolutionary ardour. Under the direction of Severino Cassio, he studied English in order to follow more easily the newspapers reporting political events in Europe. He was influenced by the liberal ideas of the French writers Benjamin Constant and François Guizot, and his adversaries remained those of his childhood: paternalistic absolutism; legitimist reactionaries representing the landed interests, the aristocracy, and the clergy; and the union of throne and altar. Of necessity this attitude pitted him consciously against the caste to which he belonged.

The influence of the events in France on the temperamental Cavour once again aroused official suspicions, and this time he was subjected to police surveillance. As usual, his father's intervention helped to avert more serious consequences; in this case he was simply transferred to a remote mountain fort. It had become obvious, however, that he could no longer remain in the army, from which he resigned in 1831. His father found him a sort of occupation: he was appointed mayor of a village south of Turin and also became the administrator of extensive holdings in the vicinity belonging to his uncles.

Although these modest occupations served to fill his time and to insulate him from his family, they aggravated his despondency over what appeared to be the end of his political ambitions. Social interests began to absorb him: the problems of poverty and of prisoner education became the subjects of his researches. In 1834 he wrote a memoir on poverty in Piedmont, which was published the following year in London in the *Report from His Majesty's Commissioners for inquiring into the Administration and practical Operation of the Poor Laws.* A second pamphlet on the history of the Poor Laws in England was edited and published by Cavour in 1835 at Turin.

During those years he was at last able to make his first long-awaited visit to Paris and London, thus widening his knowledge of Europe. He now came to know the two greatest and most advanced Western capitals—both ruled by constitutional and liberal regimes (however much they differed in character) and both attempting to effect the boldest economic and social changes. He took a feverishly active interest in the parliamentary life of England and France; he attended university lectures and visited factories, railways, ports, hospitals, schools, and prisons. The experience he acquired in the two Western capitals and in Geneva set him firmly on the path he had already instinctively chosen: always to follow the "golden mean." He was repelled equally by the revolutionaries who wished to destroy society through terror in order to construct a better one without realizing that their methods would defile human dignity, and by the reactionaries, who, in blindly opposing all progress, eventually provoked revolutionary uprisings. Rejecting all extremes, he wanted above all to be a good European. Yet Cavour always remained a patriot. When his worth and his great ambition were acknowledged in France and one of his friends invited him to abandon the petty and wretched Piedmont of Charles Albert for a brilliant career in France, Cavour rejected the invitation.

In 1835, after his return from his travels, he began to engage in a fruitful series of enterprises that helped him to accumulate a considerable fortune. He also achieved a certain reputation with his writing. Even without directly facing the question of Italy's future political structure, all his writings proclaimed social or economic principles that could in no way be reconciled with the prevailing conditions in Italy. Above all, the economic measures and the construction of railroads proposed by Cavour would have transformed the Italy of that period beyond recognition.

Statesman. Gradually, as the year 1848 drew near and the first gusts of the great revolutionary storm of that year could be felt, Cavour's interest in politics began once more to dominate all others. This is shown by the chronological sequence of his writings. His transition to politics was completed when King Charles Albert decided to embark on measures of reform and to concede a certain amount of freedom to the press. Cavour took advantage of this to found the newspaper *Il Risorgimento,* which soon became the champion of increasingly drastic reforms. After taking a leading part in persuading Charles Albert to grant a liberal constitution, Cavour used *Il Risorgimento* to propagate the idea of an immediate war with Austria (which still ruled Lombardy and Venetia) as a historical necessity. Once elected a member of Parliament in June 1848, however, he assumed an intermediate position between the conservatives and the revolutionaries, thus calling forth the enmity of both left and right.

The war against Austria was undertaken, but developments went against the Piedmontese. This prompted Cavour to offer his services as a volunteer until, on being elected a deputy in the third Legislature (July 1848), he began to fight for the approval of a peace treaty with Austria, although the extremists of the left wanted to continue a war that was, in effect, already lost. The intelligence and expertise he displayed in the debates on financial and military questions gained him a prominent place among the deputies of the majority that supported the right-wing government of Massimo d'Azeglio. In October 1850, he was offered the post of minister of agriculture and soon became the most active and influential member of the Cabinet. Through a series of treaties with France, Belgium, and England, Cavour attempted to bring about the greatest possible amount of free trade. He also sought to form a network of economic interests with the great powers to pave the way for a political alliance against Austria. His appointment as minister of finance in 1850 was evidence of his growing ambitions.

Cavour now sought to create an alliance between the centre right and the centre left that would form a new majority with greater ability to move toward a policy of secularization and modernization in Piedmont. The alliance, called the *connubio* ("marriage"), brought about the resignation of d'Azeglio, whose parliamentary standing had been completely destroyed. After vain attempts to restore an effective d'Azeglio ministry, Victor Emmanuel II, who had succeeded his father Charles Albert in 1849, resigned himself to entrusting the formation of a government to Cavour, who from that time (Nov. 4, 1852) until his death was his country's acknowledged political leader.

The European drama into which Cavour was drawn against his will began in 1854 with the Crimean War (1853–56), which saw France and England allied against Russia in order to defend the integrity of the Turkish territory threatened by Russia's determination to open the Dardanelles for passage from the Black Sea to the Mediterranean. Victor Emmanuel immediately pledged his help to the French and English representatives. Cavour, whose ministers voted against the Crimean venture, was on the point of being dismissed by the King if he rejected the alliance or of being forced to resign by his colleagues if he accepted it. Accepting the alliance with customary boldness and self-confidence, he averted dismissal by the King and embarked upon war. The turning point of the war came with the Anglo-French-Sardinian victory that persuaded Austria to cast aside its neutrality and, by means of an ultimatum, force Russia to make peace.

With some difficulty, Cavour secured the participation of the small power of Piedmont in the peace negotiations at the Congress of Paris (1856), at which the greatest European powers were represented. By supporting Napoleon III's undeclared yet obvious intention to intervene militarily in Italy in the near future and by taking advantage of the general animosity toward Austria, which had joined the allies in the Crimean War only when victory over Russia was assured, Cavour succeeded in proposing the discussion of the Italian problem on the grounds that it was one that threatened European peace. In his view, peace was threatened by Austrian encroachment, papal misgovernment in central Italy, and the autocratic rule of the Spanish Bourbons in southern Italy. Thus, for the first time, the Italian question was presented for diplomatic consideration in a manner favouring the liberation of the peninsula. The difficulty was to persuade the two great powers, France and England, to persevere in their support of an anti-Austrian policy on the part of Piedmont.

In Paris, Cavour had occasion to meet and appraise the stature of Europe's most capable diplomats and to examine the reasons behind the policies of the great powers. He knew full well that it was illusory to hope for the disinterested assistance of Europe in the Italian cause; nevertheless, with his tireless energy and unlimited capacity to take advantage of the most adverse situations, he finally succeeded in winning Napoleon III over to his side. His trump card was the proposition to reestablish France as the leading power on the Continent by an expedition into Italy that would replace Austrian domination of the peninsula with French rule.

At a secret meeting at Plombières in July 1858, Napoleon III and Cavour agreed to provoke a European war against Austria in the following year. At the first suspicions of a secret agreement, the European powers—espe-

cially England—began a campaign to prevent the French and Piedmontese from carrying out their intentions, a campaign so intense that Cavour saw himself being dragged toward the brink of personal and national catastrophe. He was saved by an incredible blunder on the part of Austria, which sent an ultimatum threatening war unless Piedmont disarmed at once. The Franco-Piedmontese alliance accordingly came into force, and this time Austria's superior military power was counterbalanced by the French contribution. Franco-Piedmontese victories followed one after another until Napoleon signed an armistice with Emperor Francis Joseph I at Villafranca in July 1859.

The war had unleashed revolutionary movements in Tuscany, in the duchies of Modena and Parma, and in the papal states between the Po and the Apennines, from Bologna to Cattolica; the ducal rulers had been expelled, as had the papal legates. The armistice seemed to call everything into question, except for Victor Emmanuel's acquisition of Lombardy, which was a minimal gain compared with Cavour's dreams of liberating Italy from the Alps to the Adriatic. At Villafranca, Cavour vented his rage and frustration on the King and resigned his office.

Contrary to his usual perception, he realized only later the advantages to be derived from the armistice. The revolutionary landslide in Italy could no longer be checked, nor could the French emperor withdraw from his position as protector of Italian self-determination. After being returned to power by the reluctant king in January 1860, Cavour worked for the annexation of the central duchies that had formerly belonged to the ancient rulers of Piedmont; he was able to do this only by ceding Savoy and Nice to France.

Unification of Italy. The surrender of Nice to France vastly sharpened the conflict between Cavour and Giuseppe Garibaldi, for Nice was the popular hero's birthplace. The surrender of Piedmont's Alpine bulwark could be compensated for only by territorial expansion into central Italy (at the pope's expense) and into the Kingdom of the Two Sicilies. But Cavour, by now the black sheep of European diplomacy for having disturbed its tranquillity too often, was not in a position to take the initiative, even though England now favoured his policy.

It was Garibaldi who resolved the stalemate caused by Cavour's enforced inactivity. Sailing with his famous Thousand to Sicily, he destroyed Bourbon rule there and in the south. The daring diplomacy of Piedmont and Cavour seemed momentarily to be eclipsed by the military exploits of the red-shirted hero, but more important, there now appeared the first outlines of rivalry between a moderate, monarchist Italy and a revolutionary, republican Italy. The danger of a rupture was averted by the good sense and magnanimity of Garibaldi and by a diplomatic stratagem of Cavour. Cavour, taking up his stance before Europe as the defender of law and order against revolutionary excesses, and before Napoleon as the defender of the last strip of papal territory against attack by Garibaldi, sent an army under Victor Emmanuel across Marche and Umbria in order to check the "hero of the two worlds" and to weld the two Italies into one united kingdom.

There still remained the problem of establishing a capital. Cavour felt that only Rome could be the capital of the new state; but that meant he had to face the most complex problem of his life—that of the position to be assigned to the pope, the head of Catholicism, once Rome had become the capital of Italy. Cavour wholeheartedly accepted the concept of the separation of church and state; in his negotiations with the papacy he became a passionate supporter of the idea. He maintained that the liberty of the church was to be the fulcrum of the renewal of the world, even though this involved the renunciation of its temporal power and the surrender of Rome to the Italian nation. An entirely spiritual church and papacy, he asserted, would revive mankind. Pius IX's answer to these proposals was negative. But while Cavour was still vigorously promoting his formula of "a free church in a free state," he fell seriously ill and died, after having formed a nation in 10 years of impassioned and restless activity.

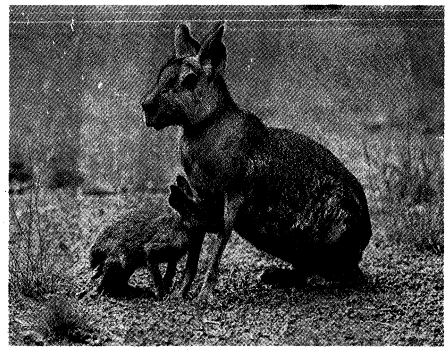
(U.M./Ed.)

BIBLIOGRAPHY. Paul Matter, *Cavour et l'unité italienne* . . . , 3 vol. (1922–27); Arthur J.B. Whyte, *The Early Life and Letters of Cavour, 1810–1848* (1925, reprinted 1970), and *The Political Life and Letters of Cavour, 1848–1861* (1930, reprinted 1975), are documented works available in English. W. Roscoe Thayer, *The Life and Times of Cavour,* 2 vol. (1911, reissued 1971), contains a full bibliography. Heinrich von Treitschke, *Cavour* (1870, reissued 1939), depicts Cavour as an exponent of *Realpolitik.* Rosario Romeo, *Cavour e il suo tempo,* 3rd ed., vol. 1– (1977–), is a standard work on Cavour. Denis Mack Smith, *Victor Emanuel, Cavour and the Risorgimento* (1971), is a revisionist work on Cavour and the Risorgimento.

cavy, any of several South American rodents belonging to the family Caviidae (order Rodentia), which also includes the domestic guinea pig. Cavies, except for the Patagonian and salt desert cavies (*Dolichotis*), are small, stout animals resembling gray or brown guinea pigs. They are 25 to 30 centimetres (10 to 12 inches) long and have short ears, short legs, and no visible tail. They are placed in four genera: *Cavia* (true cavies); *Kerodon* (rock cavy); and *Galea* and *Microcavia* (mountain, marsh, and pampas cavies).

The Patagonian cavy, or mara (*Dolichotis patagona*), and the salt desert cavy (*D. salinicola*) are long-legged, rather rabbit-like, hopping animals with relatively large ears, large eyes, short tails, and, unlike other cavies, hooflike nails on the hind toes. The Patagonian cavy is large, attaining a length of 75 cm and a weight of as much as 16 kilograms (35 pounds). The salt desert cavy is smaller, about 45 cm long.

Cavies are social animals. They live in burrows, sometimes undermining the ground so completely that it collapses when walked on, and they feed on grass, leaves, and other available vegetation. They are found in various habitats, including plains, marshes, and rocky areas. Most are nocturnal; the Patagonian and salt desert cavies are diurnal and spend much time basking in the sun. True cavies breed twice yearly, the female bearing one to four young after about two months' gestation.



Patagonian cavy (*Dolichotis patagona*)
George Holton—Photo Researchers

The spotted cavy (*see* paca) is a rodent of an entirely different family, Dasyproctidae.

Cawahíb (people): *see* Kawaíb.

Cawdor, village and castle in Highland region, Scotland, south of Nairn, near Inverness. The local castle, according to a tradition perpetuated by Shakespeare, was the scene of the murder of King Duncan I by Macbeth, the thane of Cawdor, in 1040. The oldest part of the present castle dates from 1454, however, and there is no evidence of an earlier structure. The castle was considerably enlarged in the 17th century and remains the seat of the earls of Cawdor. Pop. (1981) 617.

Cawnpore (India): *see* Kānpur.

Caxias, city, east central Maranhão state, northeastern Brazil, on the Rio Itapicuru, at 207 ft (63 m) above sea level. Formerly known as São José das Aldeias Altas, it was renamed to honour Luis Alves de Lima e Silva, duque de Caxias, governor and military commander in Maranhão (1837). The city is the commercial centre of eastern Maranhão and processes rice, cotton, carnauba and babassu palms (for oil), cashews, and almonds that are grown in the region. The seat of a bishopric, Caxias is accessible by railroad, highway, and air from São Luís, the state capital (171 mi [275 km] northwest), and neighbouring communities, including Teresina (40 mi southeast), capital of Piauí state. Pop. (1980 prelim.) 56,755.

Caxias, Luiz Alves de Lima e Silva, duque de (duke of) (b. Aug. 25, 1803, Rio de Janeiro—d. May 7, 1880, Rio de Janeiro), military hero and statesman who gave the military a prominent position in the government of the Brazilian empire.

Caxias
By courtesy of the Library of Congress, Washington, D.C.

Caxias kept up his family's tradition by joining the military service at age 14, and within a year he was promoted to second lieutenant. At 21 he was appointed adjutant of the battalion of the emperor. Caxias first displayed his military skills during the war of independence (1823) in the state of Bahia. On April 7, 1831, the emperor Pedro I abdicated, and Caxias organized a battalion to police Rio de Janeiro until a new government was formed. After becoming governor of the state of Maranhão in 1837, Caxias was elected to Brazil's House of Deputies in 1840.

Caxias resumed his military career when he was asked to pacify local disturbances in the states of São Paulo, Minas Gerais, and Rio Grande do Sul (1841–45), where a separatist revolt was in progress; in 1852 he was appointed to lead the Brazilian troops that helped overthrow the Argentine dictator Juan Manuel de Rosas. In 1855 Caxias was named minister of war, a post he held for many years; he also served as president of the council of ministers twice (1866 and 1875–78). In 1867 Caxias was given command of the army, which had suffered two years of reverses during the Paraguayan War (1864–70). After his capture of Asunción in 1869, he was named duke of the empire and was considered the champion of the conservatives in Brazil.

Caxias do Sul, city, northeastern Rio Grande do Sul state, southern Brazil, lying at 2,490 ft (760 m) above sea level on the range of hills separating the Antas and Caí river valleys. It

was founded in 1875 by Italian colonists and given city status in 1910. Metallurgic industries and viticulture are the city's economic mainstays; the vineyards of the surrounding area are considered Brazil's best. The Universidade de Caxias do Sul (1967) is located there. Caxias do Sul is the terminus of a branch railway line from Pôrto Alegre, the state capital, to the south; it is also on a major highway running north to São Paulo. Pop. (1980 prelim.) 198,824.

Caxton, William (b. *c.* 1422, Kent, Eng.—d. 1491, London), the first English printer, who as a translator and publisher exerted an important influence on English literature.

In 1438 he was apprenticed to Robert Large, a rich mercer, who in the following year became lord mayor of London. Large died in 1441, and Caxton moved to Bruges, the centre of the European wool trade; during the next 30 years he became an increasingly prosperous and influential member of the English trading community in Flanders and Holland. In 1463 he took up duties as "Governor of the English Nation of Merchant Adventurers" in the Low Countries—a post of real authority over his fellow merchants. Some time in 1470 he ceased to be governor and entered the service of Margaret, duchess of Burgundy, possibly as her financial adviser.

In that period Caxton's interests were turning to literature. In March 1469 he had begun to translate Raoul Le Fèvre's *Recueil des histoires de Troye,* which he laid aside and did not finish until Sept. 19, 1471. In Cologne, where he lived from 1470 to the end of 1472, he learned printing. In the epilogue of Book III of the completed translation, entitled *The Recuyell of the Historyes of Troye,* he tells how his "pen became worn, his hand weary, his eye dimmed" with copying the book; so he "practised and learnt" at great personal cost how to print it. He set up a press in Bruges in about 1474, and the *Recuyell,* the first book printed in English, was published there in 1475. Caxton's translation from the French of *The Game and Playe of the Chesse* (in which chess is treated as an allegory of life) was published in 1476.

Caxton printed two or three other works in Bruges in French, but toward the end of 1476 he returned to England and established his press at Westminster. From then on he devoted himself to writing and printing.

Although a pioneer of printing in England, Caxton showed no great typographical originality and produced no books of remarkable beauty. The first dated book printed in English, *Dictes and Sayenges of the Phylosophers,* appeared on Nov. 18, 1477. Kings, nobles, and rich merchants were Caxton's patrons and sometimes commissioned special books. His varied output—including books of chivalric romance, conduct, morality, history, and philosophy, and an encyclopaedia, *The Myrrour of the worlde* (1481), the first illustrated English book—shows that he catered also to a general public. The large number of service books and devotional works published by Caxton were the staple reading of most literate persons. He also printed nearly all the English literature available to him in his time: *Canterbury Tales* (1478? and 1484?) and other poems by Chaucer, John Gower's *Confessio amantis* (1483), Sir Thomas Malory's *Morte Darthur* (1485), and much of John Lydgate. Caxton translated 24 books, some of them immensely long. By the time of his death, he had published about 100 items of various kinds.

cay, also spelled KEY, small, low island, usually sandy, situated on a coral reef platform. Such islands are commonly referred to as keys in Florida and parts of the Caribbean. Sand cays are usually built on the edge of the coral platform, opposite the direction from which the prevailing winds blow. Debris broken from the reef is swept across the platform at high tide but is prevented from washing over the edge by waves produced by the refraction and convergence of waves around the platform itself. The accumulation of sand may at first move around but gradually will become stabilized as beach rock (sand and debris cemented at water level by precipitated calcium carbonate) is formed and the tiny island becomes vegetated. The sand is generally built to 1½ to 3 metres (5 to 10 feet) above the high-tide level, although the wind may raise dunes somewhat higher. A cay is often elongated perpendicular to the prevailing winds, but its shape may change considerably with deposition in calm weather and erosion during storms. Even fairly large cays are vulnerable to complete destruction by severe hurricanes or typhoons. Occasionally sand cays may have a rampart of coarse material on the windward side, just beyond a shallow lagoon filled with mangroves. In some cases cays or ramparts that consist of chunks of dead coral and other debris may form on the windward edge of the coral reef platform.

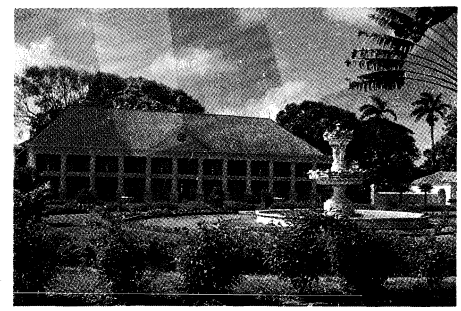
A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

Cayapa, Indians of the coastal lowlands of western Ecuador, one of the few aboriginal groups left in the region. The Cayapa speak a Chibchan language somewhat related to the language of the neighbouring Colorado people. Like the Colorado, the Cayapa believe themselves to be descended from peoples of the Andean highlands. The Cayapa probably numbered about 3,000 in the early 1970s.

Agriculture, fishing, and hunting are the chief sources of food for the Cayapa. Plantains, manioc, sugarcane, yams, and peppers are grown; some domestic animals are raised, but they are not a major food source. Fish and shellfish are abundant, and many species of jungle animals are hunted. A typical settlement consists of single-family households spread through the tropical forest along a river or stream. The traditional house has a thatched roof supported by posts; it is usually unenclosed but is sometimes divided into two sections. Women wear ankle-length wraparound skirts, men a pair of short, tight pants and a thin calico shirt. Weaving, pottery, and woodworking are the chief crafts. The religion of the Cayapa is a mixture of Roman Catholicism and aboriginal pagan beliefs. Their political system consists of hereditary chiefs and subordinate officials.

Cayenne, capital and Atlantic port of French Guiana, at the northwestern end of the Île de Cayenne, an island formed by the estuaries of the Cayenne and Mahury rivers. Founded in 1643 by the French as La Ravardière, it was reoccupied in 1664 after destruction by the Indians and was declared a city and renamed Cayenne in 1777. After the emancipation of slaves in 1848, it became a centre of French penal settlements in Guiana, established mainly as compensatory labour sources. In 1852 Napoleon III decreed that convicts with sentences of more than seven years were to be sent to French Guiana, and Cayenne became known as the city of the condemned. The prisons were closed in 1945.

The port of Dégrad des Cannes, on the estuary of the river Mahury, has become the major port, replacing Larivot and the Îles du Salut. Timber, rosewood essence, rum, and gold are exported in small quantities. In the mid-1960s sugarcane and pineapple were planted around the city, and a pineapple cannery and a shrimp-processing plant were later built. A seafront avenue links Cayenne with the suburbs of Chaton and Montabo, where the French Institute of Tropical America and the Pasteur Institute are located. Historic landmarks include the Church of the Holy Saviour and a prefecture on the Place d'Armes. There is an international airport.



The Government Building, Cayenne, French Guiana
Peter L. Gould

The city is the administrative seat of Cayenne *arrondissement* (area 19,112 sq mi [49,500 sq km]) established in 1969, comprising part of the Inini (*q.v.*) hinterland and the tropical coastal strip of French Guiana, which ranges from 15 to 50 mi (24 to 80 km) in width. Pop. (1982) mun., 38,091; *arrondissement,* 61,587.

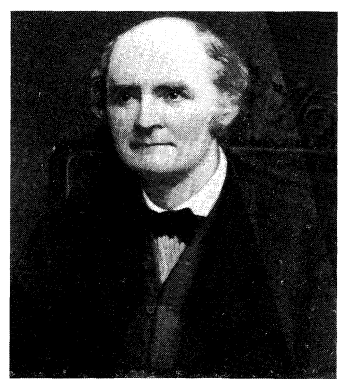
cayenne pepper, very pungent spice produced by drying and grinding the orange to deep-red fruits of small-fruited species of *Capsicum. See* pepper.

Cayes (Haiti): *see* Les Cayes.

Cayey, town and municipality, central Sierra de Cayey, Puerto Rico. The town, at an altitude of 1,300 ft (400 m), was founded in 1773 as Cayey de Muesas on the Spanish military highway linking San Juan with Ponce on the southern coast; its cool summers made it a favourite Spanish military post. It has some clothing and tobacco industries. Cayey University College, affiliated with the University of Puerto Rico, was founded in 1967.

The municipality, with an area of 50 sq mi (130 sq km), has 2 urban and 20 rural *barrios* (wards). The principal economic activity is tobacco growing. Pop. (1980) town, 23,305; mun., 41,099.

Cayley, Arthur (b. Aug. 16, 1821, Richmond, Surrey, Eng.—d. Jan. 26, 1895, Cambridge, Cambridgeshire), English mathematician who played a leading role in founding the modern British school of pure mathematics.



Arthur Cayley, detail of an oil painting by W.H. Longmaid, 1884; in the collection of Trinity College, University of Cambridge, England
By courtesy of The Master and Fellows of Trinity College, Cambridge, England

Cayley was born during a periodic visit of his family to England from Russia, where his father was engaged in trade. Cayley's remarkable mathematical ability became apparent by his skill as a child in doing complex calculations for amusement. On the advice of school

authorities, his father, who had by then settled in England, enrolled him in May 1839 at Trinity College, University of Cambridge, where he mastered Greek, French, German, and Italian and distinguished himself in mathematics.

Following his graduation in 1842, he obtained a three-year appointment at Trinity, which allowed him to begin work on the problems in mathematics that occupied his attention for the next 50 years. During this extremely productive period, he also began a lifelong interest in mountaineering, painting, and travel. Because no positions in mathematics were open to him when his term ended in 1845, he entered Lincoln's Inn, London, to prepare for a legal career. Admitted to the bar in 1849, Cayley earned just enough by practicing law during the next 14 years to allow him to pursue his interest in mathematics. During this time, Cayley wrote his brilliant mathematical papers. In 1850 he met James Joseph Sylvester, a fellow lawyer and mathematician, and the two thenceforth spent much time in enthusiastic collaboration.

Cayley's work treated nearly every subject of pure mathematics. The concept that the order of points formed by intersecting lines is always invariant, regardless of spatial transformations, is an application of the theory of algebraic invariance, which he originated and developed with encouragement from Sylvester. This concept is of importance in working out space–time relationships in physics. Cayley's development of the geometry of spaces of any number of dimensions is also significant in conceptualizing four dimensions (space–time) in relativity and in going beyond the dependence on points and lines as elements by which geometric space is constructed. Cayley also developed the algebra of matrices, which are arrays of numbers in rows and columns, in which the order and direction of multiplication determines the quantitative result. This tool was used by the German physicist Werner Heisenberg in 1925 for his work in quantum mechanics.

Cayley also prepared the way for the idea that Euclidean and non-Euclidean geometries are special cases of the same kind of geometry. He did this by devising a means of uniting projective geometry, which is dependent upon invariant properties of figures, and metrical geometry, which is dependent upon sizes of angles and lengths of lines. He also prepared two reports—on theoretical dynamics and on the mean motion of the Moon—for the British Association for the Advancement of Science (1857, 1862).

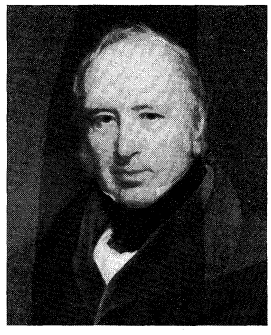
Cayley practiced law until 1863, when he was elected to the new Sadlerian chair of pure mathematics at Cambridge. He married Susan Moline the same year. From the time of his arrival at Cambridge until his death he was constantly engaged in mathematical investigation. He was also influential in assisting women to be admitted as students for the first time. His lectures at Cambridge attracted very few students; among them, however, was A.R. Forsyth, who succeeded him in the Sadlerian chair and, by introducing the new theory of functions that had been making progress in France and Germany, helped to bring English mathematics back into the mainstream of European trends.

In 1881–82 Cayley lectured at Johns Hopkins University in Baltimore on Abelian functions—a means of combining numbers such that the result of mathematical treatment is independent of the order. At Johns Hopkins he again met his friend Sylvester, who had become professor there in 1876.

Cayley was the recipient of nearly every academic distinction that can be conferred upon an eminent man of science: honorary degrees from several universities, election as fellow or foreign corresponding member of the academies of several countries, and the Copley Medal in 1883 from the Royal Society of London. At various times he was president of the Cambridge Philosophical Society, of the London Mathematical Society, and of the Royal Astronomical Society.

BIBLIOGRAPHY. The basic biography is by A.R. Forsyth in the *Proc. R. Soc.*, 58:1–43 (1895), and is reprinted, with slight changes, in vol. 8 of *The Collected Mathematical Papers of Arthur Cayley*, 13 vol. (1889–97). For other biographical studies, see Ganesh Prasad, *Some Great Mathematicians of the Nineteenth Century*, vol. 2, ch. 1 (1934); Alexander MacFarlane, *Lectures on Ten British Mathematicians of the Nineteenth Century*, pp. 64–77 (1916); and E.T. Bell, *Men of Mathematics* (1937, reprinted 1961).

Cayley, Sir George (b. Dec. 27, 1773, Scarborough, Yorkshire, Eng.—d. Dec. 15, 1857, Scarborough), English pioneer of aerial navigation and founder of the science of aerodynamics, who built the first successful man-carrying glider.



George Cayley, detail of an oil painting by Henry Perronet Briggs, 1840; in the National Portrait Gallery, London

By courtesy of the National Portrait Gallery, London

Discarding the notion of using movable wings for flight, he developed the basic configuration of the modern airplane, complete with fixed wings, fuselage, and a tail unit with elevators and rudder. He also studied the advantages of streamlining, problems of longitudinal and lateral stability, the design of wing surfaces for maximum lift, and superposed wings (which were eventually used in biplanes and triplanes), testing all of his ideas with small models. Cayley's efforts culminated in 1853 with a glider that carried his reluctant coachman on the first manned glider flight.

Cayley understood very well that there were no engines then capable of powering an airplane, for he had carefully calculated the power and performance characteristics needed. Cayley predicted the development of the internal-combustion engine and its utility as a power plant for airplanes. His efforts represented the most advanced point in the development of aviation during the 19th century.

Cayley founded the Regent Street Polytechnic Institution, London, in 1839, and among his many inventions was the caterpillar tractor. He also did research in land reclamation, in scientific education, and on railway equipment.

Caylus, Anne-Claude-Philippe de Tubières, comte de (count of) (b. Oct. 31, 1692, Paris—d. Sept. 5, 1765, Paris), French archaeologist, engraver, and man of letters.

Caylus, detail of an engraving by N.-H. Jacob

J.P. Ziolo

The only son of the Marquise de Caylus, he fought with distinction in the War of the Spanish Succession (1704–14). After the war he resigned his commission to travel to Italy, then to Constantinople and Greece, and later in the Netherlands and England. Returning to Paris, he devoted his life to engraving and archaeology, winning election to both the Académie de Peinture et Sculpture and the Académie des Inscriptions. His principal work is *Recueil d'antiquités égyptiennes, étrusques, grecques, romaines, et gauloises*, 7 vol. (1652–67; "Collection of Egyptian, Etruscan, Greek, Roman, and Gallic Antiquities").

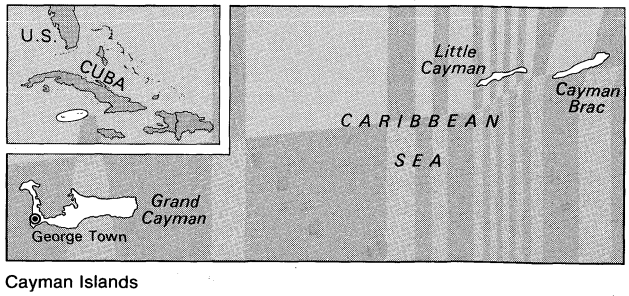
cayman (reptile): *see* caiman.

Cayman Islands, British colony in the Caribbean Sea, composed of the coral islands of Grand Cayman, Cayman Brac, and Little Cayman. The islands are located about 180 mi (290 km) northwest of Jamaica, and their total land area, including inland water, is 102 sq mi (264 sq km). The capital, George Town, is on Grand Cayman Island. The population in 1984 was estimated to be 19,000.

The article that follows is a summary of significant detail about the Cayman Islands. For information about regional aspects of the Cayman Islands, see MACROPAEDIA: West Indies.

For current history and for statistics on society and economy, *see* the article "World Affairs" and BRITANNICA WORLD DATA, respectively, in the *Britannica Book of the Year.*

The land. The Cayman Islands are low-lying for the most part, although Cayman Brac has a central bluff, and the coasts are reefed and rocky. The white sand of the broad, clean beaches is composed chiefly of coral and thus remains cool even on the hottest days. The largest and most populous island is Grand Cayman, about 22 mi long and 8 mi across at its widest, with a total area of 76 sq mi. Cayman Brac, about 89 mi northeast of Grand Cayman, is the next largest island; it is about 12 mi long, averages about 1 mi in width, and has the highest elevation of the group, rising to 140 ft (42 m) above sea level. Its total area is 14 sq mi. The smallest of the islands, Little Cayman, lies 5 mi west of Cayman Brac; it is 10 mi long, has a maximum width of 2 mi, and a total area of 10 sq mi. There are no streams on any of the islands.



Cayman Islands

A pleasant tropical climate is one of the colony's main assets, tourism being of primary importance to the economy. Temperatures are moderate throughout the year, averaging about 79° F (26.1° C) annually. The rainy season extends from mid-May through October, and the dry season lasts the balance of the year. Rainfall averages about 62 in. (1,575 mm) yearly. The islands lie in the path of Caribbean hurricanes.

Mangrove swamp covers about 30 percent of the land area. A variety of commercially useful trees grow on the islands, among them coconut palms, breadfruit, banana, and mango and those producing citrus fruits. There are also thatch palm and some logwood and mahogany trees. The only indigenous mammal is the agouti. There are numerous reptiles, however, including the green sea turtle, which was noted by Columbus when he visited the islands. Iguanas, other lizards, and frogs are also common, and the islands are rich in bird life.

The people. About 25 percent of the Caymanians are European, mostly of British stock; about 25 percent are black, the descendants of African slaves; and the remainder are predominantly of mixed stock. The main spoken and official language is English, which occurs in a variety of dialects; Spanish is frequently a second language. The main population centre is George Town, the capital, with a population of 2,700 in 1979. The total population of Cayman Brac was 1,603 and that of Little Cayman only 74. The population density of the islands is about 186 persons per sq mi (72 per sq km). The chief religious groups are the Presbyterians, mostly on Grand Cayman, and the Baptists, chiefly on Cayman Brac. In 1982 the birth rate on the Cayman Islands was 18.5 per 1,000 population, while the death rate stood at almost 6. The annual rate of population increase was about 1.25 percent.

The economy. Finance and tourism are the major industries of the Cayman Islands. The growth of the financial community has been encouraged by the islands' favourable laws governing taxes and confidentiality of accounts. In 1982 there were more than 400 licensed banks and trust companies in the colony. The islands' physical beauty and their superb climate have made them an attractive resort for Caribbean tourists. The government invests heavily in the promotion of tourism, which increased fivefold between 1970 and 1982. The chief occupations are in clerical and service work and in the construction trades. Agriculture occupies only a small number of Caymanians, and much of the islands' food must be imported. The main crops are fruits, such as mangoes, bananas, and plantains, as well as coconuts, and vegetables, including sweet potatoes, yams, and tomatoes. Some livestock is raised, chiefly cattle and poultry. The production of food, shell, and leather products derived from turtles is an important industry and provides the Caymans with their most important export. Stamp duties are also a source of revenue. The major imports are machinery and transport equipment, other manufactured items, fuels, and foods. The unit of currency is the Cayman Islands dollar, which is pegged in value to the U.S. dollar.

Automobiles and buses provide the main means of transportation on the islands, which have about 110 mi of roads. The chief port is George Town. Cayman Airways offers flights to Texas, Florida, and Jamaica and also provides interisland service. The International Airport is on Grand Cayman, and smaller airports are on Cayman Brac and Little Cayman.

Administrative and social conditions. The government of the Cayman Islands colony is administered according to the constitution of 1972. It provides for a Legislative Assembly composed of the governor, 3 official members, and 12 elected members. The governor represents the British monarch, who is the head of state. An Executive Council, composed of three official and four elected members, advises the governor. There are no political parties.

The Caymanians have a relatively high standard of living. The government provides adequate social services, there is practically no unemployment, and the crime rate is low. Health care is provided by the Health Services Department, which operates a hospital on Grand Cayman and a smaller one on Cayman Brac. The incidence of tropical disease on the islands is low. Education is compulsory for children between the ages of 5 and 14 and is provided free in government primary schools. The government also operates a middle school in George Town and comprehensive high schools on all three islands. Higher education is available at the Community College and at the International College of the Cayman Islands. Several schools also provide technical education. Four newspapers were being published on the islands in 1983. Radio Cayman, a government-owned station, operates six days a week, and television transmission to the colony was scheduled to begin in 1983. Theatrical performances and art exhibits are held by community organizations, and a number of residents engage in craftwork, particularly the making of jewelry from black coral.

History. The Cayman Islands were first sighted by Columbus in 1503 on his last voyage to the West Indies. Although uninhabited at that time, the islands were visited by Carib or Arawak Indians. The Spaniards first called the islands Las Tortugas, because of the abundance of turtles in the surrounding waters. In the period 1527–30 they were renamed Cayman (from Spanish *caimán*, meaning "alligator"), a possible mistaken reference to the islands' indigenous iguanas. The Caymans were frequently visited by Spanish, English, and French ships but were not claimed by anyone until ceded to the British in 1670. Settlers then began arriving on the islands, which became a favourite haunt of pirates and buccaneers. The early settlers were mainly interested in turtle fishing, which they did so intently that they almost exhausted local waters of the species. The Caymanians also developed a reputation as shipbuilders. The remote location of the islands hampered economic development until the 1940s, when they became accessible through air transportation. The Cayman Islands were administered as a dependency of the colony of Jamaica until 1959, when they became a separate dependency but with the governor of Jamaica continuing as their governor. After Jamaica became independent in 1962 an administrator assumed most of the powers of the governor in the Cayman Islands. In 1971 the title of administrator was changed to that of governor.

Cayman Trench, also called BARTLETT DEEP, or BARTLETT TROUGH, submarine trench on the floor of the western Caribbean Sea between Jamaica and the Cayman Islands. It extends from the Windward Passage at the southeastern tip of Cuba toward Guatemala. The relatively narrow trough trends east-northeast to west-southwest and has a maximum depth of 25,216 ft (7,686 m), the deepest point in the Caribbean Sea. The Cayman Ridge separates the trough from the Yucatan Basin in the north, and the Jamaica Ridge, which supports the island of Jamaica, separates it from the Colombian Basin farther south. Submarine earthquakes sometimes occur around the edges of the trench.

Cayo (Belize): *see* San Ignacio.

Cayrol, Jean(-Raphaël-Marie-Noël) (b. June 6, 1911, Bordeaux, Fr.), poet, novelist, and essayist who stood at the frontiers of the *nouveau roman* ("new novel"), the avant-garde French novel that emerged in the 1950s.

In World War II he was deported to a concentration camp after participating in the Resistance movement, and that experience is at the heart of his artistic creation. It inspired his first poems, *Poèmes de la nuit et du brouillard* (1945; "Poems of the Night and the Fog"); his seminal essay *Lazare parmi nous* (1950; "Lazarus Among Us"); and his prizewinning trilogy of novels, *Je vivrai l'amour des autres* (1947–50; "I Will Live the Love of Others"). The image of Lazarus (*i.e.,* one who is neither living nor dead) is central to Cayrol's work. His characters are estranged from the normal world of people and things and drift through shadowy, passive existences on its outskirts.

Cayrol was a prolific writer, producing fiction, poems, essays, and screenplays. His novels include *L'Espace d'une nuit* (1954; *All in a Night,* 1957) and *Les Corps étrangers* (1959; *Foreign Bodies,* 1960), the only translated works to receive a considerable English audience. Other notable novels are *Le Froid du soleil* (1963; "The Chill of the Sun"), *Midi-Minuit* (1966; "Midday-Midnight"), *Je l'entends encour* (1968; "I Still Hear It"), *Histoire d'un prairie* (1969; "History of a Prairie"), *Histoire d'un désert* (1972; "History of a Desert"), *Histoire de la mer* (1973; "History of the Sea"), *Histoire du ciel* (1975; "History of the Sky"), *Histoire de la forêt* (1975; "History of the Forest"), *Histoire d'une maison* (1976; "History of a House"), *Les Quatre saisons* (1977; "The Four Seasons"), and *Exposés au soleil* (1980; "Exposed to the Sun").

Cayuga, Iroquoian-speaking North American Indians, members of the Iroquois League (*q.v.*), who originally inhabited the region bordering Cayuga Lake in what is now central New York state. (*See also* Iroquois.) Cayuga men hunted the abundant game, waterfowl, and fish of the region, while women cultivated corn (maize). Villages consisted of multiple-fireside longhouses that sheltered related families. When first visited by the French Jesuit René Ménard in 1656, their towns occupied the lands east of the lake above the marshes south of the Seneca River. Approximately 1,500 people lived in some 100 longhouses. The local Cayuga council, which guided the village chiefs, comprised representatives of the eight exogamous clans. The clans were grouped into two major divisions, or moieties, which had largely ceremonial functions at funerals and games.

Throughout their history the Cayuga have been a composite people. When they had a refuge settlement north of Lake Ontario, they took in Huron and Erie captives to replace war losses, and in the late 17th century they absorbed many Siouan-speaking and Algonkian-speaking bands from the near south and west. At the beginning of the American Revolution a large part of the Cayuga tribe, which favoured the British, moved to Canada. After the Revolution the remaining Cayuga sold their New York lands and scattered among other Iroquois peoples in Wisconsin, Ohio, and Grand River, Ontario, where in the late 20th century on Six Nations Indian Reserve about 1,500 descendants perpetuated the language and ceremonial life of the tribe. About 200 live among the Seneca nation in western New York, and perhaps 100 live in Oklahoma.

Cayugan Series, last of the three major divisions of Silurian rocks and time (the Silurian Period began about 430,000,000 years ago and lasted about 35,000,000 years). It was named for exposures studied in the region about Cayuga Lake, New York. During Cayugan time, marine waters on the North American continent became gradually restricted. Arid conditions prevailed, and evaporation

produced many deposits of salt, gypsum, and anhydrite that are extensively mined.

In New York and the Great Lakes region, Cayugan rocks are characterized by an extensive development of impure dolomites, these also being known as water limes. These rocks contain fossils of rather specialized fauna, the most familiar of which are the eurypterids—large, aquatic, scorpion-like arthropods that probably preyed on worms and on the early fishlike vertebrates.

cayuse, also called BRONCO, or MUSTANG, North American wild or Indian-tamed horse, descended from horses taken to the New World by the Spanish in the 16th century.

Cayuses (mustangs)
Mark Mikolas—Bruce Coleman Inc./EB Inc.

The name comes from that of an Indian tribe of eastern Washington and Oregon that was known for the small horses it bred.

Cazembe (African nation): *see* Kazembe.

Cazenovian Stage, division of Middle Devonian rocks and time in North America (the Devonian Period began about 395,000,000 years ago and lasted about 50,000,000 years); it was named for exposures studied in the region of Cazenovia, N.Y. In east-central New York, where the Cazenovian has been well studied, the Bakoven Shale Formation, a black shale, underlies the Mount Marion Sandstone Formation, about 240 m (800 feet) of marine sandstones and shales that are rich in fossils and noted for the diversity of their marine-invertebrate fauna (brachiopoda). Overlying the Mount Marion, the Ashokan Sandstone Formation consists of about 150 m (500 feet) of nonmarine shales and sandstones.

The Cazenovian Stage reflects a progressive shift in depositional environments during Middle Devonian time; continental deposits replaced marine deposits, and the shoreline retreated westward. The Cazenovian Stage follows the Onesquethaw Stage and precedes the Tioughnioga Stage.

Cazimir (Polish, Romanian, etc., personal name): *see under* Casimir.

C.B., companion of the Bath, member of a British order of knighthood, although this rank does not confer knighthood. *See* Bath, The Most Honourable Order of the.

CB radio: *see* citizens band radio.

C.B.E., commander of the British Empire, member of a British order of knighthood, although this rank does not confer knighthood. *See* British Empire, The Most Excellent Order of the.

CBS Inc., formerly (1928–74) COLUMBIA BROADCASTING SYSTEM, major American broadcasting company and operator of the CBS national radio and television networks. The company was incorporated in 1927 as United Independent Broadcasters, Inc., and its name was changed a year later to Columbia Broadcasting System, Inc. Its present name was adopted in 1974. Headquarters are in New York City.

Under the direction of longtime chairman William Paley, CBS has made media history since the late 1920s. Paley, whose father owned the company that made La Palina cigars, invested in the Columbia Broadcasting System, which was then a small, struggling radio network, in 1928. Realizing that the key to radio's success was large audiences that would attract advertisers, Paley offered programming free to affiliated stations in return for having a certain part of their schedule devoted to sponsored network shows. From 22 stations in 1928, the network grew to 114 stations in a decade.

Ratings grew during the 1930s with stars such as Phil Harris, Fred Allen, Bing Crosby, and Kate Smith. When television began to grow more popular during the 1940s, and the appearance of performers became as important as their voices, Paley raided rival NBC, signing up stars such as Amos 'n' Andy, George Burns and Gracie Allen, and Jack Benny, who proved to be as popular on television as they had been on radio. In following decades, Ed Sullivan, Lucille Ball, Mary Tyler Moore, and newscaster Walter Cronkite were among the personalities who made CBS the most watched television network in the country. CBS remained the dominant network until the late 1970s.

In 1938 CBS acquired the American Recording Corporation, which later became Columbia Records. Dr. Peter Goldmark of CBS laboratories invented high fidelity long-playing records, and the Columbia record label introduced them to the public in 1948.

In the 1960s and '70s CBS diversified into the production of books, magazines, musical instruments, and toys. But in the years 1985–88 the company sold off all of these other operations and also sold its highly successful record unit, which was bought by the Sony Corporation. Thenceforth CBS concentrated on its core of operations, television and radio broadcasting.

CCC (U.S.): *see* Civilian Conservation Corps.

CCF (Canadian political party): *see* Co-operative Commonwealth Federation.

Cchinvali (Georgian S.S.R.): *see* Tskhinvali.

CCP: *see* Chinese Communist Party.

CD, abbreviation of *Córdoba Durchmusterung* (*q.v.*), an astronomical catalog.

CD: *see* deposit, certificate of.

CDU (West German political party): *see* Christian Democratic Union.

CE (contagious ecthyma; animal disease): *see* sore mouth.

Ceadda, SAINT (7th-century English cleric): *see* Chad, Saint.

Ceanannus Mór, formerly KELLS, market town and urban district of County Meath, Ireland, on the River Blackwater. The town was originally a royal residence. In the 6th century it was granted to St. Columba and became a centre of learning. A bishopric was founded there about 807 and was united to that of Meath in the 13th century. The house of St. Columba, later converted into a church, was built about 807. Near the present church is a round tower, and there are several ancient crosses still standing in the locality. The Book of Kells, an illuminated copy of the Gospels in Latin and containing local records, was probably completed there in the 9th century. Preserved in the library of Trinity College, Dublin, it is one of the finest extant examples of Hiberno-Saxon manuscript art. The town's industries include the manufacture of computer cabinets. Pop. (1981) 2,623.

Ceanothus, genus of North American shrubs, of the buckthorn family (Rhamnaceae), com-

Ceanothus
J.M. Langham

prising about 55 species. The leaves are alternate or opposite. The very small blue or white flowers are borne in profuse, erect clusters.

Ceanothus americanus, commonly called New Jersey tea, occurs from Canada to Florida. During the American Revolutionary War, its leaves were used as a tea substitute. The plant grows about 1 m (3 feet) tall and has deciduous, rather oval leaves. The white flowers grow in a flat-topped cluster.

Ceanothus arboreus, called Catalina or felt-leaf ceanothus, an evergreen tree occurring on the islands off the coast of California, has leaves with a dark-green upper surface and a dense white pubescence beneath. The tree, 5–8 m (16–26 feet) high, bears fragrant blue flowers in the early spring.

List of Abbreviations

A.B.	bachelor of arts (Latin *artium baccalaureus*)
ac	acre(s)
Ac	actinium
AC	alternating current
A.C.T.	Australian Capital Territory
AD	in the year of the Lord (Latin *anno Domini*)
Adm.	Admiral
Afg.	Afghanistan
Ag	silver (Latin *argentum*)
AG	Limited-liability Company (German *Aktiengesellschaft*)
AH	in the year of the hijrah (hegira), or Muslim era (Latin *anno Hegirae*)
Al	aluminum, aluminium
Ala.	Alabama
Alb.	Albania
Alg.	Algeria
Alta.	Alberta
Am	americium
AM	before noon (Latin *ante meridiem*)
AM	amplitude modulation
A.M.	master of arts (Latin *artium magister*)
Ar	argon
Arg.	Argentina
Ariz.	Arizona
Ark.	Arkansas
As	arsenic
A.S.S.R.	Autonomous Soviet Socialist Republic
At	astatine
Au	gold (Latin *aurum*)
Aug.	August
b.	born
B	boron
Ba	barium
B.A.	bachelor of arts
BC	before Christ
B.C.	British Columbia
BCE	before the Christian era, or Common Era
Be	beryllium
B.Ed.	bachelor of education
Belg.	Belgium
Bi	bismuth
Bk	berkelium
Bol.	Bolivia
BP	before the present
B.Ph.	bachelor of philosophy
Br	bromine
Braz.	Brazil
Brig.	Brigadier
Brit.	British
B.S.	bachelor of science
B.Sc.	bachelor of science
Bulg.	Bulgaria
c.	about, approximately (Latin *circa*)
C	carbon; Celsius
Ca	calcium
Calif.	California
Can.	Canada
Capt.	Captain
Cb	columbium
C.B.	Companion of the Order of the Bath
C.B.E.	Companion of the Order of the British Empire
Cd	cadmium
Ce	cerium
CE	Christian era, Common Era
cf.	compare (Latin *confer*)
Cf	californium
cg	centigram(s)
ch.	chapter
C.H.	Member of the Order of Companions of Honour
Chron.	Chronicles (Bible)
Cia.	Company (Italian *Compagnia;* Portuguese *Companhia;* Spanish *Compañia*)
Cie.	Company (French *Compagnie*)
cl	centilitre(s)
Cl	chlorine
cm	centimetre(s)
Cm	curium
C.M.G.	Companion of the Order of St. Michael and St. George
CMSA	consolidated metropolitan statistical area
Co	cobalt
Co.	Company
Col.	Colonel; Colossians (Bible)
Colo.	Colorado
Colom.	Colombia
Comdr.	Commander
Comdt.	Commandant
Commo.	Commodore
Conn.	Connecticut
Cor.	Corinthians (Bible)
Corp.	Corporation
cos	cosine
cot	cotangent
Cr	chromium
Cs	cesium
csc	cosecant
cu	cubic
Cu	copper (Latin *cuprum*)
C.V.O.	Commander of the Royal Victorian Order
Czech.	Czechoslovakia
d.	died
Dan.	Daniel (Bible)
D.B.E.	Dame Commander of the Order of the British Empire
DC	direct current
D.C.	District of Columbia
D.C.M.G.	Dame Commander of the Order of St. Michael and St. George
D.C.V.O.	Dame Commander of the Royal Victorian Order
D.D.	doctor of divinity
Dec.	December
Del.	Delaware
Den.	Denmark
Deut.	Deuteronomy (Bible)
D.F.	Federal District (Spanish *Distrito Federal*)
D.Litt.	doctor of letters (Latin *doctor litterarum*)
Dom.Rep.	Dominican Republic
Dr.	Doctor
Dy	dysprosium
E	east
Eccles.	Ecclesiastes (Bible)
ed.	edited; edition; editor
Ed.B.	bachelor of education
eds.	editors
e.g.	for example (Latin *exempli gratia*)
E.Ger.	East Germany
Eng.	England; English
Eph.	Ephesians (Bible)
Er	erbium
Es	einsteinium
est.	estimate; estimated
Esth.	Esther (Bible)
et al.	and others (Latin *et alii,* or *aliae*)
et seq.	and following page(s) (Latin *et sequens, sequentes,* or *sequentia*)
etc.	and so forth (Latin *et cetera*)
Eth.	Ethiopia
Eu	europium
Ex.	Exodus (Bible)
Ezek.	Ezekiel (Bible)
F	Fahrenheit; fluorine
Fe	iron (Latin *ferrum*)
Feb.	February
ff.	and following pages
Fig.	Figure
Fin.	Finland
fl.	flourished (Latin *floruit*)
Fla.	Florida
Fm	fermium
FM	frequency modulation
Fr	francium
Fr.	France
ft	foot, feet
Ft.	Fort
g	gram(s)
Ga	gallium
Ga.	Georgia
gal	gallon(s)
Gal.	Galatians (Bible)
G.B.E.	Knight (or Dame) Grand Cross of the Order of the British Empire
G.C.B.	Knight (or Dame) Grand Cross of the Order of the Bath
G.C.M.G.	Knight (or Dame) Grand Cross of the Order of St. Michael and St. George
G.C.V.O.	Knight (or Dame) Grand Cross of the Royal Victorian Order
Gd	gadolinium
Ge	germanium
Gen.	General; Genesis (Bible)
Ger.	Germany
GmbH	Company with Limited Liability (German *Gesellschaft mit beschränkter Haftung*)
Guat.	Guatemala
h	hour
H	hydrogen
ha	hectare(s)
Ha	hahnium
Hab.	Habakkuk (Bible)
Hag.	Haggai (Bible)
He	helium
Heb.	Hebrews (Bible)
Hf	hafnium
Hg	mercury (Latin *hydrargyrum*)
HMS	His, or Her, Majesty's Ship, or Service
HMSO	His, or Her, Majesty's Stationery Office
Ho	holmium
Hos.	Hosea (Bible)
hr	hour(s)
Hung.	Hungary
I	iodine
ibid.	in the same place (Latin *ibidem*)
Ice.	Iceland
i.e.	that is (Latin *id est*)
Ill.	Illinois
in.	inch(es)
In	indium
Inc.	Incorporated
Ind.	Indiana
Indon.	Indonesia
Ir	iridium
Ire.	Ireland
Isa.	Isaiah (Bible)
Jam.	Jamaica
Jan.	January
Jer.	Jeremiah (Bible)
Josh.	Joshua (Bible)
Jr.	Junior
Judg.	Judges (Bible)
K	Kelvin; potassium (Latin *kalium*); Köchel catalog number
Kan.	Kansas
K.B.E.	Knight Commander of the Order of the British Empire
K.C.B.	Knight Commander of the Order of the Bath
K.C.M.G.	Knight Commander of the Order of St. Michael and St. George
K.C.V.O.	Knight Commander of the Royal Victorian Order
kg	kilogram(s)
KG	Limited Partnership (German *Kommandit Gesellschaft*)
K.G.	Knight of the Order of the Garter
KK	Limited-liability Company (Japanese *Kabushiki Kaisha*)
kl	kilolitre(s)
km	kilometre(s)
kph	kilometre(s) per hour
Kr	krypton
K.T.	Knight of the Order of the Thistle
Ky.	Kentucky
l	litre(s)
La	lanthanum
La.	Louisiana
Lam.	Lamentations (Bible)
lb	pound(s)
Lev.	Leviticus (Bible)
Li	lithium
Liech.	Liechtenstein
Lieut.	Lieutenant
LL.B.	bachelor of laws (Latin *legum baccalaureus*)
LL.D.	doctor of laws (Latin *legum doctor*)
log	logarithm
Lr	lawrencium
Ltd.	Limited
Lu	lutetium
Luxem.	Luxembourg
m	metre(s)
M.A.	master of arts
Maj.	Major
Mal.	Malachi (Bible)
Man.	Manitoba
Mass.	Massachusetts
Matt.	Matthew (Bible)
M.B.E.	Member of the Order of the British Empire
mbH	Limited, with Limited Liability (German *mit beschränkter Haftung*)
Md	mendelevium
Md.	Maryland
M.D.	doctor of medicine (Latin *medicinae doctor*)
Mex.	Mexico
mg	milligram(s)
Mg	magnesium
mi	mile(s)
Mic.	Micah (Bible)
Mich.	Michigan
Mij	Company (Dutch *Maatschappij*)
min	minute(s)
Minn.	Minnesota
Miss.	Mississippi
ml	millilitre(s)
Mlle	Mademoiselle
mm	millimetre(s)
Mme	Madame
Mn	manganese
Mo	molybdenum
Mo.	Missouri
Mong.	Mongolia
Mont.	Montana
Mor.	Morocco
MP	member of Parliament
mph	mile(s) per hour
Mr.	Mister
Mrs.	"Missus"
MS.	manuscript
M.S.	master of science
MSA	metropolitan statistical area
M.Sc.	master of science

Msgr.	Monsignor
MSS.	manuscripts
Mt.	Mount; Mountain(s)
mun.	municipality
MV	Motor Vessel
M.V.O.	Member of the Royal Victorian Order
N	nitrogen; north
Na	sodium (Latin *natrium*)
NA	National Association
Nah.	Nahum (Bible)
Nb	niobium
N.B.	New Brunswick
N.C.	North Carolina
n.d.	no date
Nd	neodymium
N.D.	North Dakota
Ne	neon
NE	northeast
Neb.	Nebraska
Neh.	Nehemiah (Bible)
Neth.	The Netherlands
Nev.	Nevada
Nfd.	Newfoundland
N.H.	New Hampshire
Ni	nickel
Nic.	Nicaragua
N.Ire.	Northern Ireland
N.J.	New Jersey
N.Kor.	North Korea
N.M.	New Mexico
no.	number
No	nobelium
Nor.	Norway
Nov.	November
Np	neptunium
NS	Nuclear Ship
N.S.	New Style (calendar); Nova Scotia
N.S.W.	New South Wales
N.Terr.	Northern Territory
Num.	Numbers (Bible)
NV	Limited-liability Company (Dutch *Naamloze Vennootschap*)
NW	northwest
N.W.Terr.	Northwest Territories
N.Y.	New York
N.Z.	New Zealand
O	oxygen
Obad.	Obadiah (Bible)
O.B.E.	Officer of the Order of the British Empire
Oct.	October
Okla.	Oklahoma
Ont.	Ontario
op.	opus
op. cit.	in the work cited (Latin *opere citato*, or *opus citato*)
Ore.	Oregon
Os	osmium
O.S.	Old Style (calendar)
oz	ounce(s)
p.	page
P	phosphorus
pA	Limited (Italian *per Azioni*)
Pa	protactinium
Pa.	Pennsylvania
Pak.	Pakistan
Pan.	Panama
Pb	lead (Latin *plumbum*)
Pd	palladium
P.E.I.	Prince Edward Island
Pet.	Peter (Bible)
pH	potential of hydrogen (acidity–alkalinity factor)
Ph.B.	bachelor of philosophy (Latin *philosophiae baccalaureus*)
Ph.D.	doctor of philosophy (Latin *philosophiae doctor*)
Phil.	Philippians (Bible); Philippines
Philem.	Philemon (Bible)
PLC	Public Limited Company
Pm	promethium
PM	afternoon (Latin *post meridiem*)
PMSA	primary metropolitan statistical area
Po	polonium
Pol.	Poland
pop.	population
Port.	Portugal
pp.	pages
Pr	praseodymium
P.R.	Puerto Rico
prelim.	preliminary
Pres.	President
Prov.	Proverbs (Bible)
Ps.	Psalms (Bible)
Pt	platinum
Pu	plutonium
qq.v.	which see (plural; Latin *quae vide*)
Que.	Quebec
Queen.	Queensland
q.v.	which see (singular; Latin *quod vide*)
R	Rankine
Ra	radium
Rb	rubidium
Re	rhenium
rev.	revised; revision
Rev.	Revelations (Bible); Reverend
Rf	rutherfordium
Rh	rhodium
R.I.	Rhode Island
Rn	radon
Rom.	Romania; Romans (Bible)
rpm	revolutions per minute
Rt. Rev.	Right Reverend
Ru	ruthenium
s	second
S	south; sulfur
S.	Saint (*san, santo, santa, sant'*)
S. of Sol.	Song of Solomon (Bible)
SA	Limited-liability Company (French *Société Anonyme;* Italian *Società Anònima;* Portuguese *Sociedade Anónima;* Spanish *Sociedad Anónima*)
S.Af.	South Africa
Sam.	Samuel (Bible)
Sask.	Saskatchewan
S.Aus.	South Australia
Sb	antimony (Latin *stibium*)
Sc	scandium
S.C.	South Carolina
Scot.	Scotland
SCSA	standard consolidated statistical area
S.D.	South Dakota
Se	selenium
SE	southeast
sec	secant; second(s)
Sept.	September
S.F.S.R.	Soviet Federated Socialist Republic
Si	silicon
sin	sine
S.Kor.	South Korea
Sm	samarium
SMSA	standard metropolitan statistical area
Sn	tin (Latin *stannum*)
SpA	Limited-liability Company (Italian *Società per Azioni*)
sq	square
Sr	strontium
Sr.	Senior
SS	Steamship
SS.	Saints; Saintliest, or Holiest (Italian *Santissimo, Santissima*)
S.S.R.	Soviet Socialist Republic
St.	Saint (*Sankt, Sint*)
Sta.	Saint (*Santa*)
Ste.	Saint (*Sainte*)
SW	southwest
Swed.	Sweden
Switz.	Switzerland
Ta	tantalum
tan	tangent
Tanz.	Tanzania
Tas.	Tasmania
Tb	terbium
Tc	technetium
Te	tellurium
Tenn.	Tennessee
Th	thorium
Thai.	Thailand
Thess.	Thessalonians (Bible)
Ti	titanium
Tim.	Timothy (Bible)
Tit.	Titus (Bible)
Tl	thallium
Tm	thulium
trans.	translated; translation; translator(s)
Tun.	Tunisia
Tur.	Turkey
U	uranium
U.A.E.	United Arab Emirates
U.A.R.	United Arab Republic
U.K.	United Kingdom
UN	United Nations
U.S.	United States
USGPO	United States Government Printing Office
USS	United States Ship
U.S.S.R.	Union of Soviet Socialist Republics
v.	versus (law)
V	vanadium
Va.	Virginia
Venez.	Venezuela
Vic.	Victoria
Vir.Is.	Virgin Islands
vol.	volume(s)
Vt.	Vermont
W	tungsten (wolfram); west
Wash.	Washington
W.Aus.	Western Australia
W.Ger.	West Germany
Wis.	Wisconsin
W.Va.	West Virginia
Wyo.	Wyoming
Xe	Xenon
Y	yttrium
Yb	ytterbium
yd	yard(s)
Yugos.	Yugoslavia
Zech.	Zechariah (Bible)
Zeph.	Zephaniah (Bible)
Zimb.	Zimbabwe
Zn	zinc
Zr	zirconium

Table of Measurement Conversions

To convert	Into	Multiply by
acres	hectares	0.40468564
Celsius (centigrade)	Fahrenheit	$(C° \times 9/5) + 32$
centimetres	inches	0.3937008
cubic feet	cubic metres	0.028316847
cubic metres	cubic feet	35.31467
Fahrenheit	Celsius (centigrade)	$5/9(F° - 32)$
feet	metres	0.3048
gallons (U.S. liquid)	litres	3.785412
grams	ounces (troy)	0.032150747
hectares	acres	2.471054
inches	centimetres	2.54
inches	millimetres	25.4
kilograms	pounds	2.2046226
kilometres	miles (nautical)	0.5399568
kilometres	miles (statute)	0.6213712
litres	gallons (U.S. liquid)	0.26417205
metres	feet	3.2808399
metres	yards	1.093613298
miles (nautical)	kilometres	1.852
miles (statute)	kilometres	1.609344
millilitres	ounces (U.S. fluid)	0.03381402
millimetres	inches	0.03937008
newtons	pounds (of force)	0.224809
ounces (troy)	grams	31.1034768
ounces (U.S. fluid)	millilitres	29.57353
pounds	kilograms	0.45359237
pounds (of force)	newtons	4.44822
square kilometres	square miles	0.38610216
square miles	square kilometres	2.58998811
yards	metres	0.9144